

Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix B

Fiscal Years 2017 – 2021

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APPENDIX B

DETAILED PROGRAM PLAN DATA

Appendix B provides detailed information about planned capital investments in the 5 year window of the plan. Each year, these details are updated to reflect any program changes.

ACTIVITIES AND BUDGET LINES

The structure of Appendix B follows the structure presented in the FY 2017 President's Budget Request. Budget Activities group together budget line items (BLI) with similar objectives. There are 6 budget activities in the FAA Facilities & Equipment (F&E) account for capital spending including engineering development, air traffic investments, other FAA investments, support contracts, personnel costs, and subscription and other services. Activity 5, personnel costs, is not discussed. The BLI shown within each budget activity provide a detailed description for each program. In some BLIs, related programs are shown and described together within a single write-up. This occurs when individual programs have the same overall objective (e.g. data communications) but each addresses a different aspect of the solution. Note that programs with planned funding beginning after FY 2017, while not included in the President's Budget, are included in the CIP and are designated with an "X" in the BLI number or before the CIP title.

PROGRAM DESCRIPTION

The program scope and purpose is provided in this section. Some programs may have distinctly different activities included within the overall program write-up. In this case, each program activity will be separately described and have its own Performance Output Goals.

ALIGNMENT OF PROGRAM TO FAA STRATEGIC PRIORITY AND PERFORMANCE METRIC

Each program in the CIP is aligned with a single Strategic Priority and Performance Metric. The Strategic Priorities are part of the framework for strategic planning and the metrics are based on the approved Agency Organization Success Indicators (OSI). The FAA specific metrics in the DOT strategic plan are included in the OSI metrics. To align all programs to an appropriate metric, some business planning metrics have also been included. Some programs, as a bi-product, may contribute to other metrics, but to maintain focus on the single performance metric these secondary contributions are not described.

RELATIONSHIP TO PERFORMANCE METRIC

This section describes how the new system, service or capability provided by this program contributes to the selected Performance Metric. If available, quantifiable information has been provided. This section may also highlight how NAS safety or operations will change as a result of the new system, service or capability.

PERFORMANCE OUTPUT GOALS

Output goals are the specific accomplishments, deliverables or work products that will be delivered for each year within the 5 year window of the plan. "None" indicates that no funding is planned for that year. Programs baselined for cost, schedule and performance have specific approved Acquisition Program Baseline (APB) milestones that are tracked for accomplishment and included as output goals. The FAA F&E appropriation can be obligated for up to 2 years after the year appropriated (funds available for 3 years). Program milestones and deliverables shown as output goals beyond the last year of planned funding are marked as "prior year funding".

SYSTEM IMPLEMENTATION SCHEDULE

A schedule is provided for programs deploying systems or upgrades into the NAS. When available, other information will also be provided to indicate how long the system will be in operation or when a system will be decommissioned. The schedule legend is as follows:

Upgrades
Development
Implementation
Operational
Decommissioning
Continued



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ACTIVITY 1: ENGINEERING, DEVELOPMENT, TEST, AND EVALUATION

1A01, ADVANCED TECHNOLOGY DEVELOPMENT AND PROTOTYPING (ATDP)

FY 2017 Request \$24.8M

- A, Runway Incursion Reduction Program (RIRP) – ATDP, S09.02-00
- B, Operations Concept Validation and Infrastructure Evolution – ATDP, M08.29-00
- C, Major Airspace Redesign – ATDP, M08.28-04
- D, Strategy and Evaluation – ATDP, M46.01-01
- E, Dynamic Capital Planning, M47.01-01
- F, Operational Analysis and Reporting System (OARS), M08.32-03
- G, Operations Network (OPSNET) Replacement – ATDP, A37.01-01
- H, Operational Modeling Analysis and Data, M52.01-01

A, Runway Incursion Reduction Program (RIRP) – ATDP, S09.02-00

Program Description

The RIRP will continue research, development, and operational evaluation of technologies to increase runway safety. Consistent with standing National Transportation Safety Board recommendations, research emphasis will remain on technologies that provide direct safety indications and alerts to pilots at large airports, as well as, those that can be applied cost effectively at small to medium airports. The program will test alternative airport surface detection technology and the application of these technologies for pilot, controller, and vehicle operator situational awareness tools. Current initiatives include the development and operational testing of the Small Airport Surveillance Sensor (SASS), Runway Safety Assessment (RSA) studies, Enhanced Final Approach Runway Occupancy Signal (eFAROS) evaluations, and the removal of the Low Cost Ground Surveillance (LCGS) pilot sites. When appropriate, investment analyses will be performed to support acquisition and implementation of selected solutions.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 4 – Reduce Category A & B (most serious) runway incursions to a rate of no more than 0.395 per million operations, and maintain or improve through FY 2018.*

Relationship to Performance Metric

The program is developing and testing technologies that provide direct and preventive alerts to pilots and vehicle operators to reduce both the frequency and risk of runway incursions. Much of the program's research emphasis is based on studies that show that direct pilot and vehicle warning mechanisms are the best defense against the most serious runway conflicts. For example, initial operational evaluations of Runway Status Lights (RWSL) technology have yielded a reduction in runway incursions of up to 70% at the test runways. Other RIRP technology development initiatives will explore other technologies that further support the performance metric.

Program Plans FY 2017 – Performance Output Goals

- Complete annual technical and operational evaluation report of existing RIRP prototype systems.
- Complete annual report documenting results of human-in-the-loop (HITL) testing Human Factors (HF), safety logic, aircraft performance, or any uncertainty or deficiency pertaining to surface based Runway Incursion (RI) indications.
- Complete annual report on testing of safety logic enhancements to RI detection and prevention products.
- Complete report documenting candidate site selection for a system to test the utilization of a SASS as a sensor to drive the activation of direct to pilot alerting safety logic.
- Complete report on integration of a system to test the utilization of a SASS as a sensor to drive the activation of direct to pilot alerting safety logic.
- Publish the initial Project Plan and Resource Management Plan (RMP) for the utilization of an advanced ground surveillance sensor to drive the activation of direct to pilot alerting safety logic.

Program Plans FY 2018 – Performance Output Goals

- Complete annual technical and operational evaluation report of existing RIRP prototype systems.
- Complete annual report documenting results of HITL testing HF, safety logic, aircraft performance, or any uncertainty or deficiency pertaining to surface based RI indications.
- Complete annual report on testing of safety logic enhancements to RI detection and prevention products.
- Complete report on results of initial shadow operations testing for the utilization of a SASS as a sensor to drive the activation of direct to pilot alerting safety logic.
- Complete report documenting candidate site selection for a system to test the utilization of an advanced ground surveillance sensor to drive the activation of direct to pilot alerting safety logic.
- Complete report on integration of a system to test the utilization of an advanced ground surveillance sensor to drive the activation of direct to pilot alerting safety logic.

Program Plans FY 2019 – Performance Output Goals

- Complete annual technical and operational evaluation report of existing RIRP prototype systems.
- Complete annual report documenting results of HITL testing HF, safety logic, aircraft performance, or any uncertainty or deficiency pertaining to surface based RI indications.
- Complete annual report on testing of safety logic enhancements to RI detection and prevention products.
- Complete annual report documenting results of using a SASS as a sensor to drive the activation of direct to pilot alerting safety logic.
- Complete report on results of initial shadow operations testing for the utilization of an advanced ground surveillance sensor to drive the activation of direct to pilot alerting safety logic.
- Complete preliminary report on Digital-Lighting Application (surveillance integration).

Program Plans FY 2020 – Performance Output Goals

- Complete annual technical and operational evaluation report of existing RIRP prototype systems.
- Complete annual report documenting results of HITL testing HF, safety logic, aircraft performance, or any uncertainty or deficiency pertaining to surface based RI indications.
- Complete annual report on testing of safety logic enhancements to RI detection and prevention products.
- Complete annual report documenting results of using a SASS as a sensor to drive the activation of direct to pilot alerting safety logic.
- Select site, complete SRMD, and initiate operational evaluation of an advanced ground surveillance sensor to drive the activation of direct to pilot alerting safety logic.
- Complete final report on Digital-Lighting Application (surveillance integration).

Program Plans FY 2021 – Performance Output Goals

- Complete annual technical and operational evaluation report of existing RIRP prototype systems.
- Complete annual report documenting results of HITL testing HF, safety logic, aircraft performance, or any uncertainty or deficiency pertaining to surface based RI indications.
- Complete annual report on testing of safety logic enhancements to RI detection and prevention products.
- Complete annual report documenting results of using a SASS as a sensor to drive the activation of direct to pilot alerting safety logic.
- Initiate Technical Transfer of SASS technology to ATO Program Management Office (PMO).
- Complete operational evaluation of an advanced ground surveillance sensor to drive the activation of direct to pilot alerting safety logic.

B, Operations Concept Validation and Infrastructure Evolution – ATDP, M08.29-00

Program Description

Developing operational concepts is the first step in developing an Enterprise Architecture. This program develops and validates NAS level operational concepts that are key to the FAA modernization programs and the Next Generation Air Transportation System (NextGen). This program conducts the overall analysis and planning for NAS evolution by determining the required annual updates to the following NAS Enterprise Architecture products: Operational Improvements, Operational Sustainment and Operational Requirements. It executes research, engineering analysis, and evaluation in support of mission analysis and investment analysis. This program conducts shortfall analyses as part of service analysis and ensures the linkage of proposed solutions back to validated operational needs to support budget planning and investment decisions. This program develops and maintains detailed second level concepts that support validation and requirements development. This work ensures that the NAS level operational concept and sustainment activities are integrated and consistent with the overall NAS Enterprise Architecture. This project also supports the development and sustainment of analytical and computer models used to assess and validate operational changes to the NAS. Specifically, the program supports the following activities:

- Conduct analyses to support assessments of new air traffic control operational concepts;
- Develop common concept development, validation, and measurement methodologies to support Single European Sky ATM Research (SESAR) Joint Undertaking;
- Develop concepts of use to describe the operational use of new communication, navigation, automation, surveillance and flight deck capabilities;
- Produce reports on concept development and validation findings including 2nd-level concepts, fast-time analyses and human-in-the-loop real time studies; and
- Develop operational, information and performance requirements.

This program contributes to the FAA’s support for the RTCA, a non-profit association that develops standards based on manufacturers, government, and aviation operator inputs. RTCA also recommends operational improvements to increase the efficiency of air transportation.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Concept validation supports development, analysis, and simulation of new concepts to assess requirements and to evaluate the impact of the concept on system capacity, efficiency, safety and human performance. Evaluation criteria to include the following:

- Determine impact/improvement to Air Traffic Service Providers and airspace users from automation that could increase capacity;
- Determine impact/improvement to airspace structure which may increase productivity and hence capacity;
- Determine impact/improvement from communication, navigation, and surveillance requirements that support the FAA's efforts to reduce cost, increase capacity and efficiency; and
- Determine impact/improvement from changes to automation, display, and facility configuration elements designed to increase productivity and hence capacity.

Program Plans FY 2017-2021 – Performance Output Goals

- Develop annual updates to the NAS Enterprise Level Operational Requirements based on prior year research and development.
- Develop annual updates to the NAS Enterprise Architecture for NAS level Operational Improvements and operational sustainment activities based on prior year research and acquisition decisions.
- Conduct concept engineering activities and develop concept engineering/requirements validation artifacts, such as shortfall analyses, concept of operations, requirements, technical assessments, and evaluation documents.
- Develop technical papers and reports in support of RTCA, the premier public-private partnership forum to develop consensus among aviation stakeholders across the globe. These artifacts include safety and performance requirements, operational services and environment definitions, minimum aviation system performance standards, minimum operational performance standards, and other reports as necessary.
- Support NAC priorities through various activities, such as:
 - Monitor and report on current commitments as outlined in the Joint Implementation Plan and updated in October 2015;
 - Develop a traffic flow management strategy to maintain capacity during PBN operations commensurate with the FAA's implementation of the PBN Navigation Strategy; and
 - Review and assess FAA operational increments for NextGen planning commensurate with the FAA's NextGen Vision.

C, Major Airspace Redesign – ATDP, M08.28-04

Program Description

The Major Airspace Redesign program supports increased efficiency and enhanced safety by funding physical changes in facilities necessary to accommodate airspace redesign. Implementation of an airspace redesign frequently results in changes to the number and span of control of operational positions or sectors, including changes to sector, area or facility boundaries. Transition to a new configuration resulting from airspace redesign requires changes in the supporting infrastructure. These infrastructure changes can include:

- Radio frequencies connecting a radio site to a control facility,
- Position to position connectivity,
- Surveillance infrastructure modifications to ensure proper radar coverage;
- Automation modifications to facility data and flight data processing;
- Inter-facility communication modifications;
- Additional consoles and communication backup needs; and
- Modifications to facility power and cabling.

The FAA prioritizes candidate airspace redesign projects to determine which projects provide the most benefits and develops criteria for assessing a project's system-wide impact. Airspace redesign efforts seek to optimize Terminal, En Route and Oceanic airspace by redesigning airspace via projects in major metropolitan areas with critical system wide impacts. Modernization of airspace through the Major Airspace Redesign Program is characterized by the migration from constrained ground-based navigation to the freedom of an Area Navigation / Required Navigation Performance based system. Airspace redesign efforts will modernize airspace in support of the full utilization of NextGen capabilities.

The program also supports the use of risk management and collaborative evaluation capabilities to identify requirements, opportunities and threats in the early stages of the design process.

Near term Airspace Redesign funding will be used in support of airspace projects, including but not limited to, the Palm Beach International TRACON / Airspace Expansion Project and Miami (ZMA) Oceanic and San Juan (ZSU) airspace. Future funding will be directed at operationally selected terminal airspace that would benefit from redesign. Any necessary sector or route changes associated with redesign cannot be implemented without support from this program, which makes the infrastructure changes needed to allow improvements in the efficient use of that airspace. Those changes require engineering, analytical and technical support of this program for safe and effective implementation.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Airspace Redesign will increase system efficiency by reducing limitations that the airspace places on the system. Congestion, complexity and limited departure points in the current airspace can result in restrictions, limiting airport throughput. Airspace redesign addresses large, complex, multi-facility changes impacting NAS performance.

Program Plans FY 2017 – Performance Output Goals

- Conduct engineering analysis as needed for Caribbean airspace redesign implementation.
- Implement infrastructure changes resulting from airspace redesign.

Program Plans FY 2018 – Performance Output Goals

- Conduct engineering analysis as needed for Caribbean airspace redesign implementation.
- Implement infrastructure changes resulting from airspace redesign.

Program Plans FY 2019-2021 – Performance Output Goals

- Conduct engineering analysis for airspace redesign implementation.
- Implement infrastructure changes resulting from airspace redesign.

D, Strategy and Evaluation – ATDP, M46.01-01

Program Description

The Strategy and Evaluation program develops and maintains mathematical models of the NAS which are used to help guide NextGen investments and other FAA enterprise-wide analyses. FAA's modeling suite includes models of varying scope, from systems dynamics models of the entire air transportation system to detailed airport surface models.

Several of the existing models have become obsolete and cannot support the analysis of advanced Air Traffic Management (ATM) concepts. The Strategy and Evaluation program has been developing two new computer models to rectify these shortfalls. These models are being used to aid organizations throughout the FAA with analyses of proposed new investments, trade-off studies, and analyses of the impacts of changes in operational conditions (e.g., weather, air carrier schedules, commercial space operations, etc.) on NAS performance.

1. A System-Wide NAS Model is being developed to replace the existing National Airspace System Performance Analysis Capability (NASPAC) model. This new system-wide model is required to analyze advanced ATM concepts and aid with NextGen program trade-off studies, investment analyses, and NAS performance analyses. The model adds enhancements to the initial model as they are completed. The new

model, known as the System-Wide Analysis Capability (SWAC), is currently being used by FAA and contractors to support ongoing analyses.

2. An Airport Capacity Model is being developed for use in analyzing new airport capacity-related projects. The model will facilitate rapid analysis of airport improvements, the impact of air travel demand changes, and ATM technology insertions. It will support runway capacity studies, investment analyses, NextGen analyses, and the evaluation of airport infrastructure changes. This model provides a de facto standard for airport capacity analyses.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

In order to achieve this and other capacity metrics, the FAA is making a major long-term investment in the NextGen program; a wide-ranging transformation of the air transportation system. Numerous cost-benefit and engineering trade studies are required to support this complex undertaking. New models will be used for evaluating proposed operational improvements such as optimized profile descents, oceanic in trail procedures, trajectory-based operations, surface traffic management, collaborative ATM, closely-spaced parallel operations, advanced Required Navigation Performance (RNP) procedures, etc. New and improved models are needed to provide the analytical capabilities required to support these NAS improvements and help us realize our capacity objectives.

Program Plans FY 2017 – Performance Output Goals

- Delivery of new SWAC executable software integrating the FAA Air Traffic Organization's near-term traffic forecasts.
- Delivery of new SWAC executable software containing an initial model for addressing commercial space activities in the NAS.
- Delivery of new ADSIM+ executable software incorporating wake mitigation modeling.
- Delivery of new ADSIM+ executable software integrating time-based airport configuration definition to the delay model.

Program Plans FY 2018 – Performance Output Goals

- Delivery of new SWAC executable software incorporating advanced RNP concepts (e.g., dynamic RNP).
- Delivery of new SWAC executable software integrating the ATO gate assignment model.
- Delivery of new SWAC executable software with an improved commercial space model.
- Delivery of new ADSIM+ executable software improving the blocking rule-set used to limit inter-aircraft interactions based upon wingspan and available space.
- Delivery of new ADSIM+ executable software improving the strategy rules-set used by an individual aircraft to guide response when airport resources are blocked by other aircraft.

Program Plans FY 2019 – Performance Output Goals

- Delivery of new SWAC executable software integrating Base of Aircraft Data (BADA) version 4.0.
- Delivery of new SWAC executable software capable of interacting with Geographical Information System (GIS).
- Delivery of new ADSIM+ executable software capable of generating and creating user-defined scenarios and applications.
- Delivery of new ADSIM+ executable software with an enhanced Graphical User Interface (GUI).

Program Plans FY 2020 – Performance Output Goals

- Delivery of new SWAC executable software updating the integration of Base of Aircraft Data (BADA) version 4.0.
- Delivery of new SWAC executable software updating the interface with Geographical Information System (GIS).
- Delivery of new ADSIM+ executable software updating the capability to generate user-defined scenarios and applications.
- Delivery of new ADSIM+ executable software with an enhanced Graphical User Interface (GUI).

Program Plans FY 2021 – Performance Output Goals

- Delivery of new SWAC executable software with initial capability of enhanced airport representation.
- Delivery of new SWAC executable software with enhanced command line interface.
- Delivery of new ADSIM+ executable software with disaggregation of gate nodes and taxi-path cloning model.
- Delivery of new ADSIM+ executable software with an application program interface for integrating with NAS-wide models.

E, Dynamic Capital Planning, M47.01-01

Program Description

The Dynamic Capital Planning tools and support will allow FAA to make optimal decisions based on best business practices. These tools and support will provide verification that disciplined management of capital programs continues to be carried out. This program provides financial analysis tools and support for ongoing evaluation, tracking, and reporting of capital programs throughout the acquisition life cycle.

Dynamic Capital Planning supports FAA acquisition programs by:

- Validating quantitative and qualitative economic value and internal benefits for capital programs;
- Tracking NAS Plan schedules for all Capital Programs;
- Comparing financial performance to approved baselines for all major programs;
- Milestone tracking and schedule modeling;
- Tracking field implementation status of all NAS programs by site;
- Earned value monitoring through program life cycle;
- Post implementation analysis for corporate lessons; and
- Capitalizing NAS Plan installed equipment including disposal of retired assets in financial statements.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 8 – 90% of major baselined acquisition programs must be maintained within 10% of their current acquisition cost, schedule and technical performance baseline as of the end of fiscal year 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

Dynamic Capital Planning helps capital programs maintain baselines by providing program tracking and analysis which leads to better baseline investment decisions and early identification of programs that are not performing so that corrective actions can be implemented.

Program Plans FY 2017-2021 – Performance Output Goals

- Complete monthly Capitalization report.
- Complete monthly program baseline status report.

F, Operational Analysis and Reporting System (OARS), M08.32-03

Program Description

The Air Traffic Organization's (ATO) Operational Analysis and Reporting System (OARS) will provide a predictive approach to identifying and managing NAS-wide safety trends and emerging risks before they result in accidents or incidents. This initiative will deliver a suite of analytical capabilities and user interfaces to achieve the next level of safety required to support the introduction of NextGen technologies, operational concepts, and procedures into the NAS and to enhance the ATO's Safety Management System (SMS).

In order to identify safety trends and emerging risks, the ATO collects and analyzes operational data to identify and classify potential hazards. The results of these analyses are used to make decisions on how to best mitigate any unacceptable potential safety risks. OARS will provide the ATO with near real time automated data sharing capability among legacy and future systems, databases, and tools utilized for safety risk analysis across the NAS. By facilitating automated data sharing, OARS will provide the end-user with quick and easy access to consistent, accurate and timely data and allow more efficient, comprehensive, and proactive analyses of risk in the NAS.

OARS will be a centralized platform for ATO data distribution, fusion of data from multiple locations, and data warehousing. It will be an integrated suite of interconnected databases and applications. OARS will be one system comprised of centralized hardware and software consisting of commercial off the shelf (COTS) technology when possible. OARS will also leverage technology from existing FAA systems such as the System-Wide Information Management (SWIM) system and the FAA Telecommunications Infrastructure (FTI).

Functionally, OARS will: (1) Directly support the ATO's safety core business functions by integrating all ATO domains to identify, create, standardize, analyze, assess, and disseminate safety data throughout ATO and external organizations; and (2) Integrate with operational NAS systems to ensure that the information required to successfully implement the SMS is readily available, not only for component-level safety assessments, but for an integrated system safety approach.

The OARS Program achieved a successful Investment Analysis Readiness Decision (IARD) in FY 2015. The Initial Investment Decision (IID) is planned for 3rd quarter, FY 2016. The Final Investment Decision (FID) is planned in 4th quarter, FY 2017.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 5 – Reduce risks in flight by limiting the rate of the most serious losses of standard separation to 20 or fewer for every thousand (.02) losses of standard separation within the National Airspace System.*

Relationship to Performance Metric

To achieve the next level of safety, the traditional methods of identifying losses of separation and other hazardous events are not sufficient; the FAA must identify safety risks before they result in hazardous events. OARS will allow the FAA to identify the high risk events for all phases of flight. This data will be used to identify corrective action plans to mitigate potential high risk events in the NAS before they occur. This will allow the strategic management of equipment and personnel resources in prioritizing efforts to obtain maximum safety improvements utilizing the most cost effective approach.

Program Plans FY 2017 – Performance Output Goals

- Complete development of the following products in support of the FID:
 - Final Program Requirements documentation;
 - Enterprise Architecture Artifacts;
 - Business Case documentation;
 - Finalized Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve a JRC FID.

Program Plans FY 2018 – Performance Output Goals

- Pending JRC approval:
 - Award Development Contract.
 - Begin System Development and Integration.

Program Plans FY 2019-2021 – Performance Output Goals

- Output goals will be determined at FID.

G, Operations Network (OPSNET) Replacement – ATDP, A37.01-01

Program Description

Accurate NAS metrics are needed to evaluate and improve the FAA's management of the NAS. The current Operations Network (OPSNET) is the official FAA system for collecting and reporting flight operations count and delay metrics. The OPSNET system measures the number of delays attributable by cause and includes weather, air traffic volume, equipment status, and runway conditions. Identifying all delays and attributing causal-factors is necessary to identify capacity-constraining scenarios, develop mitigation strategies, and improve efficiency of NAS operations. The OPSNET system provides automated facility-level flight-operations counts by user classification including air carrier, air taxi, general aviation, and military for FAA towered airports, TRACONs, and ARTCCs, whereas Federal contract towers provide manual traffic counts. Primary uses of OPSNET include the Administrator's weekly NAS performance status report (the S-1 Report), measurement of post-implementation NextGen improvements, facility classifications, workforce planning, and performance analysis among the aviation community.

Few modifications have been made to OPSNET over the past 25 years and the system possesses significant limitations. Categories of current limitations include: Data Accuracy and Completeness, Information Availability, Data Input/System, and Data Harmonization. The reported delay data does not provide a comprehensive picture of delays and differs from the airline delay data reported to the Department of Transportation. The current collection of Delay Data is not fully automated, the storage capabilities are limited, and the system cannot easily adapt to regulatory changes.

The OPSNET Replacement program will expand the collection and recording of delay capabilities to improve reporting and it will provide a system that limits manual data entry and automates compilation of operational data received from FAA automation systems. These improvements, along with increased accuracy in reporting, will enable the FAA and the aviation community to measure causes of delay by phase of flight to improve air traffic operational services and procedures. By improving definitions for measuring NAS performance, and in coordination with the aviation community, the definition of the reported metrics can be standardized. Having accurate, standardized metrics for reporting will enable improved benchmarking and more accurate forecasting to facilitate analysis of NAS performance.

OPSNET Replacement Investment Analysis Readiness Decision (IARD) is planned for FY 2017; the Initial Investment Decision (IID) is planned for FY 2018; and the Final Investment Decision (FID) is planned for FY 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Target

Benefits include improved reliability in the reporting of operations data, reduced ATC workload of data input through automation systems and better reporting of NextGen performance metrics. Analysis and reporting provided by the OPSNET Replacement may identify opportunities for changes to NextGen Operational Improvements that allow more efficient use of NAS airspace.

Program Plans FY 2017 – Performance Output Goals

- Complete the following products in support of the IARD:
 - Final Shortfall Analysis Quantification
 - Solution Concept of Operations
 - Functional Analysis
 - Enterprise Architecture Products
 - Preliminary Program Requirements
- Achieve IARD.
- Complete the following products in support of the IID:
 - Initial Program Requirements
 - Business Case Analysis Report (BCAR)
 - Enterprise Architecture Products
- Conduct Market Research.

Program Plans FY 2018 – Performance Output Goals

- Complete the Initial Implementation Strategy and Planning Document (ISPD).
- Complete the Final Investment Analysis Plan.
- Achieve IID.
- Complete the following products in support of the FID:
 - Final Program Requirements (fPR) Document
 - Enterprise Architecture Products
 - Business Case documentation
 - Final Implementation Strategy and Planning Document (ISPD)
 - Acquisition Program Baseline (APB) (Execution Plan)
- Achieve FID.

Program Plans FY 2019 – Performance Output Goals

- Complete Activities to Award Contract and Enter Solution Implementation:
 - Award Contract
 - Produce the System Specification Document
 - Complete System Design Reviews
 - System Development and Integration
- Other output goals will be determined at FID.

Program Plans FY 2020 – Performance Output Goals

- Complete the following and achieve In-Service Decision:
 - Stakeholder Coordination and Review
 - Operational Testing
 - Information System Security Authorization

Program Plans FY 2021 – Performance Output Goals

- Conduct Post-Implementation Review Operational Analysis.

H, Operational Modeling Analysis and Data, M52.01-01

Program Description

The Operational Modeling Analysis and Data program provides support to NAS performance analysis by improving the datasets and other tools used to assess the performance of the NAS as a whole, and its component parts. Many ATO operational units model and analyze NAS data to support operational and capital investment planning. A previous study of FAA-wide operational databases identified a shortfall in available analytical products. The study recommended that the FAA create a database to capture operational events associated with individual flights to improve the timeliness and reduce the cost of operational analyses. Because most strategic and planning activities rely upon data analysis or modeling, other programs will also benefit from the products developed by this program.

This program will develop an analytics database that provides standardized operational events data on a per-flight basis and by facility (e.g. airport). The initial analytics database will be based on currently available operational data. As new operational data becomes available, this program will evaluate and integrate the new data.

The following products are planned:

- An analytics database that provides operational events data on a per-flight basis;
- An analytics database that provides operational events data by facility;
- Operational efficiency and performance reporting tools developed from data collected in the analytics databases; and
- Tools that provide reliable and comprehensive extraction of data from repositories of operational data.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Operational modeling and analysis are used by the ATO to understand the causes of delay, which are usually related to capacity constraints. Models are also essential tools for estimating the improvement to NAS performance resulting from capacity-enhancing programs. This program will allow the ATO to determine the potential benefits of capacity initiatives and help in choosing the most promising investments to expand capacity.

Program Plans FY 2017 – Performance Output Goals

- Award contract for Analytics Database.
- Develop means for analyzing and modeling fix capacity.
- Develop and publish Release 1 of Analytics Database (combined flight and track data).

Program Plans FY 2018 – Performance Output Goals

- Develop and publish Release 2 of Analytics Database (National Traffic Management Log (NTML) and weather data added).
- Develop analysis methodology for weather delay and efficiency.

Program Plans FY 2019 – Performance Output Goals

- Complete requirements definition for surface data capture tool.
- Develop and publish Release 3 of Analytics Database (Data Comm added).

Program Plans FY 2020 – Performance Output Goals

- Develop and publish Release 4 of Analytics Database (combined surface data added).

Program Plans FY 2021 – Performance Output Goals

- Develop and publish Release 5 of Analytics Database.

1A02/1A03, WILLIAM J. HUGHES TECHNICAL CENTER LABORATORY IMPROVEMENT

FY 2017 Request \$1.0M

FY 2017 Request \$19.0M

William J. Hughes Technical Center Laboratories, F14.00-00

Program Description

The William J. Hughes Technical Center (WJHTC) Laboratories program provides for the sustainment and modernization of FAA’s centralized NAS laboratories located in Atlantic City, NJ. These laboratory facilities with supporting infrastructure provide an integrated platform for research, development, test, evaluation, and operational field support for all NAS and NextGen acquisition programs within the FAA. These laboratories are used to support development and test of prototype systems and NextGen solutions for integration into the NAS. Once operational, these systems become part of the FAA’s laboratories and are used for future development, system upgrades, and testing necessary to support operational field sites. Sustaining these laboratories in system configurations and capabilities that match field sites is critical to providing around the clock operational support to En Route, Terminal, and other ATC facilities.

Testing and support facilities include:

- En Route System Support Facility;
- Terminal System Support Facility;
- Oceanic System Support Facility;
- Traffic Management Systems;
- Weather Systems;
- Communications Systems;
- Radar Systems;
- Navigation and Tracking Systems;
- Target Generator Facility;
- Cockpit and Tower Simulation Facilities;
- Human Factors Laboratory; and
- Flying Laboratories which are specially instrumented test aircraft.

The program uses shared support services to sustain the operation of the laboratories, including infrastructure engineering, flight test support, technical services, laboratory networking, configuration management, test and simulation services, laboratory maintenance, scheduling support for multi-user laboratories, and laboratory management. The program provides for the hardware and software licenses and maintenance agreements for the NAS equipment and supporting infrastructure in the laboratories.

The Laboratory Services Division maintains a Space and Infrastructure Master Plan that provides for consolidation and segregation of Operational (Priority One) systems, isolating batteries in the labs containing electrolytes, reconfiguring laboratories to provide space for new labs, grouping equipment with similar functions, and ensuring the continuity of operations for the laboratory systems. Operational Priority One systems require an infrastructure that supports a 24/7 environment with resiliency provisions. Implementation of these type of projects will be conducted over 5 phases from FY 2016 through 2020.

This program also provides for the NAS Modernization of laboratory infrastructure and equipment by providing life-cycle replacement or upgrades of items, such as transient voltage surge suppression, raised floors, electrical distribution panels, power monitoring in electrical distribution panels, computer air conditioning units, main lighting panels, and computer room air conditioning monitoring systems.

This program is registered to the ISO 9001:2008 standard for its processes and procedures in the management of computer systems laboratories in support of the NAS. This ensures that the laboratories are operated at their optimal level of efficiency, meeting customer requirements, maintaining scope and schedule, and continually improving.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

These centralized laboratories at the WJHTC serve as FAA's research, development, testing, evaluation, and operational field support. With centralization of the laboratories, programs do not need to establish and maintain separate laboratory facilities to support research, development, test, evaluation, and field support. Having centralized laboratories enables the FAA to evaluate concepts and programs that span more than one domain and integrate NextGen solutions into the NAS. This reduces the overall cost to the FAA, helps critical acquisition programs maintain cost and schedule targets, and improves the overall operational efficiency of the agency.

Program Plans FY 2017 – Performance Output Goals

- Implement the 2nd phase of the Space and Infrastructure Master Plan that reconfigures the labs and consolidates and segregates the priority one systems. Implementation projects include Weather systems consolidation area phase 1 of 2, installation of Terminal Flight Data Manager (TFDM), and relocation of Automatic Dependent Surveillance Broadcast (ADS-B).
- Complete a performance assessment of the laboratory management support services including engineering, configuration management, system design and installation, data management, and technical support services for NAS and NextGen programs.
- Complete 80% of the Quality Goals as part of the WJHTC Laboratory's ISO 9001:2008 quality management system. Validate by passing an independent audit.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete installation of Traffic Flow Production Control Emergency Power-Off & Fire Suppression system.
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2017.

Program Plans FY 2018 – Performance Output Goals

- Implement the 3rd phase of the Space and Infrastructure Master Plan that reconfigures the labs and consolidates and segregates the priority one systems. Implementation projects include Weather systems consolidation area phase 2 of 2, reconfiguration lab system manager areas, finalization of the Priority One Rack Room design, and installation of Common Support Services-Weather (CSS-WX).
- Complete a performance assessment of the laboratory management support services including engineering, configuration management, system design and installation, data management, and technical support services for NAS and NextGen programs.
- Complete 80% of the Quality Goals as part of the WJHTC Laboratory's ISO 9001:2008 quality management system. Validate by passing an independent audit.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2018.

Program Plans FY 2019 – Performance Output Goals

- Implement the 4th phase of the Space and Infrastructure Master Plan that reconfigures the labs and consolidates and segregates the priority one systems. The projects include the relocation of the NextGen Integration & Evaluation Capability (NIEC), expansion of the Unmanned Aircraft Systems (UAS) lab, and relocation of the Target Generation Facility.
- Complete a performance assessment of the laboratory management support services including engineering, configuration management, system design and installation, data management, and technical support services for NAS and NextGen programs.
- Complete 80% of the Quality Goals as part of the WJHTC Laboratory’s ISO 9001:2008 quality management system. Validate by passing an independent audit.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2019.

Program Plans FY 2020 – Performance Output Goals

- Implement the 5th phase of the Space and Infrastructure Master Plan that reconfigures the labs and consolidates and segregates the priority one systems. The projects include completing the construction of the Priority One Rack Room and the relocation of the priority one equipment into the room.
- Complete a performance assessment of the laboratory management support services including engineering, configuration management, system design and installation, data management, and technical support services for NAS and NextGen programs.
- Complete 80% of the Quality Goals as part of the WJHTC Laboratory’s ISO 9001:2008 quality management system. Validate by passing an independent audit.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2020.

Program Plans FY 2021 – Performance Output Goals

- Complete a performance assessment of the laboratory management support services including engineering, configuration management, system design and installation, data management, and technical support services for NAS and NextGen programs.
- Complete 80% of the Quality Goals as part of the WJHTC Laboratory’s ISO 9001:2008 quality management system. Validate by passing an independent audit.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2021.

1A04, WILLIAM J. HUGHES TECHNICAL CENTER INFRASTRUCTURE SUSTAINMENT

FY 2017 Request \$12.2M

William J. Hughes Technical Center Building & Plant Support, F16.00-00

Program Description

The FAA William J. Hughes Technical Center (WJHTC) owns and operates approximately 1.6 million square feet of test and evaluation, research and development, and administrative facilities, plus numerous project test sites. The current value of the buildings and infrastructure is in excess of \$400 million. These facilities require an annual program of capital improvements and modernization. Example projects include: (1) replacing old heating, ventilation, and air-conditioning systems; (2) upgrading the electrical distribution systems; and (3) upgrading fire-suppression systems to current fire safety codes.

An infrastructure providing and sustaining a suitable, reliable environment (i.e. power, cooling, etc.) for the Technical Center’s 24x7x365 operations supports mission crucial systems hosted at the Technical Center such as

Traffic Flow Management Production Center (TPC), FAA Telecommunications Infrastructure (FTI), and the Enterprise Data Centers that support FAA Information Technology (IT) operations. In addition to these operational systems at WJHTC, the Technical Center must provide 24x7 support to monitoring of systems and functions such as Reduced Vertical Separation Minimum (RVSM), Wide Area Augmentation System (WAAS), Automatic Dependent Surveillance Broadcast (ADS-B) and System Wide Information Management (SWIM). The infrastructure also supports second level engineering support to resolve critical issues for operational NAS systems (e.g., En Route Automation Modernization (ERAM), Standard Terminal Automation Replacement System (STARS), and Advanced Technologies and Oceanic Procedures (ATOP)).

The WJHTC developed a 20 year facility master plan for building infrastructure sustainment, which was completed in July of 2008 and updated in September of 2014. The master plan was developed based upon consideration of life safety issues, code compliance issues, equipment age, life expectancy, replacement part availability, and general condition for each system. Replacement strategies and priorities were developed based upon Condition Codes and Importance Factors. The Condition Codes indicate the need for modernization or replacement. The Importance Factors address the importance of each building and project to WJHTC's mission. Projects have been programmed to reflect consideration of their respective Condition Codes (i.e., need for update or replacement) and Importance Factors (relative mission impact if not updated or replaced).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

Infrastructure Modernization at the WJHTC will control costs while delivering quality customer service by replacing aging facility systems /equipment before serious problems occur. It will also reduce energy consumption, and cost, on a per-square-foot basis. This line item will improve life cycle infrastructure planning as well as update facilities and facility support systems to ensure that the laboratories and associated buildings operate properly and can handle the utility loads of the systems being tested. As the WJHTC plays a key role in developing and testing new equipment that will be used in the NAS, it is critical that the facilities operate efficiently. WJHTC effectiveness in testing and approving equipment can result in earlier system deployment thereby reducing costs for system implementation.

Program Plans FY 2017 – Performance Output Goals

Execute the following Center Facility System Improvements:

- Complete Building 316 Electrical Substation Replacements (2 Substations plus Switch House) (Phase 1 of 2).
- Complete Building 316 Chiller Replacements (2 Chillers).
- Complete Buildings 211 and 303 Roof Replacements.
- Complete Design for Building 300 Mechanical Equipment Replacements (Air Conditioning (AC) Units 6, 7 and 8) (Phase 3 of 4).
- Complete Main Electrical Substation Upgrades (Switchgear Enclosure).
- Complete Design for Central Utilities Plant Chiller Replacements (Nos. 2 & 3).
- Complete Design for Central Utilities Plant Electrical Switchgear Replacement.
- Complete Life Safety Improvements to Five Facilities (Buildings 27 and 28) (Phase 1 of 2).

Program Plans FY 2018 – Performance Output Goals

Execute the following Center Facility System Improvements:

- Complete Building 316 Electrical Substation Replacements (3 Substations) (Phase 2 of 2).
- Complete Central Utilities Plant Chiller (No. 2 of 3) Replacement.
- Complete Life Safety Improvements to Five Facilities (Buildings 33, 56 and 270) (Phase 2 of 2).
- Complete Refurbishment of Elevators in Five Buildings (Building 316) (Phase 2 of 3).
- Complete Building 300 Mechanical Equipment Replacements (AC Units 10 and 17) (Phase 2 of 4).

Program Plans FY 2019 – Performance Output Goals

Execute the following Center Facility System Improvements:

- Complete Central Utilities Plant Chiller (No. 3 of 3) Replacement.
- Complete Building 300 Mechanical Equipment Replacements (AC Units 6, 7 and 8) (Phase 3 of 4).
- Complete Central Utilities Plant Electrical Switchgear Replacement.
- Complete Refurbishment of Elevators in Five Buildings (Buildings 27, 287 and 301) (Phase 3 of 3).
- Complete Design for Architectural, Mechanical and Electrical Systems Improvements to Various Research and Development Buildings.
- Complete Design for Primary Electrical Feeder Replacement to Building 316.
- Complete Design for Building 316 Fire Detection/Annunciation System Upgrades.
- Complete Master Plan for Site Utilities and Infrastructure.
- Complete Technical Support Space Utilization Strategy.

Program Plans FY 2020 – Performance Output Goals

Execute the following Center Facility System Improvements:

- Complete Architectural, Mechanical and Electrical Systems Improvements to Various Research and Development Buildings.
- Complete Primary Electrical Feeder Replacement to Building 316.
- Complete Building 316 Fire Detection/Annunciation System Upgrades.
- Complete Design for Building 300 Mechanical Equipment Replacements (Remaining AC Units) (Phase 4 of 4).
- Complete Design for Buildings 275 and 305 Roof Replacements.

Program Plans FY 2021 – Performance Output Goals

Execute the following Center Facility System Improvements:

- Complete Center Wide Building Automation System Upgrade/Expansion.
- Complete Design for Overhead Electrical Distribution System Replacement.
- Complete Design for Sanitary Sewer System Improvements.
- Complete Repairs to Storm Water Distribution System.

1A05, NEXTGEN – SEPARATION MANAGEMENT PORTFOLIO

FY 2017 Request \$25.8M

- A, Automatic Dependent Surveillance-Broadcast (ADS-B) In Applications – Flight Interval Management, G01S.02-01
- B, Modern Procedures, G01A.01-01
- C, Alternative Positioning Navigation and Timing (APNT), G06N.01-06
- D, Wake Turbulence Re-Categorization, G06M.02-02
- E, Oceanic Tactical Trajectory Management, G01A.02-02
- F, Unmanned Aircraft Systems (UAS) Concept Validation and Requirements Development, G01A.01-09
- G, Separation Management Concept & Analysis, G01M.02-04
- H, Reduced Oceanic Separation, G02S.04-01
- I, Separation Automation System Engineering, G01A.01-06
- X, NextGen Oceanic Capabilities, G01A.01-07
- X, Conflict Advisories, G01A.02-03

A, Automatic Dependent Surveillance-Broadcast (ADS-B) In Applications – Flight Interval Management, G01S.02-01

Program Description

ADS-B In Applications – Interval Management (IM) consists of a set of ground and flight-deck capabilities and procedures that are used in combination by air traffic controllers and flight crews to more efficiently and precisely manage inter-aircraft spacing (e.g., achieve a precise interval between aircraft in a stream of traffic). An air traffic controller can issue an IM clearance that allows flight crews to manage spacing through speed adjustments generated by onboard IM avionics until reaching a planned termination point. IM operations require new flight-deck functions implemented in Flight Interval Management avionics to provide speed guidance to a flight crew to achieve and maintain a relative spacing interval from another aircraft. Changes to ERAM, STARS, and TBFM automation systems will be needed to support the initiation and monitoring of IM operations. Interval Management-Spacing (IM-S) Arrivals, Approach, & Cruise (AA&C) supports IM operations for arrival and approach applications for independent runway operations and for cruise operations (i.e., spacing during en route metering and Miles-in-Trail operations). Advanced-IM (A-IM) will extend the capabilities developed as a part of IM-S AA&C to dependent runway and departure operations, Pairwise Trajectory Management (PTM) operations in oceanic airspace, and will support changes to the current separation standards to enable additional benefits.

The Surveillance and Broadcast Services Office is maturing the requirements definition of a suite of ADS-B In IM applications and will pursue a series of Final Investment Decisions (FID) as each application or set of applications are deemed suitably defined for implementation. Pre-implementation activities and AMS milestones through FID for ADS-B In IM Applications are funded under this program, G01S.02-01. FID for the first set of ADS-B In Applications, IM-S AA&C is planned in FY 2020.

Post FID implementation activities will be funded and executed under ADS-B NAS Wide Implementation - Future Segments, G02S.01-02.

IM-S AA&C is applicable to oceanic, en route, and terminal airspace and will require investments in both air traffic management and decision support automation systems, as well as flight deck avionics. Additional pre-implementation activities under this program include:

- Developing prototype ground-based automation software for ERAM, STARS, and TBFM and completing prototype avionics enhancements;
- Completing integrated air-ground Human-in-the-Loop (HITL) simulation and IM Flight Test;
 - The IM Flight Test is intended to validate Flight-deck based Interval Management (FIM) Minimum Operational Performance Standards (MOPS) v1 avionics functionality; prototype automation functionality; and IM-S AA&C procedures; and
- Working with RTCA to update the Safety Performance Requirements Document and develop FIM A-IM avionics standards.

A-IM dependent runway, departure and oceanic operations, and other future concepts along with the associated avionics standards will be developed with RTCA and the user community. SBS plans to complete investment activities both Initial Investment Decision (IID) and FID for A-IM after the completion of IM-S AA&C FID.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Interval management will optimize spacing resulting in maximizing the number of aircraft arriving in the proper sequence for landing. Reducing the variance in inter-aircraft spacing will result in more efficient use of runway capacity. The full benefits case is part of the analysis to be completed for the FID.

Program Plans FY 2017 – Performance Output Goals

- Complete revised draft of the RTCA SC-186 navigation and communication integration requirements for FIM MOPS v2 for A-IM.

Program Plans FY 2018 – Performance Output Goals

- Develop the Implementation Strategy and Planning Document in support of IM-S AA&C FID.
- Complete the draft RTCA SC-186 Integrated Test Procedures for FIM MOPS v2 for A-IM.

Program Plans FY 2019 – Performance Output Goals

- Develop the following products in support of IM-S AA&C FID:
 - Business Case documentation; and
 - Acquisition Program Baseline.
- Complete RTCA SC-186 Integrated Test Procedures for FIM MOPS v2 for A-IM.

Program Plans FY 2020 – Performance Output Goals

- Achieve FID for IM-S AA&C.
- Complete Final Review and Comment and Program Management Committee approval for RTCA SC-186 SPR and FIM MOPS v2 for A-IM.

Program Plans FY 2021 – Performance Output Goals

- None.

B, Modern Procedures, G01A.01-01

Program Description

Modern Procedures will develop en route automation enhancements to support planned NextGen operational improvements. Enhancements will be developed by evaluating operational needs, defining operational concepts, developing requirements documents, testing and prototyping of proposed enhancements and developing acquisition documents to support a decision for implementation.

The concepts and capabilities of NextGen require accurate aircraft trajectory modeling using advanced Kinetic Vertical Modeling (KVM) techniques involving aircraft characteristics, trajectory modeling when an aircraft turns, and trajectory modeling based on runway assignment.

To enhance automation separation management, controllers will be provided with decision support tools to more efficiently use available airspace and facilitate trajectory changes to avoid potential conflicts on an aircraft's planned flight path.

This program is currently planning activities in the following areas:

- ERAM KVM Phase 2 – which is intended to improve the ERAM Trajectory Model:
 - Base of Aircraft Data KVM in Aircraft Trajectory Modeling
 - “Hybrid (Kinetic and Parametric) Model” prototyping
 - Complex Turn Modeling (Study)
 - Runway assignment data and availability into ERAM (Study)
 - ERAM and TBFM Harmonization
 - Kinetic Aircraft Performance Model Parameter Accuracy
 - Modern Procedures Support for Optimized Profile Descent Standard Terminal Arrival Route Execution
- KVM Enhancements – Operational Evaluation

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Enhancements to Air Traffic Control automation will allow controllers to more efficiently use available airspace by identifying potential conflicts or other complications on an aircraft's planned flight path and facilitate trajectory changes if advised. Trajectory Based Operations requires this capability to increase airspace capacity and provide more efficient routes and altitudes to accommodate demand.

Program Plans FY 2017 – Performance Output Goals

- Complete complex turns prototype.
- Complete analysis of potential ERAM vertical modeling changes based on runway information being available.
- Complete Automation-Assisted Controller-to-Controller Coordination prototype.
- Conduct an initial operational evaluation for Probe Menu and Trial Planning extensions to En Route Radar Controller Conflict Detection.
- Develop detailed KVM concepts and requirements documents.

Program Plans FY 2018 – Performance Output Goals

- Develop Probe Menus and Trail Planning concepts and requirements documents.
- Develop Multi-step Probe menus scenarios for Human-in-the-Loop (HITL) evaluations.
- Develop resolutions for Reduced Controller Coordination scenarios for HITL evaluations.

Program Plans FY 2019-2021 – Performance Output Goals

- None.

C, Alternative Positioning Navigation and Timing (APNT), G06N.01-06

Program Description

Presidential Policy Directive 21 (PPD-21) and National Security Presidential Directive 39 (NSPD-39) were directed towards Department of Homeland Security, Department of Defense, and Department of Transportation (DOT) to implement a national Position, Navigation, and Timing (PNT) to mitigate the possibility of a Global Positioning System (GPS) outage. The FAA under DOT is tasked to establish a resilient backup for aviation services in the event of a GPS outage or interference event to maintain safety and security; maintain a reasonable level of capacity and efficiency; and minimize economic impact. The FAA during analysis of their operational Alternative Positioning, Navigation and Timing (APNT) solution for aviation will ensure that it fits into the framework of the national strategy solutions and is harmonized with the international community.

The APNT program is investigating alternatives for providing a backup for GPS based PNT services. GPS PNT services enable Performance Based Navigation (PBN) and Automatic Dependent Surveillance – Broadcast (ADS-B) services, which are necessary for Trajectory Based Operations (TBO), Area Navigation (RNAV), Required Navigation Performance (RNP), and other NextGen advanced implementations. The objective of the NextGen APNT program is to provide critical Air Traffic Management (ATM) services if GPS services become temporarily unavailable so that users can seamlessly continue RNAV operations to a safe landing.

The FAA currently relies on existing legacy systems including Very High Frequency Omnidirectional Range (VOR), Distance Measuring Equipment (DME) and Tactical Air Navigation (TACAN) as a backup to GPS navigation, but these systems do not fully support RNAV, RNP or TBO. The NextGen APNT program is exploring a full range of alternatives to provide the NAS with a GPS independent backup solution to support PBN. Services provided by APNT must be near equivalent to those provided by GPS. The program will identify and evaluate new

technical concepts and operational alternatives for GPS back-up and select the best alternative to recommend for development based on cost and performance.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

This program supports sustainment of NAS operational availability by ensuring PNT services remain available during periods of GPS outage. The APNT strategy is consistent with the NextGen Implementation Plan and FAA Strategic Priorities 1 and 2 for increased safety and delivering benefits, respectively. Pilots, dispatchers, and air traffic controllers will all benefit from the availability of APNT services. Pilots will have access to an accurate and reliable source for aircraft position, navigation and timing services during a GPS outage. Airline dispatchers will retain the ability to schedule operations and choose preferred trajectories during a GPS outage. Controllers, in conjunction with automation improvements, can continue to manage separation using performance based operations during a loss of GPS.

Program Plans FY 2017 – Performance Output Goals

- Complete Refinement of Operational Requirements.
- Complete Refinement of Concept of Operations.
- Analyze the Current and Future Concepts Based on Needs, Requirements, and Concept of Operations.

Program Plans FY 2018-2021 – Performance Output Goals

- None.

D, Wake Turbulence Re-Categorization, G06M.02-02

Program Description

Since the last full review of wake separation standards used by air traffic control (ATC), fleet mixes have changed dramatically. Airport runway complexes have also changed, and new aircraft designs such as the A380, B787, B747-8, A-350, very light jets, and unmanned aircraft systems have been introduced into the NAS. The approximately 25 year old wake separation standards provided safe separation of aircraft from each other's wake vortices, but no longer provided the most capacity efficient spacing and sequencing of aircraft in terminal and en-route operations. This loss of efficient spacing has contributed to the gap between current demand and NAS capacity.

The Wake Turbulence Re-Categorization project, begun in collaboration with EUROCONTROL, has developed and implemented new airport runway ATC wake mitigation separation standards (RECAT Phase I); and, based on that work, has developed tailored leader and follower aircraft static pair-wise wake mitigation separation standards (RECAT Phase II) for 99% of all aircraft types operating in the United States. Use of the RECAT Phase II standards will result in increased airport runway arrival and departure capacity above what can be achieved with the RECAT Phase I standards, especially when the airport is experiencing weather or other conditions requiring it to operate with instrument landing procedures. The final phase of the project (RECAT Phase III) will develop the ATC based capabilities required to achieve the NextGen goal of safe, most capacity efficient, pair-wise dynamic wake mitigation separations of aircraft.

This project originated as part of a joint EUROCONTROL and FAA program that reviewed the then current required wake mitigation aircraft separations used in both the USA's and Europe's air traffic control processes and determined the then current standards could be safely modified to increase the operational capacity of airports and their surrounding airspace. Work to address the introduction of large aircraft into the NAS has occurred over the last several years to accommodate the A380, B747-8 and B787 aircraft and work will continue to address the

introduction of other aircraft types into the NAS. This program builds on that joint work and is accomplishing a more general review to include regional jets, and is working towards potential procedural mitigations for Unmanned Aircraft Systems (UASs), micro-jets, etc. The work is phased, and started with optimizing the then current standards to reflect the change in fleet mix that occurred during the last 25 years. In 2010, this project provided a set of recommendations (RECAT Phase I) for international review that focused on changes to the then current static standards. To accomplish this, the project used a data driven, relative risk safety analysis approach. That approach was complimented with enhanced analysis tools to link observed wake behavior to standards and provide additional confidence in the determined safety risk associated with potential new standards relative to existing standards. Use of the RECAT Phase I standards in the United States began at the Memphis International Airport in November 2012 and since have been implemented at the Louisville International Airport in FY 2013, Cincinnati/Northern Kentucky (CVG) International Airport and Atlanta area airports in FY 2014, and Houston, Charlotte, New York and Chicago area airports in FY 2015. In FY 2015, the RECAT Phase II portion of this program developed a wake separation minimum matrix of approximately 100 aircraft type pairs for use by controllers and associated decision support tools to provide more capacity efficient static wake separations of aircraft flying into and out of U.S. airports. The RECAT Phase II standards and supporting benefit and safety cases have been provided to ICAO for their review. It is projected that the RECAT Phase II wake separation standards will begin initial implementation for evaluation in FY 2017.

The final phase of this project, developing RECAT Phase III dynamic wake separation standards and processes for application, will encompass extensive analyses, modeling, and data collection to further define and validate potential improved wake mitigation processes and standards developed by the FAA NextGen – Wake Turbulence research project. Unlike the static separations, which are constant at all times, the ATC dynamic pair-wise wake separation standards will adjust the required minimum aircraft wake mitigation separations based on the aircraft types in the pairing as well as likely parameters such as winds and turbulence being experienced by the aircraft being separated.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The Wake Turbulence Re-Categorization project is addressing one of the major constraints in implementing processes and procedures that will allow more aircraft flights into and out of airports and through congested air corridors. In the near term, RECAT Phase I has rebalanced the wake turbulence separation standards to address today's mix of aircraft utilizing the nation's core airports. RECAT Phase I has yielded significant additional arrival and departure runway throughput for those airports whose fleet mix closely matches the design of the RECAT Phase I standards. The first operational use of the RECAT Phase I standards occurred in November 2012 at the Memphis International Airport (MEM), and since been implemented at ATC facilities serving six additional metropolitan area (Louisville/Cincinnati, Atlanta, Houston, Charlotte, New York City/Newark, and Chicago) airports. FedEx, the major air carrier at MEM, has received a double digit MEM departure runway throughput capacity increase since the introduction of the RECAT Phase I standards as well as significant fuel savings in their MEM arrival operations. United Parcel Service is seeing similar benefits at its major hub airport Louisville International Airports. Delta Air Lines, the major air carrier at Hartsfield-Jackson Atlanta International Airport (ATL), is reporting significant decrease in operating cost at ATL. The increased runway throughput capacity is achieved by reduction in many of the previously required wake mitigation in-trail separation distances of aircraft. Implementation of the RECAT Phase II wake separation standards is projected to provide an additional 4-7% increase in a Core airport's runway throughput capacity.

Program Plans FY 2017 – Performance Output Goals

- Complete initial deployment of the RECAT Phase II wake separation standards to three metropolitan area airports – for evaluation of the standards use and modification (if required) for ease of application by controllers.
- Develop detail descriptions of ATC dynamic wake separation standards alternatives and how they would be applied in the NAS.
- Deliver briefings to and conduct data gathering with the aviation community concerning alternative ATC dynamic wake separation processes and procedures.

Program Plans FY 2018 – Performance Output Goals

- Complete high level analyses supporting the development of ATC dynamic wake separation standards.

Program Plans FY 2019 – Performance Output Goals

- Complete design of ATC dynamic wake separation standards.
- Develop process and procedures for the ATC dynamic wake separation standards.

Program Plans FY 2020-2021 – Performance Output Goals

- None.

E, Oceanic Tactical Trajectory Management, G01A.02-02

Program Description

The Oceanic Tactical Trajectory Management (OTTM) program addresses Oceanic Trajectory Management in Four Dimensions (OTM-4D). The key objective of this concept is to use trajectory-based operations to improve fuel efficiency, system predictability, and performance by enabling airlines and other operators to flight plan and fly closer to their optimal, or preferred 4D trajectories while in oceanic airspace. This requires new decision support capabilities and integration with traffic flow management. OTTM has adopted specific initiatives that address both the pre-departure and in-flight phases of the oceanic flight, as well as improvements that allow sharing additional information between the FAA and airspace users in a collaborative arrangement.

OTTM takes advantage of Airline Operations Center and Air Navigation Service Provider oceanic capabilities, as well as evolving technologies such as System-Wide Information Management to develop these potential concepts. These oceanic capabilities involve both procedural and automation changes. The implementation of these capabilities will occur incrementally and will eventually affect all domains and phases of flights to improve airspace capacity and allow more airspace users to optimize their flight trajectories through collaborative efforts with air traffic management resulting in savings of time, fuel, and emissions.

This program provides the following operational improvements:

- Interactive Planning Using 4D Trajectory Information in the Oceanic Environment (OI:104102)

This program will develop the following capabilities: Traffic Congestion Depiction and Flight Specific Likelihood Feedback, Re-Profile Alert and Pre-Oceanic Planner. These capabilities are all dependent on the 4-D Stochastic Trajectory Model which provides a three-dimensional (longitude, latitude, altitude) density function of a flight position with respect to its planned flight time:

- User Trajectory Planning in Pre-Oceanic Phase Capability (OI:104102-23):
 - Traffic Congestion Depiction and Flight Specific Likelihood Feedback – Will enable interactive flight plan collaboration between airspace users and the FAA in which the airspace user informs the FAA of their intended 4D oceanic trajectory and receives feedback on the trajectory considering the constraints of traffic, weather, and special activity airspace prior to the flight’s entry into oceanic airspace.
 - Re-Profile Alert – Will notify airlines of the changes in the flight likelihood or congestion based on the parameters determined by the airline. The airline can then choose how to best respond to the changes.

- Pre-Oceanic Planner – A system designed for more congested airspace where flight specific likelihood does not give enough predictability to the flight operators. Considering the ordered preferences of the participants and acceptable variances, the planner provides a schedule that considers the full oceanic trajectory for de-conflicting rather than just the oceanic entry point.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

With increased system precision and enhanced automation, aircraft can more closely fly routes to realize the airlines' goals for fuel efficiency and schedule reliability. Reduced separation standards for aircraft that rely on shared state and intent data will lead to fewer predicted conflicts, and as a result, fewer diversions from the preferred routing. Reduced separation standards will also result in more efficient use of capacity within flow-constrained airspace, allowing more aircraft to fly through those areas, rather than being re-routed or delayed to avoid them.

Program Plans FY 2017 – Performance Output Goals

- Complete Benefits Analysis and Validation and report results.
- Complete tech transfer and associated documentation.

Program Plans FY 2018-2021 – Performance Output Goals

- None.

F, Unmanned Aircraft Systems (UAS) Concept Validation and Requirements Development, G01A.01-09

Program Description

The UAS Concept Validation and Requirements Development program conducts the overall analysis and planning for the development, integration, and subsequent implementation of emerging UAS enabling technologies within the NAS infrastructure. This program executes concept development, engineering analysis, and evaluation in support of mission and investment analysis activities; conducts shortfall analyses as part of service analysis; and ensures the linkage of proposed solutions back to validated operational needs to support budget planning and investment decisions.

UAS operations have increased dramatically in both the public and private sectors. Air Traffic products, policies, and procedures must be reviewed and refined, or developed through supporting research, to permit UAS operations in the NAS. These UAS operations can be grouped into five categories:

- Public UAS operations (all sizes and airspace): Accommodated through Certificates of Authorizations (COAs), with risk controls tailored to the operation.
- Integrated UAS operations: UAS operating in airspace widely used by manned aircraft.
- Low altitude, beyond visual-line-of sight commercial small UAS (sUAS) operations: sUAS that are operated at low altitudes or remote areas, outside areas typically used for manned aircraft.
- Low altitude, visual line-of-sight sUAS operations: sUAS operated for other than hobby or recreation purposes, including private and commercial purposes, within visual line-of-sight (Part 107 operations).
- Model aircraft operations: UAS flown for hobby or recreation within visual line-of-sight.

The program will identify and mature UAS enabling technologies within the NAS infrastructure to support these categories of operations. The need for new capabilities, mitigations, and verification and validation methods to

enable safe UAS operations will require the development, integration, and implementation of emerging technologies. These new technologies may include communications, surveillance, and automation changes to support continued evolution of UAS in the NAS. Issues involved with UAS integration include the inability to comply with traditional see and avoid requirements, unique communications needs, lost link procedures, and other challenges which dictate that concept engineering activities address all aspects of how UAS operations fit with other NAS operations. Work to address existing UAS shortfalls must be completed to inform Acquisition Management System decision points for changes to FAA systems required to support UAS operations. If the concept development, maturation, and validation activities are not performed in a timely manner, all subsequent activities will be delayed, such as necessary ATM automation enhancements, significantly prolonging the timeline for achieving UAS integration. UAS Command and Control (C2) capability requirements and solution sets will be identified for each category of UAS operations as needed. In order to ensure effective coordination of the tightly-coupled activities necessary to address and resolve these issues, a centralized ATO program management function will be utilized.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 9 – Safely and efficiently integrate new types of operations, such as commercial space and unmanned aircraft, into the NAS and enable the benefits these operations will provide. (FAA Business Planning Metric)*

Relationship to Performance Target

Successful integration of UAS into the NAS provides benefits to both public and civil users. Studies indicate benefits when UAS are used in missions related to agriculture, search and rescue, border protection and pipeline monitoring among other applications. These public and civil users, as well as the general public and Commercial and General Aviation, benefit from the work being conducted under this activity which will lead to the safe integration of UAS in the NAS.

Program Plans FY 2017 – Performance Output Goals

- Develop, review and approve additional operational scenarios for integrated UAS operations.
- Complete update of existing UAS concept maturation products (e.g., mid-term and mature state scenarios, allocation tables).
- Complete annual update of UAS shortfalls and operational requirements database (identify new/updated requirements).
- Complete annual update of UAS Concept Maturation Plan based on findings from FY 2017 work (identify new concept maturation areas).
- Finalize initial C2 operational requirements for each category.

Program Plans FY 2018 – Performance Output Goals

- Complete annual update of existing UAS concept maturation products (e.g., mid-term and mature state scenarios, allocation tables).
- Complete annual update of UAS shortfalls and operational requirements database (identify new/updated requirements).
- Complete annual update of UAS Concept Maturation Plan based on findings from FY 2018 work.
- Complete Spectrum Management Alternative Analysis and identify initial spectrum required, by UAS usage category.
- Complete conversion of C2 ground Infrastructure Alternative Analysis into a Concept of Operations.

Program Plans FY 2019 – Performance Output Goals

- Complete annual update of existing UAS concept maturation products (e.g., mid-term and mature state scenarios, allocation tables).
- Complete annual update of UAS Concept Maturation Plan based on findings from FY 2019 work.
- Finalize UAS shortfalls and operational requirements database.
- Complete development of draft AMS artifacts to support Concept and Requirements Definition Readiness Decision (CRDRD):
 - Concept and Requirements Definition (CRD) Plan;
 - Preliminary shortfall analysis report; and
 - Enterprise Architecture (EA) change notices, products, and amendments.
- Complete documentation of Spectrum Allocation and Management Approach, by UAS usage category.
- Complete analysis of the UAS C2 solutions; identify C2 infrastructure solution(s), by UAS usage category.

Program Plans FY 2020 – Performance Output Goals

- Complete AMS artifacts to support CRDRD:
 - Preliminary shortfall analysis report;
 - CRD Plan; and
 - EA change notices, products, and amendments.
- Achieve CRDRD.
- Complete development of draft AMS artifacts to support Investment Analysis Readiness Decision (IARD):
 - Solution Concept of Operations;
 - Preliminary program requirements;
 - Technical alternatives and associated cost estimates;
 - Final shortfall analysis report; and
 - Investment analysis plan.

Program Plans FY 2021 – Performance Output Goals

- Complete AMS artifacts to support IARD:
 - Solution Concept of Operations;
 - Preliminary program requirements;
 - Technical alternatives and associated cost estimates;
 - Final shortfall analysis report; and
 - Investment analysis plan.

G, Separation Management Concept & Analysis, G01M.02-04

Program Description

As NextGen evolves, precise flight trajectories will require accurate monitoring capability to maintain consistent or increasing levels of airspace capacity and efficiency while maintaining safety. This program provides Operational Concepts and sets of scenarios that describe operational changes which provide controllers with decision support tools and enhanced procedures to manage aircraft in a mixed environment of varying navigation equipment and wake performance capabilities. The program will evaluate the applicability and feasibility of using such criteria, recommendations, standards and practices to inform and positively impact the engineering, design, acquisition and selection of new tools and the implementation of necessary updates to the procedures to achieve the operational performance. Automation enhancements will not only alert controllers of pending conflicts but decision support tools (DSTs) will provide rank-ordered conflict resolution actions to controllers based on environmental factors such as efficiency, weather, risk that an action creates additional conflicts, and overall system resiliency in maintaining safe separation standard when using the added level of automation. Human performance issues for controllers will be considered to ensure safe operations at increased capacity levels and assess how operational changes will be supported by allocation of functions between humans and automation.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

This program will develop concepts for improving the use of airport capacity; evaluate whether proposed benefits for new operational concepts can be achieved; and assess the implications on human factors of new and other related NextGen concepts and technologies. Incorporation of these concepts and products into NAS systems will result in improvements in air traffic controller efficiency to meet forecast demand and increase airport throughput while maintaining required safety.

Program Plans FY 2017 – Performance Output Goals

- Complete concept validation studies for end-to-end and lower level operational concepts for implementation in 2023 and beyond.
- Develop operational requirements and other documents required for technical transfer of validated concepts for NAS implementation in 2020-2022 and beyond.
- Document and report findings to reduce risk/uncertainties of NextGen Mid Term Operational Concepts.
- Document procedures to decrease workload/increase reliance on automation for routine tasking, to increase efficiency of the NAS.
- Develop and document operational methods to address future growth in demand and reduce gate-to-gate transit time.
- Complete report documenting initial research on assessing human and system performance of reduced horizontal separation standards, 3 nautical miles (nm), in the en route environment.
- Complete report documenting initial research for assessing “no closer than” spacing operations in the terminal area where Time Based Flow Management (TBFM) is not being used and describe interactions of the controller, ground automation, and required avionics on the flight deck for successful operations.

Program Plans FY 2018 – Performance Output Goals

- Complete concept validation studies for lower level operational concepts for implementation in 2022 and beyond and to reduce risk/uncertainties of NextGen Mid Term Operational.
- Develop and document operational methods and procedures that will address future growth in demand; reduce gate-to-gate transit time; and increase efficiency through decreased controller workload through greater reliance on automation.
- Develop criteria for assessing human and system performance impacts from the use of 3-nm separation in the en route environment and address potential impact to wake mitigation procedures and separation standards for various aircraft classes en route.
- Develop criteria to conduct and assess information and design requirements for performing relative spacing “no closer than” in the terminal environment for the air traffic controller and associated automation systems.
- Document findings from concept validation studies for assessing enhancements of conflict resolution automation and advisories.

Program Plans FY 2019 – Performance Output Goals

- Document findings from concept validation studies for lower level operational concepts for implementation in 2022 and beyond and to reduce risk/uncertainties of NextGen Mid Term Operational Improvements.
- Develop and document operational methods and procedures that will address future growth in demand; reduce gate-to-gate transit time; and increase efficiency through decreased controller workload through greater reliance on automation.
- Validate the information and design requirements evaluation criteria to assess human performance impacts when implementing 3-nm separation operations en route.
- Conduct evaluation of human performance impacts for new en route separation standards.
- Validate the information and design requirement evaluation criteria for “no closer than” spacing operations and start evaluation with a subset of relevant use cases.
- Develop evaluation criteria to assess the rank-ordered conflict resolutions recommendations that the DST provide and analyze the impact on the human performance, in the context of nominal and off-nominal operations adding stress on the overall system.

Program Plans FY 2020 – Performance Output Goals

- Document findings from concept validation studies for lower level operational concepts for implementation in 2022 and beyond and to reduce risk/uncertainties of NextGen Mid Term Operational Improvements.
- Develop and document operational methods and procedures that will address future growth in demand; reduce gate-to-gate transit time; and increase efficiency through decreased controller workload through greater reliance on automation.
- Consolidate identified impacts and issues from assessment on 3-nm separation operations en route and deliver a report that provides guidance for enhancing human and system performance to accommodate and comply with 3-nm separation in en route airspace.
- Consolidate data gathered from the evaluation exercises and provide guidance for the presentation of the information to the controller through the primary automation system display.
- Provide recommendation on updates to operational procedures through advisory circulars and/or updates to FAA Orders to support “no closer than” spacing.
- Validate and consolidate criteria used for evaluating human performance impacts related to using automated rank-ordered conflict resolutions from DST and provide additional recommendations to the design of these tools.

Program Plans FY 2021 – Performance Output Goals

- Develop ATC requirements for the display of separation management tools for UAS.
- Develop ATC requirements for display of separation management tools for Space Vehicle path of travel/debris through FAA controlled airspace.

H, Reduced Oceanic Separation, G02S.04-01

Program Description

The Reduced Oceanic Separation (ROS) program will increase the use of 30/30nm separation and potentially reduce separation to 15/15nm in Oceanic Flight Information Regions (FIRs). Oceanic and remote domestic airspace is different from the rest of the NAS due to current limitations in surveillance, navigation, and communication capabilities. Enhancing surveillance and communication capabilities can provide significant improvements to air navigation services by reducing separation minima for optimum routing or new air routes for increased airspace capacity. The performance of required communications, navigation, and surveillance equipment must be capable of providing the overall accuracy necessary for reducing separation standards. The ROS program will reexamine current limitations to reducing oceanic separation standards. This will also benefit a number of planned NextGen Operational Improvements (OIs) including: OI 102108 – Oceanic In-Trail Climb and Descent and OI 104102 – Flexible Entry Times for Oceanic Tracks.

Despite improved capability to control aircraft in oceanic sectors there are still limitations associated with oceanic airspace. These limitations include insufficient radar coverage due to vast areas of airspace over the ocean and

inherent inefficiencies associated with data link and high frequency communications; this requires more separation between aircraft to ensure safe operations. Required oceanic separation is also dependent upon aircraft equipage. Inadequate equipage for aircraft flying oceanic routes requires greater separation than for well-equipped aircraft.

To address limitations in the oceanic ATC system, FAA developed and implemented the Advanced Technologies and Oceanic Procedures (ATOP) program. ATOP provides controllers with automated aircraft track generation, conflict prediction and reporting, weather data processing, automation of airspace sectorization capabilities, recognition of separation minima based on aircraft equipage, and aircraft position data. This automated information displayed on ATOP is generated by the Future Air Navigation System (FANS) onboard aircraft today; in the future this information could be generated and/or enhanced by one of the ROS alternatives.

An Investment Analysis Readiness Decision was completed in January 2014 followed by a JRC Strategy Briefing in October of 2014. In the October 2014 strategy briefing, the program requested approval to continue maturing three alternatives to provide users with the service opportunity to best suits their business needs. The three alternatives presented included the use of: 1) FANS-1/A; 2) space-based surveillance using ADS-B; and 3) ADS-B In Pairwise Trajectory Management (PTM). At the recommendation of the ROS program manager, Alternative 3, ADS-B In PTM, ceased to be part of the Reduced Oceanic Separation program and was incorporated into the ADS-B NAS Wide Implementation – Future Segments (CIP G02S.01-02) program. The JRC approved the strategy as proposed.

For Alternatives 1 and 2, the following activities would be conducted:

- Collision Risks and Safety efforts with ICAO
- Separation assurance and safety assessments
- FAA Safety Management efforts for changes to the NAS
- Engage in testing
- Develop requirements

As an initial step towards an ROS investment, the FAA is pursuing the concept to Ingest and Process Space-Based ADS-B reports to update the ATOP flight profile and further strengthen 30/30nm Oceanic Separation. Another JRC Strategy Decision took place on July 15, 2015 to request approval to use FY 2016 CIP funding to begin software development of ATOP enhancements.

In addition the JRC approved the ROS program to seek an Initial Investment Decision in FY 2017 with a Final Investment Decision in FY 2018 for ROS alternatives 1 and 2.

- Evaluate Space-Based ADS-B for:
 - 30/30nm separation
 - 15/15nm separation
- Evaluate Enhanced FANS 1/A for:
 - Less-than 30/30nm separation (separation minima unknown)

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 5 – Reduce risks in flight by limiting the rate of the most serious losses of standard separation to 20 or fewer for every thousand (.02) losses of standard separation within the National Airspace System.*

Relationship to Performance Target

This program supports the strategic priority of making aviation safer and smarter by improving air traffic services in US-controlled oceanic airspace as well as in remote NAS airspace. By increasing the use of 30/30nm separation and pursuing reductions to 15/15nm separation standards, this investment will increase the precision of information used for aircraft separation resulting in safer operations.

Program Plans FY 2017 – Performance Output Goals

- Complete development of ATOP upgrades to Ingest and Process Space-based ADS-B.
- Complete Target Level of Safety Analysis.
- Obtain Service Acceptance Test at the WJHTC for Oceanic service volumes.
- Conduct ICAO and FAA Safety Assessments – FANS-1/A and Space Based ADS-B.
- Develop the following draft products in support of the FID:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve IID for ROS.

Program Plans FY 2018 – Performance Output Goals

- Conduct ICAO & FAA safety assessments.
- Develop the following final products in support of the FID:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID for ROS.

Program Plans FY 2019-2021 – Performance Output Goals

- Milestones will be developed at FID.

I, Separation Automation System Engineering, G01A.01-06

Program Description

Separation Automation System Engineering (SASE) is a pre-implementation program that matures emerging NextGen Separation Management automation capabilities and develops automation enhancements for En Route, Terminal, and Oceanic domains to support planned NextGen operational improvements. Separation Management automation is defined to include all Air Traffic Control (ATC) automation capabilities that assist controllers in maintaining safe aircraft separation while optimizing use of airspace system capacity.

SASE will reduce the risks inherent with introducing new technology and operational procedures using System Engineering analysis that examines the integrated use of proven techniques and equipment necessary to maintain safe separation. System engineering techniques such as analysis, simulation and modeling, and human-in-the-loop simulations will identify, assess, and validate the impact of new technology and operational procedures on the NAS infrastructure. Throughout the product development lifecycle for NextGen Separation Automation systems, any required changes will be determined and specific products created to support the investment decision process for implementation of these changes. This program is currently planning concept exploration and development activities in the following areas:

Controller’s Operational Decision Support Tools:

Automation provides the controller with tools to manage aircraft separation in a mixed navigation and wake performance environment operating with different performance characteristics within the same volume of airspace.

Controllers will use automation enhancements to provide situational awareness of aircraft with differing performance capabilities (e.g., equipped vs. non-equipped aircraft, Area Navigation (RNAV), Required Navigation Performance (RNP), and trajectory flight data management). These enhancements enable Air Navigation Service Providers (ANSP) to manage the anticipated increase in complexity and volume of air traffic. Categories of separation management automation enhancements to be addressed include:

- Conflict prediction (tactical and strategic)
- Trial Planning (new on R-side)
- Flight data display and data entry capabilities
- Conflict Resolution assistance (Provide controller multiple alternatives selection options in the trajectory and resolutions that promote improved operational decisions, reduced workload, and increased controller productivity)
- Automation-assisted controller to controller coordination (Reduce controller coordination for strategic resolution maneuver implementation)

These automation-based tools will enable controllers to proactively identify and resolve aircraft/airspace conflicts, a key enabler for advanced trajectory-based operations and the ability to handle expected growth in air traffic.

Trajectory Modeling:

Ground automation support for Trajectory Based Operation (TBO) and other future NextGen concepts demand a higher fidelity Four Dimensional Trajectory (4DT) in En Route climb, cruise, descent, and airport surface phases of flight to reduce the uncertainty of an aircraft's future flight path. Accuracy will be improved through better evaluation of constraints and the integration of separation assurance and traffic management constraints based on precise knowledge of aircraft arrival times at points along the flight plan leading to more optimal routes and altitude profiles. Categories of Separation Management automation enhancements to be addressed include:

- **Improve Aircraft trajectory modeling accuracy:** The evolution of En Route Automation Modernization (ERAM) to include a kinetic vertical modeling (KVM) capability would allow the ERAM trajectory modeler to exploit flight-specific intent information, when available, to improve trajectory accuracy and conflict probe efficacy.
- **Improve Interoperability:** It can be anticipated that there will be a need for data exchange or greater interplay between the ERAM and Time Based Flow Management (TBFM) decision support tools in support of the implementation of conflict-free scheduling solutions intended to increase the number of flights able to use Optimized Profile Descents (OPDs). This provides an additional motivation for examining trajectory prediction differences in the two systems, and to identify ways to make the two system's trajectories more compatible.
- **Optimize use of aircraft Performance-Based Navigation (PBN) data:** The current use of PBN procedures is limited across the NAS. Even with certain improvements (e.g., Terminal Sequencing and Spacing/TBFM) the extent of RNAV and RNP route usage will remain constrained by the lack of automation and information exchange. Without implementation of these capabilities, utilization of PBN in the TRACON will be reduced, resulting in a significant reduction of PBN benefits across the NAS. These capabilities provide the automation to support and maximize use of PBN in the TRACON, facilitating capture of full PBN benefits.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

This program will refine the definition of proposed concepts, such as trajectory-based operations, the exchange and use of 4D Trajectories and others, to validate them as both viable and necessary additions to the NAS. The continuous growth of aircraft movement both in the air and on the ground is projected to exceed the capacity of the current system, resulting in delays and gridlock. New ATC automation capabilities will assist controllers in maintaining safe aircraft separation while optimizing the use of available system capacity. The results from this program will promote the safe and efficient use of airspace and airports.

Program Plans FY 2017 – Performance Output Goals

- Enhance controller operational decision support tools with the following activities:
 - Conduct concept engineering activities to identify shortfalls associated with terminal conflict alert (CA) and minimum safe altitude warning (MSAW) functions and potential enhancements to those functions.
- Enhance the trajectory modeling capabilities with the following activities:
 - Conduct an operational assessment of extended en route trajectory prediction and automated conflict detection capabilities for all airspace domains; and
 - Complete a gap analysis of ERAM's ability to issue a 4D Trajectory for direct routes.

Program Plans FY 2018 – Performance Output Goals

- Enhance controller operational decision support tools with the following activities:
 - Conduct an operational integration analysis to identify potential separation management issues due to introduction of multiple changes to the primary separation management platforms;
 - Develop an Operational Concept within the scope of an air-ground trajectory synchronization/negotiation;
 - Conduct engineering analysis of operational needs, ops concept, and scenarios for improved approval of user requests, conditional handoffs, and pointouts;
 - Develop an initial operational concept of rank-ordered conflict resolution based on efficiency of the maneuvers in the event of aircraft, airspace, or metering problem;
 - Complete concepts and requirements for preferred routing in constrained oceanic airspace;
 - Complete prototype and operational evaluation for approval of user requests in oceanic airspace;
 - Complete concept engineering efforts to improve terminal CA and MSAW; and
 - Conduct concept engineering evaluation for airspace configuration management capability in the Terminal domain.
- Enhance the trajectory modeling capabilities with the following activities:
 - Update ERAM KVM prototype using Flight Management System (FMS) Extended Projected Profile data downlinked via Automatic Dependent Surveillance – Contract (ADS-C).
- Exploit and prototype Flight-specific Aircraft Intent, from trajectory exchanged between ANSP (including planned trajectory as proposed in Flight and Flow-Information for a Collaborative Environment, as well as Dynamic RNP, Flight Deck Interval Management-Spacing, and OPDs using Required Time of Arrival).
- Develop the following products in support of the Concept and Requirements Definition Readiness Decision (CRDRD) for a future ERAM Segment:
 - Preliminary shortfall analysis;
 - As-Is and To-Be functional analyses;
 - Preliminary concept of operations document; and
 - Concept and Requirements Definition plan.
- Develop the following for future Terminal enhancements:
 - Develop preliminary shortfalls analysis
 - Conduct preliminary functional analysis
 - Perform initial algorithmic modeling and develop initial operational requirements
 - Perform preliminary cost, risk and safety assessments

Program Plans FY 2019 – Performance Output Goals

- Enhance controller operational decision support tools with the following activities:
 - Develop and operationally evaluate mitigations in response to the introduction of multiple capabilities that impact separation management platforms;
 - Complete an operational concept of rank-ordered conflict resolution based on efficiency of the maneuvers; and
 - Perform an initial feasibility study of user requests and resolving conflicts with multiple maneuvers in En Route airspace.
- Enhance the trajectory modeling capabilities with the following activities:
 - Complete an operational evaluation of 4DT options and complex clearance and maneuvers in En Route airspace;
 - Develop and execute Human-in-the-Loop (HITL) simulation test plan to assess 4D trajectory operations; and
 - Analyze HITL simulation test results and develop technical report on the impact of 4D trajectory modeling.
- Develop the following products in support of Investment Analysis Readiness Decision (IARD) for a future ERAM Segment:
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operations;
 - Functional Analysis;
 - Enterprise Architecture Products; and
 - Preliminary Program Requirements.
- Conduct engineering analysis to refine the operations, scenarios, and use cases for the following Terminal areas:
 - Improved coordination and utilization of available PBN procedures/routes;
 - Enhancements in the prediction, coordination, execution, and overall management of NAS assets;
 - Enhancements in the accuracy, availability, and dissemination of runway assignment data; and
 - Improved Terminal airspace/route demand and capacity modeling.

Program Plans FY 2020 – Performance Output Goals

- Enhance controller operational decision support tools with the following activities:
 - Develop an initial operational concept to increase capacity and efficiency using Flight Management Computer (FMC) route offset in En Route airspace.
- Enhance the trajectory modeling capabilities with the following activities:
 - Complete enhancements capabilities of High Fidelity Trajectory Modeling.
- Develop the following products in support of Initial Investment Decision (IID) for a future ERAM Segment:
 - Initial Program Requirements;
 - Business Case Analysis Report (BCAR);
 - Enterprise Architecture Products;
 - Initial ISPD; and
 - Final Investment Analysis Plan (IAP).
- Conduct Concept Engineering activities to mature and validate new concepts for subsequent investment decisions:
 - Complete concepts and requirements for extended use of 3 nautical mile separation airspace;
 - Conduct service analyses across the domains to identify remaining separation management gaps; and
 - Based upon gaps, complete As Is and To Be functional analyses, and conduct concept validation activities to mature new enhancements.
- Develop the following IARD materials in support of Terminal Work Package 2:
 - Down-select suitable capabilities from previous concept exploration activities;
 - Develop Concepts of Operations document(s); and
 - Perform functional analyses and initial program requirements development.

Program Plans FY 2021 – Performance Output Goals

- Conduct Concept Engineering activities to mature and validate new concepts for subsequent investment decisions:
 - Complete concepts and requirements for extended use of 3 nautical mile separation airspace;
 - Conduct service analyses across the domains to identify remaining separation management gaps; and
 - Based upon gaps, complete As Is and To Be functional analyses, and conduct concept validation activities to mature new enhancements.
- Complete an operational evaluation of resolving conflicts with multiple maneuvers including use of rank-ordered maneuvers and full data communication services in En Route airspace.
- Complete an operational concept to increase capacity and efficiency using Flight Management Computer (FMC) route offset in En Route airspace.
- Conduct an operational evaluation of expanded use of 3NM separation in broader En Route airspace.
- Perform a feasibility study of wake re-categorization with dynamic, pair-wise wake separation standards applied in En Route airspace.
- Develop an operational concept for Interval Management – Spacing during departure operations.
- Develop the following products in support of the Final Investment Decision (FID) for Sector Enhancements 2:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final ISPD; and
 - Acquisition Program Baseline (Execution Plan).
- Develop the following products in support of the IARD for Terminal WP2:
 - Shortfall Analysis/Quantification;
 - Enterprise Architecture Products; and
 - Preliminary Program Requirements.
- Develop the following products in support of the IID for Terminal WP2:
 - Initial Program Requirements;
 - Business Case Analysis Report (BCAR);
 - Enterprise Architecture Products;
 - Initial ISPD; and
 - Final Investment Analysis Plan (IAP).

X, NextGen Oceanic Capabilities, G01A.01-07

Program Description

The NextGen Oceanic Capabilities program is a critical NextGen capability that addresses current performance gaps in the areas of capacity, productivity, efficiency, safety, and environmental impacts in the oceanic environment. The key objective of this program is to use trajectory-based operations to improve fuel efficiency, system predictability, and performance by enabling airlines and other operators to fly oceanic routes more closely aligned with the optimal, or preferred, 4D trajectories.

NextGen Oceanic Capabilities will handle a wide-range of aircraft equipage, Airline Operations Center capabilities, and Air Navigation Service Provider capabilities, as well as using evolving technologies such as System-Wide Information Management (SWIM) to develop and deploy NextGen 4D trajectories capabilities in oceanic airspace. The implementation of these capabilities will involve procedural and automation changes and will occur incrementally. Trajectory-based operations will allow more airspace users to collaborate with air traffic management to obtain desired routes. Optimized flight trajectories will result in fuel and time savings and lower emissions.

This program will provide the following operational improvements:

- Flexible entry time for oceanic tracks;
- Aircraft-specific traffic flow management capability with optimized flight trajectories;
- Improved management of traffic flow at merge points;

- Improved Oceanic Air Traffic Management by integrating weather information into decision support tools; and
- Providing decision support tools for the controllers, resulting in improved efficiency and increased safety.

Planned capabilities include the following enhancements:

- NextGen: Data Exchange via SWIM - new services;
- NextGen: Enhanced conflict probe for airspace controlled by advanced technologies and oceanic procedures automation;
- NextGen: Approval of user requests in oceanic airspace - auto re-probe; and
- NextGen: Approval of user requests in oceanic airspace - conflict resolution advisory.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

With increased system precision and enhanced automation, aircraft can be assigned to more closely spaced oceanic routes that meet airline goals for fuel efficiency and schedule reliability. By reducing lateral and longitudinal separation for aircraft that provide shared state and intent data, the NAS will increase opportunities for aircraft operators to fly preferred routing. Reduced separation standards will also result in increased capacity using optimal tracks allowing more aircraft to fly fuel and time efficient altitudes and paths.

Program Plans FY 2017-2018 – Performance Output Goals

- None.

Program Plans FY 2019 – Performance Output Goals

- Begin development of the engineering requirements.
- Begin development of software design and development for candidate capabilities.
- Publish synchronized data using SWIM data exchange.

Program Plans FY 2020 – Performance Output Goals

- Complete development of the engineering requirements.
- Complete software design and development for candidate capabilities.

Program Plans FY 2021 – Performance Output Goals

- Publish system analysis recording via SWIM.

X, Conflict Advisories, G01A.02-03

Program Description

This program provides the analysis, development and pre-implementation activities required to reduce en route controller workload by assisting controllers in determining conflict resolutions. It produces computer generated conflict resolution advisories (CRA), which are initially transmitted to aircraft using both voice and data communications, and ultimately using only data communications when equipage permits. It investigates the impacts of various equipage levels on the benefits associated with this solution as well as on controller workload and task performance. High performance aircraft will connect via air-ground data communications that link directly to the flight management system, facilitating electronic data communications between the ATC automation and the flight deck automation.

In airspace with mixed equipage aircraft, the controller will still be responsible for aircraft separation by responding to problems predicted by the ATC automation. Instead of monitoring the sector airspace display to predict potential problems and mentally calculating problem resolutions, the automation will not only predict the problems but determine the best solution. The controller will have the option to transmit the solution via voice or data link for equipped aircraft. This level of automation support helps manage controller workload as a means of safely dealing with the predicted increases in traffic volume. This program will initially prototype relatively basic resolution capabilities, such as pre-probed altitude and speed amendments, that can be transferred either verbally by controllers or via data link. The program will also evaluate the impact these clearances have on the Computer-Human Interface design and system performance. As the research matures, more complex capabilities will be investigated for future implementation such as multiple horizontal segment maneuvers. The research will evaluate the role of the human versus automation in voice clearance, mixed voice and data communications environments, and eventually data communications only.

The program is defined in terms of incremental builds of deployable capabilities. Build 1 capability includes the most mature set of tools and menus that support basic two stage maneuvers and an initial ranked list of automation generated resolutions. Build 2 will add more complex multiple segment maneuvers and more constraints such as time based metering. Future builds may include more complex topics such as the airspace constraints caused by convective weather.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Automated problem prediction and resolution will allow the controller to handle more aircraft (i.e., demand) because predicted problems will be resolved strategically, reducing the number of situations that require multiple time-critical actions.

Program Plans FY 2017-2019 – Performance Output Goals

- None.

Program Plans FY 2020 – Performance Output Goals

- Complete revision of trajectory based operations separation management CONOPS re-aligning to Data Communications and ERAM Sector Enhancements programs.
- Update impacted automation functional and nonfunctional requirements based on re-alignment.
- Validate requirements and update benefits case through engineering analysis, prototyping development, and simulation.

Program Plans FY 2021 – Performance Output Goals

- Update requirements document for CRA Build 1 automation capability based on re-alignment and corresponding validation exercises.
- Perform tasks to support the benefits case for the CRA Build 1 JRC decision.
- Perform safety assessment to support the CRA Build 1 JRC decision.
- Develop operational concept for CRA Build 2 automation capability.
- Validate requirements and update benefits case to include CRA Build 2 automation capability through engineering analysis, prototyping development, and simulation.

1A06, NEXTGEN – IMPROVED SURFACE PORTFOLIO

FY 2017 Request \$2.0M

- Surface Tactical Flow, G02A.01-01
- X, Surface Conformance Monitoring, G02A.01-02
- X, Enhanced Service Small Communities (ESSC), G03M.04-02

Surface Tactical Flow, G02A.01-01

Program Description

The Surface Tactical Flow (STF) program is developing trajectory-based surface operations in support of NextGen. It leverages the development efforts of the NASA Surface Management System (SMS) and provides guidelines for the development of a collaborative Surface Traffic Management (STM) system. The STM system will provide the tools necessary to achieve a fully collaborative surface environment where the input of airlines, airports and air traffic controllers are all used to provide a shared surface situational awareness. Shared awareness is required to safely expand the use of airport capacity by coordinating surface and airborne trajectory based operations. The STF program will support the Surface Collaborative Decision Making (CDM) sub team of the CDM Stakeholder's Group (CSG) to incorporate flight operator and airport authority stakeholder viewpoints for potential NAS-wide deployment of surface capabilities.

This program will demonstrate and document requirements for a series of new capabilities that build upon the NextGen vision for Surface Trajectory-Based Operations (STBO). Examples of capabilities include a local data exchange which leads to the sharing of flight readiness information enabling collaboration of pre-planned runway schedules integrated with airborne trajectory-based operations. Surface flow management will reduce operating time during surface operations saving fuel, reducing environmental impact and avoiding surface gridlock.

The STF program will require changes to procedures in the flight operator and Tower environments. The program will follow incremental steps leading to the complete concept providing benefits at each step of the way while remaining aligned with the introduction of other NextGen technologies.

The STF program will conduct research activities to develop and mature STBO capabilities to leverage and extend mid-term STBO capabilities of information sharing, planning and scheduling, and taxi route management to:

- Further increase the efficiency, throughput and predictability of airport surface operations;
- Reduce the environmental impact of surface operations;
- Enhance benefits of operational surface data exchange among stakeholders;
- Meet time-based goals of NextGen surface operations; and
- Identify research issues and gaps to achieve STBO goals.

The STBO concept is expected to be implemented as a set of decision support tools.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The STF program will move Aircraft to and from the runway in a more efficient, predictable, and coordinated manner complying with Traffic Management Initiatives and supporting user preferences. This will increase efficiency and capacity while reducing controller workload through the automated assignment of runways, taxi routes, and departure queues.

Program Plans FY 2017 – Performance Output Goals

- Complete deployment of NASA Airspace Technology Demonstration -2 (ATD-2) Surface Subsystem to Charlotte Tower and Atlanta ARTCC.
- Conduct and deliver a limited field evaluation report of collaborative departure management (CDM) capability, to include surface CDM and collaboration with flight operators, airport operators, and ATC to support Terminal Flight Data Manager (TFDM) contractor technical design review.

Program Plans FY 2018 – Performance Output Goals

- Update the concept maturity assessment (based on NASA and FAA research) for collaborative departure metering capability to support the technology transfer package to the Program Management Office (PMO).
- Deliver a FAA assessment of NASA's ATD-2 collaborative departure metering capability including Surface-Collaborative Decision Making and collaboration with flight operators, airport operators, and ATC.
- Complete technology transfer of lessons learned in departure metering for single airport with integrated scheduling in the NAS.

Program Plans FY 2019 – Performance Output Goals

- Conduct integrated departure scheduling cognitive walkthrough workshops based on operational scenarios including flight strip and airport surveillance events.
- Analyze and model integrated departure scheduling on a metroplex airport, focusing on characteristics of the combined airport environment.
- Complete and deliver a report on integrated scheduling in an operationally relevant environment.

Program Plans FY 2020 – Performance Output Goals

- Deliver a report summarizing NASA research efforts for NAS integrated scheduling, focusing on metroplex airports.
- Analyze quality of data for flow control for controllers to accept time-based flight controls, i.e. Conflict Probe.
- Complete and deliver a report on the analysis of NAS wide impacts of integrated departure scheduling.
- Conduct benefits analysis of integrated departure scheduling.

Program Plans FY 2021 – Performance Output Goals

- Deliver functional allocation of new integrated departure scheduling capabilities to 3T; Time Based Flow Management, Traffic Flow Management System, and Terminal Flight Data Manager.
- Deliver an operational integration assessment report of 3T capabilities.
- Deliver updated maturity assessment of integrated departure scheduling capabilities.
- Complete Technical Transfer of integrated departure scheduling capabilities in a metroplex to Program Offices.

X, Surface Conformance Monitoring, G02A.01-02

Program Description

The Surface Conformance Monitoring (SCM) program will develop surface conformance monitoring concepts and will demonstrate and validate procedures and algorithms. Current runway incursion capabilities detect when an aircraft is about to enter a safety area such as the runway and is not capable of identifying a taxi deviation such as a missed hold short instruction. SCM will provide monitoring of an aircraft following an assigned taxi route. The air traffic controller transmits a precise, unambiguous taxi clearance to the aircraft via data link and conformance to the clearance would be monitored by automation in the tower. The SCM program will develop and demonstrate user-friendly, minimal-workload methods to help the controller specify the taxi route. Conformance monitoring can be limited to route adherence only, or both route and timing through the inclusion of timed check points in the taxi clearance. By using a proactive approach to separation on the airport surface, taxiing aircraft can be “de-conflicted” with other aircraft in the taxi, landing, and takeoff phases of flight, resulting in safer ground operations.

The program will:

- Demonstrate and validate procedures for Taxi Conformance Monitoring in a realistic ATCT environment;
- Evaluate performance of pre-established taxi routes vs. controller-generated taxi routes in a SCM environment;
- Evaluate performance of prototype surface conformance algorithms;
- Demonstrate Trajectory Based Operations (TBO) concept feasibility on airport surface; and
- Transfer mature concepts and supporting documentation to the Terminal Flight Data Manager program for implementation.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

An automated means to monitor surface conformance and alert controllers to deviations from the expected taxi route will reduce controller workload and allow controllers to more efficiently manage aircraft on the surface environment resulting in reduced taxi times and fewer surface delays at congested airports.

Program Plans FY 2017-2018 – Performance Output Goals

- None.

Program Plans FY 2019 – Performance Output Goals

- Complete assessment of state of the art technologies for Surface Conformance Monitoring.
- Complete update of Concept of Use document for Surface Conformance Monitoring to include flight deck and ground based conformance integration.
- Deliver report on shortfalls and potential benefits of surface conformance monitoring.
- Develop Human-in-the-Loop (HITL) evaluation plan for Time Based Surface Conformance Monitoring incorporating Departure-Taxi clearance delivery.
- Develop integrated research platform integrating Departure-Taxi Capability with Surface Management to support HITL's.

Program Plans FY 2020 – Performance Output Goals

- Conduct HITL simulations of Time-Based Surface Trajectory Based Operation Surface Conformance Monitoring evaluating the performance of Departure-Taxi clearance delivery.
- Complete HITL evaluation report for Time-Based Surface Trajectory Based Operation Surface Conformance Monitoring evaluating the performance of Departure-Taxi clearance delivery.
- Complete initial use case and operational procedures for Conformance Monitoring with integrated Flight Deck.
- Develop HITL evaluation plan for Time Based Surface Conformance Monitoring integrating NASA Integrated Surface Management with Flight Deck.
- Complete HITL evaluation of Time Based Surface Conformance Monitoring integrating NASA Integrated Surface Management with Flight Deck.

Program Plans FY 2021 – Performance Output Goals

- Complete HITL evaluation report for Time Based Surface Conformance Monitoring integrating NASA Integrated Surface Management with Flight Deck.
- Complete Technology transfer of SCM artifacts to PMO.

X, Enhanced Service Small Communities (ESSC), G03M.04-02

Program Description

Current Air Traffic Control (ATC) services at airports that support small communities are severely limited. The ESSC program will develop an approach to expanding low-cost service capability to small communities that are currently served by non-towered airports or airports with limited ATC services. ESSC will identify and group airports based on similar configurations. ESSC will evaluate a group of airports based on their required level of service and make recommendations based on the potential benefits that could be achieved. Improving ATC services at these locations will enable increased capacity, improved safety and incentivize communities served by these airports to increase aviation support. This program will evaluate procedures and technologies, and leverage NextGen surveillance, communications, data sharing, and new optical technologies to provide ATC tower-like services at airports that do not currently meet the criteria for an ATC Tower. The FAA will identify and develop recommended changes to controller equipment, standards, procedures and policies to provide required surveillance, communications, and other capabilities to support improved air traffic services and access to smaller airports. These services may be performed from a remote location.

Additional access to small airports will also be achieved by utilizing en route and/or terminal surveillance capability down to, and including the surface movement area (runways and taxiways) for these small airports. This will reduce delays due to one-in and one-out operations at these airports, and strengthen economic opportunities for these communities. This effort expands on existing FAA activities which leverage improved surveillance using technologies such as multilateration, ADS-B and cameras to track aircraft down to and on the airport surface, and by adding capabilities to controller workstations at other locations to support these non-towered airports.

The FAA will use its authority to enter into cost recovery mechanisms for enhanced service to small communities through state, municipal, or local airport funding of the infrastructure enhancements.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

ESSC will develop tailored solutions or options based on needed level of service and potential benefits to be achieved. Improving ATC services at these locations will allow for increased capacity and improved safety, and will provide incentives for increased aviation support for the communities served by these airports. This program will include future technologies, standards, procedures and policies to accommodate the need for improved airport services in these small communities. ESSC will improve access to non-towered airports and airports with limited ATC services reduce one-in and one-out delays, expand service to meet the demand for greater capacity and provide economic opportunities to these smaller communities in a cost effective manner. ESSC will leverage existing NextGen surveillance, communications, data sharing and new optical technologies to provide potential alternatives to the costly construction of new staffed ATC towers.

Program Plans FY 2017 – Performance Output Goals

- None.

Program Plans FY 2018 – Performance Output Goals

- Complete analysis of selected airport category for operational capabilities and configurations.
- Complete draft ESSC alternatives analysis document.
- Complete draft ESSC feasibility study document.
- Complete draft concept of operations (ConOps) document for ESSC.

Program Plans FY 2019 – Performance Output Goals

- Initiate simulation activity for ESSC.
- Complete initial safety case analysis.
- Develop draft operational procedures.

Program Plans FY 2020 – Performance Output Goals

- Update operational procedures.
- Complete simulation activity for ESSC.
- Update ConOps for ESSC.
- Prepare for field demonstration and evaluation at key site(s) for ESSC.

Program Plans FY 2021 – Performance Output Goals

- Conduct field demonstration and evaluation at key site(s) for ESSC.
- Complete benefits analysis for ESSC.
- Complete initial requirements document for ESSC.
- Update safety case analysis.

1A07, NEXTGEN – ON DEMAND NAS PORTFOLIO

FY 2017 Request \$8.5M

- A, Flight Object, G05A.02-03
- B, Common Status & Structure Data, G05A.02-01
- C, Flight Object Exchange Services (FOXS), G05A.02-08
- D, Dynamic Airspace, G05A.04-01
- E, Advanced Methods, G05A.02-02
- X, Airspace Resource Management System (ARMS), G05A.02-09

A, Flight Object, G05A.02-03

Program Description

NAS systems currently operate as separate entities servicing different flight domains; Preflight, Departure, Arrival, En Route, and Oceanic. Similarly, International Air Navigation Service Providers (ANSPs) also operate as separate entities servicing their own airspace. Even though flight data is found in multiple NAS systems, a unified, complete, accurate, up-to-date, and easily-accessible picture of all flights does not exist today. The primary goal of the Flight Object program is to develop an International data standard, “FIXM” (Flight Information Exchange Model) and to support systems implementation of this data standard. This data standard will support the exchange of flight information between systems across multiple domains including the NAS and International systems.

The flight object will be the standard medium for capturing and sharing the most up-to-date information on any flight, and will serve as the single common reference for all system information about that flight. A flight object will be created for each proposed flight, and the flight object information will be updated throughout the entire time the flight progresses from gate to gate. The flight object will collect, manage and provide flight-specific data, such as aircraft identification, aircraft parameters, current flight plan information, operator preferences, flight capabilities, and security information. The flight object is not envisioned to include environment or weather information, since these are system-wide elements that affect multiple flights. The sum of information contained in the flight object will be more detailed than today’s flight data construct. FIXM is part of a family of information exchange models that includes the Aeronautical Information Exchange Model (AIXM) and the Weather Information Exchange Model (WXXM) designed to cover the information needs of Air Traffic Management (ATM). FIXM is an International data exchange standard, and will periodically require incremental updates at regular intervals to add/delete/modify FIXM data elements as necessary.

There are several initiatives to implement FIXM in today's ATM operations in both domestic and international domains. FAA's Flight Data Publication Service (FDPS) under the SWIM Segment 1 program, G05C.01-01, currently publishes SWIM-compliant flight data from En Route Automation Modernization (ERAM) in the FIXM standard. Release 10 of the Traffic Flow Management System publishes FIXM formatted data through a mediator provided by SWIM and with release 13 will publish FIXM format without a mediator. International data exchange will also be available soon. Airservices Australia's Flight Information Broker (FIB) provides a variety of flight information services in the FIXM format, and Australia's Operational Data Services (ODS), a future flight information management system, is planning to deploy using FIXM.

The FIXM data model will continue to grow into a large and complex specification. To manage this complexity, FIXM was developed with a "Core & Extensions" architecture. The core contains the base flight information that is globally applicable and expected to be used by any application in the international settings. Extensions are accompanying but separate data models and schemas that add additional elements to supplement the FIXM core to support additional regional requirements from particular communities of interest. Concepts and data elements from regional extensions can be promoted to the core if they demonstrate global applicability. FAA publishes and manages the FIXM US extension, which contains the flight data specific to NAS operations.

For future versions of FIXM, the Core is expected to include additional sets of data elements to support the four-dimensional trajectory (4DT) concept. A series of 4DT operational scenarios are being developed and coordinated between the Single European Skies ATM Research Program (SESAR) and NextGen and have initially been incorporated in FIXM beginning with version 3.0 in FY 2014. The continued development of these scenarios, along with FIXM data elements necessary to support the 4DT concept, will provide additional input for the development of FIXM Core data standard. The 4DT concept is part of a larger effort to define new provisions through International Civil Aviation Organization (ICAO) to support a Flight and Flow Integrated Collaborative Environment (FF-ICE). FF-ICE defines international information requirements for flight planning, flow management and trajectory management and aims to be a cornerstone of performance-based navigation. This international effort embraces the FIXM standard to facilitate a successful collaboration and will also require FIXM data elements and supporting services to implement provisions planned for the future.

Along with the continued development and evolution of the FIXM Core, the FIXM US Extension will supplement FIXM content in the following data areas to support various FAA NextGen initiatives. Future version releases of v5.0 through v7.0 are planned to contain elements related to the following areas:

- Surface flow Collaborative Decision Making;
- Unmanned Aircraft System (UAS) operations; and
- 4D Trajectory operations.

The Flight Object program will be composed of two major components:

- Development of the FIXM standard; and
- FIXM Operational Analysis.

Development of FIXM Standard:

The FIXM Core Standard and US extension will be updated as needed to support NextGen capabilities and the FF-ICE international initiative. The following artifacts will be created for each version: FIXM Operational Data Description, FIXM Logical Model and XML schema. The updates will be created with collaboration with FAA stakeholders, International partners, industry, ICAO, and International Air Transport Association (IATA).

FIXM Operational Analysis:

The operational analysis will assess various ATM capabilities and identify the data requirements that should be considered for inclusion in each release of FIXM. Additionally, operational scenarios will be developed to define operational context in FIXM artifacts and verify that their contents accurately address the operational needs.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Use of FIXM will provide a unified, complete, accurate, up-to-date, and easily-accessible picture of any and all flights. The use of standardized flight data will increase data quality and availability between stakeholders enabling operational benefits such as increased coordination, common situational awareness, and collaborative decision-making across all phases of flight; improving planning, decision making, and NAS capacity.

Program Plans FY 2017 – Performance Output Goals

Development of FIXM Standard:

- Complete work to accommodate maintenance updates to FIXM Core v4.0 to reflect corrections/modifications as a result of FF-ICE/1 Implementation Guidance and early user review.
- Develop updated US Extension to support v4.0 maintenance release.

FIXM Operational Analysis:

- Develop a FIXM NAS Implementation Strategy for transitioning from today's ATM environments to the full implementation of FIXM. This strategy will provide a projected overview on which NAS System will implement FIXM at what time frame. FIXM must ensure it is prepared to accommodate the systems to be transitioned.
- Conduct the assessment for the NAS FIXM messaging guideline for constructing and exchanging FIXM compliant messages for various NAS data exchanges.
- Identify and prioritize changes to FIXM in support of FAA and non-FAA systems migrating to FIXM standard.

Program Plans FY 2018 – Performance Output Goals

Development of FIXM Standard:

- Complete impact assessment of an ICAO Reference Model on the FIXM Standards.
- Complete impact assessment of the ICAO FF-ICE/1 Implementation Manual on FIXM.
- Develop draft FIXM Core v5.0 artifacts. This release may include UAS or Commercial Space Operations.
- Develop draft FIXM US extension v5.0 artifacts.

FIXM Operational Analysis:

- Develop Operational Scenarios to support FIXM Core and US Extension v5.0.
- Develop a FIXM Global Implementation Strategy. This strategy will provide a projected overview on implementing FIXM for global data exchanges.
- Conduct the assessment for the Global FIXM messaging guideline for constructing and exchanging FIXM compliant messages in the global data exchanges.
- Identify and prioritize changes to FIXM in support of FAA and non-FAA systems migrating to FIXM standard.

Program Plans FY 2019 – Performance Output Goals

Development of FIXM Standard:

- Develop and complete FIXM v5.0 Core artifacts. This version may include UAS or Commercial Space Operations. In addition, there may be new requirements to reflect the ICAO Reference Model.
- Develop and complete FIXM US extension v5.0 artifacts.
- Update the FIXM messaging standard based on FIXM content changes.

FIXM Operational Analysis:

- Develop Operational Scenarios to support FIXM US Extension v5.1 (if needed).
- Initiate developing Operational Scenarios to support FIXM Core v6.0.
- Initiate developing Operational Scenarios to support FIXM US Extension v6.0.
- Identify and prioritize changes to FIXM in support of FAA and non-FAA systems migrating to FIXM standard.

Program Plans FY 2020 – Performance Output Goals

Development of FIXM Standard:

- Develop and complete draft FIXM Core v6.0 artifacts.
- Develop and complete draft FIXM US extension v6.0 artifacts.

FIXM Operational Analysis:

- Develop Operational Scenarios to support FIXM Core and US Extension v6.

Program Plans FY 2021 – Performance Output Goals

Development of FIXM Standard:

- Develop and complete final FIXM Core v6.0 artifacts.
- Develop and complete final FIXM US extension v6.0 artifacts.
- Update the FIXM messaging standard based on FIXM content changes.

FIXM Operational Analysis:

- Develop and complete final operational scenarios to define the operational context for FIXM Core v7.0.
- Develop and complete final operational scenarios to define the operational context for FIXM US extension v7.0.

B, Common Status & Structure Data, G05A.02-01

Program Description

The Common Status and Structure Data (CSSD) program will establish the requirements and information flows for the collection, management, and maintenance of aeronautical information in a digital format for machine to machine exchange. The common data and information services and integration activities enable improved flight planning and pilot briefing services; increased on-demand NAS operational performance information; and better airspace management using timely schedule information and a common awareness of Special Activity Airspace (SAA) status across the NAS. To support NextGen capabilities, this program enables the FAA to improve situational awareness through better access to aeronautical information and a common language. This allows external users including DoD, Airline Operations Centers, Flight Operation Centers, pilots and Air Navigation Service Providers (ANSP) to make more informed decisions and base their plans on the most current information available with respect to planned NAS constraints such as SAA, airport configurations, static airspace constraints, and NOTAMs.

Key elements of the CSSD program include:

- The Aeronautical Common Services (ACS) platform - Implemented as part of Aeronautical Information Management Modernization (AIMM) Segment 2, this platform will be used to accept data from authoritative databases, process and combine data from these sources, and distribute data via the System-Wide Information Management (SWIM) infrastructure. The ACS, SWIM network, and authoritative NAS databases will provide an enterprise level platform for accessing and delivering both authoritative data, and or products, from multiple authoritative data sources;
- Capturing and maintaining digital information about flow constraints, reference data, and NAS status information affecting operations;
- Publishing aeronautical status information digitally using international standards;
- Providing more accurate, complete, standardized and digitized AI, and greater AI integration into the NAS ATM environment to support capabilities including constraint-aware flight planning using digitized airspace constraints contained in Standard Operating Procedures (SOP) and Letters of Agreement (LOA), real-time Special Activity Airspace (SAA) status information, integrated SAA schedule/status information, integrated NOTAM processing, improved adaptation data generation, and digitized charting; and
- Using the SAA schedule, status and legal description information to improve operational performance metrics calculations and forecasting of airspace system performance.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter.*
- *FAA performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

CSSD provides support for the information, systems and tools necessary to implement comprehensive NAS safety management. CSSD will achieve this by establishing the requirements and information flows for the collection, transformation, distribution, integration, and maintenance of aeronautical information in a standardized digital

format between systems. When fully realized, the FAA will have the ability to model how new procedures, regulations, airspace changes, and dynamic SAA information may affect the current and future safety of the NAS.

Identifying the requirements and benefits of integrated flight planning and briefing (including flight constraint information) will lead to better flight planning and arrival/departure safety plans. Supporting preflight, during flight and post-operational aeronautical information for exchange and use by NAS automation systems will enable the FAA to maximize safety and may reduce the number of incidents.

Program Plans FY 2017 – Performance Output Goals

- Develop the following products in support of the Investment Analysis Readiness Decision (IARD) for AIMM S3, which will focus on the digitization of constraint data, integration of AI data with decision support tools, improved adaptation generation, and digitized charting:
 - Shortfall Analysis/ Quantification;
 - Solution Concept of Operations;
 - Functional Analysis;
 - Range of Alternatives;
 - Investment Analysis Plan
 - Enterprise Architecture Products; and
 - Preliminary Program Requirements.
- Achieve IARD for AIMM S3.

Program Plans FY 2018 – Performance Output Goals

- Develop the following products in support of the Investment Analysis for AIMM S3:
 - Initial Program Requirements;
 - Initial Business Case Analysis Report (BCAR);
 - Enterprise Architecture Products; and
 - Initial Implementation Strategy and Planning Document (ISPD).

Program Plans FY 2019 – Performance Output Goals

- Develop the following products in support of the Final Investment Decision (FID) for AIMM S3:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - BCAR;
 - Final ISPD;
 - Acquisition Program Baseline (Execution Plan);
 - Independent Evaluation Review (IER); and
 - Project Management and Communications Plan.
- Achieve FID for AIMM S3.

Program Plans FY 2020 – Performance Output Goals

- Develop the following products in support of the Concept and Requirements Definition Readiness Decision (CRDRD) for AIM Modernization Segment 4 (AIMM S4), which will focus on expanding the digitization of AI and integrating AI data into additional operational decisions and enabling tools:
 - Preliminary Shortfall Analysis
 - CRD Plan
- Achieve CRDRD for AIMM S4.

Program Plans FY 2021 – Performance Output Goals

- Develop the following products in support of the IARD for AIMM S4:
 - Shortfall Analysis/ Quantification;
 - Solution Concept of Operations;
 - Functional Analysis;
 - Range of Alternatives;
 - Investment Analysis Plan;
 - Enterprise Architecture Products; and
 - Preliminary Program Requirements.
- Achieve IARD for AIMM S4.

C, Flight Object Exchange Services (FOXS), G05A.02-08

Program Description

Flight data is essential to air traffic control. It alerts controllers to the intended flight path of the aircraft they are controlling. Even though flight data may be found in multiple NAS systems, a unified, complete, accurate, and up-to-date data-set containing all flights managed by en route, terminal and surface facilities in the various stages of flight does not exist today. Coordination of flight data with two way data exchange is needed to support future concepts, such as Trajectory Based Operations, that require gate to gate planning for execution of the flight.

FOXS will establish the information architecture for modifying NAS interfaces to support the transition of real time operational NAS systems from existing data standards and interfaces into a data standard and interface that will support coordinated use. FOXS will support the Flight Information Exchange Model (FIXM) standard which is a part of a family of information exchange models that includes the Aeronautical Information Exchange Model (AIXM), and the Weather information Exchange Model (WXXM) designed to support the information needs of Air Traffic Management (ATM). FIXM is an International data exchange standard which will be updated annually and will require that FOXS also be updated to support new versions of the standard.

Integration of FIXM into NAS flight data will be managed through the implementation of the NAS flight object. The FOXS program will incorporate flight object data and support NAS and Non-NAS client connectivity to the service. FOXS connected clients will be able to access flight object data and modify flight object data as authorized. Flight object information will be used to capture and distribute the most up-to-date information on any flight, and will serve as the single common reference for all system information about that flight. A flight object will be created for each proposed flight, and the flight object information will be updated in real time as the flight progresses through planning states to active states gate to gate. The flight object will collect, manage and provide flight-specific data, such as aircraft identification, aircraft parameters, current flight plan information, operator preferences, flight capabilities, trajectory, and security information. Over time, flight-specific data and other information contained in the flight object may become more detailed to support new capabilities.

The program is currently in the Concept and Requirements Definition (CRD) phase. It is scheduled for an Investment Analysis Readiness Decision (IARD) in FY 2017, Initial Investment Decision (IID) in FY 2018 and a Final Investment Decision (FID) by FY 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

FOXS will provide a unified, complete, accurate, up-to-date, and easily-accessible picture of all flights. Connectivity to FOXS, and the use of flight object data will improve the information management and availability of flight object data between stakeholders, enabling operational benefits such as improved non-verbal coordination,

common operational situational awareness, and collaborative decision-making across all phases of flight; improving planning, decision making, and the use of NAS capacity.

Program Plans FY 2017 – Performance Output Goals

- Complete operational analysis and system allocation of:
 - Flight Data Common Service (FDCS);
 - Flight Object Exchange Services (FOXS); and
 - Unified Flight Planning and Filing Service (UFPF).
- Complete the following products in support of the FOXS IARD:
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operations;
 - Functional Analysis; Enterprise Architecture Products; and
 - Preliminary Program Requirements.
- Achieve IARD for FOXS.

Program Plans FY 2018 – Performance Output Goals

- Conduct engineering development of:
 - Flight Data Common Service (FDCS)
 - Flight Object Exchange Services (FOXS)
 - Unified Flight Planning and Filing Service (UFPF)
- Complete the following products in support of the FOXS IID:
 - Initial Program Requirements;
 - Initial Business Case Analysis Report (BCAR);
 - Enterprise Architecture Products;
 - Initial Implementation Strategy and Planning Document (ISPD); and
 - Final Investment Analysis Plan (IAP).
- Achieve IID for FOXS.
- Complete engineering and investment analysis planning to incorporate FIXM changes into FOXS and SWIM services.

Program Plans FY 2019 – Performance Output Goals

- Complete the following products in support of the FOXS FID:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final ISPD; and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID for FOXS.

Program Plans FY 2020 – Performance Output Goals

- Initiate FOXS implementation, including:
 - FOXS hardware infrastructure; and
 - FOXS services (including Globally Unique Flight Identifier (GUFI) service and data fusion service).

Program Plans FY 2021 – Performance Output Goals

- Complete FOXS implementation, including:
 - FOXS hardware infrastructure; and
 - FOXS services (including GUFI service and data fusion service).
- Complete the following products to support the FOXS In-Service Decision (ISD):
 - Operational test report(s);
 - Independent Operational Assessment Report; and
 - In-Service Review (ISR) Checklist completed or action plans for those remaining open.

D, Dynamic Airspace, G05A.04-01

Program Description

The Dynamic Airspace program will develop the requirements and algorithms for tools to enable air traffic managers to reconfigure airspace to expand or contract air traffic control sectors to match the overall level of activity in the facility's airspace and dynamically manage restrictions on travel through designated areas. Airspace reconfiguration will be flexible, so that it can be applied across time horizons of varying scale; from years, to months, to days, to hours. It will allow the transfer of airspace from adjacent areas within a facility, as well as airspace from adjacent facilities to improve the overall efficiency of operations. When mitigating constraints such as weather and Special Use Airspace (SUA), Dynamic Airspace provides an additional tool to support robust aviation capabilities and ensuring a continuous NAS flow strategy.

The acquisition milestones for the Dynamic Airspace Program are planned as follows: Concept and Requirements Definition Readiness Decision (CRDRD) in FY 2019; Investment Analysis Readiness Decision (IARD) in FY 2020; Initial Investment Decision (IID) in FY 2021; and a Final Investment Decision (FID) in FY 2022.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Dynamic Airspace will allow traffic managers to optimize the airspace configuration across the NAS to decrease congestion in workload-constrained airspace while addressing weather and SUA.

Program Plans FY 2017 – Performance Output Goals

- Develop Project Plan.
- Develop a preliminary shortfall analysis.

Program Plans FY 2018 – Performance Output Goals

- Develop an initial Concept of Operations (ConOps).

Program Plans FY 2019 – Performance Output Goals

- Conduct concept validation activities, such as a human-in-the-loop simulation.
- Complete documentation in preparation for CRDRD:
 - Concepts and Requirements Definition Plan
 - Updated ConOps
 - Updated Shortfall Analysis
- Achieve CRDRD.
- Conduct concept validation activities, such as a human-in-the-loop simulation.
- Complete the following documentation in preparation for IARD:
 - Final Shortfall Analysis Document
 - Final Solution ConOps

Program Plans FY 2020 – Performance Output Goals

- Complete the following documentation in preparation for IARD:
 - Functional Analysis document
 - NAS EA Products
 - Operational Safety Assessment (OSA)
 - Preliminary Program Requirements
 - Range of Alternatives Document
 - Acquisition Category
- Achieve IARD.
- Complete the following documentation in preparation for IID:
 - Initial Plan for Final Investment Analysis
 - Initial Program Requirements (IPR)

Program Plans FY 2021 – Performance Output Goals

- Complete the following documentation in preparation for IID:
 - Initial Business Case Definition for each alternative
 - Initial Implementation Strategy and Planning Document (ISPD)
 - Safety Assessment
 - NAS EA Products
- Complete initial Screening Information Request.
- Achieve IID.

E, Advanced Methods, G05A.02-02

Program Description

Advanced Methods for Traffic Flow Management (TFM) will explore technologies, infrastructure enhancements, and procedural changes to meet current and future traffic management needs. This program will support improvements to increase airport capacity, sector throughput, and reduce sector delays by providing NAS users and Air Traffic Management with a common understanding of NAS constraints. The program will develop and test prototype improvements and provide operational concepts and requirements for implementation by automation programs and operational organizations.

The capabilities developed through Advanced Methods, together with those developed through the Strategic Flow Management Application (SFMA) program (G05A.01-01) will provide the concepts and requirements to the Strategic Flow Management Engineering Enhancements program (SFMEE) (G05A.01-02) to progress these through the AMS process as part of future investments for CATMT.

The capabilities defined by this program are grouped in the following enhancement areas:

- Constraint Prediction, Monitoring and Alerting:
 - Translate the effects of weather and traffic complexity on the number of flights that can fly through constrained airspace during a specific timeframe (airspace resource capacity);
 - Refine and determine which methods should be used in different operational contexts and planning horizons; and
 - Consolidate monitoring and alerting functions, incorporate probabilistic data into alerting, and improve user-customization of what is monitored, how information is presented, and how/when alerts are triggered.
- Operational Response Development:
 - Incorporate probabilistic capacity and demand information into decision support capabilities. The initial step would be to provide enhanced risk assessment information to users as they conduct what if analyses on the parameters of potential Traffic Management Initiative (TMI) strategies;

- Continue to enhance models that map a current operational event to similar historical events and associated TMI strategies. Engage operational subject matter experts to identify and capture relevant attributes to develop models for decision support capabilities; and
- Continue to explore methods to allow operators to submit quantitative input to system performance goals such as capacity, predictability, efficiency, and equity, and appropriately weigh and aggregate operator inputs. Begin to explore methods for translating aggregated performance expectations into TMI parameter recommendations.
- TFM System Performance Analysis Capability:
 - Identify improvements to capture and store relevant TFM data;
 - Provide ability to assess weather forecast performance, capacity/demand prediction accuracy, TMI compliance/execution precision and the effectiveness of TMIs against their performance objectives;
 - Provide capabilities to cluster similar historical events and TMI strategies;
 - Provide what-if modeling of alternate resolution strategies; and
 - Investigate the creation of a training simulation environment to sector simulation problems that controller trainees may experience.
- Flow Management to Support Dynamic Airspace:
 - Provide ability to assess post-operations data from areas with known problem of matching demand and capacity;
 - Leverage post-operations data to enable airspace redesign to incorporate user-proposed routings, Special Activity Airspace, reverse or combined traffic flow capabilities and common weather impact configurations;
 - Leverage post-operations data to enable flexible sector design based on time of day, season, typical weather, or staffing; and
 - Determine methods to display predicted congestion, weather events, and constraints to assist in configuration selections by Traffic Management Coordinators (TMCs).
- Collaborative Airport and Airspace Configuration Management:
 - Increase departure flow efficiency and reduce delays by providing decision-making support capabilities to optimize integrated arrival/departure flow planning and execution;
 - Automate the process of monitoring departure demand and the identification of departure slots in relationship to airport arrival demand; and
 - Support evaluation and coordination of related airspace and airport configuration changes with associated route changes. It includes collaboration among the tower, TRACON, en route, airport authority, and airspace users.
- Improved Weather Integration into Flow Planning:
 - Increase flow efficiency by incorporating improved weather products (e.g. CoSpa) into flow planning capabilities; and
 - Provide improved weather display on Traffic Situation Display (TSD) for flow planning purposes.

All of the above capabilities, along with other emerging TFM capabilities, will be prioritized as the program moves forward. Prioritization will be based on concept maturity, operational benefit(s), and schedule. The prioritized capabilities will be recommended for future CATMT investment based upon available funding and may be updated once prioritization is completed.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Advanced Methods for TFM will analyze different technologies, infrastructure enhancements, and procedural changes to support more efficient use of airport capacity, increases in sector throughput, and reductions in sector delays.

Program Plans FY 2017 – Performance Output Goals

- Conduct concept validation activities – prototyping/evaluations/human in the loop (HITLs)/reports for individual capabilities under Constraint Prediction, Monitoring and Alerting; and TFM System Performance Analysis Capability.

Program Plans FY 2018 – Performance Output Goals

- Conduct concept engineering activities to develop the following products for individual capabilities under Constraint Prediction, Monitoring and Alerting, Operational Response Development, and TFM System Performance Analysis Capability:
 - Updated Capability Functional Analysis;
 - Updated Capability Requirements;
 - Rough order of magnitude cost estimates; and
 - Rough order of quantitative capability benefits.
- Update products as necessary for individual capabilities under Constraint Prediction, Monitoring and Alerting; Operational Response Development; and TFM System Performance Analysis Capability:
 - Capability Functional Analysis;
 - Capability Requirements;
 - Rough order of magnitude cost estimates; and
 - Rough order of quantitative capability benefits.
- Conduct and report on a gap analysis between existing/near-term planned TFM capabilities and the NextGen Concept of Operations (CONOPS)/Operational Improvements (OIs) in the enhancement areas of Flow Management to Support Dynamic Airspace, Collaborative Airport and Airspace Configuration Management, and Improved Weather Integration into Flow Planning.
- Develop the following products based on the above analysis:
 - Capability Shortfall Analysis; and
 - Preliminary Capability CONOPS.

Program Plans FY 2019 – Performance Output Goals

- Develop the following products for new capabilities:
 - Preliminary Capability Functional Analysis;
 - Preliminary Capability Requirements;
 - Concept Validation Activities – Prototyping, Evaluations, Human in the Loop, and Reports; and
 - Updated Capability CONOPS.

Program Plans FY 2020 – Performance Output Goals

- Conduct concept engineering activities to complete the following:
 - Update Capability Functional Analysis;
 - Update Capability Requirements; and
 - Update rough order of magnitude cost estimates.

Program Plans FY 2021 – Performance Output Goals

- Provide Quantitative Capability Benefits for individual capabilities under Flow Management to Support Dynamic Airspace, Collaborative Airport and Airspace Configuration Management, and Improved Weather Integration into Flow Planning.
- Update the following products as necessary for individual capabilities of Flow Management to Support Dynamic Airspace, Collaborative Airport and Airspace Configuration Management, and Improved Weather Integration into Flow Planning:
 - Capability Functional Analysis;
 - Capability Requirements; and
 - Rough order of magnitude cost estimates.
- Conduct a gap analysis between existing/near-term planned TFM capabilities and the NextGen CONOPS/OIs in the enhancement areas of Automated Execution of TMs, Advanced Arrival Parameter Setting, and Advanced Ground Delay Program.
- Develop the following products based on the above analysis:
 - Quantitative Capability Benefits for individual capabilities;
 - Capability Shortfall Analysis; and
 - Preliminary Capability CONOPS.

X, Airspace Resource Management System (ARMS), G05A.02-09

Program Description

The future NextGen framework for airspace allocation will no longer rely on navigation aids and sectors. The Airspace Resource Management System (ARMS) will implement the tools for controlling the reconfiguration of the NextGen networked communications infrastructure to support the operational requirement for reconfigurable airspace. ARMS will allocate airspace as a resource to meet demand, safety, and environmental requirements and will manage voice, data link communications, and communication links between facilities.

Key benefits from ARMS include:

- Reduced air traffic controller workload while controlling constrained airspace (i.e. Special Activity Airspace, weather).
- More flexibility for air traffic managers to reconfigure airspace to address convective weather and fluctuations in user demand.

An Investment Analysis Readiness Decision (IARD) for this program is planned for FY 2020. Initial Investment Decision (IID) is planned for FY 2020. A Final Investment Decision (FID) is planned in FY 2021.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

The performance metric to increase on-time arrivals is supported by providing tools to air traffic managers for more flexibility to reconfigure airspace to address convective weather and meet fluctuations in user demand.

Program Plans FY 2017-2019 – Performance Output Goals

- None.

Program Plans FY 2020 – Performance Output Goals

- Develop the following products in support of the IARD:
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operation;
 - Functional Analysis;
 - Enterprise Architecture Products;
 - Program requirements; and
 - Safety Assessment.
- Achieve IARD.
- Develop the following products in support of the IID:
 - Initial Program Requirements;
 - Business Case Analysis Report (BCAR);
 - Enterprise Architecture Products;
 - Initial Implementation Strategy and Planning Document (ISPD); and
 - Final Investment Analysis Plan (IAP).
- Achieve IID.

Program Plans FY 2021 – Performance Output Goals

- Develop the following products in support of the FID:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Complete Chief Financial Officer Package.
- Achieve FID for ARMS.
- Release Screening Information Request.

1A08, NEXTGEN – IMPROVED MULTIPLE RUNWAY OPERATIONS PORTFOLIO
FY 2017 Request \$6.5M

- A, Wake Turbulence Mitigation for Arrivals (WTMA), G06A.01-02
- B, Closely Spaced Parallel Runway Operations, G06N.01-02

A, Wake Turbulence Mitigation for Arrivals (WTMA), G06A.01-02

Program Description

The WTMA program is developing Air Traffic Control (ATC) wake mitigation separation arrival procedures and supporting decision support technology. When development of ATC wake mitigation separation and arrival procedures are completed the throughput capacity benefit will be evaluated in operational demonstrations prior to the WTMA being fully implemented in the NAS. If the program's developed procedures and supporting technology demonstrate a reasonable benefit in NAS throughput, they will be incorporated into FAA terminal area air traffic control procedures and supporting terminal automation systems.

The WTMA capabilities, when implemented, will restore part of the airport runway throughput capacity lost when airports change from visual approach operations to instrument approach operations and implement required wake mitigation separation minima between landing aircraft. High level analyses have indicated that current air traffic control wake mitigation separation process when aided by technology can safely increase capacity efficiency. The WTMA procedure evaluation and requirements development products are expected to allow a rapid integration of the WTMA capability into NextGen ATC procedures and supporting automation platforms.

Wake Turbulence Mitigation for Arrivals – Procedural (WTMA-P) only requires extensive collection and analysis of aircraft wake track data to determine which closely spaced parallel runways (CSPR) airports have the required runway configuration to allow the use of WTMA-P reduced diagonal wake mitigation spacing between aircraft operating at that airport. In FY 2015, WTMA-P was incorporated into FAA Order 7110.308A which approved the use of WTMA-P will at Philadelphia International Airport (PHL) and Detroit Metropolitan Wayne County Airport (DTW) once their operations can be adjusted for the use of the procedure. Additional Core CSPR airports may qualify to run WTMA-P, based on the operational analyses that will continue into FY 2016.

Associated with the development of WTMA-P, the WTMA project is developing as the second part of the project, the Automated Terminal Proximity Alert Phase 2 (ATPA-P2) product. ATPA-P2 is being designed for use by controllers in conducting the dependent approach procedures, such as WTMA-P and other dependent approaches authorized by FAA Order 7110.308A. Controller use of ATPA-P1, designed to assist in single runway approach operations, has resulted in a 1% increase in the number of approach operations a controller conducts per hour/per runway. It is expected that controller use of ATPA-P2 for dependent stagger approaches to parallel runways will net a similar percentage increase in the number of instrument flight rule operations controllers can conduct on the parallel runways using the dependent stagger approach procedures. ATPA-P2 is also an enabling ATC display capability for display of Wake RECAT Phase II separations for parallel runway approach operations and the display of the WTMA System (WTMA-S) crosswind dependent wake protection separation limits.

WTMA-S, the third product of the project, is a more complex technology supported solution that builds on the analysis work accomplished to develop the procedures defined by FAA Order 7110.308 and the development of WTMA-P. WTMA-S will be available for use by all CSPR airports that require more efficient use of runway capacity during instrument approach operations. The WTMA-S procedure and supporting technology allows controllers to position aircraft in a separation interval ahead of wake turbulence from the leading aircraft on the adjacent CSPR approach to the airport. WTMA-S will determine, based on the actual and predicted crosswinds in the approach corridor, the maximum allowed diagonal separation between paired aircraft to keep the following aircraft safely in front of the leading aircraft's wake. WTMA-S requires knowledge of the current measured and forecast wind conditions in the approach corridor and a longer term forecast, up to 2 hours in the future, to advise on the airport acceptance rate. WTMA-S can provide WTMA-P like CSPR instrument arrival throughput capacity to almost all Core CSPR airports when crosswinds are favorable at those airports.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The WTMA project, part of the Improved Multiple Runway Operations portfolio, contributes to the FAA Strategic Priority of "Deliver Benefits through Technology and Infrastructure" by developing technology solutions that will provide increased arrival throughput capacity for Core CSPR airports. The developed WTMA procedure and supporting technology for some CSPR airports, allows ATC, when unable to use visual approach procedures, to implement a diagonal reduced wake separation procedure resulting in more arrivals per hour than can be obtained by present ATC wake separation procedures.

PHL and DTW are already approved by FAA Order 7110.308A to use the WTMA-P CSPR arrival procedure. Once PHL is able to add WTMA-P CSPR instrument approach procedures to its arrival operations, the benefit to PHL and its air carriers, is a 30% to 40% increase above PHL's CSPR instrument arrival operational capacity would be without the use of FAA Order 7110.308A. Similar benefit is estimated for DTW, when it is able to conduct WTMA-P CSPR instrument approach operations. The WTMA-S product will extend the WTMA-P type of benefit to CSPR airports that do not have the runway configuration to allow use of WTMA-P. Simulation of the WTMA-S capability has shown that airport arrival rate (AAR) during airport conditions requiring instrument approaches can be increased by up to 10 arrivals per hour, changing the AAR for airports like Boston from 30 an hour to 40 an hour.

Program Plans FY 2017 – Performance Output Goals

- Complete development and one year operational demonstration of the ATPA-P2 modification to the ATPA STARS software module for use with WTMA-P dependent stagger approaches.
- Complete Functional Description Narratives for the development of software modifications in NAS automation platforms to implement the WTMA-S air traffic control decision support capability.
- Complete review by Stakeholders of the WTMA-S Functional Description Narratives.
- Complete WTMA-S concept refinement and preliminary safety analysis documentation for future investment analysis.

Program Plans FY 2018-2021 – Performance Output Goals

- None.

B, Closely Spaced Parallel Runway Operations, G06N.01-02

Program Description

Closely Spaced Parallel Operations (CSPO) are simultaneous approaches and departures of aircraft to airports with single and multiple parallel runways that are closely spaced; defined as less than 4300 feet apart. CSPOs have been implemented at several Metroplex airports to meet increased demand. When weather conditions cause airport visibility to fall below minimums for visual operations, the airport arrival rate can be reduced by as much as half since aircraft arrivals are scheduled on the assumption of visibility above airport minimums. When weather conditions do not allow for visual approaches, the use of Simultaneous Independent Instrument Approach (SIIA) operations significantly reduces the impact on the airport arrival rate by maximizing the use of available capacity.

Recently, dual SIIA operations were approved for runways when centerlines are separated by 3600 feet or greater. If High Update Rate surveillance is used, independent approaches can be conducted to runways separated by at least 3400 feet or in some cases, down to 3000 feet if one of the approaches is offset from the opposite parallel runway approach path. In comparison, separation standards for dual simultaneous dependent approach operations, where aircraft are staggered along their respective parallel final approach path, can be used when runways are separated by 2500 feet or more. Dependent staggered approaches to runways separated by less than 2500 feet are approved for a limited number of airports under specific restrictions. Dependent staggered approaches provide an incremental increase in capacity but do not increase capacity as much as SIIA.

The CSPO program will accelerate activities to provide increased arrival and departure operations to airports with closely spaced parallel runways in limited visual conditions. CSPO will develop the performance requirements that enable the implementation of innovative procedures, tools and controller or pilot aids that increase capacity at airports utilizing multiple independent and dependent operations. This initiative will enhance procedures that allow dependent operations to closely spaced parallel runways or converging approaches to runways greater than 700 feet apart, as well as supporting independent operations to parallel runways between 2500 feet and 4300 feet. Furthermore, CSPO will identify potential alternatives for meeting functional requirements such as applying existing and new technologies to current standards, evaluating high update rate surveillance requirements and sensors such as Automatic Dependent Surveillance-Broadcast (ADS-B), navigation system performance and pilot and controller response times used for risk assessments, and the development of new standards to facilitate NextGen applications.

This program will also evaluate Flight Deck Interval Management (FIM) and Cockpit Display of Traffic Information (CDTI) technologies providing the aircrew with a monitoring capability that mimics the visual monitoring the aircrew uses to self-separate from other aircraft and obstacles, as allowed in Visual Meteorological Conditions (VMC) operations.

The Paired Approach demonstration will demonstrate how satellite surveillance of aircraft for controllers, using ADS-B and FIM pilot automation tools, can be combined to conduct simultaneous instrument approaches in all weather conditions to runways that are closely spaced and parallel to each other. This demonstration is expected to show benefits such as increased airport arrival rates, less time spent in the air maneuvering for a final approach, fuel

savings for the airlines, and reduced emissions for the environment. This demonstration is funded through G08M 01-04.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

CSPO is focused on finding safe ways to recover capacity lost by the current aircraft-to-aircraft separation procedures required for simultaneous operations to closely spaced parallel runways during limited visual conditions. The goal of CSPO analysis is to maintain the same arrival and departure rates regardless of weather conditions. Using CSPO, some airports may increase arrival rates by as much as 6 to 12 operations per hour but will vary based on local operations and procedures.

Program Plans FY 2017 – Performance Output Goals

Closely Spaced Parallel Runway Operations:

- Perform analysis of data collected in Paired Approach (PA) to CAT I minima human in the loop (HITL) simulations and provide technical report.
- Complete Simultaneous Approaches using High Update Rate surveillance technical report and supply a status memo.
- Perform analysis of course divergence on departure to support future CSPO departures HITL simulations and provide technical report.

Stakeholder Demo – Improved Multiple Runway Ops Portfolio - Paired Approach:

- Complete Demonstration Execution Plan.
- Perform safety assessment for flight demonstration.
- Complete prototype demonstration cockpit avionics and ground ATC tools (as needed).

Program Plans FY 2018 – Performance Output Goals

Closely Spaced Parallel Runway Operations:

- Finalize analysis of PA to CAT I minima and provide technical report.

Stakeholder Demo – Improved Multiple Runway Ops Portfolio - Paired Approach:

- Conduct demonstration of Paired Approach for CAT I capability.
- Complete demonstration evaluation report and benefits assessment.

Program Plans FY 2019 – Performance Output Goals

Closely Spaced Parallel Runway Operations:

- Complete inputs to the development of safety risk documentation and controller/pilot training materials to support the use of new standards for PA to CAT I approach minima at applicable airports.

Program Plans FY2020-2021 – Performance Output Goals

Closely Spaced Parallel Runway Operations:

- None.

1A09, NEXTGEN – NAS INFRASTRUCTURE PORTFOLIO

FY 2017 Request \$17.7M

- A, Weather Observation Improvements, G04W.02-01
- B, Weather Forecast Improvements – Work Package 1, G04W.03-01
- C, NextGen Navigation Engineering, G06N.01-03
- D, New ATM Requirements, G01M.02-02
- E, Surface/Tower/Terminal Systems Engineering, G06A.02-01
- F, NextGen Distance Measuring Equipment (DME) Support For Performance Based Navigation (PBN) Strategy, G01N.01-02
- G, Information Management, G05M.03-01

A, Weather Observation Improvements, G04W.02-01

Program Description

This program will manage the evolution of the existing aviation weather observation sensor networks to one that provides the optimal quantity and quality of ground, air, and space-based sensors. A consistent and effective aviation weather sensor network is fundamental to NextGen. Of primary focus is the surface weather sensor network in the Terminal environment. A comprehensive list of weather observation shortfalls is continuously refined and prioritized based on feedback from key stakeholders and user groups. The program uses this information to explore potential NextGen-enabled concepts and to mitigate the high priority shortfalls. Technical studies are underway to identify methods to optimize existing ground-based legacy surface platforms. In the near term, this program is addressing current limitations of the sensor network for the Terminal environment; specifically, the ability to identify the type and intensity of frozen precipitation which impacts the efficiency of winter weather and deicing operations and conduct technical and operational risk assessments of alternative solutions. Improvements to the aviation weather-observation sensor network may require collaboration between the FAA and other NextGen partners including the National Oceanic and Atmospheric Administration (NOAA) and the Department of Defense (DoD).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

This program provides the analysis and engineering to improve aviation weather observations to enable improvements in forecasts; and the integration of weather data into decision support tools for collaborative and dynamic NAS decision making. It will enhance capacity by expanding the use of weather information for operational decision-making. This will include support for optimal selection of aircraft routes and precise spacing for arriving and departing aircraft. The increased accuracy of forecasts and improved observations will also enable individual trajectory-based profiles and optimized use of available airspace.

Program Plans FY 2017 – Performance Output Goals

- Produce a concept maturity technology plan for terminal wind operational improvements that identifies improved spatial sampling in the terminal area, improved information availability, and sensor modernization and consolidation opportunities.
- Complete update of weather observations shortfall analysis; ascertain stakeholder buy-in and prioritization, and document terminal winds operational improvement in NAS Infrastructure portfolio.
- Deliver assessment of market technologies and maturing research and development programs for adverse wind mitigating applications.
- Complete required AMS system engineering artifacts for terminal-area adverse winds useful segment.

Program Plans FY 2018 – Performance Output Goals

- Deliver Terminal Winds Risk Mitigation Plan for Newark Liberty (EWR), LaGuardia (LGA) and John F. Kennedy (JFK) airports.
- Deliver draft ConOps and initial concept level requirements (CML 2) for wind measuring technologies and siting/installation alternatives.
- Complete stakeholder review and assessment of draft ConOps document for wind measuring technologies and siting/installation alternatives.
- Complete laboratory and field infrastructure upgrades required to perform CML 3 demonstration of wind measuring technologies and siting/installation alternatives.
- Deliver results of stakeholder focus group meetings conducted to strategize how information gathered as a result of improved wind measuring technologies and siting/installation techniques can be integrated into existing/proposed information display systems.
- Deliver draft feasibility study (cost, schedule, and logistics) report for conducting CML 4 demonstration of wind mitigation concepts at EWR, LGA and JFK versus alternate location(s).

Program Plans FY 2019 – Performance Output Goals

- Deliver CML 3 results, analysis and recommendations report of wind measuring technologies and siting/installation alternatives at Atlantic City (ACY) airport.
- Deliver final feasibility study (cost, schedule, and logistics) for conducting CML 4 demonstration of wind mitigation concepts at EWR, LGA and JFK versus alternate location(s).
- Deliver CML 4 plan for conducting shortfall-mitigating techniques needed to eliminate technical risk, thus allowing concept to enter investment analysis.
- Complete site survey for CML 4 demonstration.
- Deliver CML 4 site configuration document.
- Issue Screening Information requests for CML 4 equipment and services.
- Deliver design document for web-based tool for presentation of archive wind event data collected during CML 4 for the evaluation of operational decision-making benefits.

Program Plans FY 2020 – Performance Output Goals

- Demonstrate web-based tool for presentation of archive wind event data collected during CML 4 for the evaluation of operational decision-making benefits.
- Procure CML 4 demonstration equipment and services.
- Complete installation of CML 4 wind measuring and data collection equipment at identified location(s).
- Deliver update to Terminal Winds Risk Mitigation document.
- Deliver draft report documenting which other Core 30 terminals would benefit from Terminal Winds Work Package.

Program Plans FY 2021 – Performance Output Goals

- Deliver CML 4 demonstration results and analysis to key stakeholders and users and formulate operational performance requirements.
- Deliver final report documenting which other Core 30 terminals would benefit from Terminal Winds Work Package.
- Deliver results report from model and simulation activities of legacy vs improved wind sensor positioning at EWR, LGA and JFK.
- Deliver technical transfer package of siting guidelines, installation procedures, validated equipment and integration paradigms to the Program Management Organization for incorporation into Aviation Surface Weather Observation Network (ASWON).
- Remove evaluation equipment from demonstration locations.
- Deliver work package closeout materials such as lessons learned document and final stakeholder register.

B, Weather Forecast Improvements – Work Package 1, G04W.03-01

Program Description

The Weather Forecast Improvements (WFI) program seeks to improve weather predictions and determine how to improve the use of that information. The overall complexity of high demand NAS operations makes many weather-constrained traffic management problems difficult to define and even harder to resolve. Even the most seasoned professionals are challenged by the many variables impacting the decision-making process during a weather-constrained event. There is very little automation currently available to assist with identifying, analyzing, and developing mitigation strategies for weather-constrained airports and airspace.

Sophisticated National Weather Service (NWS) forecast models will be overlaid on areas of constrained airspace that can then be interpreted for NAS impact and problem resolution. In today's NAS, traffic managers and users must mentally interpret weather conditions and the potential impact of weather on ATC decisions. This program will improve the decision process and the accuracy of aviation weather information to include an automated indication of the constraints placed on the NAS. It will enable the integration of aviation weather information into collaborative and dynamic decision-making processes by implementing advanced aviation weather forecasting models to determine the effects on traffic forecasts. Metrics will be developed and applied to evaluate how effective weather forecast improvements can be in increasing usage of NAS capacity.

The program will also develop the necessary policies and guidance in the provision of aeronautical meteorological services under U.S. commitments to the International Civil Aviation Organization (ICAO). Specific work elements under Weather Forecast Improvements include the following:

- ATM Weather Integration (AWI) – This work includes exploration of weather translation techniques for non-convective weather constraints, weather alerting and collaborative lab experiments designed to explore AWI concepts and capabilities. Output from these activities will be directly transferable to future Collaborative Air Traffic Management Technologies (CATM-T) and Time Based Flow Management (TBFM) work packages. This work also supports the evaluation of remaining shortfalls in support of service analysis for a future NextGen Weather Processor (NWP) work package and includes AWI activities necessary to help support exchange standards, such as for the Weather Information Exchange Model (WXXM).
- International – This effort develops and coordinates globally-harmonized requirements for the production and dissemination of meteorological information to support international air navigation for adoption as ICAO Standards and Recommended Practices (SARPs) and inclusion in ICAO Annex 3 Meteorological Services and other guidance documents. (Note: ICAO Annex 3 is updated on a 2-year cycle.)
- NWP & Common Support Services-Weather (CSS-Wx) Future Work Package Analysis – This work will also support the evaluation of remaining shortfalls and prepare investment analysis products in support of investment decisions for a future NWP and CSS-Wx work package.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The Weather Forecast Improvements program translates aviation weather data for integration into decision support tools and collaborative and dynamic NAS decision-making. It supports the efficient use of capacity by identifying and displaying airspace constraints that may impact NAS operations and with the selection of optimal aircraft routing and spacing for arriving and departing aircraft. The increased accuracy of aviation weather observations and forecasts enables trajectory-based profiles that optimize the usage of available airspace.

Program Plans FY 2017 – Performance Output Goals

ATM Weather Integration (AWI):

- Traffic Flow Management (TFM) Alerting Concept Development – Expand automated Threshold Event (TE); Identification and Alerting analysis to Core 30 airports #2 and #3; explore methods of weather alerting for traffic managers; conduct Human in the Loop (HITL) tests with simulated alerting systems for airport and en route events in collaboration with FAA Aviation Weather Development and Evaluation (AWDE) personnel.
- Evolution of Translation – Threshold Events. Develop report on translation of threshold events to inform future NextGen weather processing systems; develop associated techniques to be implemented in airport capacity and decision support tools (DSTs) with designated CATM-T researchers.
- Develop recommended TFM training concepts to improve the cognitive assessment of probabilistic weather forecasts and incorporation of risk management by TFM decision-makers.
- AWI Change Management – Explore issues in human factors related to the introduction of AWI processes and evaluates the utility of weather information translations in operational decision making in collaboration with the FAA AWDE group.
- AWI Roadmap – Complete bi-annual AWI Progress Assessment and Recommendations.

International:

- Complete draft Standards and Recommended Practices (SARPs) for Amendment 78 to Annex 3 for Space Weather (SWx), Regional Hazardous Weather Advisory Center (RHWAC), Release of Radioactive Material (RRM), and the Volcanic Ash (VA) work streams for approval by the ICAO Air Navigation Commission.
- Develop draft guidance material for the SWx, RHWAC, RRM, and VA work streams to support the SARPs included in Amendment 78 to Annex 3.
- Complete annual report on US differences and assessment of opportunities to harmonize US Meteorological (MET) practices and procedures with ICAO SARPs.
- Coordinate and harmonize the requirements for the provision and dissemination of meteorological information to support NextGen and SESAR operational capabilities.
- Complete US position on draft Amendment 78 to ICAO Annex 3.

Program Plans FY 2018 – Performance Output Goals

ATM Weather Integration:

- TFM Alerting Concept Development – Expand automated Threshold Event (TE); Identification and Alerting analysis to Core 30 airports #4 and #5; explore methods of weather alerting for traffic managers; conduct Human in the Loop (HITL) tests with simulated alerting systems for airport and en route events in collaboration with FAA AWDE personnel.
- Evolution of Translation – Turbulence. Develop report on translation of turbulence to inform future NextGen weather processing systems; produce turbulence weather avoidance fields (TWAFs) for implementation in CATM airspace DSTs in collaboration with the FAA Aviation Weather Research Team (AWRT). Complete development of recommended TFM training concepts to improve the cognitive assessment of probabilistic weather forecasts by TFM decision-makers.

International:

- Complete draft SARPs for Amendment 79 to Annex 3 for the SWx, VA, and World Area Forecast System (WAFS) work streams for approval by the ICAO Air Navigation Commission.
- Develop draft guidance material for SWx and VA work streams to support the SARPs included in Amendment 78 to Annex 3.
- Complete annual report on US differences and assessment of opportunities to harmonize US MET practices and procedures with ICAO SARPs.
- Coordinate and harmonize the requirements for the provision and dissemination of meteorological information to support NextGen and SESAR operational capabilities.
- Complete US response to final version of Amendment 78 to ICAO Annex 3.

NWP & CSS-Wx Future Work Package Analysis:

- Develop the following products in support of the Investment Analysis Readiness Decision (IARD) for NWP WP2/CSS-Wx WP2:
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operation;
 - Functional Analysis Document;
 - EA products;
 - Preliminary program requirements;
 - Safety Assessment;
 - Alternatives & ROM Costs; and
 - Investment Analysis Plan.

Program Plans FY 2019 – Performance Output Goals

ATM Weather Integration:

- TFM Alerting Concept Development – Expand automated Threshold Event (TE) Identification and Alerting analysis to Core 30 airports #6 and #7; Explore methods of weather alerting for traffic managers; Conduct Human in the Loop (HITL) tests with simulated alerting systems for airport and en route events in collaboration with FAA AWDE personnel.
- Evolution of Translation – Icing. Develop report on translation of icing to inform future NextGen weather processing systems; produce IWAfs for implementation in CATM airspace DSTs in collaboration with members of the FAA AWRT.
- AWI Lab HITLs and M&S – Sector Capacity. Develop concepts and capabilities for sector capacity management in the 2-4 hour planning horizon; test the concepts via lab HITLs and modeling and simulation (M&S) in collaboration with FAA AWDE and transfer successful concepts and capabilities to appropriate programs.
- AWI Roadmap – Complete bi-annual AWI Progress Assessment and Recommendations.

International:

- Complete draft SARPs for Amendment 79 to Annex 3 for SWx, VA, and WAFS work streams for approval by the ICAO Air Navigation Commission.
- Develop draft guidance material to support the SARPs included in Amendment 79 to Annex 3.
- Complete annual report on US differences and assessment of opportunities to harmonize US MET practices and procedures with ICAO SARPs.
- Coordinate and harmonize the requirements for the provision and dissemination of meteorological information to support NextGen and SESAR operational capabilities.
- Complete US position on draft Amendment 79 to ICAO Annex 3.

NWP & CSS-Wx Future Work Package Analysis:

- Achieve IARD for NWP WP2/CSS-WP2.
- Develop the following products in support of the Initial Investment Decision (IID) for targeted AMS investment:
 - Initial Program Requirements;
 - Business Case Analysis Report (BCAR);
 - Enterprise Architecture Artifacts; and
 - Implementation Strategy and Planning Document (ISPD).
- Achieve IID for NWP WP2/CSS-Wx WP2.

Program Plans FY 2020 – Performance Output Goals

ATM-Weather Integration:

- TFM Alerting Concept Development – Expand automated Threshold Event (TE) Identification and Alerting analysis to Core 30 airports #8-10; explore methods of weather alerting for traffic managers; conduct Human in the Loop (HITL) tests with simulated alerting systems for airport and en route events in collaboration with FAA AWDE personnel.
- AWI Change Management – Complete human factors studies with emphasis on Human Over the Loop (HOTL) decision-making in collaboration with FAA AWDE; transfer key HOTL considerations and change management techniques to groups implementing new weather-related DSTs.
- AWI Lab HITLs and M&S – Flight Object Exchange Services (FOXS). Develop concepts and capabilities for the use of Flight Object Exchange Services (FOXS) to supplement translation and conversion of weather constraint information; test the concepts via lab HITLs and modeling and simulation (M&S) in collaboration with FAA AWDE and transfer successful concepts and capabilities to appropriate programs.
- AWI Performance Metrics – Potential Shortfalls. Initiate quantitative study to measure the performance of currently integrated weather products and services to find potential shortfalls.

International:

- Complete draft SARPs for Amendment 80 to Annex 3 for the SWx, VA, and WAFS work streams for approval by the ICAO Air Navigation Commission.
- Develop draft guidance material for the SWx and VA work streams to support the SARPs included in Amendment 79 to Annex 3.
- Complete annual report on US differences and assessment of opportunities to harmonize US MET practices and procedures with ICAO SARPs.
- Coordinate and harmonize the requirements for the provision and dissemination of meteorological information to support NextGen and SESAR operational capabilities.
- Complete US response to final version of Amendment 79 to ICAO Annex 3.

NWP & CSS-Wx Future Work Package Analysis:

- Develop the following products in support of the Final Investment Decision (FID) for targeted NWP WP2 / CSS-Wx WP2 investment:
 - Final Program Requirements documentation;
 - Enterprise Architecture Artifacts;
 - Business Case documentation;
 - Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID for NWP WP2/CSS-Wx WP2.

Program Plans FY 2021 – Performance Output Goals

ATM-Weather Integration:

- TFM Alerting Concept Development – Expand automated Threshold Event (TE) Identification and Alerting analysis to remaining Core 30 airports; explore methods of weather alerting for traffic managers; conduct Human in the Loop (HITL) tests with simulated alerting systems for airport and en route events in collaboration with FAA AWDE personnel.
- AWI Performance Metrics – Future NWP. Complete quantitative study measuring AWI performance of currently integrated weather products to help support service analysis activities for a future NWP work package.
- AWI Roadmap – Complete bi-annual AWI Progress Assessment and Recommendations.

International:

- Complete SARPs for Amendment 80 to Annex 3 for the SWx, VA, and WAFS work streams for approval by the ICAO Air Navigation Commission.
- Develop draft guidance material to support the SARPs included in Amendment 80 to Annex 3.
- Complete annual report on US differences and assessment of opportunities to harmonize US MET practices and procedures with ICAO SARPs.
- Coordinate and harmonize the requirements for the provision and dissemination of meteorological information to support NextGen and SESAR operational capabilities.
- Complete US position on draft version of Amendment 80 to ICAO Annex 3.

C, NextGen Navigation Engineering, G06N.01-03

Program Description

The NextGen Navigation Engineering program supports the NextGen goal to increase NAS efficiency and capacity and increase access to airports through innovation. The two activities in NextGen Navigation Engineering performing this work are: Area Navigation (RNAV) Distance Measuring Equipment (DME)-DME and NextGen Navigation Support Enhanced Low Visibility Operations (ELVO) Phase 3.

RNAV DME-DME:

This activity supports RNAV through the use of DME-DME, which is the use of 2 or more distance measuring navigational aids, down to 2000 feet Above Ground Level (AGL) and potentially to the Final Approach Fix, with or without the need for an Inertial Reference Unit (IRU) in the aircraft. The success of this work will allow expansion of NextGen RNAV benefits to all properly equipped aircraft, including regional jets and business jets that are not equipped with an IRU. It also will ensure that the DME infrastructure can support NAS-wide performance based navigation (PBN) as envisioned by NextGen by identifying capacity and availability shortfalls. Spectrum modelling and testing results from previous years already show that additional Class A and Class B airspace could be supported through DME-only defined airspace and that the United States standard for DMEs, not currently in alignment with the International Civil Aviation Organization (ICAO) standard, could be moved to be the same. Work progressing to define the Very High Frequency Omnidirectional Range (VOR) system, Minimum Operational Network (MON) supports cases where the VOR is removed but the DME is still required for operations. This activity will develop the new spectrum service volume required to support implementation of NAS-wide Performance-Based Navigation and planning documentation for NextGen DME.

NextGen Navigation Support – ELVO Phase 3:

This activity supports requirements analysis for low visibility operations for landing or departing aircraft when the horizontal visibility along the runway is less than 1,200 feet. These low visibility operations cover takeoff using Heads Up Display (HUD) reference to centerline orientation via a “high quality” CAT I ILS localizer signal. This Low Visibility Operations (LVO) below 1,200 feet visibility will require the use of a HUD. The activity will determine the need for improvements to ground-based navigational aids or lighting systems such as Runway Visual Range (RVR) to support ELVO Phase 3. This activity will support the investment analysis activities for ELVO Phase 3 program to be established.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

This program supports the average daily capacity performance metric by enabling more users to use PBN and by increasing the number of landing and departures during low visibility conditions.

Program Plans FY 2017 – Performance Output Goals

RNAV DME-DME:

- Complete coordination and approval of FAA Order 9840.1 (RNAV-DME).
- Develop spectrum plan for integration of non-collocated DME-only facilities into NAS Operations.
- Finalize planning documentation in support of the Acquisition Decision for the NextGen DME.

NextGen Navigation Support – ELVO Phase 3:

- None.

Program Plans FY 2018 – Performance Output Goals

RNAV DME-DME:

- None.

NextGen Navigation Support – ELVO Phase 3:

- Complete operational concept validation for diverse airports to determine requirements and develop IARD artifacts.
- Develop the following draft products in support of the IARD:
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operation;
 - Functional Analysis;
 - Enterprise Architecture Products;
 - Program requirements; and
 - Safety Assessment.

Program Plans FY 2019-2021 – Performance Output Goals

RNAV DME-DME:

- None.

NextGen Navigation Support – ELVO Phase 3:

- None.

D, New ATM Requirements, G01M.02-02

Program Description

The New Air Traffic Management (ATM) Requirements program identifies new opportunities to improve the efficiency and effectiveness of air traffic management. It supports the NextGen goal of expanding capacity by developing decision support tools that improve the strategic management of operations in the NAS. New ATM requirements activities include:

New Radar Requirements (Surveillance and Weather):

New Radar Requirements is a technology development initiative to identify viable alternatives that could provide for FAA's future weather and surveillance radar needs. This initiative involves identification of technical challenges; evaluation of cost models; development of technology approaches and proposed solutions; and performance of concept demonstrations, modeling and prototyping. The overall activity includes multifunction phased-array antenna maturation; engineering studies – technology assessment; multifunction radar data processing and control definition; and acquisition management system support. The outcome of this work will result in an initial antenna and radar electronics specification and support an FAA investment analysis decision.

Enterprise Information Protocol & Exchange Standards:

This project addresses the need for harmonization protocols and standards for using enterprise information both internally, and with external agency partners including the Department of Defense, the National Weather Service, and international partners. This research will identify the shortfalls in moving from direct data sharing to a network environment. It includes protocols for enterprise information, criteria for managing and developing incremental versions for exchange standards, and conformance monitoring techniques. After this analysis is complete the activities will shift to development and implementation of baseline versions of exchange models and continued conformance monitoring to ensure compliance. Enterprise information protocol and exchange standards are necessary to coordinate information standards work and achieve global harmonization of standards and protocols; especially as they relate to engagement with Open Geospatial Consortium and harmonization with ICAO standards.

Future Collision Avoidance System (Future CAS):

Future CAS will complement work planned under the Airborne Collision Avoidance System (ACAS) X program (M54.01-01) to include new user classes such as Unmanned Aircraft Systems (Xu) and General Aviation (Xp). This activity will conduct research to develop requirements for these new classes of users to ensure future collision avoidance systems are interoperable within the NAS.

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. Weather Transition will manage appropriate activities to include: (a) development, validation, and allocation of aviation requirements for weather; (b) analysis of current FAA weather-related services and unmet operational needs; (c) develop initial operational concepts to satisfy those needs and determine which concepts should be further developed; and (d) creation, testing and evaluation of prototypes, including operational demonstrations, for the purpose of defining and refining their operational use.

Synchronization of Air/Ground Procedures:

In an effort to reduce the strain on the limited-capacity storage on the aircraft Flight Management System (FMS), this activity will evaluate methods for ground systems to communicate procedures to the aircraft. This will reduce the need to load the FMS with variations of the same procedure for different flight conditions. This will also allow air traffic to provide tactical capacity management methods with automation, such as extending the down-wind leg of the approach, increasing predictability and efficiency.

Advanced Air Ground Communications:

In partnership with international partners, this project will evaluate advanced communications standards such as L-band Digital Aeronautical Communication System (LDACS) and satellite-based communication for operational usage. This activity will also evaluate advanced communications to support new capabilities such as Push-to-Talk in remote areas; and the capability for these links to alleviate spectrum congestion issues and meet the more stringent NextGen performance requirements.

Command & Control in a Cloud Environment:

This activity will identify and assess current and future command and control capability for NAS Systems in a cloud environment. As part of this effort, technical assumptions will be evaluated based on safety, mission criticality, and the ability of current and future cloud architecture to provide command and control services in the future.

Common Displays/Commercial-Of-The-Shelf (COTS):

This activity addresses the need to transition to COTS displays for use as Common Displays in the NAS. As part of this effort, current COTS display capabilities will be reassessed and previously identified gaps in using COTS displays as Common Displays will be reevaluated. Requirements definition for displaying strategic decision data will be completed and development of a transition strategy for the possible use of COTS displays as Common Displays in the NAS will be initiated.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

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.

Program Plans FY 2017 – Performance Output Goals

New Radar Requirements (Surveillance & Weather):

- Finalize Multi-function Phased Array Radar (MPAR) performance requirements.
- Develop detailed MPAR advanced technology demonstrator test and evaluation plan.

Enterprise Information Protocol and Exchange Standards:

- Assess Flight Information Exchange Model (FIXM) compliance with ICAO Reference Model.
- Develop transition plan for FIXM.
- Conduct Quality Assurance (QA)/Quality Control (QC) validation for Weather information Exchange Model (WXXM).

Future CAS:

- Review the ACAS Xu System Requirements and Specification (SRS) V1.0 document to inform RTCA SC-147 and SC-228 with standards development activities.
- Incorporate optimization and tuning updates with stakeholder feedback into the ACAS Xu Run 3 logic.
- Complete the ACAS Xu Run 3 Algorithm Design Description (ADD) document.

Weather Transition:

- Conduct engineering studies and analyses which evaluate the translation of weather information into operational impacts.
- Develop and validate weather requirements for NWS to improve forecasts in support of FAA operational decision-making.

Synchronization of Air/Ground Procedures:

- Develop validation plan for air/ground procedure synchronization.
- Develop documentation of air/ground procedures standards with user community.
- Conduct trials and develop a validation report for air/ground procedure synchronization.

Advanced Air/Ground Communications:

- Conduct engineering assessment of L-band communication system performance from prototype testing conducted under Single European Sky ATM Research (SESAR) development activities.
- Develop Minimum Operational Performance Standards (MOPS) for Iridium-Next which will enable the Satcom system to support data communications in domestic airspace.
- Conduct prototype testing to support the development of Internet Protocol (IP) Standards to support the FAA's Data Comm Segment 2 and Future Communication Systems including NextSat, LDACS and Aeronautical Mobile Airport Communications System (AeroMACS).

Program Plans FY 2018 – Performance Output Goals

- Enterprise Information Protocol and Exchange Standards:
- Assess WXXM compliance with ICAO Reference Model.
- Develop transition plan for WXXM.
- Develop mitigation artifacts for enterprise service (SWIM) to mitigate to the latest version of the exchange models.

Future CAS:

- Complete worksheet review and gap analysis on ACAS Xu System Requirements to inform RTCA SC-147 and SC-228 with standards development activities.
- Integrate analysis results and logic changes from the 2016 ACAS Xu Flight Test into the ACAS Xu Run 4 candidate.
- Input changes and updates from the ACAS Xu Run 4 candidate into a revised ACAS Xu ADD document.

Weather Transition:

- Conduct engineering studies and analyses which evaluate the translation of weather information into operational impacts.
- Develop and validate weather requirements for NWS to improve forecasts in support of FAA operational decision-making.

Synchronization of Air/Ground Procedures:

- Document trials results and provide recommendations.

Advanced Air/Ground Communications:

- Evaluate standards validation test results for the new L-band communications system and develop a Validation Matrix to support ICAO Standards and Recommended Practices (SARPS) acceptance.
- Initiate development of the ICAO Class B Satellite SARPS to support Data Communications in domestic airspace.
- Initiate development of IP Standards to support the FAA's Data Comm Segment 2 and Future Communication Systems including NextSat, LDACS and AeroMACS.
- Identify Security requirements for future ATN/IP Air-Ground Communication Systems.

Command & Control in a Cloud Environment:

- Develop engineering study evaluating the command & control capability for NAS Systems in a cloud environment.
- Update technical assumptions documentation based on safety and mission criticality, and ability of cloud architecture to provide command and control services.

Common Displays/COTS:

- Evaluate performance requirements for NAS information systems displays.
- Conduct assessment of strategic decision displays data requirements.

Program Plans FY 2019 – Performance Output Goals

Enterprise Information Protocol and Exchange Standards:

- Assess Aeronautical Information Exchange Model (AIXM) compliance with ICAO Reference Model.
- Develop transition plan for AIXM.
- Conduct QA/QC validation for ICAO Reference Model.

Future CAS:

- Formalize ACAS Xp system concept and requirements to inform ongoing RTCA SC-147 standards development activities.

Weather Transition:

- Develop and validate weather requirements for NWS to improve forecasts in support of FAA operational decision-making.
- Conduct technical analyses of current FAA weather-related services and unmet operational needs.
- Conduct engineering studies and analyses which evaluate the translation of weather information into operational impacts.
- Create and evaluate prototypes and conduct operational demonstrations for the purpose of defining and refining operational use concepts.

Advanced Air/Ground Communications:

- Complete the LDACS SARPS and associate Technical Manual.
- Complete development of the ICAO Class B Satellite SARPS to support Data Communications in domestic airspace.
- Complete development of IP Standards to support the FAA's Data Comm Segment 2 and Future Communication Systems including NextSat, LDACS and AeroMACS.
- Initiate Security standards development for future ATN/IP Air-Ground Communication Systems.

Command & Control in a Cloud Environment:

- Assess gaps in current cloud architecture to support command and control capability for NAS systems.
- Identify and evaluate NAS Systems potentially suitable for command and control in a cloud environment

Common Displays/COTS:

- Evaluate existing commercial common display/COTS capabilities.
- Assess and validate previously identified gaps in common display/COTS.

Program Plans FY 2020 – Performance Output Goals

Enterprise Information Protocol and Exchange Standards:

- Maintain and update information protocols and exchange standards documentation.

Future CAS:

- Complete draft ACAS Xu Minimum Operational Performance Standards (MOPS) for review and comment within RTCA.

Weather Transition:

- Develop and validate weather requirements for NWS to improve forecasts in support of FAA operational decision-making.
- Create and evaluate prototypes and conduct operational demonstrations for the purpose of defining and refining operational use concepts.
- Conduct technical analyses of current FAA weather-related services and unmet operational needs.
- Conduct engineering studies and analyses which evaluate the translation of weather information into operational impacts.

Advanced Air/Ground Communications:

- Initiate development of ICAO Class A Satcom Standards to support full 4D trajectory operations.
- Complete Security standards development for future ATN/IP Air-Ground Communication Systems.

Command & Control in a Cloud Environment:

- Develop transition strategy document for NAS Systems identified as potentially suitable for command and control in a cloud environment.

Common Displays/COTS:

- Develop common display/COTS transition strategy for NAS systems.
- Perform feasibility study of common display/COTS transition strategy and document findings.

Program Plans FY 2021 – Performance Output Goals

Enterprise Information Protocol and Exchange Standards:

- Maintain and update information protocols and exchange standards documentation.
- Develop mitigation artifacts for enterprise service (SWIM) to mitigate to the latest version of the exchange models.

Future CAS:

- Initiate limited Implementation Program partnerships to validate ACAS Xu / inform Technical Standard Order development activities.

Weather Transition:

- Develop, validate, and refine weather requirements for NWS to improve forecasts in support of FAA operational decision-making.
- Create and evaluate prototypes and conduct operational demonstrations for the purpose of defining and refining operational use concepts.
- Conduct technical analyses of current FAA weather-related services and unmet operational needs.
- Conduct engineering studies and analyses which evaluate the translation of weather information into operational impacts.

Advanced Air/Ground Communications:

- Complete development of ICAO Class A Satcom Standards to support full 4D trajectory operations.
- Establish requirements for a Software Defined Radio to support multi-modal operations.

E, Surface/Tower/Terminal Systems Engineering, G06A.02-01

Program Description

The Surface/Tower/Terminal Systems Engineering program is an early stage developmental program to refine and validate Terminal NextGen concepts for improving the efficiency of traffic flow in the terminal area. This program will reduce risk associated with the introduction of new technology and operational procedures by using systems engineering analysis to identify and evaluate potential impacts from the integration of the techniques and equipment necessary to achieve traffic flow efficiencies. The systems engineering work will also assess the impact on NAS architecture and any changes needed throughout the product development lifecycle for terminal systems.

The Surface/Tower/Terminal Systems Engineering program will perform a Safety Risk Management study to identify these issues relative to the proposed TRACON automation capabilities. Concept engineering activities include analysis, evaluation, and assessments to develop and mature concepts for changes to Terminal/TRACON automation, as well as identifying associated procedural changes. The primary focus areas are:

- Enhanced inter/intra-facility coordination
 - Enhanced communication methods between control positions
 - Improved information sharing between facilities
- Facilitated airspace and sector management
 - Assess sector loading/demand prediction
 - Airspace changes – timing and impact of airspace changes
- Augmented flight data management at the control position
 - Flight Data Input/Output functionality at control position

- View available route and altitude options from control position
- Decision support for managing air traffic operations
 - Support for merging and spacing, and conflict detection
- Improved operations at uncontrolled airports
 - Improved communication to pilots at uncontrolled airports
 - Display of aircraft position outside of surveillance coverage
- Collaboration with airspace users (Pilots / Flight Operation Centers/ Airline Operation Centers)
 - Exchanging information with pilots and flight operators

The concept engineering activities conducted by the Surface/Tower/Terminal Systems Engineering program will reduce technical risk, quantify benefits, support alternatives development, and identify safety concerns prior to implementation by the Terminal Work Package 1 program, A04.08-01. The Initial Investment Decision (IID) and Final Investment Decision (FID) are both planned for FY 2017.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The Surface/Tower/Terminal Systems Engineering program supports the efficient use of air traffic capacity by analyzing and evaluating new concepts to improve the transfer of flight information, including movement constraints to interconnected systems, facilities, controllers, pilots, and airport operators. This program will identify and develop capabilities that will enable the Terminal domain to more efficiently balance arrivals, departures, and surface operations.

Program Plans FY 2017 – Performance Output Goals

- Conduct a gap analysis designed to identify the remaining shortfalls and opportunities in the TRACON in the 2020 and beyond time frame following the implementation of capabilities planned for implementation by 2020.
- Refine the overall strategic plan for the Terminal domain in terms of out-year capabilities.
- Conduct initial human-in-the-loop (HITL) prototyping and evaluation to support concept development, validation, and refinement, for the airport, runway, route, and airspace configuration management capability.
- Document initial functions and concept of operations.
- Complete algorithmic development and documentation.

Program Plans FY 2018 – Performance Output Goals

- Conduct second round of HITL prototyping and evaluation to support concept development, validation, and refinement, for the airport, runway, route, and airspace configuration management capability, based on findings from the initial round in 2017.
- Develop preliminary shortfall analysis.
- Update the functional analyses and conops.
- Develop initial requirements.
- Develop a projected benefits analysis.
- Conduct an initial safety assessment.
- Update algorithmic development and documentation.

Program Plans FY 2019-2021 – Performance Output Goals

- None.

F, NextGen Distance Measuring Equipment (DME) Support For Performance Based Navigation (PBN) Strategy, G01N.01-02

Program Description

The NextGen DME program will expand DME coverage in both enroute and terminal airspace to provide a resilient, complimentary navigation service to support Performance Based Navigation (PBN) operations in the event of a disruption to the Global Navigation Satellite Service (GNSS). Existing coverage and redundancy gaps will be filled in Class A Airspace and the busiest Navigation Service Group (NSG) one and two airports for DME/DME aircraft without the need for an Inertial reference Unit (IRU).

The NextGen DME program will provide the following benefits:

- Aircraft equipped with Area Navigation (RNAV) using multiple DMEs (called DME/DME) will continue PBN operations in the event of a GNSS outage;
- Sufficient redundancy will be provided to enable DME/DME aircraft to continue flying PBN procedures in the event of single DME failures;
- DME/DME Area Navigation (RNAV) service will be available to almost all commercial and business aircraft without the need to carry an IRU; and
- Pilot and controller workload will be reduced during GNSS service disruptions, while maintaining PBN capacity and efficiency benefits.

This activity performs the solution implementation work for the engineering analysis and acquisition planning activity for DME-DME RNAV performed under NextGen Navigation Engineering (NNE), G06N.01-03. New DMEs will be installed, existing DMEs with limited capacity will be replaced, and unneeded DMEs will be discontinued consistent with the technical and programmatic requirements approved at the Final Investment Decision (FID).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Expanding DME/DME RNAV service across the NAS will enable aircraft to continue PBN operations during GNSS disruptions, preventing navigation-based impacts to capacity and efficiency benefits at the Core airports during arrivals and departures.

Program Plans FY 2017 – Performance Output Goals

EnRoute:

- Procure 5 NextGen DMEs for installation.

Terminal:

- Procure 21 NextGen DMEs for installation.

Program Plans FY 2018 – Performance Output Goals

EnRoute:

- Procure 3 NextGen DMEs for installation.
- Commission 2 NextGen DME sites.

Terminal:

- Procure 20 NextGen DMEs for installation.

Program Plans FY 2019 – Performance Output Goals

EnRoute:

- Commission 3 NextGen DMEs sites.

Terminal:

- Procure 37 NextGen DMEs for installation.
- Commission 38 NextGen DMEs sites.

Program Plans FY 2020 – Performance Output Goals

EnRoute:

- Commission 3 NextGen DME sites.

Terminal:

- Procure 37 NextGen DMEs for installation.
- Commission 30 NextGen DMEs sites.

Program Plans FY 2021 – Performance Output Goals

Terminal:

- Procure 29 NextGen DMEs for installation.
- Commission 35 NextGen DMEs sites.

G, Information Management, G05M.03-01

Program Description

Information management is a proof of concept and technology demonstration program that is in the pre-implementation phase. Recent experience in sharing surface data information with users through new service-oriented architecture, coupled with the proliferation of data repositories to perform post-analysis, has highlighted the need to move from data sharing to full information management. This requires services to deliver information by type and amount based on business case analysis to establish performance requirements, monitoring, and governance of how and when the information is provided. Improvements to information management approaches are necessary to ensure the efficient use of FAA Telecommunications Infrastructure and System Wide Information Management (SWIM) as conduits of information. The Executive Order (13642) and cloud first mandates also require improvements to the information management infrastructure of the NAS.

Research initiated within the Information Management program will identify the shortfalls in moving from data sharing to a network environment and will address authoritative operational data stores, use of emerging technologies in machine learning and analytics, information management governance and evaluation techniques, and performance monitoring techniques and policies to ensure compliance. Research will also identify existing hardware and software that would be used to resolve shortfalls. After this analysis and preliminary engineering design is complete, the activities will shift to development and implementation of the required capabilities and governance. The concepts demonstrated within Information Management could be leveraged by other information driven FAA programs to support their requirements for data storage, search, extraction, and analysis.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

In the transformation to NextGen, the program ensures the necessary and required information sharing to improve situational awareness is provided with guaranteed performance. Implementation of Information Management will allow the FAA to more efficiently manage NAS resources to optimize capacity in the system. Achieving capacity goals requires increased sharing of data with guaranteed delivery and performance. To assure this delivery is cost

effective; the agency needs to migrate from data sharing to full-scale data management using SWIM as a component.

Program Plans FY 2017 – Performance Output Goals

- Develop a plan for the migration of NER (NAS Enterprise Repository) prototype to FAA Cloud Services in an enterprise data management production environment.

Program Plans FY 2018 – Performance Output Goals

- Enhancement of NER infrastructure in keeping with Enterprise Information Management goals and to facilitate alignment of programs with the enterprise capability.
- Enhance NER infrastructure and software based upon feedback and lessons learned.
- Develop Plan for supporting additional users /programs.

Program Plans FY 2019 – Performance Output Goals

- Develop training materials and roles and responsibilities for those who interact with NER.
- Migrate capability to FAA Cloud Services.
- Evaluate Information Management performance and assess additional features.
- Perform functionality comparison of Information Management system data to other systems in the NAS.

Program Plans FY 2020 – Performance Output Goals

- Support the migration to real-time safety analysis via enterprise data infrastructure.
- Complete analysis and deliver report on availability of additional data for the extended user community.
- Complete strategic plans for long-term enhancements of Information Management baseline capabilities.

Program Plans FY 2021 – Performance Output Goals

- Complete analysis and deliver report on enhanced analytical capabilities.
- Deliver report on initial coordination with key organizations to ensure compliance of Information Management Governance.

1A10, NEXTGEN – LABORATORY SUPPORT PORTFOLIO

FY 2017 Request \$12.0M

NextGen Laboratories, G03M.02-01

Program Description

NextGen Laboratories provide the NAS environments required to validate the broad framework of NextGen concepts, technologies, and systems and to test the integration, development, and operations functions before they are introduced into the NAS. This program provides the test platforms at the NextGen Integration and Evaluation Capability (NIEC) and Florida NextGen Test Bed (FTB). These labs facilitate conducting NextGen demonstrations quickly and efficiently using replicated NAS environments without affecting actual NAS operations. This approach reduces overall risk and costs by enabling the FAA to evaluate the viability of new technologies before committing to further investment or making system implementation decisions.

Operational Assessment supports the transition to NextGen by developing a NAS implementation plan in the mid-term and far-term timeframes that support a comprehensive evaluation of fielded capabilities and reporting of post-implementation performance information on the NextGen Performance Snapshots (NPS) website. These activities also support NextGen benefits modeling and cost-benefit data collection.

NextGen Integration and Evaluation Capability (NIEC):

The NIEC is a NextGen integration and evaluation facility located at the William J. Hughes Technical Center (WJHTC) in Atlantic City, New Jersey. The NIEC provides a real-time, NextGen-capable environment that allows for concept development and validation, integration and operations analysis capabilities through Human-in-the Loop

simulation testing and data analysis capability. NextGen systems and procedures will be developed and integrated into the NIEC to support studies that measure and validate concept feasibility, human performance, usability, changes in workload, and safety. The program will include the development and validation of prototypes and analysis capabilities to support the definition of NextGen requirements while researching possible solutions to challenges posed by the integration of NextGen technologies.

Florida NextGen Test Bed (FTB):

The FTB is located at the Daytona Beach International Airport (DAB) in Florida and provides a platform where early-stage NextGen concepts can be integrated, demonstrated, and evaluated. The FTB core infrastructure is architected and configured to enable remote connections with other FAA NextGen and industry partner sites to allow for multi-site demonstration capabilities. Through appropriate governance and oversight, the FTB provides the ability for industry to bring and integrate new concepts and technologies; maintain and sustain their systems at the FTB; and conduct ongoing activities.

NextGen Operational Assessment – Performance:

This activity supports NextGen implementation in three areas: Systems Analysis, NPS and NAS Segment Implementation Plan (NSIP).

- System Analysis will focus on quantitative assessments of the operational impacts of fielded NextGen components as they become available. Aspects contributing to quantitative estimates of anticipated operational benefits, such as avionics cost will also be studied.
- NPS website was created to provide post-implementation performance information at 21 Metroplexes, as well as at selected airports and airspace. It is a reporting tool designed to show the progress that has been made at specific locations after the implementation of NextGen programs.
- NSIP development will aid the planning and deployment of NextGen portfolios in the mid-term and far-term timeframes. The objective of the NSIP is to identify and manage incremental improvements necessary to develop, integrate, and implement NextGen capabilities and NAS Current Operations activities.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The NIEC provides the capability to conduct early proof of concept studies, rapid prototyping, concept validation and maturation, risk reduction, and improved operational performance across all NextGen Portfolios. The rapid prototyping and integration capabilities of the NIEC are able to conduct early phase concept assessments and simulations, thereby enabling the FAA to implement cost efficiency measures by reducing risks, costs and overall time to implementation. The NIEC is able to replicate all domains of the NAS, as well as integrate with any of the other laboratories provided by the William J. Hughes Technical Center to provide a high fidelity environment. In addition, the NIEC is able to leverage the infrastructure and expertise gained from previous simulations to support future sponsor requests at reduced cost to the agency.

The FTB provides a platform for early stage NextGen demonstrations to be quickly and efficiently conducted at an early stage without affecting NAS operations. This reduces risk and overall costs by enabling the FAA to evaluate the viability of these new technologies and concepts before making further investments and decisions on potential implementation in operations. In addition, the FTB approach of establishing partnerships with industry promotes contributions and R&D investment from industry, and leverages industry's capabilities which provides cost avoidance to the FAA and helps to accelerate NextGen development.

The NextGen Operational Assessment — Performance program supports cost efficiency initiatives by providing a cohesive implementation plan for NextGen portfolios in the mid-term and far-term timeframes. Includes information on projected qualitative benefits, system dependencies, success criteria, identified integration challenges for implementation, established follow-on activities, and deployment progress reports. Additionally, through

conducting operational performance assessments of fielded capabilities it serves as lessons learned for making sound investment decisions to appropriately plan for expenditure of taxpayer funds. It also reports progress of NextGen implementation on the NPS website.

Program Plans FY 2017 – Performance Output Goals

NIEC:

- Provide engineering support for the infrastructure and NextGen research.
- Provide for services to ensure the operational capabilities of the laboratory.
- Provide the necessary licenses, maintenance agreements, and equipment of the laboratory.
- Install upgrades to the laboratory infrastructure to support a NextGen research platform.
- Complete integration of Ground-Air Data Communication capabilities.

FTB:

- Provide engineering support for the infrastructure and capabilities to support NextGen demonstrations.
- Provide for services to ensure the operational capabilities of the laboratory.
- Provide the licenses, leases, utilities, equipment, and maintenance necessary to maintain the laboratory at a high level of readiness to respond to emergent needs.
- Complete installation of upgrades to the laboratory infrastructure to support a NextGen integration platform.

NextGen Operational Assessment – Performance:

- Evaluate the operational performance impacts of NextGen technologies and procedures, and publish an annual report. Candidate capabilities for performance studies include:
 - Wake Re-categorization, Phase 2 – pair-wise wake separation standards that uniquely address the needs of a given airport (Denver, CO (DEN) and Anchorage, AK (ANC)).
 - Dual parallel operations between 2,500 and 3,600 feet – for parallel runways that are between 2,500 and 3,600 feet, dependent stagger-separation will be removed from 1.5 nm to 1.0 nm (Minneapolis-St. Paul, MN (MSP), John F. Kennedy, NY (JFK), Seattle-Tacoma, WA (SEA), Portland, OR (PDX), Raleigh-Durham, NC (RDU), Dallas Love Field, TX (DAL) and Memphis, TN (MEM)).
- Develop documentation and data sources for new NPS information including any new metrics.
- Complete update of metrics and success stories in the NextGen Performance Snapshots website.
- Complete annual NSIP update to aid the planning, deployment, and monitoring of NextGen portfolio in the mid-term and far-term timeframes.

Program Plans FY 2018 – Performance Output Goals

NIEC:

- Provide engineering support for the infrastructure and NextGen research.
- Provide for services to ensure the operational capabilities of the laboratory.
- Provide the necessary licenses, maintenance agreements, and equipment of the laboratory.
- Install upgrades to the laboratory infrastructure to support a NextGen research platform.
- Provide a near real time data analysis capability to better support simulations and demonstrations.

FTB:

- Provide engineering support for the infrastructure and NextGen demonstrations.
- Provide for services to ensure the operational capabilities of the laboratory.
- Provide the licenses, leases, utilities, equipment, and maintenance necessary to maintain the laboratory at a high level of readiness to respond to emergent needs.
- Complete the installation of upgrades to the laboratory infrastructure to support a NextGen integration platform.
- Add new scenario development and analysis tools.

NextGen Operational Assessment – Performance:

- Evaluate the operational performance impacts of NextGen technologies and procedures, and publish an annual report. Candidate capabilities for performance studies include:
 - Triple Independent Parallel Operations – triple simultaneous operations for runways spaced greater than approximately 3,900 feet (Atlanta, GA (ATL) and Dulles, VA (IAD)).
 - Metroplex Project – an integrated solution comprising of Performance Based Navigation (PBN) procedures and airspace redesign that address unique needs of a system of airports that operate in close proximity of each other (ATL and Charlotte, NC (CLT)).
 - Established on Required Navigation Performance (RNP) (EoR) for Widely Spaced Operations – national standard enabling EoR operations at eligible locations throughout the NAS.
- Develop documentation and data sources for new NPS information including any new metrics.
- Complete annual NSIP update to aid the planning, deployment, and monitoring of NextGen portfolio in the mid-term and far-term timeframes.

Program Plans FY 2019-2021 – Performance Output Goals

NIEC:

- Provide engineering support for the infrastructure and NextGen research.
- Provide for services to ensure the operational capabilities of the laboratory.
- Provide the necessary licenses, maintenance agreements and equipment of the laboratory.
- Install upgrades to the laboratory infrastructure to support a NextGen research platform.

FTB:

- Provide engineering support for the infrastructure and capabilities to support NextGen demonstrations.
- Provide for services to ensure the operational capabilities of the laboratory.
- Provide the licenses, leases, utilities, equipment, and maintenance necessary to maintain the laboratory at a high level of readiness to respond to emergent needs.
- Complete the installation of upgrades to the laboratory infrastructure to support a NextGen integration platform.

NextGen Operational Assessment – Performance:

- Evaluate the operational performance impacts of NextGen technologies and procedures, and publish an annual report.
- Develop documentation and data sources for new NPS information including any new metrics.
- Complete annual NSIP update to aid the planning, deployment, and monitoring of NextGen portfolio in the mid-term and far-term timeframes.

1A11, NEXTGEN – PERFORMANCE BASED NAVIGATION & METROPLEX PORTFOLIO

FY 2017 Request \$17.5M

- A, NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP), G05N.01-01
- B, Concept Development for Integrated NAS Design & Procedure Planning, G05A.02-04
- X, NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP) - Future Plans, G05N.01-03

A, NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP), G05N.01-01

Program Description

NextGen Performance Based Navigation (PBN) – Metroplex RNAV/Required Navigation Performance (RNP) will develop procedures at Metroplexes to improve airspace efficiency. The Airspace Optimization Group integrates airspace design and associated activities, including traffic flow analysis, arrival and departure route design and procedures optimization, providing a framework for developing PBN initiatives. Optimizing airspace use and associated procedures development in Metroplexes includes:

- Examining the use of additional transition access/egress points to/from terminal airspace not tied to ground-based navigation aids;
- Developing and implementing optimized arrival and departure procedures;
- Decoupling conflicting operations to and from primary and secondary/satellite airports serviced by the same complex terminal airspace; and if needed,
- Developing high altitude routes through congested airspace to create more efficient routes between major metropolitan areas.

Development of RNAV and RNP routes and procedures will address the RTCA Task Force 5 recommendations, maximize benefits, and accelerate NextGen concepts.

Optimization of airspace and procedures using quantitative and qualitative metrics will target specific Metroplex areas that have been designated as high priority using criteria established by FAA with input from RTCA. The current program plan will address 12 Metroplexes. The Metroplex approach began in FY 2010 and will be completed at the selected locations by FY 2019. These can be located in unique metropolitan areas such as North Texas which includes Dallas/Fort-Worth (DFW), Dallas Love Field Airport (DAL), and other regional airports or by combining Metropolitan areas, such as the Central and Southern Florida Metroplex which includes Orlando (MCO), Miami (MIA), Tampa (TPA), Palm Beach (PBI), Fort Lauderdale (FLL) and other regional airports. Central and Southern Florida Metroplex is being addressed as a single project to take advantage of overlapping airspace. Las Vegas was added as the 12th location. Study Team results guide the design and implementation of those procedures that have the highest benefits. Design and Evaluation Team efforts include analyses and simulations, assessment of alternatives, and modeling of projected airspace and procedures benefits. These efforts include:

- Study and Scoping: The Study Phase is conducted by study teams that identify issues and propose potential solutions through facility and industry interface meetings. Industry representation is achieved using lead carrier representatives. The result of this phase is a set of conceptual designs, with a high-level assessment of benefits, costs, and risks.
- Design and Procedure Development: The Design Phase is where the detailed Integrated Airspace and Procedures design work is conducted. The work conducted in this phase uses the results of the study teams and is conducted by a Design and Implementation (D&I) team. Industry representation is achieved using lead carrier representatives. When appropriate and justified, Human-in-the-Loop simulations and other design analyses are performed.
- Evaluation: The Evaluation Phase is the second stage conducted by the D&I team. It includes all necessary operational modeling, Safety Management System analyses, and environmental reviews. Industry representation is achieved using lead carrier representatives. If analyses are conducted during the Design Phase, they may carry over into the Evaluation Phase.
- Implementation and Training: The Implementation Phase is the last part of the Optimization of Airspace and Procedures in the Metroplex (Metroplex) process conducted by the D&I team. This phase includes all steps required for implementation of the Metroplex project including flight inspections, publishing procedures, planning and executing training. Industry representation is achieved using lead carrier representatives.
- Post Implementation Review and Modifications: The Post-Implementation Phase includes a review of the implemented airspace and procedures changes to determine if they have delivered desired benefits and/or caused other impacts. Modifications or refinements may be made to better achieve the desired benefits or address unforeseen impacts.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 6 – Optimize airspace and Performance Based Navigation (PBN) procedures to improve efficiency an average of 10 percent across Core airports by 2018. (FAA Business Planning Metric)*

Relationship to Performance Metric

Developing PBN in Metroplex airspace will allow more efficient use of airspace and improve arrival and departure flows. Metroplex solutions are focused on optimizing procedures and traffic flows, and may include airspace structure changes to support optimized routings. Specific operational changes include converting conventional procedures to PBN, removing level-offs on arrivals, segregating arrival routes to deconflict traffic flows, adding departure points, expediting departures, adding new high-altitude PBN routes, and realigning airspace to support those changes.

Program Plans FY 2017 – Performance Output Goals

- Complete the Evaluation Phase of three Metroplex projects (e.g. Denver, Florida, and Las Vegas).
- Complete Implementation Phase at four Metroplex sites (e.g. Charlotte, Southern California, Cleveland/Detroit, and Phoenix).
- Complete Post Implementation Phase activities at three Metroplex sites (e.g. Charlotte, Atlanta, and Southern California).

Program Plans FY 2018 – Performance Output Goals

- Complete Implementation Phase of three Metroplex projects (e.g. Denver, Florida, and Las Vegas).
- Complete Post Implementation Review and Modifications activities for three Metroplex projects (e.g. Cleveland/Detroit, Phoenix, and Denver).

Program Plans FY 2019 – Performance Output Goals

- Complete Post Implementation Review and Modifications activities for last two remaining Metroplex projects (e.g. Florida and Las Vegas).
- Provide comprehensive lessons learned for archives.

Program Plans FY 2020-2021 – Performance Output Goals

- None.

B, Concept Development for Integrated NAS Design & Procedure Planning, G05A.02-04

Program Description

The Integrated NAS Design and Procedure Planning (INDP) program is currently analyzing the Performance Based Navigation (PBN) strategy for initiatives to prepare for the future NAS-wide implementation of PBN procedures with the initial focus on Established-on-Required Navigation Performance (RNP) Instrument Approach Procedures (IAPs). Established-on-RNP (EoR) will allow air traffic controllers to clear aircraft on an RNP approach with a curved turn to final without providing standard radar separation between it and another aircraft that is established on an approach to a parallel runway. In addition, EoR is expected to provide opportunities for increased efficiency including reduced track length, fuel burn, environmental footprint, and noise exposure. Furthermore, EoR may be able to provide opportunities for increased efficiency through the use of more repeatable and predictable operations. After the initial implementation of EoR at developmental sites, additional data will be collected to support final safety and benefits validation.

Human Factors activities will focus on the interaction between the air and ground domains to document and disseminate lessons learned that will provide guidance for future PBN procedure implementations and support the refinement and revisions of published procedures. This work will provide insights into the factors affecting the

successful implementation of RNAV (Area Navigation) /RNP routes under NextGen objectives and enable the operational deployment of navigation requirements and operational acceptance. To achieve these goals, human factors work will analyze the PBN strategy and assess the NextGen automation systems and Decision Support Tools (DSTs) supporting PBN procedures, and how they contribute to increasing the efficiency and performance of the workforce. The focus of the research aligns actions and behaviors occurring on the flight deck and in air traffic control operations to increase usage of PBN procedures.

This program supports RTCA Task Force 5 recommendations and integrates industry and agency efforts to improve efficiency by taking advantage of aircraft performance capabilities, Standard Terminal Arrivals (STARs) and Optimum Profile Descents (OPDs). The primary focus of the program is to safely design and implement various EoR IAPs in an effort to provide shorter, repeatable and stabilized paths to the runway for RNP aircraft. In addition, concept development activities will validate concepts that increase capacity and improve efficiency and throughput, while leveraging PBN technologies. In addition, the EoR project will begin to leverage their work and pave the way for other innovative PBN concepts to support the Agency's PBN Strategy. Although there are no current commitments and further direction depends on the PBN NAS Strategy Document, additional PBN initiatives that might be studied are Advanced RNP, RNP to ILS capture, and Established on Departure Operations (EDO).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

This program will contribute to the average daily airport capacity metric by providing the modeling and analysis needed to modify airspace and procedures. This will result in more efficient use of airspace through repeatable and dependable operations resulting in a more consistent daily capacity.

Program Plans FY 2017 – Performance Output Goals

- Initiate modeling and safety analysis of one new RNP approach scenario. Develop modeling and safety analysis and data collection plan.
- Conduct initial implementation of EoR scenarios at developmental site(s) to validate EoR operational concept.
- Complete Safety Risk Management artifacts to support separation standard change to allow for EoR operations in the NAS.
- Develop operational requirements and other documents required for technical transfer for validated concepts for implementation in 2020-2022 and beyond.
- Complete final report on control structure for PBN operations to FAA stakeholders and industry partners.
- Consolidate the identified PBN implementation issues and refine the evaluation criteria gained from interviews with RNAV/RNP procedure design specialists and draft report.
- Conduct Lab Activity to support preliminary PBN Route Coordination and Deconfliction analysis.
- Define model attributes and develop procedures/tool requirements to assess optimal arrival/departure routing options and implementation strategies that support PBN Route Optimization.
- Leverage existing research to develop human performance metrics and criteria for the analysis of EoR operations on ATC workload and safety.
- Apply human performance metrics during human-in-the-loop simulations for the initial implementation of EoR.

Program Plans FY 2018 – Performance Output Goals

- Complete modeling and safety analysis of one RNP approach scenario.
- Conduct initial implementation of EoR scenarios at developmental site(s) to validate EoR operational concept.
- Complete Safety Risk Management artifacts to support separation standard change to allow for EoR operations in the NAS.
- Conduct concept validation studies based on the PBN strategy and document findings to reduce risk/uncertainties of NextGen Mid Term Operational Concepts.
- Initiate investigation of integration issues associated with the integration of RNAV/OPD arrivals and Time Based Flow Management (TBFM).
- Develop Concept of Operations supporting PBN Route Coordination and Deconfliction analysis.
- Provide initial integration analysis of the PBN strategy to assess optimal arrival/departure routing options and implementation strategies for PBN Route Optimization.
- Apply human performance metrics during human-in-the-loop simulations for the initial implementation of EoR.
- Based on the PBN strategy, provide a report on measures of workload and safety impact of EoR operations for inclusion in the Safety Risk Management Decision.
- Develop white paper to identify current wake recategorization impacts on EoR procedure design and efficiency when considering multiple runway operations.
- Document analysis conclusions for possible inclusion into the PBN strategy update.

Program Plans FY 2019 – Performance Output Goals

- Initiate modeling and safety analysis of one new RNP approach scenario. Develop modeling and safety analysis and data collection plan.
- Conduct initial implementation of EoR scenarios at developmental site(s) to validate EoR operational concept.
- Complete Safety Risk Management artifacts to support separation standard change to allow for EoR operations in the NAS.
- Document procedures to decrease workload/increase reliance on automation for routine tasking, to increase efficiency of the NAS.
- Develop criteria necessary to assess the integration issues associated with RNAV/OPD and TBFM from both the air traffic and flight deck perspectives.
- Develop Automation Requirements supporting PBN Route Coordination and Deconfliction analysis.
- Develop preliminary operational and functional requirements for incorporating PBN Route Optimization with TBFM/Terminal Sequencing and Spacing.
- Analyze identified wake recategorization impacts and provide recommendations for future PBN procedure design when considering multiple runway operations.
- Provide updates to the PBN strategy based on operational testing of improved PBN capabilities.

Program Plans FY 2020 – Performance Output Goals

- Complete modeling and safety analysis of one RNP approach scenario.
- Conduct initial implementation of EoR scenarios at developmental site(s) to validate EoR operational concept.
- Complete Safety Risk Management artifacts to support separation standard change to allow for EoR operations in the NAS.
- Utilizing the PBN strategy, develop operational methods document to address future growth in demand and reduce gate-to-gate transit time.
- Validate the assessment criteria and begin the evaluation and assessment of current RNAV/OPD procedures in relation to TBFM operations and constraints.
- Deliver analysis supporting PBN Route Coordination and Deconfliction analysis to include technical transfer package, prototype requirements, operational requirements and final Concept of Operations.
- Develop technical transfer package for PBN Route Optimization.
- Provide human factors recommendations for the consideration of human factors guidance in the Performance Based Navigation Implementation Process (7100.41) and procedure design review.

Program Plans FY 2021 – Performance Output Goals

- Conduct Advanced RNP (A-RNP) assessment in support of PBN Strategy.
- Initiate modeling and safety analysis of one new RNP approach scenario. Develop modeling and safety analysis and data collection plan.
- Conduct initial implementation of EoR scenarios at developmental site(s) to validate EoR operational concept.
- Complete Safety Risk Management artifacts to support separation standard change to allow for EoR operations in the NAS.
- Execute technical transfer of validated concepts for implementation.
- Develop and provide final technical documentation to support NAS operational criteria development and changes in air traffic control regulations and operating manuals related to the FY 2017-2020 performance outputs.
- Develop and provide final documentation for the identification of human factors requirements applied to NextGen automation systems and decision support tools (DSTs) supporting PBN procedures.
- Conduct and participate in field site surveys to evaluate the implementation of the human factors recommendations to the PBN procedure implementation and revision process and development of new PBN procedures.

X, NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP) - Future Plans, G05N.01-03

Program Description

NextGen Performance Based Navigation (PBN) – RNAV/Required Navigation Performance (RNP) will develop procedures to structure traffic and flows to Service Group (SG) 1 as defined by the PBN NAS Navigation Strategy locations to improve airspace efficiency. Procedures may be designed for SG 2 locations for key site implementation, or to compliment SG1 activity. The Airspace Optimization Group integrates airspace design and associated activities, including traffic flow analysis, arrival and departure route design and procedures optimization in preparation for, and/or in response to new controller tools, such as Ground-based Interval Management-Spacing (GIM-S) and Terminal Sequencing and Spacing (TSAS)), that provide a framework for developing PBN initiatives. Optimizing airspace use and associated procedures development includes:

- Examining the use of additional transition access/egress points to/from terminal airspace not tied to ground-based navigation aids;
- Developing and implementing optimized arrival and departure procedures;
- Decoupling conflicting operations to and from primary and secondary/satellite airports serviced by the same complex terminal airspace; and if needed;
- Developing high altitude routes through congested airspace to create more efficient routes between major metropolitan areas;
- Introducing new PBN capabilities, e.g. Established on RNP (EoR) procedures and Advanced-RNP (A-RNP); and
- Removing legacy procedures/infrastructure not in alignment with the PBN Strategy or supported by other defined program activity.

Development of RNAV and RNP routes and procedures will address the RTCA Task Force 5 recommendations, maximize benefits, and accelerate NextGen concepts. The previous Metroplex program developed a collaborative 5-stage process to deliver PBN capabilities to the NAS. This process will be reviewed and revised based upon lessons learned; incorporation of the new PBN capabilities (e.g. EoR, A-RNP); and in preparation for, and/or in response to, new controller decision support tools (e.g. GIM-S, TSAS).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 6 – Optimize airspace and Performance Based Navigation (PBN) procedures to improve efficiency an average of 10 percent across Core airports by 2018. (FAA Business Planning Metric)*

Relationship to Performance Metric

Developing PBN in SG1 locations will allow more efficient use of airspace and improve arrival and departure flows. PBN Strategy implementation will continue optimizing procedures and traffic flows, and may include airspace structure changes to support optimized routings, new PBN capabilities, and utilization of new controller decision support tools. Specific operational changes include adding new PBN capabilities (e.g. EoR, A-RNP), and optimizing operations to enable/support use of new controller decision support tools (e.g. GIM-S, TSAS). Methods may include converting or removing conventional procedures; removing level-offs on arrivals; segregating arrival routes to deconflict traffic flows; adding departure points; expediting departures; adding new high-altitude PBN routes; and realigning airspace to support these changes.

Program Plans FY 2017-2019 – Performance Output Goals

- None.

Program Plans FY 2020 – Performance Output Goals

- Apply lessons learned through Metroplex program to develop a revised process to deliver new PBN capabilities to SG 1 locations (procedures may be designed for SG 2 locations for key site and/or to compliment implementation at SG1 locations).
- Begin execution: deliver PBN capabilities at a key site.

Program Plans FY 2021 – Performance Output Goals

- Initiate subsequent phases defined at key site.
- Deliver PBN capabilities at second location.

ACTIVITY 2: AIR TRAFFIC CONTROL FACILITIES AND EQUIPMENT

A: En Route Programs

2A01, NEXTGEN – EN ROUTE AUTOMATION MODERNIZATION (ERAM) – SYSTEM ENHANCEMENTS AND TECHNOLOGY REFRESH

FY 2017 Request \$78.0M

- A, En Route Automation Modernization (ERAM) Technology Refresh, G01A.01-10
- B, En Route Automation Modernization (ERAM) Sector Enhancements, G01A.01-04

A, En Route Automation Modernization (ERAM) Technology Refresh, G01A.01-10

Program Description

Technology refresh of the ERAM system will be accomplished by a series of programs. In FY 2016, the System Enhancements and Technology Refresh program, G01A.01-05, will complete the replacement a subset of ERAM system equipment that has become obsolete.

This program, ERAM Technology Refresh, G01A.01-10, will replace another subset of ERAM system equipment that is at, or near the end of, its service life, or is otherwise contributing to increased ERAM sustainment risk due to increasing failure rates or degraded performance.

A Final Investment Decision (FID) for ERAM Technology Refresh will occur in Q4 FY 2016 with an expected period of performance of five years from FY 2017 through FY 2021. The program will be baselined by the FID, including the scope of the technology refresh, extent of the annual capabilities rollout (i.e., waterfall) and annual budget.

The current scope of the ERAM Technology Refresh program, pending the final scope to be defined by FID, includes:

- Refresh the existing analog tactical position, i.e., the R-Side, display; approximately 1,500 units;
- Refresh the Keyboard/Video/Mouse (KVM) accessories for the tactical position, R-Side; approximately 1,500 units;
- Refresh the IBM Power PC/RISC based processor with x86 based processor for both the R-Side and D-Side positions; approximately 2,500 units;
- Migrate the tactical, R-side, and strategic, D-Side, positions processors' operating system (O/S) from IBM's AIX to Linux Open Source O/S; approximately 2,500 licenses;
- Refresh the Display capture and recording technology for R and D-Sides; approximately 3,000 recorders;
- Refresh the display graphics adaptor for displays; approximately 3,000 units; and
- Add operational supplemental processors to the existing backroom processors farm to mitigate emerging increased demand for ERAM system processing capacity.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

ERAM Technology Refresh will update the ERAM system by refreshing a subset of ERAM equipment that is in critical need of replacement during the FY 2017 through FY 2021 time frame at the 20 Air Route Traffic Control Centers (ARTCC) sites. The benefit of this upgrade is the continued use of ERAM to control air traffic in the en route domain. The upgrade will maintain the ERAM system's ability for en-route controllers at each center to track 1,900 aircraft at a time; critical for meeting the FAA's Strategic Priority 2. The upgrade will also enable the ERAM system to meet its operational availability and performance requirements; critical for meeting the FAA's Performance Metric 1.

Program Plans FY 2017 – Performance Output Goals

- Complete final engineering design plan for ERAM technology refresh system.
- Complete the procurement of technology refresh equipment for the key site.

Program Plans FY 2018 – Performance Output Goals

- Complete the procurement of technology refresh equipment for two additional sites.
- Deploy ERAM technology refresh at key site and two additional sites (3 of 20, 15%).

Program Plans FY 2019 – Performance Output Goals

- Complete the procurement of technology refresh equipment for five additional sites.
- Deploy ERAM technology refresh at five additional sites (8 of 20, 40%).

Program Plans FY 2020 – Performance Output Goals

- Complete the procurement of technology refresh equipment for six additional sites.
- Deploy ERAM technology refresh at six additional sites (14 of 20, 70%).

Program Plans FY 2021 – Performance Output Goals

- Complete the procurement of technology refresh equipment for six additional sites.
- Deploy ERAM technology refresh at six sites (20 of 20, 100%).

B, En Route Automation Modernization (ERAM) Sector Enhancements, G01A.01-04

Program Description

ERAM Sector Enhancements provides software enhancements for the en route sector controller team. It is a multi-year effort to improve the efficiency and effectiveness of en route sector operations through enhanced trajectory management and improved collaboration between the tactical (R Side) and strategic (D Side) controllers. It also involves upgrades to flight data management and system support functions. Current automation capabilities are limited in providing the requisite accuracy, consistency, and usability needed during high demand scenarios which can result in decreasing the efficient use of airspace. ERAM Sector Enhancements will develop and implement improvements to en route automation and procedures, building upon existing ERAM capabilities and leveraging previous NextGen pre-implementation activities.

The Investment Analysis Readiness Decision was made in July of 2014, and the Final Investment Decision (FID) is planned for the fourth quarter of FY 2016. Prime contractor system engineering, software development, and implementation activities are planned to begin in FY 2017 and complete in FY 2022.

A baseline for the planned allocation of enhancements to a specific ERAM release will be part of the program's FID baseline. The specific enhancements under analysis as a part of FID activities are listed below and will be deployed as a series of ERAM releases throughout the program lifecycle.

- Trajectory Modeling Enhancements - Improve the Flight Plan Trajectory Modeling to consistently identify the next sector for handoff and flight data distribution;
- Flight Plan Trajectory - Improve the accuracy of Aircraft Trajectory Modeling;

- Conflict Probe Enhancements - Improve Conflict Probe through better representation of the adherence bounds used to determine the need for computing a new aircraft trajectory, minimize false alerts, and apply a 3-nautical mile (NM) separation standard and wake turbulence procedure (whichever is larger) in the 3-NM separation airspace and transition airspace;
- Conflict Probe Enhancements - Provide Conflict Probe at the Radar Controller's display (R-Side) to facilitate the use of Conflict Probe information, especially when the sector is staffed with one controller;
- Flight Plan Processing - Improve controller access to modern aircraft flight data and equipage information that is available in the International Civil Aviation Organization (ICAO) flight plan;
- ERAM Enhancements to Support UAS - Improve the processing of UAS flight information, including routes, aircraft types, and performance characteristics;
- International Common Harmonization - Expand the automated coordination of flight data and aircraft control with the Canadian, Cuban and Dominican Republic Air Navigation Service Providers (ANSP);
- ERAM Adaptation Refinements - Improve the ability of the Air Route Traffic Control Center (ARTCC) support personnel to efficiently and dynamically change adaptation data; and
- Technical Operations Enhancements - Provide maintenance support at the Monitor and Control (M&C) system.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The ERAM Sector Enhancements program will improve trajectory modeling, enhance conflict probe processing and detection, and leverage ICAO 2012 Flight Plan data, among other improvements. These improvements will enable implementation of NextGen capabilities which will allow for increased efficiency and capacity benefits.

Program Plans FY 2017 – Performance Output Goals

- Complete requirements, engineering and design of the first release of ERAM Sector Enhancements.
- Complete the requirements document of the second release of ERAM Sector Enhancements.

Program Plans FY 2018 – Performance Output Goals

- Complete development, test and deployment of the first release of ERAM Sector Enhancements.
- Complete engineering and design of the second release of ERAM Sector Enhancements.
- Complete the requirements document of the third release of ERAM Sector Enhancements.

Program Plans FY 2019 – Performance Output Goals

- Complete software development, test and deployment of the second release of ERAM Sector Enhancements.
- Complete engineering and design of the third release of ERAM Sector Enhancements.
- Complete the requirements, engineering and design of the fourth release of ERAM Sector Enhancements.

Program Plans FY 2020 – Performance Output Goals

- Complete development, test and deployment of the third release of ERAM Sector Enhancements.
- Complete development, test and deployment of the fourth release of ERAM Sector Enhancement.
- Complete requirements, engineering and design of the fifth release of ERAM Sector Enhancements.
- Complete requirements, engineering and design of the sixth release of ERAM Sector Enhancements.

Program Plans FY 2021 – Performance Output Goals

- Complete development, test and deployment of the fifth release of ERAM Sector Enhancement.
- Complete development, test and deployment of the sixth release of ERAM Sector Enhancement.
- Complete requirements, engineering and design of the seventh release of ERAM Sector Enhancements.
- Complete requirements, engineering and design of the eighth release of ERAM Sector Enhancements.

2A02, EN ROUTE COMMUNICATIONS GATEWAY (ECG)

FY 2017 Request \$2.7M

En Route Communications Gateway (ECG) – Technology Refresh, A01.12-02

Program Description

The En Route Communications Gateway (ECG) system is a fully operational computer system that formats and conveys critical air traffic data to the En Route Automation Modernization (ERAM) and the Enhanced Backup Surveillance System at the Air Route Traffic Control Centers. The ECG increases efficiency in the use of NAS capacity and allows air traffic facilities to expand the use of airspace for air traffic control by enabling the current automation systems to use new surveillance technology, such as Automatic Dependence Surveillance Broadcast and Wide Area Multilateration. ECG introduced new interface standards and data formats which are required for compatibility with International Civil Aviation Organization standards. ECG also increased capacity to process data to accommodate inputs from additional remote equipment such as radars. ECG provides better use of the system capacity and the ability to expand coverage to support anticipated increases in air traffic and changes in the operational environment.

This program is structured into two activities – Performance Monitoring and Technology Refresh.

Performance Monitoring:

The ECG Operational Analysis (OA) and Sustainment and Technology Evolution Plan (STEP) activities monitor the actual performance of the ECG system and provide valuable input to the ECG Technology Refresh activity. OA monitors system availability and performance and documents the results with a quarterly ECG OA Report. STEP facilitates Post Production Support of the ECG system and identifies the processes/procedures that will be implemented to support the evolution and sustainment of the ECG system. ECG STEP provides a monthly report detailing product End-of-Life (EOL), End-of-Service (EOS), support termination and performance or supportability limitations.

Technology Refresh:

Based on input from ECG OA, STEP, and the evolving operational needs of the NAS, the ECG Technology Refresh activity plans, procures, and deploys ECG hardware or software components to maintain a high level of system availability. The items refreshed can be for EOL, EOS, or performance issues as well as modifications to increase capacity and add new interface and data formats. Upgrades can be required due to various product factors that may include cost of maintaining the existing system, system failures, licenses, spare quantities, and repair turn-around time. Work will continue to upgrade the following components to address EOL and EOS status: Interface Processor, Magma Chassis and Intelligent Communication Adapter cards. The deployment of these components will begin in FY 2017. Technology Refresh deployment will be completed in FY 2017.

The next phase of ECG technology refresh will begin in FY 2018. It will address EOL and EOS issues for the LAN Based Random Access Plan Position Indicator (RAPPI) (LBR) Surveillance Gateway System (SGS). The program will continue to use engineering analysis data from the monthly STEP EOL and quarterly OA Reports to determine the next technology refresh components.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The ECG Technology refresh program will replace some of the hardware and update critical software in this operational air traffic control automation system. This investment will reduce supportability limitations and keep the system up-to-date to avoid failures and system outages. This will insure the ECG system maintains its

availability and reliability. Quarterly ECG Operational Analysis Reports indicate an operational availability of 100% from first site Operational Readiness Demonstration (ORD) in 2004 through June 30, 2015.

Program Plans FY 2017 – Performance Output Goals

Performance Monitoring:

- Deliver monthly STEP EOL Reports.
- Deliver quarterly OA Reports.

Technology Refresh:

- Achieve Key-site and National deployment of ECG-074 Software Release.
- Complete deployment of Interface Processor, Expansion Chassis and Serial Communications Adapter Card Technology Refresh.
- Complete Technology Refresh deployment for RAPPI.
- Start engineering analysis for the SGS.

Program Plans FY 2018 – Performance Output Goals

Performance Monitoring:

- Deliver monthly STEP EOL Reports.
- Deliver quarterly OA Reports.

Technology Refresh:

- Start Technology Refresh deployment for the SGS.

Program Plans FY 2019 – Performance Output Goals

Performance Monitoring:

- Deliver monthly STEP EOL Reports.
- Deliver quarterly OA Reports.

Technology Refresh:

- Complete Technology Refresh deployment for the SGS.
- Complete engineering analysis of ECG Technology Refresh utilizing monthly STEP EOL and quarterly OA Reports.

Program Plans FY 2020-2021 – Performance Output Goals

Performance Monitoring:

- Deliver monthly STEP EOL Reports.
- Deliver quarterly OA Reports.

Technology Refresh:

- Complete engineering analysis of ECG Technology Refresh utilizing monthly STEP EOL and quarterly OA Reports.

2A03, NEXT GENERATION WEATHER RADAR (NEXRAD)

FY 2017 Request \$6.3M

**Next Generation Weather Radar (NEXRAD) – Service Life Extension Program (SLEP)
Phase 1, W02.02-02 / X, Next Generation Weather Radar (NEXRAD) – Service Life
Extension Program (SLEP) Phase 2, W02.02-03**

Program Description

NEXRAD SLEP is a nine year refurbishment program to extend the service life of 12 FAA-owned NEXRAD systems until 2030 when a replacement capability is expected to be deployed. NEXRAD is a long range weather radar that detects, analyzes, and transmits weather information for use by the ATC System Command Center, en route, terminal and flight service facilities. This weather information helps determine the location, time of arrival, and severity of weather conditions to determine the best routing for aircraft. The National Weather Service (NWS) collects and redistributes NEXRAD weather data from the radars they operate and some of the 12 FAA operated

radars to create forecasts that are used in all phases of flight. NEXRAD products and services are processed by FAA's Weather and Radar Processor, Integrated Terminal Weather System, and the Corridor Integrated Weather System.

With NWS as the lead agency, there are currently 160 NEXRAD systems used by the Tri-Agency partners consisting of NWS, FAA, and DOD. The FAA owns and operates 12 of the NEXRAD systems; seven are located in Alaska, four in Hawaii, and one in Puerto Rico.

NEXRAD radars were initially deployed from 1992-1997; some FAA-owned NEXRAD systems began reaching their 20-year end-of-life state in 2015. However, the Tri-Agency partners intend to keep NEXRAD in full operation through 2030.

NEXRAD – SLEP Phase 1 (W02.02-02):

A Final Investment Decision for NEXRAD was achieved on 19 September 2012 and a new cost and schedule baseline established. This program will have four main purposes:

- Extend the life of the FAA's NEXRAD to 2030, and beyond. There are four NEXRAD subsystems that have been identified as needing replacement/refurbishment:
 - Signal Processor (replace)
 - Pedestal (refurbish)
 - Transmitter (refurbish)
 - NEXRAD shelters and facilities (refurbish)
- Provide continued support for product improvements to the legacy NEXRAD program in accordance with the Tri-Agency Memorandum of Agreement (MOA). Each year, the FAA pays its pro-rata share of NEXRAD Product Improvement (NPI) Science Evolution costs.
- Install hardware and software technology refresh updates on the 12 FAA-owned NEXRADs. In particular, the Radar Product Generator and Radar Data Acquisition computers and peripherals require technology refresh which began in 2014.
- Optimize and validate FAA-specific algorithms that provide the capability to discern and display in real time, incidences of in-flight icing and hail. A prime objective is to enable the (future) development of operationally suitable displays to be used by pilots, controllers, Flight Service specialists, and dispatchers for use as decision making tools for avoiding and/or mitigating airborne threats due to the presence of airborne icing and hail.

NEXRAD – SLEP Phase 2 (W02.02-03):

Program office will support NWS NPI Science Evolution and Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL) in 2021 and will initiate business case for NEXRAD SLEP Phase 2; IARD is scheduled in 2023. Program office will coordinate with 2nd level engineering and NWS Maintenance Logistics Center to identify sustainability issues of the NEXRAD System.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The NEXRAD program contributes to the Deliver Benefits through Technology and Infrastructure strategic priority by ensuring sustained operational availability of NEXRAD. NEXRAD measures precipitation intensity, storm motion, and weather echo tops, and provides this data in varied displays directly or indirectly to all Core airports and most other air traffic control facilities in the continental United States.

Program Plans FY 2017 – Performance Output Goals

NEXRAD – SLEP Phase 1 (W02.02-02):

- Fund FAA’s pro-rata share of NPI Science Evolution costs.
- Deliver upgraded Icing algorithm to Radar Operations Center (ROC).
- Complete one Signal Processor replacement (1 of 12, 8%).

NEXRAD – SLEP Phase 2 (W02.02-03):

- None.

Program Plans FY 2018 – Performance Output Goals

NEXRAD – SLEP Phase 1 (W02.02-02):

- Fund FAA’s pro-rata share of NPI Science Evolution costs.
- Complete three Signal Processor replacements (4 of 12, 33%).
- Complete one Transmitter refurbishment (1 of 12, 8%).
- Deliver upgraded Icing algorithm to ROC.

NEXRAD – SLEP Phase 2 (W02.02-03):

- None.

Program Plans FY 2019 – Performance Output Goals

NEXRAD – SLEP Phase 1 (W02.02-02):

- Fund FAA’s pro-rata share of NPI Science Evolution costs.
- Complete four Signal Processor replacements (8 of 12, 67%).
- Complete three Transmitter refurbishments (4 of 12, 33%).
- Complete one pedestal refurbishment (1 of 12, 8%).
- Deliver upgraded Icing algorithm to ROC.

NEXRAD – SLEP Phase 2 (W02.02-03):

- None.

Program Plans FY 2020 – Performance Output Goals

NEXRAD – SLEP Phase 1 (W02.02-02):

- Fund FAA’s pro-rata share of NPI Science Evolution costs.
- Complete four Signal Processor replacements (12 of 12, 100%).
- Complete four Transmitter refurbishments (8 of 12, 67%).
- Complete five pedestal refurbishments (6 of 12, 50%).
- Deliver upgraded Icing algorithm to ROC.

NEXRAD – SLEP Phase 2 (W02.02-03):

- None.

Program Plans FY 2021 – Performance Output Goals

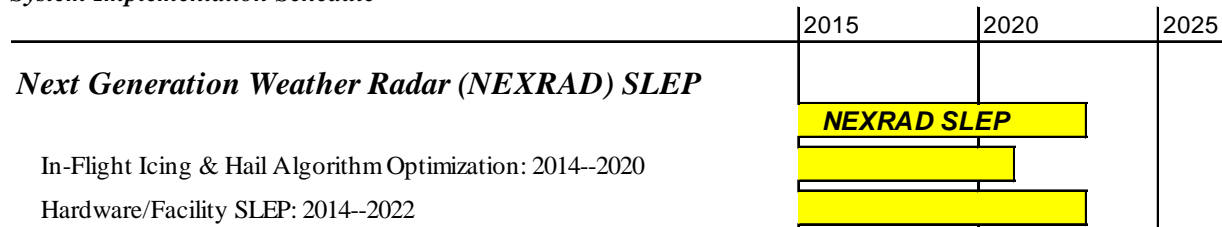
NEXRAD – SLEP Phase 1 (W02.02-02):

- Complete four Transmitter refurbishments (12 of 12, 100%).
- Complete six pedestal refurbishments (12 of 12, 100%).

NEXRAD – SLEP Phase 2 (W02.02-03):

- Fund FAA’s pro-rata share of NPI Science Evolution costs.
- Support NWS Routine Technology Refresh.
- Fund MIT/LL to enhance Icing and Hail detection algorithms.

System Implementation Schedule



2A04, AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC) & COMBINED CONTROL FACILITY (CCF) BUILDING IMPROVEMENTS

FY 2017 Request \$74.9M

Air Route Traffic Control Center (ARTCC) & Combined Control Facility (CCF) Building Improvements, F06.01-00

Program Description

The Air Route Traffic Control Center (ARTCC) and Combined Control Facility (CCF) Building Improvements program supports en route air traffic operations and service-level availability by providing life cycle management of the physical plant infrastructure at the 21 ARTCCs and 2 CCF facilities.

Major modernization projects include:

- Control Wing Basement is the space used to house NAS systems. This project renovates portions of the control wing basement by replacing or modernizing old and obsolete mechanical and electrical systems as well as fire detection and suppression systems.
- Major Mechanical Systems projects rebuilds or replaces the ARTCC chillers and cooling towers along with associated mechanical systems such as piping, pumps, fans, filters, and controls.
- Building Automation Controls System Replacement projects replace aging Direct Digital Control Systems (DDCS) that monitor and control the facility environmental systems, such as heating, ventilation, air conditioning (HVAC), chillers, cooling towers, pumps, air handlers, computer room air conditioners, and monitoring systems for water leak detection. The new Building Automation Controls Network “BACnet” replacement system will be an open communication standard protocol, developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), specifically for building automation and control networks. This project will provide standardization of Building Automation Control Systems at all FAA En Route Facilities.

Beginning in FY 2019, the following projects will be executed to extend the service life of the ARTCCs and CCFs and include:

- **Fire Alarm Replacement Project** – This project will replace the fire detection and annunciation systems at each facility. It includes demolition of the existing system and installation of a new system to include a fire alarm control panel, fire alarm annunciation panels, visual and audible annunciation devices, smoke and heat detectors, manual pull stations, addressable control devices, fire alarm conduit and fire alarm wiring.
- **Central Plant and Power Service Building Modernization Project** – This project includes the continued modernization of the facility central cooling and heating plant along with the modernization of the Power Service Building. The work in the Central Heating and Cooling Plant includes replacement of facility chillers, boiler systems, hot water heaters, lighting and electrical panel board, and Motor Control Center (MCC) replacement. The work in the Power Services Building includes architectural building upgrades including façade replacement, thermal separation of conditioned spaces from non-conditioned spaces, roof replacement, seismic and other code and accessibility upgrades, toilet and plumbing upgrades, replacement of air handling units, lighting and panel board replacement.
- **Control Wing First Floor and Attic Modernization Project** – This project consists of Control Wing first floor and attic upgrades. The project includes upgrades and restoration of fire-rated walls and floors, replacement or upgrades of access floor systems, code and accessibility upgrades, wall and floor finish upgrades, upgrades to fire suppression systems, replacement of air handling units, replacement of chiller and hot water piping systems, replacement of interior lighting, replacement of the lighting central battery system and dimming control system, replacement of building electric distribution systems including panel boards, and branch circuits. The area for this project is the facility Air Traffic Control Operations Room, which will remain in operation throughout the project.

The details on how the projects are packaged and implemented will be determined upon completion of a scoping survey. A standard design will be site adapted for each of the ARTCCs and CCFs.

Many of these structures were built in the 1960's and have been expanded several times since then. As of FY 2014 there was a \$104.5 million facility backlog of needed repairs or upgrades which includes all building systems such as HVAC components, all piping, plumbing, control systems, and both exterior and interior of the building. This backlog increases the risk of outages and may result in increased maintenance costs. This program modernizes and sustains these buildings to meet air traffic service requirements and to reduce the backlog. This program is included in the ATC Facilities Sustainment Strategic Plan.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The program contributes to the FAA's performance metric of maintaining operational availability of the NAS by ensuring that buildings that house en route air traffic control equipment are sustained and modernized to meet operational requirements. Improvements to ARTCC facility infrastructure will extend the service life of these facilities and minimize potential outages that would cause delays to air traffic. Associated risks from incidents such as roof leaks and pipe ruptures include equipment damage, mold, and interruptions to operations. The chiller plants for air conditioning are currently approaching or are past their economic life expectancy. Replacement of these plants is underway but will not be completed until approximately 2019. A catastrophic failure of a chiller plant could ultimately result in the loss of Air Traffic services at an ARTCC.

Program Plans FY 2017 – Performance Output Goals

- Award construction contract for the M1 Build Out project at Miami ARTCC.
- Award construction contracts for Control Wing Basement/Major Mechanical projects at Los Angeles, Salt Lake City, Atlanta, and Seattle ARTCCs.
- Award contracts for Building Automation Controls System Replacement projects at Anchorage ARTCC.
- Award design contracts for Building Automation Controls Systems Replacement for Atlanta, Minneapolis and Guam CCF.
- Provide funding to all ARTCCs and CCFs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all ARTCCs and CCFs.
- Award contracts for three Facility Assessment Surveys, one for each service area.

Program Plans FY 2018 – Performance Output Goals

- Award construction contracts for Control Wing Basement/Major Mechanical projects at Denver and Kansas City ARTCCs.
- Award construction contracts for Building Automation Controls System Replacement projects at Oakland, Cleveland, Washington, and Los Angeles ARTCCs.
- Award design contracts for Building Automation Controls Systems Replacement for Salt Lake, Seattle and Denver ARTCCs.
- Award design contract for Dewatering project at Minneapolis ARTCC.
- Provide funding to all ARTCCs and CCFs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all ARTCCs and CCFs.
- Award contracts for three Facility Condition Surveys, one for each service area.

Program Plans FY 2019 – Performance Output Goals

- Award construction contracts for Building Automation Controls System Replacement project at Atlanta, Guam, Minneapolis, Salt Lake, Seattle and Denver ARTCCs.
- Award construction contract for Dewatering project at Minneapolis ARTCC.
- Renovate and upgrade ARTCCs and CCFs Mechanical Systems, Fire Protection Systems, and Power Service Building infrastructure based on facility condition survey.
- Provide funding to all ARTCCs and CCFs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all other ARTCCs and CCFs.
- Award contracts for three Facility Condition Surveys, one for each service area.

Program Plans FY 2020 – Performance Output Goals

- Renovate and upgrade ARTCCs and CCFs Mechanical Systems, Fire Protection Systems, and Power Service Building infrastructure based on facility condition survey.
- Provide funding to all ARTCCs and CCFs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all ARTCCs and CCFs.
- Award contracts for three Facility Condition Surveys, one for each service area.

Program Plans FY 2021 – Performance Output Goals

- Renovate and upgrade ARTCCs and CCFs Mechanical Systems, Fire Protection Systems, and Power Service Building infrastructure based on facility condition survey.
- Provide funding to all ARTCCs and CCFs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all ARTCCs and CCFs.
- Award contracts for three Facility Condition Surveys, one for each service area.

2A05, AIR TRAFFIC MANAGEMENT (ATM) – TRAFFIC FLOW MANAGEMENT (TFM)

FY 2017 Request \$20.0M

- A, Traffic Flow Management (TFM) Infrastructure – Field/Remote Site Technology Refresh, A05.01-13
- B, Traffic Flow Management (TFM) Infrastructure – TFM Service Enhancements, A05.01-14
- C, Commercial Space Integration Into The NAS, M55.01-01

A, Traffic Flow Management (TFM) Infrastructure – Field/Remote Site Technology Refresh, A05.01-13

Program Description

The TFM System is the automation backbone for the Air Traffic Control System Command Center (ATCSCC) and the Traffic Management Units (TMUs) at en route centers and TRACONs that assist the ATCSCC in strategic planning and management of air traffic. TFM hosts the software decision support systems that are used in managing and metering air traffic to reduce delays and make maximum use of system capacity. These tools help the ATCSCC and TMUs to dynamically balance growing flight demands with NAS capacity. The system compares the projected traffic with the capacity of destination airports to determine if steps need to be taken to manage the flow and prevent delays. The FAA uses the information from this system to collaborate with aviation customers to develop and implement airspace management programs that reduce delays and ensure smooth and efficient traffic flow through FAA-controlled airspace. TFM benefits all segments of aviation including airlines, general aviation, U.S. Department of Defense (DoD), U.S. Department of Homeland Security, and appropriate foreign Air Traffic Control entities.

TFM Infrastructure Field/Remote Site Technology Refresh will replace Traffic Flow Management System (TFMS) equipment at field sites. Procured in 2008-2009, the support of current field equipment ended in 2014 and now requires hardware replacement in-kind for technology refresh. Hardware will be replaced at over 88 TFM-equipped Air Traffic Control facilities around the country including TMUs at En Route Centers, Terminal Radar Facilities, and Air Traffic Control Towers. The program achieved Final Investment Decision on June 18, 2014.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

When the NAS is impacted by severe weather, congestion and/or outages, TFM predicts chokepoints and facilitates the development and execution of mitigation initiatives and collaboration with stakeholders, using common information displays and tools to minimize NAS delays. The TFM Infrastructure program will support the FAA’s performance metric for on-time arrival through the update of automated systems that provide more accurate and timely information for all TFM system users, improve operator and passenger access to flight information, and reduce system delays. Keeping the TFMS fully mission capable also serves as an enabling function for the NextGen Collaborative Air Traffic Management Technologies Work Package 3 & 4 efforts, and in the future WP5, as they all reside and operate on TFMS.

Program Plans FY 2017 – Performance Output Goals

- Complete Operational Test & Evaluation at the William J. Hughes Technical Center. (APB milestone)
- Complete initial remote site replacements.
- Complete installation of TFM Infrastructure Field/Remote Site (TRS) equipment at first operational site. (APB milestone)

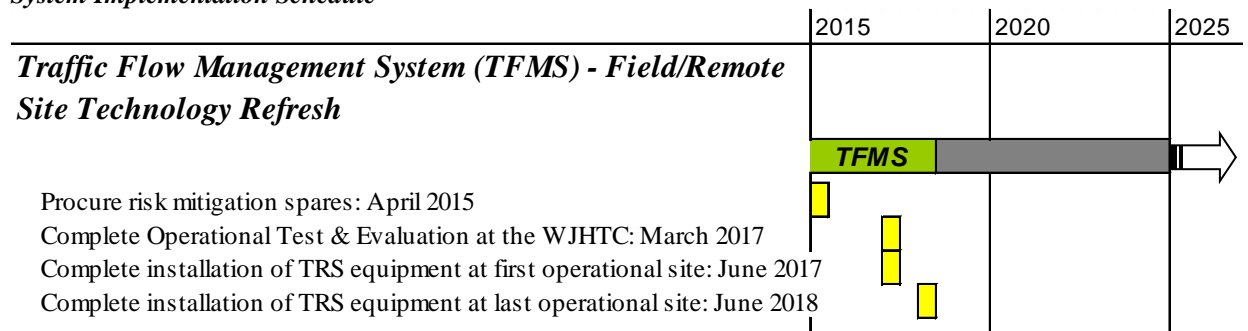
Program Plans FY 2018 – Performance Output Goals

- Complete installation of TRS equipment at last operational site. (APB milestone)

Program Plans FY 2019-2021 – Performance Output Goals

- None.

System Implementation Schedule



B, Traffic Flow Management (TFM) Infrastructure – TFM Service Enhancements, A05.01-

Program Description

This program will conduct operational analysis, engineering analysis, solution development, and solution implementation activities designed to improve the delivery of Traffic Flow Management (TFM) services. The scope

of these NAS enhancements is limited to operational changes that do not require significant capital investments or involve complex system interdependencies. The identification, management, documentation, and overall governance of these NAS changes will be articulated in an ATO Standard Operating Procedure and coordinated with applicable stakeholders. Capability areas will be explored, developed, and executed over a multi-year period.

Enhancements made through this program will align with several TFM-oriented NextGen Operational Improvements (OIs) including:

- OI 105302 – Continuous Flight Day Evaluation;
- OI 105207 – Full Collaborative Decision Making; and
- OI 105208 – Traffic Management Initiatives with Flight Specific Trajectories.

Potential capability areas include:

- Improved NAS State Awareness. Current human-computer-interface to communicate NAS status to Traffic Managers is scattered among several displays, decreasing consistent situational awareness and increasing task workload to maintain awareness;
- TFM Data Integration. Key demand and capacity information is currently not fully integrated between the FAA’s two principal flow management systems. Unlocking and integrating this data will improve overall NAS planning activities and traffic management initiative selection and execution;
- Enhanced Data Exchange with Users. Current methods to communicate system state and constraint info with users and flying public is based on old technology and is not conducive “machine to machine” exchange;
- Better use of existing TFMS surface data. Use surface data already contained in TFMS to automatically calculate airport delay information and post to the Operational Information System (OIS). These delays are tracked manually today; an automated display would give the FAA and NAS Users much needed status information; and
- Displaying Traffic Management Initiative (TMI) data from National Traffic Management Log directly on the Traffic Situation Display. This would include Ground Stops, Ground Delay Programs, Collaborative Trajectory Options Program, open/closed Fixes, Mile-in-Trail Restrictions.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Target

Traffic Flow Management System (TFMS) automation enhancements will upgrade decision support tools to help traffic managers implement more efficient TMIs. Enhancements to both the Time-Based Flow Management and TFMS will assist traffic managers in more efficiently utilizing airport and airspace resources to increase arrival and departure capacity.

Program Plans FY 2017-2020 – Performance Output Goals

- Complete operational analysis, engineering analysis, and solution development of hardware and software enhancements.
- Deliver hardware and software enhancements in the operational release to address operational problems and system improvements.

Program Plans FY 2021 – Performance Output Goals

- Complete operational analysis, engineering analysis, and solution development of hardware and software enhancements.
- Deliver hardware and software enhancements in the operational release to address operational problems and system improvements.

C, Commercial Space Integration Into The NAS, M55.01-01

Program Description

In accordance with the Commercial Space Launch Act and the President's National Space Policy, the FAA's Office of Commercial Space Transportation (AST) serves as the single government interface to the commercial space transportation industry. In this role, AST ensures protection of the public, property, and the national security and foreign policy interests of the United States during commercial launches and reentries, and it encourages, facilitates, and promotes United States commercial space transportation. AST grants licenses and permits to commercial space operators, authorizing them to conduct launches and/or reentries, or to operate launch sites.

AST works closely with Air Traffic Organization (ATO) to facilitate the development of agreements with commercial space operators required by Part 400 regulations, and to support the planning and real time monitoring processes necessary to safely integrate these missions into the National Airspace System (NAS). AST personnel are stationed at the Air Traffic Control System Command Center where they interface regularly with traffic managers and procedures specialists at Air Route Traffic Control Centers and other air traffic facilities.

The Commercial Space Transportation Integration into the NAS program focuses specifically on Commercial Space enabling NAS automation and decision support tools. The number of licensed and permitted commercial space operations and their complexity has increased significantly over the past few years. For each commercial space operation, AST and ATO must work together to safely minimize the effect on the capacity and efficiency of the NAS while providing opportunities for commercial space operators to accomplish their mission objectives. No real-time vehicle information is available to the FAA and the work to support operations is currently manual in nature, time consuming, error-prone, and unable to respond to dynamic conditions. FAA systems were not designed to support commercial space purposes and interfaces to ingest telemetry and planning data do not exist. A small team of AST and ATO personnel manually transfer data across tools, phone hotlines, and networks verbally and on paper, enter the data by hand, and complete multiple checks to minimize the potential for human error. Being resource intensive, the team can address only one mission at a time, putting stress on FAA's ability to keep pace with the increasing tempo of commercial space operations. The development of a capability that can provide commercial space data to FAA decision support tools in the strategic, tactical, and automation environments is essential to the FAA's ability to safely minimize the effects of these operations on NAS capacity and efficiency without impeding industry progress. This program will introduce processes and procedures that will allow the FAA to reduce the amount of airspace required to be closed in advance of a mission, effectively respond to off-nominal scenarios in a more timely manner during a mission, and quickly release airspace back to the system as the mission progresses.

The FAA requires a data integration capability to support upcoming operational scenarios, including those associated with NASA's Commercial Crew Program, fly back boosters, inland reentries from orbit, and other complex mission designs that must share the airspace with aviation. A prototype has been developed and installed at the Command Center where a series of prototype demonstrations of this capability are scheduled to take place in shadow mode during upcoming commercial space operations. These demonstrations were developed in close collaboration with NextGen, ATO System Operations Support, and ATO Mission Support in support of the Administrator's Strategic Initiative for the NAS. This prototype will be applied to specific missions to assist in the development of requirements and demonstrate the benefits that integrating commercial space data into the NAS can provide to the Command Center, En Route and Terminal environments. The initial phase of this program will develop a data integration capability to process real-time vehicle data and aircraft hazard area data and then interface with the Traffic Flow Management System (TFMS) at the Command Center. This will allow the FAA to dynamically modify aircraft hazard areas by releasing airspace that is no longer at risk as a mission progresses. Continued use of the prototype system and engineering assessments will allow the extension this capability to an En Route Automation Modernization and Terminal environments in future phases.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter.*
- *FAA Performance Metric 3 – No fatalities, serious injuries, or significant property damage to the uninvolved public during licensed or permitted space launch and reentry activities.*

Relationship to Performance Target

During commercial launch and reentry operations, highly manual procedures are currently followed due to the inability of the NAS to ingest real-time telemetry and planning data. This produces large, static hazard areas that close large amounts of airspace for extended periods of time. While these expanded hazard areas ensure the safety of all NAS users, they do so at the expense of system efficiency; increasing reroute mileage and delays, and reducing on-time arrival rates.

Through its licensing and permitting processes, AST is committed to ensuring that no fatalities, serious injuries, or significant property damage to the public occurs during licensed or permitted space launch and reentry activities. This program will develop and utilize a system that integrates real-time mission data, allowing for a more dynamic use of the NAS. Using precise and upgraded information will improve initial planning in determining hazard areas and closures, which will reduce the amount of airspace being closed for long periods of time while still maintaining the required level of safety for all NAS users. This program will facilitate the transition from the current use of large, static hazard areas, to smaller, dynamic hazard areas in the future. Benefits of this capability will also include consistent processes that will result in more timely and accurate information being available to NAS users to support timely and effective responses to off-nominal scenarios and timely release of airspace when it is no longer needed. This makes aviation safer and smarter while enabling the integration of more commercial space operations into the NAS.

Program Plans FY 2017 – Performance Output Goals

- Develop the following products in support of the IARD:
 - Enterprise Architecture Artifacts;
 - Investment Analysis Plan; and
 - Final Shortfall Analysis.
- Achieve JRC IARD.

Program Plans FY 2018 – Performance Output Goals

- Develop the following products in support of the IID:
 - Initial Program Requirements documentation;
 - Enterprise Architecture Artifacts;
 - Initial Business Case documentation;
 - Initial Implementation Strategy and Planning Document (ISPD)
- Achieve JRC IID.

Program Plans FY 2019 – Performance Output Goals

- Initiate transition to Long-Term NextGen Concept of Operations.
- Develop the following products in support of the FID:
 - Final Program Requirements documentation
 - Acquisition Program Baseline

Program Plans FY 2020-2021 – Performance Output Goals

- Output goals will be determined at FID, to include deployment of primary capability and follow on enhancements.

2A06, AIR/GROUND COMMUNICATIONS INFRASTRUCTURE

FY 2017 Request \$8.8M

Radio Control Equipment (RCE) – Sustainment, C04.01-01 / Communications Facilities Enhancement – Expansion, C06.01-00

Program Description

The Air-to-Ground (A/G) Communications Infrastructure Sustainment programs enhance operational efficiency and effectiveness by replacing aging radio equipment, providing new, relocated or upgraded remote communications facilities, and providing equipment and support to detect and resolve radio frequency interference with FAA communications.

Radio Control Equipment (RCE) – Sustainment (C04.01-01):

The RCE program replaces obsolete radio signaling and control equipment which controllers use to select a remote radio channel. The RCE program improves reliability by replacing older non-supported tone control equipment providing more functionality and improving operational performance. Additional functionality, such as split voice and data is provided, which splits the control data from the voice circuit enabling the voice circuit to be compressed and use less bandwidth. This reduces operating costs for satellite communications because fees are based on the bandwidth used. The new equipment will also provide dual control functionality with the option to toggle control of a remote communications facility between two towers; allowing transfer of frequency control to another facility when a tower is closed. RCE is required at service delivery sites such as Air Route Traffic Control Centers (ARTCCs), Terminal Radar Approach Control facilities, Air Traffic Control Towers, Combined Center Radar Approach Control, Radar Approach Controls, and Automated Flight Service Stations. This equipment is also installed at supporting facilities such as: Remote Center A/G facilities that serve ARTCCs, Remote Transmitter/Receiver facilities that serve terminal facilities and Remote Communications Outlet facilities that serve Flight Service Stations.

Communications Facilities Enhancement – Expansion (C06.01-00):

The Communications Facilities Enhancements (CFE) program provides new, relocated or upgraded Remote Communication Facilities (RCF's) to enhance the A/G communications between air traffic control and the aircraft when there are gaps in coverage or new routes are adopted. The program also provides various upgrades to RCFs, including building and tower grounding, lightning protection, and replacing the cables from the equipment to antennas whenever necessary to improve radio equipment performance.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The A/G Communications Infrastructure Sustainment programs reduce the number of outages by replacing aging and increasingly unreliable communications equipment with modern equipment. These programs improve and provide required upgrades at A/G Communication sites and facilities to sustain reliable operation.

Program Plans FY 2017 – Performance Output Goals

Radio Control Equipment – Sustainment (C04.01-01):

- Procure RCE Intellectual Property from vendor.
- Redesign and test prototype of identified obsolete modules.
- Prepare Screening Information Request package for power supply replacement.
- Complete RCE test bed upgrade.

Communications Facilities Enhancement – Expansion (C06.01-00):

- Complete the Establish/Replace/Upgrade of nine CFE sites.

Program Plans FY 2018 – Performance Output Goals

Radio Control Equipment – Sustainment (C04.01-01):

- Procure 100 control type power supplies.
- Procure 100 of redesigned modules to replace obsolete parts.

Communications Facilities Enhancement – Expansion (C06.01-00):

- Complete the Establish/Replace/Upgrade of nine CFE sites.

Program Plans FY 2019 – Performance Output Goals

Radio Control Equipment – Sustainment (C04.01-01):

- None.

Communications Facilities Enhancement – Expansion (C06.01-00):

- Complete the Establish/Replace/Upgrade of nine CFE sites.

Program Plans FY 2020 – Performance Output Goals

Radio Control Equipment – Sustainment (C04.01-01):

- None.

Communications Facilities Enhancement – Expansion (C06.01-00):

- Complete the Establish/Replace/Upgrade of four CFE sites.

Program Plans FY 2021 – Performance Output Goals

Radio Control Equipment – Sustainment (C04.01-01):

- None.

Communications Facilities Enhancement – Expansion (C06.01-00):

- Complete the Establish/Replace/Upgrade of four CFE sites.

2A07, AIR TRAFFIC CONTROL EN ROUTE RADAR FACILITIES IMPROVEMENTS

FY 2017 Request \$5.8M

Long Range Radar (LRR) Improvements – Infrastructure Upgrades/Sustain, S04.02-03

Program Description

The LRR Infrastructure Upgrades/Sustain program modernizes and upgrades 157 radar facilities that provide aircraft position information to FAA Air Route Traffic Control Centers and to other users (e.g., Department of Defense and Homeland Security). These planned improvements also support the installation and lifecycle modernization of the secondary beacon radars (Mode Select and Air Traffic Control Beacon Interrogator (ATCBI)); both standalone and those co-located with the long-range primary radars. Secondary radars typically have their antennas mounted above the long-range primary radar antennas, and the processors for both radars are typically installed in facilities constructed in the 1950's and 1960's. These facilities have reached the end of their designed service life, and will require renovation and upgrades to maintain their current level of service. Some En Route secondary radar service outages were due to leaking roofs and antiquated air conditioning systems. These outages can impact air traffic flow and cause delays.

The scope of work of the LRR Infrastructure Upgrades includes:

- Upgrade of existing lightning protection, grounding, bonding, and shielding (LPGBS) systems;
- Upgrade of existing power distribution systems;
- Upgrade of radar structural components to support LRR Service Life Extension Program (SLEP) and ATCBI-6 deployments;
- Major repair and replacement of access roads, grounds, storm water controls, security lighting, and walkways;
- Abatement of hazardous materials such as asbestos contaminated materials (ACM), lead based paint, and mold;
- Refurbishment of Heating, Ventilation, and Air Conditioning (HVAC) systems, cooling fans, duct works, elevators, wiring and lighting systems, and walkways; and
- Repair or replacement of building and antenna tower roofs, structural components such as foundations, beams, columns, bracings, struts, platforms, walls, and concrete slabs.

Planning is underway to develop a 10 year strategy for investments to upgrade the facilities to a sustainable level. This program is included in the ATC Facilities Sustainment Strategic Plan.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The LRR program renovates existing FAA-owned surveillance facilities and structures serving the NAS. The NAS requires reliable and continuous operation of surveillance equipment. Repairs, improvements, and modernization of existing infrastructure will enable facilities to meet current operational, environmental, and safety needs, economically extend the service life of facilities, and reduce the chance of outages that cause air traffic delays. .

Program Plans FY 2017-2021 – Performance Output Goals

- Complete upgrades of critical infrastructure systems at 12 facilities per year including Critical/Essential/Commercial Power Distribution and HVAC systems (actuals may vary based upon validation and priority for the year).
- Complete sustainment projects at 14 facilities per year. Scope includes: roof replacements, building envelope repairs, safety improvements, mold abatements, asbestos abatements, access road repairs, plumbing upgrades, lighting improvements, and fire detection upgrades (actuals may vary based upon validation and priority for the year).

2A08, VOICE SWITCHING CONTROL SYSTEM (VSCS)

FY 2017 Request \$11.3M

Voice Switching and Control System (VSCS) – Technology Refresh – Phase 3, C01.02-04 / X, Voice Switching and Control System (VSCS) – Technology Refresh – Level of Effort, C01.02-05

Program Description

The Voice Switching and Control System (VSCS) controls the switching mechanisms that allow controllers to select the communication channel they need to communicate with pilots, other controllers, other air traffic facilities, and commercial telephone contacts. Controllers need to be able to quickly select the proper channel, so they can communicate with pilots, coordinate with other controllers and/or contact emergency services as necessary.

VSCS – Technology Refresh – Phase 3 (C01.02-04):

The VSCS Technology Refresh program will replace and upgrade hardware and software components for the voice switching systems in all 21 en route air traffic control centers. The real time Field Maintenance/Testing System at the FAA William J. Hughes Technical Center (WJHTC) and the Training System at the FAA Academy will also be upgraded to perform the same as an operational site. These upgrades will ensure that the air-to-ground and ground-to-ground communications capabilities are reliable and available for separating aircraft, coordinating flight plans, and transferring information between air traffic control facilities in the en route environment. To date, this program has replaced the VSCS internal control systems, updated the obsolete language used in some software programs, and replaced the VSCS Timing and Traffic Simulation Unit at the FAA WJHTC. This WJHTC test bed is being used to test the capabilities of the upgraded systems to determine if they meet the formal baseline requirements established for VSCS performance before they are deployed to operational field facilities.

VSCS Technology Refresh Phases 1 and 2 included funding for Work Station Upgrades, VSCS Display Module Replacement, VSCS Integrated Test Suite Replacement, Maintenance Test Set Replacements – Functional At Speed Tester, Power Supply upgrades, VSCS Training and Backup Switch (VTABS), VSCS Test Controller Replacement, as well as some software code conversion from Programming Language for Microcomputers (PLM) to C.

VSCS Technology Refresh Phase 3 will be dependent upon engineering analysis which will include Ground-to-Ground (G/G) node reduction efforts (approximately 10 nodes), Fiber Optic Tie Trunk (FOTT) power supply replacements (approximately 500 supplies), Local Area Network (LAN) Transceiver retrofits (approximately 7,000), and the PLM to C software conversion for the Air-to-Ground (A/G) switch. A Final Investment Decision for VSCS Technology Refresh Phase 3 was approved in November 2012.

VSCS – Technology Refresh – Level of Effort (C01.02-05):

The VSCS Technology Refresh Level of Effort program will maintain ongoing Diminishing Manufacturing Sources and Material Shortages (DMSMS) analysis, conduct program management activities, and provide engineering support. Based on analysis, this program will replace or upgrade VSCS components to sustain VSCS and will be a stand-alone effort starting in FY 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The VSCS Technology Refresh program supports the Performance Metric to sustain operational availability of the NAS by improving the system reliability of en route voice communications for both current and future operations by replacing and upgrading components of the obsolete, non-supportable elements of VSCS hardware and software. Reports indicate VSCS equipment had an average operational availability of 99.971% from 2007 through 2010 with a downward trend as compared to a safety-critical NAS services availability requirement of 99.999%. VSCS Technology Refresh Phase 3 is required to sustain both the operational availability of the VSCS/VTABS switches and the ability of the VSCS Depot to support site requisitions.

Program Plans FY 2017 – Performance Output Goals

VSCS – Technology Refresh – Phase 3 (C01.02-04):

- Complete FOTT power supply replacement. (APB milestone)
- Complete VSCS Local Area Network (LAN) Transceiver Retrofit. (APB milestone)

VSCS – Technology Refresh – Level of Effort (C01.02-05):

- None.

Program Plans FY 2018 – Performance Output Goals

VSCS – Technology Refresh – Phase 3 (C01.02-04):

- Complete A/G PLM to C software conversion. (APB milestone)

VSCS – Technology Refresh – Level of Effort (C01.02-05):

- None.

Program Plans FY 2019 – Performance Output Goals

VSCS – Technology Refresh – Phase 3 (C01.02-04):

- None.

VSCS – Technology Refresh – Level of Effort (C01.02-05):

- Complete quarterly VSCS / VTABS System Technology Evolution Process database update needed for DMSMS analysis.
- Award contract to recover, replace or upgrade components identified in the DMSMS analysis.

Program Plans FY 2020 – Performance Output Goals

VSCS – Technology Refresh – Phase 3 (C01.02-04):

- None.

VSCS – Technology Refresh – Level of Effort (C01.02-05):

- Complete quarterly VSCS / VTABS System Technology Evolution Process database update needed for DMSMS analysis.
- Recover, replace or upgrade VSCS components as identified in the DMSMS analysis.

Program Plans FY 2021 – Performance Output Goals

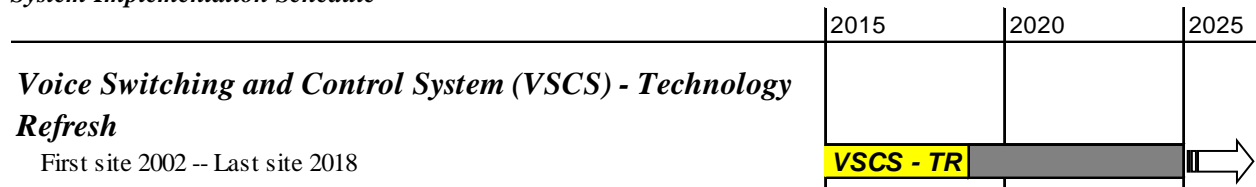
VSCS – Technology Refresh – Phase 3 (C01.02-04):

- None.

VSCS – Technology Refresh – Level of Effort (C01.02-05):

- Complete quarterly VSCS / VTABS System Technology Evolution Process database update needed for DMSMS analysis.
- Recover, replace or upgrade VSCS components as identified in the DMSMS analysis.

System Implementation Schedule



2A09, OCEANIC AUTOMATION SYSTEM (OAS)

FY 2017 Request \$24.0M

- A, Advanced Technologies and Oceanic Procedures (ATOP) – Technology Refresh, A10.03-01
- B, Advanced Technologies and Oceanic Procedures (ATOP) – Oceanic Service Enhancements, A10.03-03
- C, Oceanic Separation Standards Development and Analysis, A10.06-01
- X, Advanced Technologies and Oceanic Procedures (ATOP) – ATOP Enhancements (Work Package 1), A10.03-02

A, Advanced Technologies and Oceanic Procedures (ATOP) – Technology Refresh, A10.03-01

Program Description

The ATOP program replaced the original oceanic air traffic control system, updated procedures and modernized the Oakland, New York, and Anchorage ARTCCs, which house the oceanic automation systems. Full operational capability was achieved at all three centers in 2007. A support system was installed at the William J. Hughes Technical Center (WJHTC). ATOP fully integrates flight and radar data processing, detects conflicts between aircraft, provides data link and surveillance capabilities, and automates the previous manual processes for oceanic air traffic control.

ATOP Technology Refresh program will define engineering requirements for replacing the hardware and operating system, and procure and integrate the new hardware and operating system with the baseline ATOP applications. ATOP Technology Refresh reduces maintenance and logistics costs and supports incorporation of software changes and new capabilities to support future NextGen, Surveillance and Broadcast Service (SBS), and other NAS improvements.

Investment Analysis Readiness Decision (IARD) was completed in FY 2015 and Final Investment Decision (FID) is planned in FY 2016.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Target

ATOP Technology Refresh replaces obsolete and unsupported equipment and the operating system to reduce future system failures and increase ATOP system performance to meet future requirements and capabilities.

Program Plans FY 2017 – Performance Output Goals

- Complete the procurement of the hardware for Technology Refresh 2 for the three ATOP sites; Anchorage, New York, Oakland, and the support system at the WJHTC.

Program Plans FY 2018 – Performance Output Goals

- Complete implementation of the technology refresh configuration at the WJHTC.
- Develop and validate system transition procedures for site technical refresh.

Program Plans FY 2019 – Performance Output Goals

- Complete software porting from AIX 5.3 to Linux and provide a technology refresh hardware and software release for operational use.
- Complete the implementation of the technology refresh configuration at the first ATOP site.
- Initiate software development of a software release which will improve ATOP system performance in the NAS.

Program Plans FY 2020 – Performance Output Goals

- Complete the implementation of the technology refresh at the last two ATOP sites. (Prior year funding)
- Complete development of ATOP T28 improved performance software release. (Prior year funding)
- All three ATOP sites operational on T28 improved performance software release. (Prior year funding)

Program Plans FY 2021 – Performance Output Goals

- None.

B, Advanced Technologies and Oceanic Procedures (ATOP) – Oceanic Service Enhancements, A10.03-03

Program Description

This program will support operational analysis, engineering analysis, solution development, and solution implementation activities designed to improve the delivery of oceanic domain services. ATOP full operational capability was achieved at all three centers in 2007. The scope of these NAS enhancements is limited to operational changes that do not require significant capital investments, nor involve significant systems complexity or interdependencies, but do require an expedited solution. The identification, management, documentation, and overall governance of these NAS changes will be articulated in an ATO Standard Operating Procedure and will use the ATOP NAS Change Proposal (NCP) process to identify and prioritize the requirements.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Target

This program will improve the flexibility, reliability, and efficiency of oceanic air traffic control by providing a capability to more frequently accommodate user's preferred flight trajectories and requests for altitude changes which will increase the likelihood of on-time arrivals.

Program Plans FY 2017– Performance Output Goals

- Complete operational and engineering analysis activities for prioritized ATOP system enhancements to deliver improved oceanic air traffic service for its users.

Program Plans FY 2018-2020 – Performance Output Goals

- Complete operational and engineering analysis, solution development, and solution implementation activities for prioritized ATOP system enhancements to deliver improved oceanic air traffic service for its users.

Program Plans FY 2021 – Performance Output Goals

- None.

C, Oceanic Separation Standards Development and Analysis, A10.06-01

Program Description

The Oceanic Separation Standards Development and Analysis Program will provide specialized technical expertise to the International Civil Aviation Organization (ICAO) Separation and Airspace Safety Panel (SASP), and help to form FAA-recommended standards for ICAO regional planning groups in the North Atlantic and Asia Pacific regions, where the U.S. is responsible for significant delegated international airspace. This program contributes towards the development and implementation of separation minima and procedures in the form of data-driven safety studies, mathematical modeling, and collision risk estimation. Separation minima are predicated on the equipage of aircraft with performance-based navigation (PBN) and performance-based communication and surveillance (PBCS) capabilities along with air navigation service providers (ANSPs) having the required automation capabilities.

The FAA provides specialized technical expertise to ICAO technical panels and develops recommended standards for ICAO regional planning groups that develop proposed changes to existing standards. This approach ensures coordination of international standards with U.S. recommended standards and improves efficiency of operations for U.S. air carriers and air traffic control systems. Specialized collision risk modeling and safety training will be provided to foreign governments and ANSPs to ensure the safe implementation of separation minima.

The program supports the development of ICAO SASP technical information and working papers including recommendations for new separation minima and procedures. These recommendations support amendments to the appropriate ICAO Standards and Recommended Practices (SARPs), requirements, and documentation.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter.*
- *FAA Performance Metric 5 – Reduce risks in flight by limiting the rate of the most serious losses of standard separation to 20 or fewer for every thousand (.02) losses of standard separation within the National Airspace System.*

Relationship to Performance Target

The Oceanic Separation Standards Development and Analysis Program is linked to the AOA Strategic Priority of “Making Aviation Safer and Smarter” through FAA’s participation in the development work of new separation minima and procedures performed within the ICAO SASP. This development work conducted within the ICAO SASP assures that separation minima and procedures introduced for application in oceanic and procedural airspace will meet safety requirements established by ICAO.

Program Plans FY 2017 – Performance Output Goals

- Deliver the 30/30 Cross Boundary between New York Oceanic and Santa Maria airspace report.
- Deliver the PBCS report to ICAO SASP.
- Deliver analysis report for the North Atlantic Data Link Mandate, Phase 2B.
- Deliver analysis report on North Atlantic Minimum Navigation Performance Specification to PBN.

Program Plans FY 2018-2021 – Performance Output Goals

- None.

X, Advanced Technologies and Oceanic Procedures (ATOP) – ATOP Enhancements (Work Package 1), A10.03-02

Program Description

The ATOP program replaced the original oceanic air traffic control system, updated procedures and modernized the oceanic automation systems located at the Oakland, New York, and Anchorage Air Route Traffic Control Centers (ARTCCs). Full operational capability was achieved at all three centers in 2007. A support system was installed at the William J. Hughes Technical Center. ATOP fully integrates flight and radar data processing, detects conflicts between aircraft, provides data link and surveillance capabilities, and automates previously manual processes for oceanic air traffic control.

The ATOP Enhancements program is addressing the operational shortfalls of the current oceanic system as the FAA moves forward with NextGen and other NAS upgrades. The program continues the evolution of the capabilities and services from requirements developed by the Air Traffic Procedures Directorate, AJV-8. The program has nine planned enhancements to address the nine shortfall categories shown below:

- User interface and data processing limitations impacting controller coordination;
- Inability to access required external weather data and publish flight and system data;
- Lack of automation support for coordination with international air navigation service providers;
- Failure to realize benefits from integrating new products, services and data provided via NextGen;
- Lack of conflict probe in surveillance airspace;
- Degraded operations from server and workstation failures;
- Data handling and processing limitations in stratified surveillance sectors;
- Lack of support for automatic user request processing; and

- Lack of automation-generated alternatives aligned with preferred flight trajectories.

The nine enhancements are:

- Enhanced Controller Coordination;
- NextGen: Data Exchange via System Wide Information Management (SWIM) (Interface Rehost and Publish Services);
- Expanded Oceanic International Interfaces;
- NextGen: Data Exchange via SWIM (New Services);
- NextGen: Enhanced Conflict Probe for ATOP Surveillance Airspace;
- Service Continuity Enablers;
- ATOP in Stratified Surveillance ATC Sectors;
- NextGen: Approval of User Requests in Oceanic Airspace (Auto Re-Probe); and
- NextGen: Approval of User Requests in Oceanic Airspace (Conflict Resolution Advisory).

Investment Analysis Readiness Decision (IARD) is planned for second quarter FY 2017. Final Investment Decision (FID) is planned for second quarter FY 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 5 – Limit the impact of aircraft CO2 emissions on the global climate by achieving carbon neutral growth by 2020 compared to 2005, and net reductions of the climate impact from all aviation emissions over the longer term (by 2050). (FAA Business Planning Metric)*

Relationship to Performance Target

The ATOP Enhancements program, through improved communication, coordination and surveillance, will enable controllers to provide more direct routings that will reduce fuel burn and carbon dioxide emissions.

Program Plans FY 2017 – Performance Output Goals

- Develop the following products in support of the IARD: (prior year funds)
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operations;
 - Functional Hierarchy;
 - Enterprise Architecture Products; and
 - Preliminary Program Requirements.

Program Plans FY 2018 – Performance Output Goals

- Develop the following products in support of the FID:
 - Final Program Requirements documentation;
 - Enterprise Architecture Artifacts;
 - Business Case documentation;
 - Final Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID and initiate development of enhancements.

Program Plans FY 2019-2021 – Performance Output Goals

- Output goals will be developed at FID.

2A10, NEXT GENERATION VERY HIGH FREQUENCY AIR/GROUND COMMUNICATIONS SYSTEM (NEXCOM)

FY 2017 Request \$50.5M

Next-Generation VHF and UHF A/G Communications (NEXCOM) – Segment 2 – Phase 1 of 2, C21.02-01 / X, Next-Generation VHF and UHF A/G Communications (NEXCOM) – Segment 2 – Phase 2 of 2, C21.02-02

Program Description

The NEXCOM program replaces and modernizes the aging and obsolete NAS air-to-ground (A/G) analog radios that allow direct voice communication with pilots. Replacing the radios is part of a larger program to address the limitations on increasing the allocation of radio frequency spectrum dedicated solely for controller communications. Additional frequencies are needed to ensure that the air traffic system's capability grows to meet the projected U.S. air traffic requirements of the future. New Very High Frequency (VHF) radios can handle both the existing 25 kHz band width voice mode protocol for channel separation, or they can operate in the more efficient 8.33 kHz band width voice mode currently used in Europe. The 8.33 kHz voice-only mode divides the current bandwidth for one channel into three channels. This increase in the number of channels partitions the existing spectrum so one of the three channels can be used for a stand-alone data communications system (i.e., Datacomm program). The radios will support Voice over Internet Protocol (VoIP) and meets the requirements of the NextGen NAS Voice systems (NVS) program. In addition, replacement of obsolete radios improves A/G radio equipment maintainability and reliability, and enhances A/G information security and communications control. As part of the JRC approvals Emergency Transceivers and Hand Held Radios are included in the current program baseline. The NEXCOM program is currently reviewing and finalizing the requirements and Screening Information Request package for the upcoming procurement. The program expects contract award in FY 2017, and should start deploying the Emergency Transceivers in FY 2018.

Segment 1a of the NEXCOM program finished replacing all 25,000 en route radios with Multimode Digital Radios (MDRs) in FY 2013.

The NEXCOM Segment 2 program began replacing radios at terminal and flight services in FY 2009, under an existing contract, with completion scheduled in FY 2027. Ultimately 35,000 radios will be deployed into the NAS under the NEXCOM Segment 2 program. Segment 2 is separated into two phases. Phase 1 was approved by the JRC in 2011. The Final Investment Decision for Phase 2 is planned for the 4th quarter of FY 2016.

NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):

The NEXCOM procurement for Segment 2, Phase 1 has a combined contract to deliver VHF radios for civil aviation and Ultra High Frequency (UHF) radios for military aviation. A total of 15,000 radios will be replaced in Phase 1 from FY 2009 Through FY 2018.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):

NEXCOM Segment 2, Phase 2 completes terminal and flight services facility radio modernization that began under Phase 1. A total of 20,000 radios will be replaced during Phase 2 (FY 2019 to FY 2024).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

NEXCOM will reduce the number of unplanned outages by replacing existing communications equipment with modern A/G equipment. An added performance benefit will be the ability to increase capacity by expanding the number of communications channels within the spectrum assigned to the FAA. The Mean Time Between Failure

performance metric, which is closely related to availability, will be increased from 11,000 hours to 50,000 hours at the completion of NEXCOM Segment 2, Phase 1.

Program Plans FY 2017 – Performance Output Goals

NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):

- Deploy 3,000 new Terminal Air Traffic Control Radios.
- Purchase 3,300 Radios.
- Initiate transition from Phase One to Phase Two.
- Award contract for VHF/UHF Emergency Transceivers.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):

- None.

Program Plans FY 2018 – Performance Output Goals

NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):

- Deploy 3,000 new Terminal Air Traffic Control Radios.
- Purchase 3,300 Radios.
- Achieve IOC at 450 sites. (APB milestone)
- Deploy VHF/UHF Emergency Transceivers at key site for testing.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):

- Purchase 1200 Radios.

Program Plans FY 2019 – Performance Output Goals

NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):

- None.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):

- Deploy 3,000 new Terminal Air Traffic Control Radios.
- Purchase 4,500 Radios.
- Deploy 300 Emergency Transceivers operationally.

Program Plans FY 2020 – Performance Output Goals

NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):

- None.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):

- Deploy 3,000 new Terminal Air Traffic Control Radios.
- Purchase 4,700 Radios.
- Deploy 300 Emergency Transceivers.

Program Plans FY 2021 – Performance Output Goals

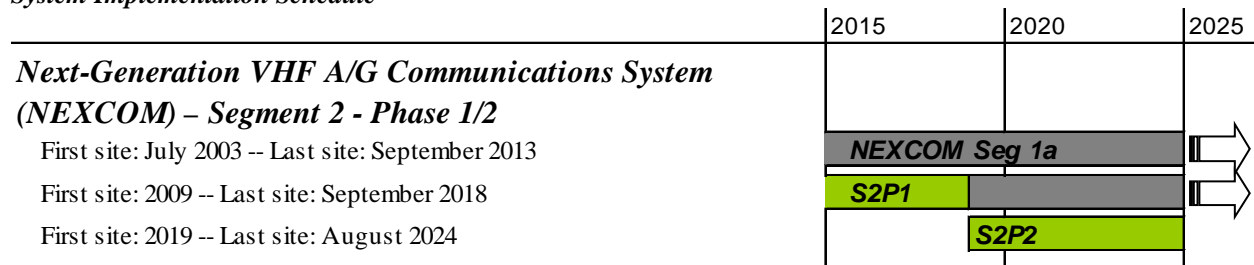
NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):

- None.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):

- Deploy 3,000 new Terminal Air Traffic Control Radios.
- Purchase 4,700 Radios.
- Deploy 300 Emergency Transceivers.

System Implementation Schedule



2A11, NEXTGEN – SYSTEM-WIDE INFORMATION MANAGEMENT (SWIM)

FY 2017 Request \$28.8M

- A, System Wide Information Management (SWIM) – Segment 2B, G05C.01-08
- B, System Wide Information Management (SWIM) – Common Support Services Weather (CSS-Wx) Work Package 1, G05C.01-06

A, System Wide Information Management (SWIM) – Segment 2B, G05C.01-08

Program Description

In 2007, the FAA established the SWIM program to implement a set of Information Technology (IT) capabilities in the NAS to provide users with relevant and commonly understandable information. The principles behind the SWIM concept include the following:

- Separation of information provision and consumption in such a way that the number and nature of the consumers can evolve through time;
- Loose system coupling, in which each component has little or no knowledge of the definitions of other separate components;
- Using publicly available open standards; and
- Using Service Oriented Architecture (SOA) implemented as a suite of interoperable services.

SWIM maximizes the use of current infrastructure while allowing the sharing of information between diverse systems enabling NextGen delivery of the right information to the right places at the right time. This is achieved by providing the IT enterprise infrastructure necessary for NAS systems to share and reuse information and increase interoperability.

SWIM's enterprise infrastructure enables systems to publish information of interest to NAS users, request and receive information from other NAS services and support NAS security requirements. Further, SWIM provides Governance to NAS programs to ensure services are SWIM compliant and meet all FAA SOA standards. By providing this Governance and the supporting enterprise infrastructure SWIM reduces the cost and risk for NextGen programs to develop and deploy services.

Plans for Segment 2B include the following:

- Continued ramping of programs onto the NAS Enterprise Messaging Service (NEMS) that provides a reliable messaging infrastructure to be leveraged by SWIM producers and consumers;
- Identity and Access Management (IAM) Phase 2: A Service Oriented Architecture (SOA) core service that provides security controls for access to SWIM. Deploys strong authentication and authorization using Private Key Infrastructure (PKI) certificates to ensure the right level of access and security in the NAS, available through Atlanta (ATL) Network Enterprise Management Center (NEMC) and Salt Lake City (SLC) NEMC;
- Enterprise Service Monitoring (ESM) Phase 2 and Phase 3: A SOA core service that provides enterprise monitoring of SWIM services and SWIM related systems. Provides situational awareness of Operations and Maintenance (O&M) status of NAS infrastructure and the SOA services, including service outages. Service will be available through ATL NEMC and SLC NEMC;
- SWIM Terminal Data Distribution System (STDDS) Phase 2: An enhanced service that provides access to terminal-related data. Implements track and flight plan data, real-time status/alerts from tower and airport systems, and other system enhancements in standard formats utilizing the SWIM infrastructure (NEMS). System will be deployed at 38 TRACONS; and
- NAS Common Reference (NCR): A new service that consists of a geospatial query engine and data aggregation utility that provides common situational awareness for traffic flow management. Provides agile filtering of spatially consistent data supporting 4D trajectory querying capability, providing a layered view of NAS data as correlated useful information. Service will be available through ATL NEMC and SLC NEMC.

The Segment 2B Final Investment Decision occurred in October 2015.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

SWIM reduces the number and types of unique interfaces, reduces redundancy of information, facilitates information-sharing, improves predictability and operational decision-making, and reduces the cost of service. The improved coordination that SWIM provides allows for the transition from tactical conflict management of air traffic to strategic, trajectory-based operations. In addition, SWIM provides the foundation for greatly enhanced information exchange and sharing outside the FAA.

Program Plans FY 2017 – Performance Output Goals

- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis processes.
- Complete Development Testing for Strong Authentication using digital certificates for internal connections between NAS systems (IAM Phase 2).
- Complete ESM Phase 2 Operational Testing at WJHTC, which enables ESM to accept status messages from a Communication, Information & Network Programs (CINP) SWIM producer. (APB milestone)

Program Plans FY 2018 – Performance Output Goals

- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis processes.
- Complete Final Flight Information Exchange Model Compliant Schema Development for STDDS Flight Data. (APB milestone)
- Complete NCR Critical Design Review (CDR). (APB milestone)
- Complete Initial Operational Capability (IOC) for Strong Authentication using digital certificates for internal connections between NAS systems (IAM Phase 2) (APB milestone)
- Complete ESM Phase 2 IOC. (APB milestone)

Program Plans FY 2019 – Performance Output Goals

- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis processes.
- Complete STDDS Phase 2 Release 4 IOC. (APB milestone)
- Complete ESM Phase 3 Development Testing, which enables ESM to accept status messages from a Non-CINP SWIM producer. (APB milestone)
- Complete NCR Operational Testing at WJHTC. (APB milestone)

Program Plans FY 2020 – Performance Output Goals

- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis processes.
- Complete ESM Phase 3 IOC. (APB milestone)
- Complete STDDS Phase 2 Release 5 IOC. (APB milestone)
- Complete IOC for Attribute Based Access Control (Authorization) Capability (IAM Phase 2). (APB milestone)
- Complete NCR IOC. (APB milestone)

Program Plans FY 2021 – Performance Output Goals

- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis processes.
- Complete STDDS Phase 2 Release 6 IOC. (APB milestone)

System Implementation Schedule



B, System Wide Information Management (SWIM) – Common Support Services Weather (CSS-Wx) Work Package 1, G05C.01-06

Program Description

Common Support Services-Weather (CSS-Wx) Work Package 1 will establish an aviation weather publishing capability for the NAS. It will enable universal access and the standardization of weather information for dissemination to users by System Wide Information Management (SWIM)(G05C.01-08), a data management and sharing system the FAA is implementing for NextGen. Consumers of CSS-Wx information will be air traffic controllers, traffic managers, commercial aviation, general aviation, and other aviation enterprises. Consolidating several legacy weather dissemination systems, CSS-Wx will be the FAA’s single provider of aviation weather data for integration into NextGen enhanced Decision Support Tools (DSTs). The CSS-Wx system is scheduled to achieve Initial Operating Capability (IOC) in FY 2019.

The CSS-Wx System will:

- Provide weather information via Web Coverage Service (WCS) for gridded data, Web Feature Service (WFS) for non-gridded data, and Web Map Service (WMS) for images;
- Filter weather information by location and time with the ability to provide the user with weather data for a specific geographic area;
- Provide weather information in common, standardized formats using Weather Information Exchange Model (WXXM) for non-gridded data and using Network Common Data Form (NetCDF) for gridded data; and
- Store, archive, and retrieve weather information.

The CSS-Wx system will deliver improved weather products for input into collaborative decision-making applications using information provided by the NextGen Weather Processor (NWP)(G04W.03-02), the National Oceanic and Atmospheric Administration’s (NOAA) NextGen Web Services, and other weather sources available to FAA and NAS users.

CSS-Wx will be deployed at 60 operational sites: two (2) centrally located facilities (Atlanta and Salt Lake City); 33 TRACONS, 21 ARTCCs, three (3) CERAPs, and one (1) at the ATCSCC.

The CSS-Wx program Work Package 1 (WP1) is in the AMS Solution Implementation phase. The program achieved Final Investment Decision (FID) for WP1 in March 2015. FID for CSS-Wx WP1 occurred with FID for NWP WP1.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

CSS-Wx is an enterprise service that provides access to weather observations and predictions to enable collaborative and dynamic NAS decision making. It will enable integration of information from weather sources into NextGen DSTs. CSS-Wx will enable Airline Operations Centers and Traffic Flow Management to better develop weather mitigation plans and replans by selecting flight paths that maximize use of available capacity in weather impacted environments. CSS-Wx will provide NWP mosaics to en route and terminal controllers enabling more precise and

timely information to respond to pilot requests for deviations around hazardous weather. CSS-Wx helps maximize use of airport capacity by providing more precise information on weather location and movement, which allows runways to remain in use longer and reopen more quickly after an adverse weather event.

Program Plans FY 2017 – Performance Output Goals

- Complete site surveys planned in FY 2017.

Program Plans FY 2018 – Performance Output Goals

- Complete CSS-Wx WP1 Factory Acceptance Testing (FAT). (APB Milestone)

Program Plans FY 2019 – Performance Output Goals

- Complete CSS-Wx WP1 Operational Testing (OT). (APB Milestone)
- Achieve CSS-Wx WP1 Key Site Initial Operational Capability (IOC). (APB Milestone)
- Achieve CSS-Wx WP1 In-Service Decision. (APB Milestone)

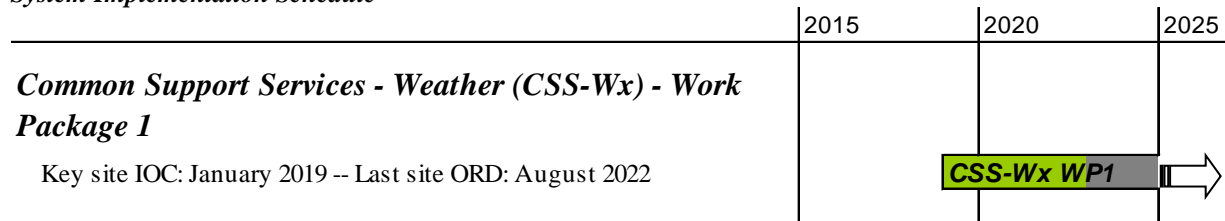
Program Plans FY 2020 – Performance Output Goals

- Achieve CSS-Wx WP1 First Site Operational Readiness Date (ORD). (APB Milestone)
- Achieve CSS-Wx WP1 ORD at 13 sites (13 of 60, 22%).

Program Plans FY 2021 – Performance Output Goals

- Achieve CSS-Wx WP1 ORD at 36 sites (49 of 60, 82%).

System Implementation Schedule



2A12, NEXTGEN – AUTOMATIC DEPENDENT SURVEILLANCE - BROADCAST (ADS-B) NAS WIDE IMPLEMENTATION

FY 2017 Request \$31.1M

- A, Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Baseline Services & Applications (Service Volume), G02S.03-01 / X, Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Baseline Services & Applications, Future Segment, G02S.03-04
- B, Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Future Segments, G02S.01-02

A, Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Baseline Services & Applications (Service Volume), G02S.03-01 / X, Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Baseline Services & Applications, Future Segment, G02S.03-04

Program Description

Automatic Dependent Surveillance Broadcast (ADS-B) is an advanced surveillance technology that provides highly accurate and comprehensive surveillance information. ADS-B is an enabling technology for NextGen. This new system promises to significantly reduce delays and enhance safety by using aircraft broadcasted position based on the aircraft’s navigation system calculation using the Global Navigation Satellite System (GNSS) or other navigation inputs, instead of position information from traditional radar.

Aircraft position (longitude, latitude, altitude, and time) is determined using the GNSS, and/or an internal inertial navigational reference system, or other navigation aids. The aircraft's ADS-B equipment processes this position information, along with other flight parameters (e.g., identification, velocity, pilot selected altitude, and other data) to be broadcast approximately once a second to ADS-B receivers. This information is used to display the aircraft's position on en route and terminal automation systems such as Common Automated Radar Tracking System (CARTS), Standard Terminal Automation Replacement System (STARS), Microprocessor En Route Automated Radar Tracking System (MicroEARTS), En Route Automation Modernization (ERAM), and Advanced Technologies and Oceanic Procedures (ATOP).

In addition to the ground-based ADS-B receivers, nearby aircraft within range of the broadcast which are equipped with ADS-B In avionics may also receive and process the surveillance information of nearby ADS-B equipped aircraft for display to the pilot on the aircraft's display. ADS-B equipment may also be installed on airport ground support or emergency vehicles to allow controllers and pilots to locate and identify them on runways or taxiways.

ADS-B NAS Wide Implementation – Baseline Services & Applications (G02S.03-01):

The acquisition of ADS-B equipment has been structured as a multi-year, performance-based service contract for the vendor to install and maintain ground-based ADS-B equipment to provide surveillance information to FAA automation systems. The program has two activities: Baseline Services and Applications and In Trail Procedures. The In Trail Procedures activity will be completed in FY 2017.

Baseline Services and Applications:

This activity continues implementation of baseline ADS-B applications and enables: Ground-based Interval Management-Spacing (GIM-S); Traffic Situation Awareness with Alerts; Airport Surface Traffic Situation Awareness; Enhanced Visual Approach to support merging and spacing with Cockpit Display of Traffic Information Assisted Visual Separation (CAVS); Weather; and NAS Situation Awareness.

Nine airports in the NAS will receive Airport Surface Surveillance Capability (ASSC): a surface multilateration system which will receive inputs from cooperative and non-cooperative sensors. ASSC consists of a multilateration subsystem, multi-processor subsystem, data distribution subsystem, tower display subsystem and a maintenance subsystem. Using fused target data, ASSC will enhance situational awareness for tower controllers by providing the position of all aircraft and ground vehicles on the airport movement area, and aircraft flying on approach to the airport.

See ADS-B Lease Services portion of the program under G02S.03-05.

In Trail Procedures:

In Trail Procedures (ITP) allows air traffic control to approve ADS-B equipped aircraft to perform oceanic flight level changes when there is less than standard separation. Using oceanic procedural separation standards, ITP allows ATC to approve these flight level change requests between properly equipped aircraft with ADS-B using reduced separation during the flight level change maneuver. This will allow aircraft to more easily access more efficient altitudes in oceanic airspace. This activity develops the operational standards, provides for operational testing, and develops supporting automation software.

ADS-B—NAS Wide Implementation – Baseline Services & Applications, Future Segment (G02S.03-04):

The Future Segment program plans to introduce new scope to Baseline Services & Applications by implementing a surveillance backup strategy, infrastructure upgrades, new mitigations for spectrum congestion, and re-competing service contracts. The scope of this program is expected to be fully defined in May 2016 with an Investment Analysis Readiness Decision. In 2018, a Final Investment Decision (FID) is planned to request funding for the FY 2020 – FY2025 timeframe. Future Segment may continue to pay subscription fees for Alaska surveillance services, CONUS Surface services (including ADS-B service at ASSC sites), and CONUS Terminal and En Route surveillance services. The Future Segment will also provide: program management to support ongoing security updates; dedicated support for Gulf of Mexico platform owner's to provide mitigation against jamming & spoofing; and other typical program management activities including risk, business case development, and communications.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

ADS-B is a technology that will allow implementation of new air traffic control procedures based on more accurate aircraft position information that will allow more efficient use of airspace capacity, fewer delays, and more optimal routing for aircraft. Other efficiency benefits include reduced weather deviations and fewer cancellations resulting from increased access to some Alaskan regions during inclement weather conditions. These efficiency benefits translate to savings in both aircraft direct operating costs and passenger value of time. The Business Case Analysis Report dated May 15, 2012 shows \$3.2B in capacity and efficiency benefits.

The objective of the ADS-B ITP is to enable aircraft that desire flight level changes in procedural airspace to more easily achieve these changes. ADS-B ITP achieves this objective by permitting a climb-through or descend-through maneuver between properly equipped aircraft, using a new separation standard that utilizes ADS-B data. The ITP limits the instances of an aircraft being held at a non-optimal flight level when conflicting traffic is present between the existing flight level and a more efficient flight level requested by the pilot.

Program Plans FY 2017 – Performance Output Goals

ADS-B NAS Wide Implementation – Baseline Services & Applications (G02S.03-01):

- Baseline Services and Applications:
 - Achieve Initial Operating Capability (IOC) of Terminal ATC Separation Services at 39 sites (119 of 160, 74%).
 - Achieve IOC of Surface Advisory Services at three ASSC site (5 of 9, 56%).
 - Complete Service Volume (SV) design at three ASSC sites.
- In Trail Procedures:
 - Achieve ATOP Oceanic ITP operational at Oakland, New York and Anchorage Centers. (APB milestone)

ADS-B NAS Wide Implementation – Baseline Services & Applications, Future Segment (G02S.03-04):

- None.

Program Plans FY 2018 – Performance Output Goals

ADS-B NAS Wide Implementation – Baseline Services & Applications (G02S.03-01):

- Baseline Services and Applications:
 - Achieve IOC of Terminal ATC Separation Services at 28 sites (147 of 160, 92%).
 - Achieve IOC of Surface Advisory Services at four ASSC sites (9 of 9, 100%).
 - Achieve FID for next ADS-B investment segment.

ADS-B NAS Wide Implementation – Baseline Services & Applications, Future Segment (G02S.03-04):

- None.

Program Plans FY 2019 – Performance Output Goals

ADS-B NAS Wide Implementation – Baseline Services & Applications (G02S.03-01):

- Baseline Services and Applications:
 - Achieve IOC of Terminal ATC Separation Services at 13 sites (160 of 160, 100%).
 - Complete 218 ATC Service Delivery Points.

ADS-B NAS Wide Implementation – Baseline Services & Applications, Future Segment (G02S.03-04):

- None.

Program Plans FY 2020 – Performance Output Goals

ADS-B NAS Wide Implementation – Baseline Services & Applications (G02S.03-01):

- Baseline Services and Applications:
 - Provide and maintain baseline services and applications through September 2020. (APB milestone)

ADS-B NAS Wide Implementation – Baseline Services & Applications, Future Segment (G02S.03-04):

- None.

Program Plans FY 2021 – Performance Output Goals

ADS-B NAS Wide Implementation – Baseline Services & Applications (G02S.03-01):

- None.

ADS-B NAS Wide Implementation – Baseline Services & Applications, Future Segment (G02S.03-04):

- Output goals will be determined at FID.

**B, Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation –
Future Segments, G02S.01-02**

Program Description

ADS-B In Applications – Interval Management (IM) consists of a set of ground and flight-deck capabilities and procedures that are used in combination by air traffic controllers and flight crews to more efficiently and precisely manage inter-aircraft spacing (e.g., achieve a precise interval between aircraft in a stream of traffic). An air traffic controller can issue an IM clearance that allows flight crews to manage spacing through speed adjustments generated by onboard IM avionics until reaching a planned termination point. IM operations require new flight-deck functions implemented in the Flight Interval Management avionics to provide speed guidance to a flight crew to achieve and maintain a relative spacing interval from another aircraft. Changes to ERAM, STARS, and TBFM automation systems will be needed to support the initiation and monitoring of IM operations. Interval Management-Spacing (IM-S) Arrivals, Approach, & Cruise (AA&C) supports IM operations for arrival and approach applications for independent runway operations and for cruise operations to provide spacing during en route metering and Miles-in-Trail operations. Advanced-IM (A-IM) will extend the capabilities developed as a part of IM-S AA&C to dependent runway and departure operations, Pairwise Trajectory Management (PTM) operations in oceanic airspace, and will support changes to the current separation standards to enable additional benefits.

The Surveillance and Broadcast Services Office is maturing the requirements definition of a suite of ADS-B In IM applications and will pursue a series of Final Investment Decisions (FID) as each application or set of applications are deemed suitably defined for implementation. Pre-implementation activities and AMS milestones through FID for ADS-B In Applications – IM are funded under G01S.02-01.

Post FID implementation activities will be funded and executed under this program, G02S.01-02. The first set of ADS-B In Applications will be IM-S AA&C.

IM-S AA&C is applicable to oceanic, en route, and terminal airspace and will require investments in both air traffic management and decision support automation systems, as well as flight deck avionics. Significant implementation activities under this program include:

- Developing ground-based automation software for implementation of IM-S AA&C capability into ERAM, STARS, and TBFM;
- Completing Safety Case for IM-S AA&C Initial Operating Capability;
- Completing Operational Benefits Validation for Flight-deck based Interval Management Minimum Operational Performance Standards (FIM MOPS) v2 avionics; and
- Installing and deploying IM-S AA&C capability in the NAS.

A-IM dependent runway, departure and oceanic operations, and other future concepts along with the associated avionics standards will be developed with RTCA and the user community. Pre-implementation activities for these future concepts will be conducted under G01S.02-01.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Interval management will optimize spacing resulting in maximizing the number of aircraft arriving in the proper sequence for landing. Reducing the variance in inter-aircraft spacing will result in more efficient use of runway capacity. The full benefits case is part of the analysis to be completed for the FID.

Program Plans FY 2017 – Performance Output Goals

- None.

Program Plans FY 2018 – Performance Output Goals

- Complete Preliminary Design and Review with automation vendors for ERAM, STARS and TBFM.
- Complete Critical Design and Review with automation vendors for ERAM, STARS, and TBFM.
- Initiate software development with TBFM automation vendor.

Program Plans FY 2019 – Performance Output Goals

- Initiate software development with ERAM and STARS automation vendors.

Program Plans FY 2020 – Performance Output Goals

- Develop plan for vendor testing of ERAM, STARS and TBFM software.

Program Plans FY 2021 – Performance Output Goals

- Complete software development with STARS and TBFM vendors.
- Award contract for FIM MOPS v2-compliant avionics.

2A13, WINDSHEAR DETECTION SERVICE (WDS)

FY 2017 Request \$4.5M

- Wind Shear Detection Services – Work Package 1, W05.03-01
- X, Juneau Airport Wind System (JAWS) – Technology Refresh, W10.01-02

Wind Shear Detection Services – Work Package 1, W05.03-01

Program Description

Wind Shear Detection Services (WSDS) Work Package 1 is a portfolio program consisting of several legacy wind shear detection systems deployed in the NAS. The program will address obsolescence of the legacy Weather Systems Processor (WSP), Low Level Windshear Alert System (LLWAS) and Wind Measuring Equipment (WME). The WSDS program will ensure continuation of the existing service levels provided by the legacy systems by upgrading the components necessary to resolve obsolescence and supportability issues of the 34 WSP, 60 WME, and 50 LLWAS systems deployed in the NAS.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

WSDS WP1 contributes to the reduction of commercial air carrier fatalities per 100 million persons by preventing aircraft accidents in the terminal environment during take-off and landing. WSDS will accomplish this by providing hazardous wind shear alerts and warnings to Air Traffic Controllers to be passed on to pilots to avoid potential wind shear encounters.

Program Plans FY 2017 – Performance Output Goals

- Install WSP site upgrade at 16 sites (17 of 34, 50%).
- Install WME site upgrade at 30 sites (30 of 60, 50%).
- Install LLWAS site upgrade at 25 sites (25 of 50, 50%).
- First WME/LLWAS site upgrade complete. (APB milestone)

Program Plans FY 2018 – Performance Output Goals

- Install WSP site upgrade at 17 sites (34 of 34, 100%).
- Last WSP site upgrade complete. (APB milestone)
- Install WME site upgrade at 30 sites (60 of 60, 100%).
- Install LLWAS site upgrade at 25 sites (50 of 50, 100%).
- Last WME/LLWAS site upgrade complete. (APB milestone)

Program Plans FY 2019-2021 – Performance Output Goals

- None.

X, Juneau Airport Wind System (JAWS) – Technology Refresh, W10.01-02

Program Description

JAWS measures and transmits wind information to the Juneau Automated Flight Service Station (AFSS), Alaska Airlines, and the National Weather Service for weather forecasting. Other Alaska aviation users access JAWS data via the Internet. JAWS provides terrain induced wind and turbulence data that addresses safety of flight and decreases the probability of experiencing unnecessary weather related delays in and out of the Juneau International Airport (JNU), Alaska. Although JAWS data is advisory, it is essential for pilots to be aware of wind conditions that affect approach and departure paths because of the restrictive geographical features on both sides of the corridor in and out of the Juneau Airport.

Periodic replacement of commercial off-the-shelf (COTS) system components is necessary because of the weather conditions on the mountains where the wind sensors are located. Updating these sensors assures continued supportability of the system through an indefinite service life. The technology refresh business case for JAWS is planned to begin in FY 2019. The technology refresh will include replacement of computers and controllers, radios, firmware and software, anemometers, profilers, and may include National Center for Atmospheric Research (NCAR) consulting support. The Final Investment Decision (FID) is planned in FY 2020.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

JAWS Technology Refresh contributes to maintaining operational availability of 99.7 by replacing obsolete unsupported equipment which could fail.

Program Plans FY 2017-2018 – Performance Output Goals

- None.

Program Plans FY 2019 – Performance Output Goals

- Develop the following products in support of the Investment Analysis Readiness Decision (IARD):
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operations;
 - Functional Analysis;
 - Enterprise Architecture Products; and
 - Preliminary Program Requirements.
- Achieve Investment Analysis Readiness Decision (IARD).

Program Plans FY 2020 – Performance Output Goals

- Develop the following products in support of the FID:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID.

Program Plans FY 2021 – Performance Output Goals

- Award contract.
- Other output goals will be developed at FID.

2A14, NEXTGEN – COLLABORATIVE AIR TRAFFIC MANAGEMENT PORTFOLIO

FY 2017 Request \$13.8M

- A, Strategic Flow Management Application, G05A.01-01
- B, Strategic Flow Management Engineering Enhancement (SFME), G05A.01-02
- C, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 4, G05A.05-03 / X,
Collaborative Air Traffic Management Technologies (CATMT) – Work Package 5, G05A.05-04

A, Strategic Flow Management Application, G05A.01-01

Program Description

Strategic Flow Management Application (SFMA) will identify operational shortfalls and gaps for rerouting of the airborne and pre-departure flights which remain after implementation of the Airborne Reroute Automation (ABRR) and the Collaborative Trajectory Options Program. SFMA will develop capabilities designed to provide traffic managers and controllers with more automated flight-specific trajectory advisory functions that will consider a wide range of input factors, such as weather impacts, resource capacity, operator preferences, and meter time assignments.

SFMA program will help resolve air traffic flow problems, reduce delays and unnecessary flying time, and improve metering operations. These advisories will also capitalize upon Data Comm-enabled complex reroutes and clearances to improve the generation, delivery, and execution of reroutes. Capabilities developed through SFMA, together with those developed through the Advanced Methods program (G05A.02-02), will provide the concepts and requirements to the Strategic Flow Management Engineering Enhancements program (SFME) (G05A.01-02) to progress them through the AMS process as part of future investments for CATMT.

SFMA will collaborate with NASA on their Airspace Technology Demonstration Project (ATD); comprised of a collection of critical technology development and demonstration activities geared toward delivery of near-term benefits to air transportation system stakeholders. Specifically, the SFMA program will benefit from, and leverage capabilities development from NASA's Applied Traffic Flow Management (ATFM) activity. This activity will explore concepts and develop technologies to execute more efficient flight paths for en route airspace.

In FY 2018, this program will also begin service analysis activities to capitalize on future data communications capabilities, further integrate traffic flow management and metering operations, and support advanced trajectory-based operations.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

This program addresses the CATM performance objectives of increased capacity and flexibility. Increased capacity is achieved by the integration of strategic flow management with trajectory based operations (TBO) which provides a more structured traffic flow so that the capacity of a given airspace can be used more efficiently to meet demand. Flexibility is improved by more frequent use of dynamic reroutes which allows controllers and pilots to react more efficiently to changing operational conditions. New rerouting concepts provide controllers, pilots, and flight operators with more choices when negotiating dynamic reroutes for active aircraft.

Program Plans FY 2017 – Performance Output Goals

- Conduct concept engineering activities including Human-in-the-Loop to develop the following products:
 - HITL execution and report for Integration of SFMA with Strategic Traffic Management Initiatives
 - HITL execution and report for Integration of SFMA with new weather products
 - SFMA updated solution Concept of Operations (ConOps)
 - SFMA updated preliminary requirements
- Conduct concept engineering activities, e.g. analysis, tabletop, and validation and develop products for SFMA capabilities in support of targeted AMS IARD investment:
 - Updated ConOps
 - Updated preliminary program requirements
- Complete and deliver a report summarizing collaboration with NASA's ATFM activity. Support technical transfer activities from NASA to the FAA to mature advanced rerouting capability.
- Conduct service analysis activities to capitalize on future data communications capability, further integrate traffic flow management and metering operations, and support advanced trajectory-based operations; complete an initial shortfall analysis.

Program Plans FY 2018 – Performance Output Goals

- Complete and deliver a report summarizing collaboration with NASA's ATFM activity. Support technical transfer activities from NASA to the FAA to mature advanced rerouting capability.
- Conduct concept engineering activities, e.g. analysis, tabletop, and validation, and develop products for SFMA capabilities in support of targeted AMS IID/FID investment artifact generation:
 - Updated ConOps
 - Updated program requirements
 - Updated cost analysis
 - Updated benefit analysis
- Conduct engineering activities, e.g. analysis, HITL evaluation and simulation, to validate shortfalls and new capabilities, and develop products for the next segment of improved strategic flow services and capabilities that will capitalize on future data comm capabilities, further integrate traffic flow management and metering operations, and support advanced trajectory-based operations:
 - Preliminary Shortfall Analysis for traffic management services and capabilities
 - Preliminary ConOps
 - Initial prototyping, HITL evaluation, and report
 - Quantitative Shortfall Analysis
 - Preliminary Functional Analysis

Program Plans FY 2019 – Performance Output Goals

- Complete Technical Transfer of applicable capabilities developed under NASA’s ATFM to program office.
- Conduct engineering activities, e.g. analysis, HITL evaluation and simulation, and develop products for the next segment of improved strategic flow services and capabilities that will capitalize on future data comm capabilities, further integrate traffic flow management and metering operations, and support advanced trajectory-based operations:
 - Prototyping, HITL evaluation, and report
 - Updated Preliminary ConOps
 - Operations Requirements
 - Updated Preliminary Functional Analysis
 - Updated Quantitative Shortfall Analysis

Program Plans FY 2020 – Performance Output Goals

- Conduct engineering activities, e.g. analysis, HITL evaluation and simulation, and develop products for the next segment of improved strategic flow services and capabilities that will capitalize on future data comm capabilities, further integrate traffic flow management and metering operations, and support advanced trajectory-based operations:
 - Prototyping, HITL evaluation, and report
 - Solution ConOps
 - Refined Preliminary Functional Analysis
 - Preliminary Program Requirements

Program Plans FY 2021 – Performance Output Goals

- Conduct engineering activities, e.g. analysis, HITL evaluation and simulation, and develop products for the next segment of improved strategic flow services and capabilities that will capitalize on future data comm capabilities, further integrate traffic flow management and metering operations, and support advanced trajectory-based operations:
 - Updated Solution ConOps
 - Updated Preliminary Program Requirements
 - Cost and benefit analysis and estimate

B, Strategic Flow Management Engineering Enhancement (SFMEE), G05A.01-02

Program Description

The Strategic Flow Management Engineering Enhancement (SFMEE) program will support future work packages for Traffic Flow Management (TFM) enhancements. SFMEE conducts concept development to address operational TFM shortfalls and progresses these concepts through the Acquisition Management System (AMS) process as part of Collaborative Air Traffic Management Technologies (CATM-T) future investments.

The concept engineering work for the individual capabilities will be conducted primarily through the Strategic Flow Management Application (SFMA) (G05A.01-01) and Advanced Methods (G05A.02-02) programs. TFM enhancements, implemented principally by the CATMT program will reside on the Traffic Flow Management System and will be available to Traffic Managers at ARTCCs, TRACONs and the ATCSCC. Candidate capabilities for future TFM work packages include:

- Constraint Evaluation Feedback;
- Negotiate Mitigations;
- User Tactical Trajectory Feedback;
- Collaborative Airport and Airspace Configuration Management;
- Airborne Trajectory Negotiations with Flight Operations Centers;
- Aircraft Equipage Eligibility During Traffic Management Initiatives (TMIs);
- Probabilistic Constraint Prediction;

- Enhanced Post Operations;
- Improved Statistical Methods for Departure Predictions; and
- Daily Objectives Exchange.

The fundamental goal of TFM is to manage the flow of air traffic to minimize delays and congestion due to system constraints such as weather or equipment outages. Operations could be more efficient by establishing strategic plans for mitigating delay and capacity issues and may also provide some predictability to support future decisions.

As systems and capabilities in TFM evolved, there was little attention paid to their integration. The Traffic Management Units of today provide piecemeal operational information and tools but cannot be combined to create a dynamic and complete view of the operation nor provide optimal support for operational decision-making. Many of the functions performed by Traffic Managers require manual assimilation of data from various sources. The potential impact of some Traffic Management Initiatives (TMIs) may not be apparent until after the initiative is implemented. Traffic Managers currently estimate potential impact by gathering data and relying on personal experience of how an initiative has performed in the past. This process is cognitively demanding, workload-intensive, and the outcome dependent upon an individual's skill and experience.

Providing a comprehensive view in real-time of the current NAS status and initiatives already in place will provide Traffic Managers with the information they need to identify traffic flow problems sooner and make better decisions. Better modeling capabilities will improve decision-making by providing expected outcomes and possible unintended consequences before an alternative is implemented.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Implementation of improved TFM capabilities will provide traffic managers with the tools and information they need to implement better, more efficient TMIs. More efficient TMIs translate to the improved usage of available NAS capacity.

Program Plans FY 2017 – Performance Output Goals

- Develop the following products in support of the Concept & Requirements Definition Readiness Decision (CRDRD) for CATM-T Work Package 5 (WP5):
 - Preliminary Shortfalls Analysis.
 - Concept & Requirements Definition Plan.
- Develop the following products in support of the Investment Analysis Readiness Decision (IARD) for CATM-T WP5:
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operation;
 - Functional Analysis;
- Achieve CRDRD for targeted AMS investment.

Program Plans FY 2018 – Performance Output Goals

- Develop the following products in support of IARD for CATM-T WP5:
 - Enterprise Architecture Products;
 - Preliminary Program Requirements;
 - Updated Functional Analysis; and
 - Safety Assessment.
- Achieve IARD for targeted AMS investment.

Program Plans FY 2019 – Performance Output Goals

- Develop the following products in support of the Initial Investment Decision (IID) for CATM-T WP5:
 - Initial Program Requirements;
 - Business Case Analysis Report (BCAR);
 - Enterprise Architecture Products;
 - Initial Implementation Strategy and Planning Document (ISPD); and
 - Final Investment Analysis Plan (IAP).
- Develop the following products in support of the Final Investment Decision (FID) for targeted AMS investment:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Artifacts;
 - Business Case documentation;
 - Final ISPD; and
 - Acquisition Program Baseline (Execution Plan).
- Achieve IID/FID for targeted AMS investment.

Program Plans FY 2020 – Performance Output Goals

- Develop the following products in support of the Concept & Requirements Definition Readiness Decision (CRDRD) for targeted AMS investment for the next segment of traffic flow management improvements (which will be developed via the SFMA and AM programs):
 - Preliminary Shortfalls Analysis;
 - Concept & Requirements Definition (CRD) Plan.
- Develop the following products in support of the Investment Analysis Readiness Decision (IARD) for targeted AMS investment:
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operation;
 - Functional Analysis;
 - EA products; and
 - Preliminary Program Requirements.
- Achieve CRDRD for targeted AMS investment.

Program Plans FY 2021 – Performance Output Goals

- Develop the following products in support of IARD for targeted AMS investment for the next segment of traffic flow management improvements (which will be developed via the SFMA and AM programs):
 - Updated Functional Analysis;
 - Updated Enterprise Architecture Products;
 - Updated Preliminary Program Requirements; and
 - Safety Assessment.
- Achieve IARD for targeted AMS investments.

C, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 4, G05A.05-03 / X, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 5, G05A.05-04

Program Description

The Collaborative Air Traffic Management Technologies program provides enhancements to the Traffic Flow Management (TFM) system (TFMS). The TFMS is the primary automation system used by the Air Traffic Control System Command Center (ATCSCC) and the nationwide Traffic Management Units that assist the ATCSCC in management of air traffic flow and planning for future air traffic demand. The TFMS is the nation's primary source for capturing and disseminating air traffic information and is the key information source for coordinating air traffic in the NAS. TFMS hosts the software decision support systems that assist in managing and metering air traffic to reduce delays and make maximum use of system capacity to dynamically balance growing flight demands with NAS capacity. The FAA also uses the information from this system to collaborate with aviation users to develop and

implement airspace management programs that reduce delays and ensure smooth and efficient traffic flow. TFM benefits passengers, the airlines, general aviation, the Department of Defense, the Department of Homeland Security, industry, and partner countries.

CATMT Work Package 4 (G05A.05-03):

CATMT Work Package 4 (WP4) is a future segment that when approved by the FAA Joint Resource Council (JRC) will provide NextGen Midterm TFM/CATM capabilities between FY 2017 and FY 2020. CATMT WP4 is currently in final investment analysis to identify possible CATMT WP4 capabilities for Final Investment Decision (FID) consideration. Capabilities being considered include:

- Improving Demand Predictions (IDP) – a set of several enhancements aimed at improving the TFMS predictions of demand for NAS resources.
- Integrated Departure Route Planner (IDRP) – a tool that provides strategic/tactical forecast of departure route and fix status due to convective weather and volume for specific terminals. Provides traffic managers with semi-automated resolution algorithm to “solve” departure constraints.

CATMT WP4 FID is planned for 4th quarter FY 2016. Business case analysis to support FID is being performed under Strategic Flow Management Engineering Enhancement (G05A.01-02).

CATMT Work Package 5 (G05A.05-04):

CATMT Work Package 5 (WP5), a future segment, when approved by the FAA Joint Resource Council (JRC) will provide NextGen Midterm TFM/CATM capabilities between FY 2021 and FY 2025. This option will be evaluated once WP4 enters full execution phase beyond FY 2017.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

The CATMT program will support the NAS on-time arrival rate performance metric through the use of automated systems that provide more accurate and timely information for all TFM system users, improve operator and passenger access to flight information, and reduce system delays. CATMT will provide more accurate forecasting of system capacity and user demand; improve modeling, evaluation and optimization of traffic management initiatives; improve information dissemination, coordination and execution of traffic flow strategies with NAS users; minimize and equitably distribute delays across airports and users; collect and process additional performance data to define metrics and identify trends; and provide greater ease of use to the traffic management users.

Program Plans FY 2017 – Performance Output Goals

CATMT WP4 (G05A.05-03):

- Pending JRC FID and contract award, complete contract transition activities and begin the system design review for the IDP capability.

CATMT WP5 (G05A.05-04):

- None.

Program Plans FY 2018 – Performance Output Goals

CATMT WP4 (G05A.05-03):

- Complete System Design Review for the IDP Capability.
- Start the system engineering work for the IDRP capability.

CATMT WP5 (G05A.05-04):

- None.

Program Plans FY 2019 – Performance Output Goals

CATMT WP4 (G05A.05-03):

- Complete Detailed Design Review and Site Acceptance Testing for the IDP capability.
- Complete System Design Review for the IDRPs capability.

CATMT WP5 (G05A.05-04):

- None.

Program Plans FY 2020 – Performance Output Goals

CATMT WP4 (G05A.05-03):

- Complete Operational Testing for the IDP capability.
- Achieve In-Service Decision for the IDP capability.
- Complete the Detailed Design Review for the IDRPs capability.

CATMT WP5 (G05A.05-04):

- None.

Program Plans FY 2021 – Performance Output Goals

CATMT WP4 (G05A.05-03):

- None.

CATMT WP5 (G05A.05-04):

- Output goals will be determined at FID.

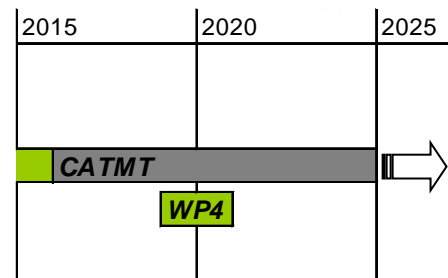
System Implementation Schedule

Collaborative Air Traffic Management Technologies (CATMT) – Work Package 4 and 5

First Operational Capability (OC): June 2008 -- Last OC: TBD

WP4 First Software Release: 2019 -- Last: 2020

WP5 - Pending final investment decision



2A15, NEXTGEN – TIME BASED FLOW MANAGEMENT (TBFM) PORTFOLIO

FY 2017 Request \$50.6M

Time Based Flow Management (TBFM) Work Package 3, G02A.01-06 / Time Based Flow Management (TBFM) Technology Refresh, G02A.01-07 / Time Based Flow Management (TBFM) Work Package 4, G02A.01-08

Program Description

The Time Based Flow Management (TBFM) system uses time-based metering to better utilize NAS capacity by improving traffic flow management of aircraft approaching and departing congested airspace and airports. TBFM has been deployed and is operational at the 20 Air Route Traffic Control Centers and adapted for most major airports served by those centers. TBFM is a vital part of the NAS and enhances air traffic operations, by reducing delays and increasing efficiency of airline operations. Enhancements to the TBFM system will directly support NextGen Portfolio concepts. TBFM Work Packages 3 and 4 will continue the modernization and enhancement of the existing TBFM system.

TBFM Work Package 3 (G02A.01-06):

TBFM Work Package 3 is a follow-on phase of TBFM Work Package 2 that will implement additional NextGen concepts, such as optimized descent during time-based metering and Terminal Sequencing and Spacing (TSAS) to provide efficient sequencing and runway assignment. The TSAS capability will extend the aircraft’s trajectory plan

into the terminal airspace up to the runway to enable better predictability and accuracy for support of advanced Performance Based Navigation (PBN) procedures such as Required Navigation Performance (RNP). Also in WP3 is the expansion of the Integrated Departure/Arrival Capability (IDAC) to additional locations. The design, development and deployment of these concepts will occur during the 2015-2022 timeframe. These enhancements support the following current NextGen Operational Improvements:

- ***Improved Management of Arrivals/Surface/Departure Flow Operations (104117)*** – Enables access to surface information to improve departure time predictions and supports a more integrated arrival/departure operation and more efficient flows. Integrates and automates the departure capability with the TBFM system.
- ***Time-Based Metering in the Terminal Environment (104128)*** – Supports a time-based sequencing and spacing capability in the terminal environment by providing TBFM developed runway and sequence assignment information to terminal automation systems for display to controllers.

Final Investment Decision (FID) for Work Package 3 was achieved in April FY 2015.

TBFM Technology Refresh (G02A.01-07):

TBFM Technology Refresh will replace the existing hardware that was deployed in 2012 and 2013 with new hardware in the FY 2018-2020 time frame. The current hardware will begin to reach its end of service and maintenance by 2017. The program office is currently working towards FID in FY 2017 to replace this hardware. The FID allows TBFM to maintain one hardware baseline with Technology Refresh and WP3 procurements.

TBFM Work Package 4 (G02A.01-08):

TBFM Work Package 4 will build upon core TBFM capabilities, already in place, to increase benefits of time-based metering across the NAS and enable expansion of PBN operations in the NAS. TBFM Work Package 4 targeted capabilities are listed below:

- **Path Stretch:** An automation-based, advisory that will enable aircraft to absorb assigned delay, laterally, while continuing to execute an optimized profile descent (OPD). This will enhance flight efficiency, reduce emissions and noise, and increase system predictability.
- **Fleet Prioritization:** Dynamically incorporate, and where feasible, use airspace user preferences when assigning time-based metering slots and associated delay. This will improve collaborative decision making and user efficiency.
- **Terminal Sequencing & Spacing (TSAS) Improvements:** Improved management of TSAS operations through the use of a dynamic dashboard to alert Traffic Management Coordinators of operational trends that may warrant adjustments to TSAS parameters and operations; and through the use of a TBFM-system wide “what if” aid that will improve the tactical management of arrival operations. These improvements will optimize the use of TSAS and in turn, further ensure aircraft can fly OPDs while optimizing arrival throughput.
- **Improved TBFM-Traffic Flow Management System (TFMS) Data Integration:** Increase the sharing of data between TBFM and TFMS systems to enhance demand capacity prediction and the integration of time-based metering, allowing for more coordinated Traffic Management Initiatives (TMI) strategy implementation and minimize unintended and disruptive TMI interactions. This will improve collaborative decision making, user efficiency, and increase system predictability.
- **TSAS Expansion:** Deploy TSAS to additional sites, beyond the sites that will receive TSAS via TBFM WP3. This geographical expansion will improve flight efficiency and system predictability at additional locations in the NAS and increases the utilization of PBN procedures.
- **IDAC Expansion:** Deploy IDAC to additional sites, beyond the sites that will receive IDAC via TBFM WP2 and WP3. This geographical expansion will reduce departure release coordination time/effort, improve flight efficiency, and enhance system predictability.
- **Weather Source Migration:** Obtain weather data, via System Wide Information Management (SWIM), from the FAA’s Common Support Service-Weather system (CSS-Wx). This will decrease FAA operating costs while minimizing future costs associated with incorporating new weather products into TBFM.

This work package will also include the award of a new contract for the prime vendor, as the existing contract will expire in 2020.

TBFM WP4 FID is planned in FY 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Target

TBFM will expand the use of time-based metering solutions to additional locations and phases of flight to support the performance metric to maintain average daily airport capacity. TBFM will improve flight efficiency by allowing controllers to sequence and space arriving aircraft to optimize the use of airport capacity thereby avoiding last minute maneuvering of aircraft as they approach the airport. Time-based metering through TBFM has provided an average 3-5% increase in throughput at the airports where it is installed.

Program Plans FY 2017 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- Complete factory acceptance testing (FAT) for TSAS. (APB milestone)
- Conduct TSAS Software development.
- Conduct Integrated Test planning.
- Complete IDAC Site Surveys.
- Complete IDAC hardware procurement.

TBFM Technology Refresh (G02A.01-07):

- Complete the following documentation required for FID:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID.
- Pending FID approval:
 - Award contract.

TBFM Work Package 4 (G02A.01-08):

- Initiate development of draft documentation required for the Investment Analysis Readiness Decision (IARD):
 - Preliminary Program Requirements (pPR) documentation;
 - Initial Benefits and Cost documentation;
 - Safety Documentation; and
 - Enterprise Architecture documentation.

Program Plans FY 2018 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- Deploy first IDAC site. (APB milestone)
- Complete deployment of IDAC to 1 site (1 of 5, 20%).

TBFM Technology Refresh (G02A.01-07):

- Pending FID approval:
 - Conduct Site Surveys.
 - Procure hardware.
 - Complete 25% of the hardware installations.

TBFM Work Package 4 (G02A.01-08):

- Complete the documentation required for IARD:
 - Preliminary Program Requirements (pPR) documentation;
 - Initial Benefits and Cost documentation;
 - Safety Documentation; and
 - Enterprise Architecture documentation.
- Achieve IARD.
- Initiate development of draft documentation required for FID:
 - Final Requirements document (fPR);
 - Business Case;
 - Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (APB).
- Conduct market survey for new prime TBFM contract.
- Develop and release new prime TBFM Screening for Information Request (SIR).

Program Plans FY 2019 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- Complete Integration and Test at WJHTC. (APB Milestone)
- Deploy first TSAS site. (APB milestone)
- Complete deployment of TSAS to 1 site (1 of 9, 11%).
- Deploy last (5th) IDAC site. (APB milestone)
- Complete deployment of IDAC to 4 sites (5 of 5, 100%).

TBFM Technology Refresh (G02A.01-07):

- Pending FID approval:
 - Complete 50% hardware installations.

TBFM Work Package 4 (G02A.01-08):

- Complete development of final documentation required for FID:
 - Final Requirements document (fPR).
 - Business Case.
 - Implementation Strategy and Planning Document (ISPD).
 - Acquisition Program Baseline (APB).
- Achieve FID.
- Award TBFM WP4 contract.
- Complete evaluation of prime contractor proposals received in response to new prime TBFM SIR.
- Award new prime TBFM contract.

Program Plans FY 2020 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- Achieve TSAS In-Service Decision. (APB milestone)

TBFM Technology Refresh (G02A.01-07):

- Complete hardware installations.
- Begin disposal activities.

TBFM Work Package 4 (G02A.01-08):

- Complete System Requirements Review (SRR) for TBFM WP4.
- Complete Preliminary Design Review (PDR) for TBFM WP4.

Program Plans FY 2021 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- Deploy 5th TSAS site. (APB milestone)
- Complete deployment of TSAS to 7 sites (8 of 9, 89%).

TBFM Technology Refresh (G02A.01-07):

- Complete disposal activities.

TBFM Work Package 4 (G02A.01-08):

- Complete Critical Design review (CDR) for TBFM WP4.
- Begin incremental software and hardware development for TBFM WP4.

2A16, ATC BEACON INTERROGATOR (ATCBI) - TECHNOLOGY REFRESH

FY 2017 Request \$1.0M

ATC Beacon Interrogator Model-6 (ATCBI-6) – Technology Refresh, S02.03-03

Program Description

The ATCBI-6 Technology Refresh Program will replace and upgrade obsolete ATCBI-6 original equipment manufacturer peculiar and Commercial Off-The-Shelf (COTS) hardware and software to ensure the continued reliable and cost effective operation of the radar system through its designated lifecycle. The original ATCBI-6 program procured 139, Monopulse Secondary Surveillance Radar (MSSR) with Selective Interrogation to replace 132 of the old model 4/5's, and seven support systems for training, testing, logistics, and operational support.

The ATCBI-6 provides air traffic controllers with a more selective interrogation capability not available in the older systems that significantly improves the accuracy of aircraft position and altitude data provided to ATC automation systems. Additionally, the ATCBI-6, in conjunction with a co-located primary Long Range Radar, provides back-up Center Radar Approach Control (CERAP) surveillance service to numerous TRACON facilities in the event terminal radar services are lost. The ATCBI-6 program commissioned the first system in FY 2002 and commissioned the last system in FY 2013.

The Technology Refresh Program is in the planning and investment analysis phase. The business case analysis will identify parts obsolescence, operational performance deficiencies, and other areas requiring technology refresh to ensure continued reliable and cost effective operation of the radar system through its designated lifecycle. The Investment Analysis Readiness Decision (IARD) is planned for June 2018 and the Final Investment Decision (FID) is planned for June 2020. This activity will determine the retrofit requirement for the 132 operational and seven support ATCBI-6 systems in the FAA inventory.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The program is necessary to ensure the continued reliable and cost effective operation of the ATCBI-6 Secondary Surveillance system through its designated lifecycle. A business case analysis will be prepared to identify parts obsolescence, operational performance deficiencies, or other areas requiring technology refresh to ensure continued reliable and cost effective operation of the radar system through its designated lifecycle.

Program Plans FY 2017 – Performance Output Goals

- Develop the following products in support of the Investment Analysis Readiness Decision (IARD):
 - Shortfall Analysis/Quantification;
 - Solution Concept of Operation;
 - Functional Analysis;
 - Enterprise Architecture Products;
 - Program requirements; and
 - Safety Assessment

Program Plans FY 2018-2021 – Performance Output Goals

- None.

2A17, NEXTGEN – NEXT GENERATION WEATHER PROCESSOR (NWP)

FY 2017 Request \$27.8M

NextGen Weather Processor (NWP), Work Package 1, G04W.03-02

Program Description

The NextGen Weather Processor (NWP) program will establish a common weather processing platform that will replace the legacy FAA weather processor systems and host new capabilities. Using data feeds from both the FAA and National Oceanic and Atmospheric Administration (NOAA) radars, other weather sensors, and NOAA forecast models, NWP will use sophisticated algorithms to create high-quality, aviation-specific current and predicted weather information. NWP will create high value weather products that will be accessed through the Common Support Services-Weather (CSS-Wx) system. NWP will perform weather translation to enable the use of this weather information by automated decision-support tools (DSTs). NWP will also provide improved aviation safety related windshear products. Collectively, these program features will help reduce rising operations and maintenance costs by consolidating the following weather systems:

- Corridor Integrated Weather System (CIWS): Provides 0-to-2 hour aviation weather predictions and information to the Traffic Flow Management System (TFMS) and associated users of heavily traveled air corridors.
- Weather and Radar Processor (WARP): Provides weather information to en route air traffic controllers, supervisors, traffic management coordinators, and Center Weather Service Unit meteorologists.
- Integrated Terminal Weather System (ITWS): Provides weather information to terminal air traffic supervisors and controllers.

The NWP program will:

- Replace and enhance the current processing and display functionality of the ITWS, CIWS, and WARP systems;
- Generate aviation weather products with expanded coverage areas and faster update rates;
- Generate 0-to-8 hour aviation weather products;
- Generate safety critical wind shear alerts and real-time weather radar information; and
- Perform translation of convective weather into weather constraint areas.

NWP will be deployed at 36 operational facilities; these include two centrally located facilities at Atlanta and Salt Lake City, and at 34 TRACONS. In addition, NWP Aviation Weather Displays (AWDs) will be deployed at 117 designated facilities.

The Joint Resources Council (JRC) approval for Final Investment Decision (FID) for NWP WP1 was approved in March 2015 concurrently with the approval of FID for CSS-Wx WP1.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

NWP produces improved weather mosaics and predictions and formats them for integration into decision support tools. It supports on-time arrival rates by making better use of weather information for operational decision-making to support the optimal selection of aircraft routing and precise spacing for arriving and departing aircraft. The

increased accuracy of predictions and improved observations allows automation systems to create and use individual trajectory-based profiles which optimize the usage of available airspace.

Most delays in the NAS are attributed to weather conditions. Based on Operations Network (OPSNET), the official source of NAS air traffic operations and delay data, 68 percent of air traffic delays over 15 minutes for 2003-2012 were due to weather. The NWP capabilities will decrease avoidable aircraft delays, diversions, and cancellations. Estimates of projected cost savings to airlines and passengers attributable to these advanced en route weather applications, including fuel costs and downstream connection delays for passengers, exceed \$110 million per year.

Program Plans FY 2017 – Performance Output Goals

- Complete NWP WP1 Critical Design Review (CDR). (APB milestone)

Program Plans FY 2018 – Performance Output Goals

- Conduct NWP WP1 Test Capability Accreditation Procedures by Prime Contractor.

Program Plans FY 2019 – Performance Output Goals

- Complete NWP WP1 Factory Acceptance Test (FAT). (APB milestone)

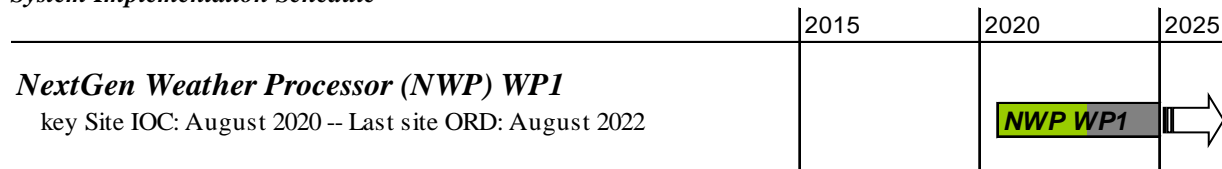
Program Plans FY 2020 – Performance Output Goals

- Complete NWP WP1 Operational Testing (OT). (APB milestone)
- Achieve NWP WP1 Key Site Initial Operational Capability (IOC). (APB milestone)

Program Plans FY 2021 – Performance Output Goals

- Achieve NWP WP1 In-Service Decision. (APB milestone)
- Complete NWP WP1 first site Operational Readiness Date (ORD). (APB milestone)
- Achieve NWP WP1 ORD at 5 sites (5 of 36, 14%)

System Implementation Schedule



2A18, AIRBORNE COLLISION AVOIDANCE SYSTEM X (ACAS X)

FY 2017 Request \$8.9M

Airborne Collision Avoidance System X (ACAS X) – Segment 1, M54.01-01

Program Description

The Airborne Collision Avoidance System X (ACAS X) is being developed to meet future collision avoidance requirements. The ACAS X program will provide guidance and technical expertise to RTCA in order to develop the functional architecture, functional interfaces and requirements for the next generation of collision avoidance capability. ACAS X will replace the existing Traffic Alert and Collision Avoidance Systems II (TCAS II) which is required in US airspace for all commercial aircraft with 30 or more seats and on all cargo aircraft greater than 33,000 pounds. ACAS X will reduce the number of false alerts, or “nuisance” Resolution Advisories (RAs) in US airspace and better support future operations.

The ACAS X program will perform simulations, develop prototypes, and create advanced performance specifications that will result in the development of Minimum Operational Performance Standard (MOPS), Technical Standard Order (TSO) and Advisory Circular (AC) documentation. Manufacturers will produce the ACAS X equipment in accordance with these documents. The program will also provide sustainment of TCAS II

field equipment, encounter models, toolsets and certification support for manufacturer equipment. ACAS X will also address shortfalls identified in the legacy TCAS II system. The system architecture will be designed to facilitate rapid updates to threat detection and resolution logic using an automated process. This capability will be very useful for future adaptations to NextGen operations and for unmanned aircraft systems (UAS) encounter profiles and patterns. ACAS X will have the flexibility to accommodate a variety of different sensor types and new generations of sensors; i.e., receiving data from ADS-B Airborne Position Messages.

The initial ACAS X systems will have two variants:

- ACAS Xa: A variant of ACAS X which will use active interrogations and replies in concert with passive reception of ADS-B information to perform surveillance. ACAS Xa is the variant of ACAS X most similar to TCAS II in its form and function.
- ACAS Xo: A variant of ACAS X intended for use with NextGen operations where other variants of ACAS X would generate unacceptably high rates of RAs if used. An example of such an operation would be Closely-spaced Parallel Operations (CSPO). This variant will be used in conjunction with ACAS Xa.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

Preliminary results of ACAS X system performance and safety analysis shows that ACAS X could produce 54% fewer alerts and be over 50% safer than current TCAS II v7.1 logic. ACAS X will reduce the number false alerts of potential midair collisions and provide the accuracy needed to maintain the high level of aviation safety that is critical in terminal air traffic areas.

Program Plans FY 2017 – Performance Output Goals

- Safety Risk Management – Complete System Safety Hazard Analysis. (APB milestone)

Program Plans FY 2018 – Performance Output Goals

- RTCA publish MOPS. (APB milestone)

Program Plans FY 2019 – Performance Output Goals

- Complete operational evaluation of ACAS X (Limited Implementation Program with Commercial Airlines on Host Aircraft). (APB milestone)
- Update and publish Standards and Recommended Practices (SARPS). (APB milestone)

Program Plans FY 2020 – Performance Output Goals

- Publish TSO and AC. (APB milestone)

Program Plans FY 2021 – Performance Output Goals

- Publish ACAS X Operational Assessment / Validation Report. (APB milestone).

2A19, NEXTGEN – DATA COMMUNICATION IN SUPPORT OF NEXTGEN

FY 2017 Request \$232.0M

Data Communications – Segment 1 Phase 1, G01C.01-05 / Data Communications – Segment 1 Phase 2 Initial En Route Services, G01C.01-06 / Data Communications – Segment 1 Phase 2 Full En Route Services, G01C.01-10 / X, Data Communications – Segment 1 Phase 1 & Phase 2 Data Comm Integrated Services (DCIS) Network Services, G01C.01-07 / X, Data Communications – Aeronautical Telecommunications Network (ATN) Gateway, G01C.01-08 / X, Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application, G01C.01-09

Program Description

The Data Communications (Data Comm) program will provide data communications services between the pilots and air traffic controllers. Data Comm will provide a direct link between ground automation and flight deck avionics for safety-of-flight ATC clearances, instructions, traffic flow management, flight crew requests and reports. Data Comm is critical to the success of NextGen operational improvements by providing communication infrastructure enhancements. Data Comm will:

- Reduce the impact of ground delay programs, airport reconfigurations, convective weather, congestion, and other causes;
- Reduce communication errors;
- Improve controller and pilot efficiency through automated information exchange;
- Enable NextGen services (e.g., enhanced re-routes, trajectory operations); and
- Increase controller productivity leading to increased capacity.

These improvements to the NAS will be delivered by Data Comm in two segments. Segment 1 will deliver in two phases the initial set of data communications services integrated with automation support tools to provide NAS benefits and lay the foundation for a data-driven NAS. Segment 1 Phase 1 (S1P1) will deploy the Controller-Pilot Data Link Communications (CPDLC) Departure Clearance (DCL) in the Tower domain. Segment 1 Phase 2 (S1P2) will deliver data communications services to the En Route domain. The Data Comm En Route services will contribute to a reduction in flight delays, more efficient routes for aircraft resulting in increased operational efficiency, enhanced safety all while reducing operational costs for airspace users.

Segment 2 will further build upon CPDLC DCL and En Route services by supporting the delivery of services to enable more advanced NextGen operations not possible using voice communications, such as four-dimensional trajectories and advanced flight interval management. Data Comm will also implement an Aeronautical Telecommunications Network (ATN) ground system to support advanced Baseline 2 avionics. ATN is a secure architecture that allows ground/ground, air/ground, and avionic data sub-networks to interoperate by adopting common interface services and protocols. The Baseline 2 set of ATN standards will enable advanced operations and services, and also represents the internationally harmonized standard for data communications avionics.

Data Communications – Segment 1 Phase 1 (G01C.01-05):

In S1P1, the Data Comm program will deliver DCL to 56 airports to include revisions with full route clearances transmitted directly to the aircraft on the airport surface. The CPDLC DCL service will expedite the delivery of departure clearances to aircraft, streamline clearance delivery operations and enable quicker recovery from adverse weather events. CPDLC DCL will improve efficiency, reduce ground delays, and result in more strategic management of NAS resources.

The major elements of S1P1 implementation are:

- Tower Data Link Services (TDLS) software and hardware enhancements to enable CPDLC DCL services in the Towers;
- En Route Automation Modernization (ERAM) software and hardware enhancements that provide log-on capability, protocol gateway functionality, and direct interface to flight data. In S1P1, all of the ERAM enhancements focus on infrastructure services for the Tower controllers;

- Data Communications Network Service (DCNS) which will provide the air/ground communications network services infrastructure; and
- Avionics Equipage Initiative which will provide incentives for airlines to equip aircraft with Future Air Navigation Systems (FANS) 1/A avionics.

Data Comm S1P1 has achieved a number of milestones:

- ERAM Critical Design Review: March 2012
- Final Investment Decision (FID): May 2012
- Data Comm Integrated Services contract award: September 2012
- Data Comm Network Services award (contract modification to DCIS): July 2013
- TDLS Critical Design Review: July 2013
- ERAM Initial Test Release: April 2014
- Operational Test (OT&E): March 2015
- First-Site Initial Operational Capability (IOC): August 2015
- Operational Readiness Decision (ORD): September 2015
- In-Service Decision (ISD): December 2015

Data Communications – Segment 1 Phase 2 Initial En Route Services (G01C.01-06):

S1P2 will leverage the S1P1 infrastructure to deliver both initial and full services to the En Route domain. Initial services will include transfer of communication/initial check-in, airborne reroutes, altimeter settings and altitudes, limited controller initiated reroutes, limited direct-to-fix messages, and limited crossing restrictions.

As Data Comm becomes fully operational, the majority of pilot-controller exchanges will be handled by Data Comm for appropriately equipped users.

The major elements of the S1P2 Initial En Route Services implementation are:

- ERAM software enhancements for En Route CPDLC applications;
- DCNS expanded coverage and capacity; and
- TDLS software enhancements to provide additional services to Tower controllers.

The FID for S1P2 Initial En Route Services was achieved in October 2014. In March of 2015 Data Comm achieved ERAM Contract Definitization, which is an APB milestone.

Data Communications – Segment 1 Phase 2 Full En Route Services (G01C.01-10):

S1P2 Full En Route Services will extend the service offerings in En Route domain to include more complex services including full controller initiated reroutes, full direct-to-fix messages, and full crossing restrictions.

The major element of the S1P2 Full En Route Services implementation is:

- ERAM software enhancements for En Route CPDLC applications.

The FID for S1P2 Full En Route Services is planned for FY 2016.

Data Communications – S1P1 and S1P2 Data Comm Integrated Services (DCIS) Network Services (G01C.01-07):

This program will continue to provide the Very High Frequency (VHF) Data Link (VDL) Mode 2 air ground network service that provides connectivity between the controllers and the cockpit. The DCIS network services also include operations and maintenance, monitoring and control, and certification suite activities. This Data Communications Network Service supports both surface and en route operations.

The DCIS Network Services costs were baselined (through FY 2021) during the S1P2 Initial En Route Services FID in October 2014.

Data Communications – ATN Gateway (G01C.01-08):

Initial Data Comm services will be delivered to FANS 1/A compliant avionics and ground system. FANS 1/A is currently certified and many airlines have FANS 1/A equipped aircraft. An ATN compliant ground system will be implemented to support ATN avionics. The ATN ground system will mirror the FANS ground system, to include

addition of an ATN Protocol Gateway and Ground Data Processor. This additional hardware and software will allow the Data Comm system to support both FANS and ATN equipped aircraft. The addition of ATN will support the implementation of more advanced NextGen services such as advanced Trajectory Based Operations (TBO), advanced Flight Interval Management (FIM), Optimized Profile Descents (OPD), and dynamic Required Navigation Performance (RNP). This will also provide the infrastructure to support advanced capabilities and additional research and development in the Data Comm Segment 2 timeframe. To support the Data Comm ATN implementation, RTCA Special Committee 214 (SC-214) standards work must be completed. These standards are expected to be completed and coordinated in 2016.

The FID for ATN Gateway is planned for FY 2020.

Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application (G01C.01-09):

The addition of more advanced NextGen services in Segment 2 will require that Baseline 2 avionics are installed in aircraft. The Baseline 2 applications will make use of the more capable ATN avionics to support the development of advanced services such as TBO, advanced FIM, OPD, and dynamic RNP. This program will provide enhancements to En Route and Terminal ground automation systems software to support message exchange with these advanced avionics.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Data Communications will revolutionize ATC communication between the ground and the cockpit, increasing the capacity, flexibility, and productivity of the NAS. Data Communications provides services which will increase throughput, reduce flight times, and enable other efficiency gains in both the Terminal and En Route environments. It will reduce air traffic control communications workload which will reduce air traffic delay and increase efficiency through an increase in controller flexibility. Data Communications will allow complex routing communications that make better use of available NAS resources such as airspace and airports. This improvement will occur for routine operations and be critical during system disruptions such as those caused by severe weather. Data Communications is a key transformational program under NextGen that will enable advanced capabilities, such as TBO, OPDs, Advanced FIM, Enhanced Surface Movement, and Dynamic RNP. Data Communication will also reduce operational errors, enhancing the safety and efficiency of the NAS.

Program Plans FY 2017 – Performance Output Goals

Data Communications – Segment 1 Phase 1 (G01C.01-05):

- Complete deployment of DCL services to 12 airports (18 of 56, 32%).

Data Communications – Segment 1 Phase 2 Initial En Route Services (G01C.01-06):

- Contractor detailed design complete. (APB Milestone)

Data Communications – Segment 1 Phase 2 Full En Route Services (G01C.01-10):

- Complete high level requirements and design.

Data Communications – S1P1 and S1P2 Data Comm Integrated Services (DCIS) Network Services (G01C.01-07):

- None.

Data Communications – ATN Gateway (G01C.01-08):

- None.

Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application (G01C.01-09):

- None.

Program Plans FY 2018 – Performance Output Goals

Data Communications – Segment 1 Phase 1 (G01C.01-05):

- Complete deployment of DCL services to 20 airports (38 of 56, 68%).

Data Communications – Segment 1 Phase 2 Initial En Route Services (G01C.01-06):

- Complete developmental testing and evaluation. (APB Milestone)
- Deliver ERAM software to test and evaluation site.
- Order DCNS service volume for S1P2 Initial En Route service key site. (APB Milestone) (This activity is required to expand the air-ground comm network to provide En Route services.)

Data Communications – Segment 1 Phase 2 Full En Route Services (G01C.01-10):

- Complete Engineering Design Reviews.

Data Communications – S1P1 and S1P2 Data Comm Integrated Services (DCIS) Network Services (G01C.01-07):

- Provide and maintain air-ground VDL-2 network services.

Data Communications – ATN Gateway (G01C.01-08):

- None.

Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application (G01C.01-09):

- None.

Program Plans FY 2019 – Performance Output Goals

Data Communications – Segment 1 Phase 1 (G01C.01-05):

- Complete deployment of DCL Services to 18 airports (56 of 56, 100%).
- Achieve last site IOC for Tower Services. (APB milestone)

Data Communications – Segment 1 Phase 2 Initial En Route Services (G01C.01-06):

- Complete Operational Evaluation.
- Achieve IOC for En Route Services. (APB Milestone)

Data Communications – Segment 1 Phase 2 Full En Route Services (G01C.01-10):

- Complete detailed design.

Data Communications – S1P1 and S1P2 Data Comm Integrated Services (DCIS) Network Services (G01C.01-07):

- Provide and maintain air-ground VDL-2 network services.

Data Communications – ATN Gateway (G01C.01-08):

- Complete draft requirements document for ATN Gateway and FANS/ATN dual stack.

Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application (G01C.01-09):

- None.

Program Plans FY 2020 – Performance Output Goals

Data Communications – Segment 1 Phase 1 (G01C.01-05):

- None.

Data Communications – Segment 1 Phase 2 Initial En Route Services (G01C.01-06):

- Achieve ISD for En Route Services. (APB Milestone)

Data Communications – Segment 1 Phase 2 Full En Route Services (G01C.01-10):

- Complete software development.

Data Communications – S1P1 and S1P2 Data Comm Integrated Services (DCIS) Network Services (G01C.01-07):

- Provide and maintain air-ground VDL-2 network services.

Data Communications – ATN Gateway (G01C.01-08):

- Complete applications analysis for high level requirements.
- Achieve the FID for ATN Gateway.

Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application (G01C.01-09):

- None.

Program Plans FY 2021 – Performance Output Goals

Data Communications – Segment 1 Phase 1 (G01C.01-05):

- None.

Data Communications – Segment 1 Phase 2 Initial En Route Services (G01C.01-06):

- Achieve last-site Initial Operational Capability. (APB milestone)

Data Communications – Segment 1 Phase 2 Full En Route Services (G01C.01-10):

- Complete development test and evaluation.

Data Communications – S1P1 and S1P2 Data Comm Integrated Services (DCIS) Network Services (G01C.01-07):

- Provide and maintain air-ground VDL-2 network services.

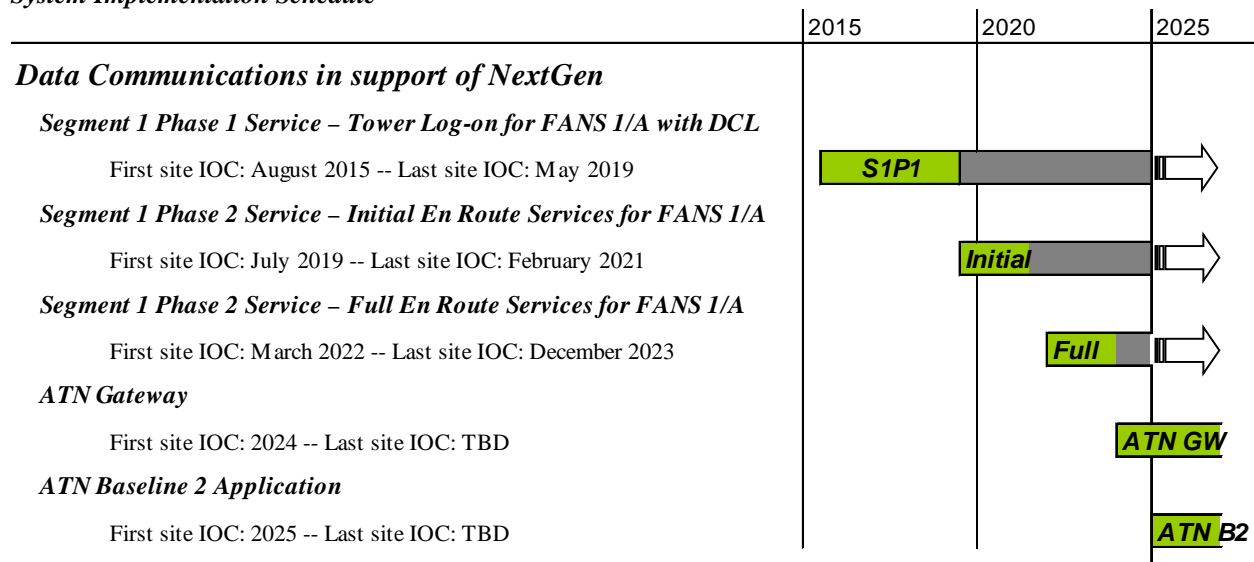
Data Communications – ATN Gateway (G01C.01-08):

- Finalize detailed requirement document for ATN Gateway.

Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application (G01C.01-09):

- Develop system requirements document for Baseline 2 applications.

System Implementation Schedule



2A20, OFFSHORE AUTOMATION

FY 2017 Request \$3.0M

Offshore Automation, A38.01-01

Program Description

The Offshore Automation program will perform service analysis and concept requirements definition for the FAA’s existing offshore automation systems. Specifically, this program will identify operational shortfalls associated with the current operations/systems; identify potential NextGen capabilities that should be expanded to these operations/systems; and create the required artifacts for possible investment decisions to replace the existing offshore systems. Replacing these one-off systems with NextGen common systems will improve NAS interoperability and reduce cost by standardizing the training, maintenance and development efforts across the platform. In addition, this program would greatly enhance the ability of personnel to transition to and from these previously unique facilities.

There are four sites in the NAS that are neither CONUS (Terminal, domestic En Route) or Oceanic (ATOP) sites. These are known as the offshore sites and consist of Anchorage Air Route Traffic Control Center (ARTCC) (ZAN), Honolulu Control Facility (HCF), Guam Combined En Route/Radar Approach Facility (CERAP) (ZUA), and San Juan CERAP (ZSU). These facilities all use the same Radar Data Processor (RDP) and Microprocessor En Route Automated Radar Tracking System (Micro-EARTS); the Flight Data Processors (FDP) varies by facility. No other

ARTCCs use these unique systems; maintaining the different FDPs adds extra training, repair, and replacement costs.

The Anchorage ARTCC uses FDP-2000; a server-based FDP. The server hardware at this ARTCC is obsolete and parts of this system are no longer covered by a maintenance contract.

The Offshore Flight Data Processing System (OFDPS) at Honolulu is a Host-based FDP running software on IBM mainframe equipment which has reached end-of-life. A new replacement IBM mainframe has been acquired but is the last mainframe in the IBM inventory able to support the obsolete connectivity requirements of OFDPS. Once this new mainframe reaches end of life, a replacement system for the entire OFDPS will be required. The ERAM program has successfully replaced all of the Host-based systems at CONUS ARTCCs and the OFDPS program will now have to cover the cost of maintaining the non-standard FDP system at Honolulu. In addition, the Job Shop system at the Technical Center, which had been providing support for the entire HOST effort as part of the second-level engineering organization, will also have to be paid for by the OFDPS alone; further increasing the support costs for this system.

The Guam facility also utilizes the OFDPS system located in Hawaii but is defined by separate airspace within the OFDPS. All physical equipment for Guam is located in Hawaii, except for the Flight Data Input/Output (FDIO). This ties Guam to the Hawaii maintenance schedule meaning that service to Guam is cut when Hawaii takes the OFDPS down for maintenance during their low-traffic time. Because of the time difference between Guam and Hawaii, Guam often loses this service during busy periods; both an inconvenient and a safety sensitive situation. Due to shared hardware, the same end of life and sustainment issues affecting the OFDPS system in Hawaii also affects Guam.

The San Juan facility has an FDIO-feed from the ERAM system at Miami ARTCC using special software called the “San Juan Patch.” As a result, San Juan is dependent on Miami Center to make any airspace or sector changes which can often result in delays. Due to the limitations of the patch and foreign airspace between Miami and San Juan, flight information for incoming flights often does not get to San Juan controllers before the aircraft enters San Juan airspace. In addition, there is limited functionality between the Micro-EARTS and the ERAM system at Miami. Data sharing is only minimally supported between the two systems or, in some cases, requires making duplicate entries in both the Micro-EARTS and the ERAM FDIO equipment.

These diverse automation systems are becoming increasingly expensive to maintain, and have end-of-life sustainability issues which may have efficiency and safety implications due to loss of coverage (i.e. Guam and San Juan), and will be difficult to upgrade to meet NextGen required capabilities.

Alternatives are being evaluated to address the automation systems at these four offshore locations. An Initial Investment Decision is planned in FY 2016 and Final Investment Decision (FID) is planned in FY 2017.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The Offshore Automation program will replace the aging legacy systems with modern NAS automation; significantly reducing the potential for system outages. This investment will also resolve the ongoing maintenance and supportability limitations at the offshore sites and improve overall system availability and reliability.

Program Plans FY 2017 – Performance Output Goals

- Develop the following products in support of the FID:
 - Final Program Requirements documentation;
 - Enterprise Architecture Artifacts;
 - Business Case documentation;
 - Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID.

Program Plans FY 2018-2019 – Performance Output Goals

- Output goals will be developed at FID.

Program Plans FY 2020-2021 – Performance Output Goals

- None.

B: Terminal Programs

2B01, AIRPORT SURFACE DETECTION EQUIPMENT - MODEL X (ASDE-X)

FY 2017 Request \$8.4M

Airport Surface Detection Equipment - Model X (ASDE-X) – Technology Refresh & Disposition, S09.01-01

Program Description

The ASDE-X Technology Refresh program provides for the replacement and upgrade of hardware and software to ensure the continued operation of the surface surveillance system through its designated lifecycle. The ASDE-X program baseline included costs for the periodic replacement of Commercial Off-The-Shelf (COTS) system components; e.g., processors, displays, computer operating systems and Commercially Available Software (CAS).

Deployment of the 35 planned ASDE-X systems was completed in FY 2011. The first ASDE-X system was delivered in 2002. Some of the equipment has reached the end of its service life and is no longer supportable without a technology refresh of the ASDE-X system.

The ASDE-X team completed a study in FY 2012 to determine the equipment and software that needs to be upgraded, updated, or replaced as part of the ASDE-X Technology Refresh effort.

The following three technology refresh projects were approved:

- Obsolescence/Spare Parts Procurement will increase the depot stock of components that are projected to be depleted from the ASDE-X depot prior to the end of the ASDE-X lifecycle;
- ASDE-X Processor Replacement replaces the obsolete ASDE-X processors with Linux based processors running applications updated via the Airport Surface Surveillance Capability (ASSC) Program; and
- The Universal Access Transceiver Receiver (UATR) Upgrade modifies the existing UATR in each remote unit to the updated UATR2 to address existing UATR performance shortfalls. The UATR Upgrade also supports the projected increase in ADS-B message traffic over the ASDE-X lifecycle.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 4 – Reduce Category A & B (most serious) runway incursions to a rate of no more than 0.395 per million operations, and maintain or improve through FY 2018.*

Relationship to Performance Metric

ASDE-X enables air traffic controllers to track surface movement of aircraft and vehicles. It was developed to aid in preventing surface collisions and in reducing critical Category A and B runway incursions. ASDE-X provides air traffic controllers with a visual representation of the traffic situation on the airport movement area and arrival corridors. It improves the ability of controllers to maintain awareness of the operational environment and to anticipate contingencies that could result in potential runway incursions. ASDE-X Safety Logic enhances the situational awareness for air traffic controllers. It uses surveillance information from ASDE-X to determine if the current and/or projected positions and movement characteristics of tracked aircraft/vehicles present a potential collision situation. Visual and audible alerts are provided to the air traffic controllers when safety logic predicts a collision.

The ASDE-X Technology Refresh Program will ensure the continued operation of ASDE-X systems through its designated lifecycle. Completing the technology refresh effort will help keep the number of Category A&B runway incursions at the reduced levels attained during ASDE-X system deployment. Since the program inception in FY 2004, the cumulative number of Category A&B runway incursions at the 35 ASDE-X airports was projected to be 77 out through FY 2011 (baseline). This number of runway incursions is a cumulative number over 8 years from FY 2004 through FY 2011. The target was to reduce the cumulative number of Category A&B runway incursions to 59.18 and the actual number determined through FY 2011 was 42. This downward trend of Category A & B runway incursions has continued and for the eight years from FY 2007 through FY 2014, there were 37 A & B incursions.

Also, the Runway Status Lights (RWSL) system requires ASDE-X data to function. The RWSL benefits are not achievable without a reliable and available ASDE-X system.

Program Plans FY 2017 – Performance Output Goals

- Complete installation of the ASDE-X Technology Refresh processor solution at 10 of the 35 airports, 66 % complete.
- UATR certify for operational use 50% complete.

Program Plans FY 2018 – Performance Output Goals

- Complete installation of the ASDE-X Technology Refresh processor solution at the remaining 12 airports, 100% complete. (Prior year funds)
- Complete last site certified for operational use (100% complete). (Prior year funds)

Program Plans FY 2019-2021 – Performance Output Goals

- None.

System Implementation Schedule

	2015	2020	2025
Airport Surface Detection Equipment – Model X (ASDE-X)			
First ORD October 2003 -- Last ORD: July 2011	ASDE-X		
First Site Delivery: January 2015 -- Last Site Delivery: August 2018	ASDE-X TR		

2B02, TERMINAL DOPPLER WEATHER RADAR (TDWR) – PROVIDE

FY 2017 Request \$5.0M

**Terminal Doppler Weather Radar (TDWR) – Service Life Extension Program (SLEP) –
Phase 2, W03.03-02**

Program Description

The Terminal Doppler Weather Radar (TDWR) is used by ATC to increase the safety of the NAS. TDWRs provide vital information and warnings regarding hazardous windshear conditions, precipitation, gust fronts, and microbursts to air traffic controllers managing arriving and departing flights in the terminal area. There are 45 TDWR systems commissioned, protecting 46 high-capacity airports, throughout the United States and Puerto Rico that are prone to wind shear events. Two additional systems at the FAA's Mike Monroney Aeronautical Center (MMAC) in Oklahoma City provide engineering support and training. There have been no wind shear accidents at any TDWR-protected airport since its TDWR was commissioned. TDWR weather data is transmitted to FAA automation systems and to 34 National Weather Service forecast offices. The current system has been in service since 1994 and is facing serious obsolescence issues and must be updated.

TDWR SLEP Phase 2 is a sustainment effort to extend the service life of the system. It will replace TDWR components that have deteriorated due to aging, have become obsolete or unsupported, and were not addressed in Phase 1. This service life extension program will enable these systems to continue to provide safety and traffic management services throughout the NAS.

Final Investment Decision was approved by the Joint Resources Council (JRC) December 16, 2015.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The TDWR's required inherent availability (excluding any logistics or administrative delays) is 99.7%. Since October 2012, considering both scheduled and unscheduled outages, TDWR service availability has only been about 97.1%. With only a small amount of the availability shortfall due to logistics and administrative delays, a significant improvement in the TDWR's operational reliability is required.

Program Plans FY 2017 – Performance Output Goals

- Complete the Procurement of 100 Circuit Card Assemblies (100%).
- Complete the Grounding System Refurbishment at 15 sites (15 of 47, 32%).

Program Plans FY 2018 – Performance Output Goals

- Complete the Ground System Refurbishment at 16 sites (31 of 47, 66%).

Program Plans FY 2019 – Performance Output Goals

- Complete the Grounding System Refurbishment at 16 sites (47 of 47, 100%).
- Complete the First Article Testing for the Wind Shear Ribbon Display, Direct Digital Controller and Antenna Controller.
- Complete installation of the Direct Digital Controller at 15 sites (15 of 47, 32%)
- Replenish 100 Wind Shear Ribbon Displays at Depot (100 of 600, 17%).

Program Plans FY 2020 – Performance Output Goals

- Replenish 200 Wind Shear Ribbon Displays at Depot (300 of 600, 50%).
- Installation of the Direct Digital Controller at 16 sites (31 of 47, 66%).
- Installation of the Antenna Controller at 16 sites (16 of 47, 34%).
- Complete the First Article Testing for the Transmitter Microwave Assembly.

Program Plans FY 2021 – Performance Output Goals

- Replenish 300 Wind Shear Ribbon Displays at Depot (600 of 600, 100%).
- Complete the Direct Digital Controller installations at 16 sites (47 of 47, 100%).
- Complete installation of the Antenna Controller at 22 sites (26 of 47, 55%).
- Complete installation of the Transmitter Microwave Assembly at 15 sites (28 of 47, 60%).

2B03, STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS) (TAMR PHASE 1)

FY 2017 Request \$64.2M

Standard Terminal Automation Replacement System (STARS) – Technology Refresh (TAMR Phase 1), A04.01-01 / X, Standard Terminal Automation Replacement System (STARS) – Infrastructure Modernization Program, A04.01-03

Program Description

The STARS program is a joint Department of Defense and Department of Transportation (DOT) FAA program to modernize terminal air traffic control automation systems. The STARS is a digital processing and display system that replaces aging air traffic control equipment at FAA Terminal Radar Approach Control (TRACON) facilities and Air Traffic Control Tower (ATCT) facilities. Air traffic controllers use STARS automation and display systems to ensure the safe separation of both military and civilian aircraft within the nation's airspace.

STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):

TAMR Phase 1 is the Technology Refreshment of the STARS automated radar processing and display systems at 47 TRACONS and their associated ATCTs. The technology refresh provides hardware updates including new high-resolution Liquid Crystal Display (LCD) color displays, processors, storage devices and enhanced memory. The program also provides a software update with the hardware technology refresh to support NextGen initiatives and to maintain, correct, or improve system performance, efficiency, safety, and security vulnerabilities.

STARS – Infrastructure Modernization Program (A04.01-03):

The STARS Infrastructure Modernization Program will provide engineering that will enable the FAA to replace key elements of STARS that have reached their end of life (EOL) and/or that are no longer compatible with current commercial offerings. Two significant engineering activities include engineering required to upgrade the present Solaris Operating System, which reaches end of life in FY 2018 and end of vendor support in FY 2021, and engineering required to support transition from the present time division multiplex (TDM) protocol to Internet Protocol (IP).

A return to the JRC in FY 2017 with requested funding for these activities was an action item from the August 2015 Baseline Change Decision (BCD) conducted for TAMR P3S1.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The STARS program has overall system availability (software/hardware) of 99.9993% at all operational sites (Source: Web NAS Performance Analysis System). This program will modernize the STARS equipment to allow it to continue to operate at this high level of availability. STARS uses Commercial-Off-The-Shelf (COTS) components that have a life expectancy of 10 to 15 years. Current STARS equipment has been in the NAS since 1999 and is in need of equipment upgrades.

Program Plans FY 2017 – Performance Output Goals

STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):

- Procure hardware for upgrades from G1 to G4 configuration at 11 operational sites.
- Complete IOC at 15 sites (22 of 47 sites, 47 %).
- Implement mandatory software security and safety enhancements, new functionality and upgrades needed for enhanced performance and capacity in support of NextGen initiatives.

STARS – Infrastructure Modernization Program (A04.01-03):

- None.

Program Plans FY 2018 – Performance Output Goals

STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):

- Procure hardware for upgrades from G1 to G4 configuration at 11 operational sites.
- Implement mandatory software security and safety enhancements, new functionality and upgrades needed for enhanced performance and capacity in support of NextGen initiatives.
- Complete IOC at 10 sites (32 of 47 sites, 68%).
- Complete IOC at 26th site. (APB milestone)

STARS – Infrastructure Modernization Program (A04.01-03):

- Complete identification of "Gaps" between standards on existing Prime contract and the FY18 FAA standards for FAA-G-2100 and FAA-STD-019.
- Complete engineering plans for transition of STARS OS from Solaris to Red Hat Linux (RHL).
- Finalize requirements for transition of TRACON - ATCT communications conversion to Virtual Local Area Network (VLAN) to provide the network segmentation services traditionally provided only by routers in LAN configurations.
- Complete engineering design for STARS Lightweight Data Access Protocol (LDAP), a set of protocols for accessing information directories.
- Finalize requirements for X4000 Processor/Digital Recording Device for continuous data recording.
- Finalize requirements for new STARS Trackball.

Program Plans FY 2019 – Performance Output Goals

STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):

- Complete IOC at 9 sites (41 of 47 sites, 87%).
- Complete IOC at 39th site. (APB milestone)

STARS – Infrastructure Modernization Program (A04.01-03):

- Complete STARS design that is compliant with FAA-G-2100 and FAA-STD-019.
- Complete consolidation of STARS documents required for FAA Second Level Engineering.
- Complete STARS engineering change proposals for transition of TRACON - ATCT communications conversion to VLAN.
- Complete testing of STARS LDAP at Key Site.
- Deploy new STARS Trackballs to Sites 1-5.
- Deploy STARS to Sites 1 and 2 (Technology Refresh of G1/G2 systems).

Program Plans FY 2020 – Performance Output Goals

STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):

- Complete IOC at 6 sites (47 of 47, 100%). (Prior year funds)
- Complete IOC at last site. (APB milestone) (Prior year funds)

STARS – Infrastructure Modernization Program (A04.01-03):

- Deploy new STARS Trackballs to Sites 6 – 10.
- Deploy STARS to Sites 3, 4, and 5 (Technology Refresh of G1/G2 systems).

Program Plans FY 2021 – Performance Output Goals

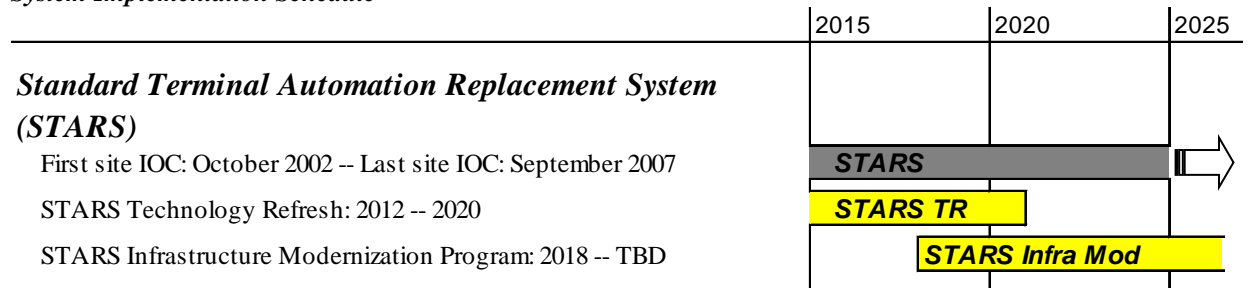
STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):

- None.

STARS – Infrastructure Modernization Program (A04.01-03):

- Output goals will be established at FID.

System Implementation Schedule



2B04, TERMINAL AUTOMATION MODERNIZATION/ REPLACEMENT PROGRAM (TAMR PHASE 3)

FY 2017 Request \$108.9M

- A, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1, A04.07-01
- B, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 2, A04.07-02
- C, Terminal Automation Modernization – Replacement (TAMR) – Post Operational Readiness Demonstration (ORD) Enhancements, A04.07-04

A, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1, A04.07-01

Program Description

The TAMR program employs a three-phased approach to modernizing the air traffic control systems that controllers use to control traffic approaching or leaving the nation's major airports. The first phase of the program – TAMR Phase 1 – replaced the automated radar processing and display systems at TRACON facilities and their associated air traffic control towers. Phase 1 deployed Standard Terminal Automation Replacement System (STARS) to 47 sites. TAMR Phase 2 replaced automation systems at five additional TRACONs and modernized air traffic controller displays and system processors at four large TRACONs including Denver and Chicago. The final phase of the program, Phase 3, will address the remaining 108 sites, 11 sites under Segment 1 and 97 sites under Segment 2.

On April 21, 2010 the JRC divided the TAMR Phase 3 program into a short term and long term segment to better address planning objectives. TAMR Phase 3 Segment 1 program will address infrastructure improvements essential for the adoption of Automatic Dependent Surveillance-Broadcast (ADS-B) at 11 Common Automated Radar Terminal (CARTS) III sites. TAMR Phase 3 Segment 2 will address the remaining 97 Automated Radar Terminal System (ARTS) sites. On December 21, 2011, the JRC approved the Final Investment Decision for Segment 1.

TAMR Phase 3 Segment 1 will replace 11 existing CARTS IIIE facilities with STARS hardware and software components. In particular, TAMR Phase 3 Segment 1 will:

- Replace the IIIE facility with STARS at Dallas (D10) (completed in 2014).
- Replace remaining 10 IIIE facilities with STARS by 2017 to complete the convergence of the IIIE's to a single Terminal Automation hardware and software baseline (Northern California (NCT), Atlanta (A80), Southern California TRACON (SCT), Potomac TRACON (PCT), Louisville (SDF), Denver (D01), Minneapolis (M98), St Louis (T75), Chicago (C90) and New York (N90)).

TAMR Phase 3 Segment 1 supports ADS-B requirements and continues FAA's original plan for terminal convergence into a single automation platform. Once completed, convergence of terminal automation will streamline the need to sustain CARTS and also eliminate redundant software development activities.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Improvements to the NAS can reduce flight delays and increase system efficiency. The TAMR Phase 3 Segment 1 program modernizes the 11 IIIE facilities in alignment with near-term NextGen requirements including support for ADS-B.

Program Plans FY 2017 – Performance Output Goals

- Complete IOC at last site (11th site IOC: APB date, October 2016).
- Achieve continuous operations and ORD at 7th-10th sites.

Program Plans FY 2018 – Performance Output Goals

- Complete ORD at last site (11th site ORD: APB milestone October 2017). (Prior year funding)

Program Plans FY 2019-2021 – Performance Output Goals

- None.

System Implementation Schedule



- Final Investment Decision for Segment 1 – December 2011.

B, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 2, A04.07-02

Program Description

The TAMR program employs a three-phased approach to modernizing the air traffic control systems that controllers use to control traffic approaching or leaving the nation's major airports. The first phase of the program – TAMR Phase 1 – replaced the automated radar processing and display systems at TRACON facilities and their associated air traffic control towers. Phase 1 deployed Standard Terminal Automation Replacement System (STARS) to 47 sites. TAMR Phase 2 replaced automation systems at five additional TRACONS and modernized air traffic

controller displays and system processors at four large TRACONs including Denver and Chicago. The final phase of the program, Phase 3, will address the remaining 108 sites, 11 sites under Segment 1 and 97 sites under Segment 2.

TAMR Phase 3 Segment 2 will replace 91 Automated Radar Terminal System (ARTS) IIE systems at TRACONs and their associated ATCTs and six ARTS IE systems (stand-alone ATCT display systems), with STARS hardware, software, and displays. This Segment will deploy a scaled STARS system, known as STARS Enhanced Local Integrated Tower Equipment (ELITE), to the ARTS IIE facilities and STARS Local Integrated Tower Equipment (LITE) to the ARTS IE facilities. The STARS automation system is a fully digital system capable of tracking all aircraft within the defined terminal airspace using available FAA and U.S. Department of Defense (DoD) surveillance systems.

TAMR Phase 3 Segment 2 supports ADS-B requirements and continues FAA's original plan for terminal convergence into a single automation platform. Once completed, convergence of terminal automation will eliminate the need to sustain Common Automated Radar Terminal System (CARTS) and associated software development activities. The Final Investment Decision (FID) for Segment 1 was approved in December 2011 and the FID for Segment 2 was approved in September 2012.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The upgrade to current technology will support ADS-B implementation and data management requirements associated with improving air traffic control management which can increase and improve the use of airspace capacity. The new equipment will provide the ability to increase the number of aircraft tracked from 256 to 1350 unique aircraft and the number of surveillance sensors that can be connected from 1 to 12. These improvements will increase efficiency in using available system capacity.

Program Plans FY 2017 – Performance Output Goals

- Procure 12 ELITE operational systems.
- Deliver 34 additional operational systems.
- Complete IOC at 34th ARTS IIE site. (APB milestone)
- Achieve IOC at 35 sites (71 of 97, 73%).

Program Plans FY 2018 – Performance Output Goals

- Procure 4 ELITE operational systems.
- Procure 6 LITE systems (4 operational and 2 support).
- Deliver 12 additional systems (11 operational and 1 support).
- Complete IOC at 65th ARTS IIE site. (APB milestone)
- Achieve IOC at 18 sites (89 of 97, 91%).

Program Plans FY 2019 – Performance Output Goal

- Deliver 4 additional operational systems. (Prior year funds)
- Achieve IOC at 8 sites (97 of 97, 100%). (Prior year funds)
- Complete IOC at last site, 91st (ARTS IIE). (APB Milestone) (Prior year funds)
- Complete ORD at last site (ARTS IIE). (APB Milestone) (Prior year funds)
- Complete ORD at last site (ARTS IE). (APB Milestone) (Prior year funds)

Program Plans FY 2020-2021 – Performance Output Goal

- None.

System Implementation Schedule



C, Terminal Automation Modernization – Replacement (TAMR) – Post Operational Readiness Demonstration (ORD) Enhancements, A04.07-04

Program Description

The TAMR program employs a three-phased approach to modernizing the air traffic control systems that controllers use to control traffic approaching or leaving the nation's major airports. The first phase of the program – TAMR Phase 1 – replaced the automated radar processing and display systems at TRACON facilities and their associated air traffic control towers. Phase 1 deployed Standard Terminal Automation Replacement System (STARS) to 47 sites. TAMR Phase 2 replaced automation systems at five additional TRACONs and modernized air traffic controller displays and system processors at four large TRACONs including Denver and Chicago. The final phase of the program, Phase 3, will address the remaining 108 sites, 11 sites under Segment 1 and 97 sites under Segment 2.

On April 21, 2010 the JRC divided the TAMR Phase 3 program into a short term and long term segment to better address planning objectives. TAMR Phase 3 Segment 1 program will address infrastructure improvements essential for the adoption of Automatic Dependent Surveillance-Broadcast (ADS-B) at 11 Common Automated Radar Terminal (CARTS) IIIIE sites. TAMR Phase 3 Segment 2 will address the remaining 97 Automated Radar Terminal System (ARTS) sites. On December 21, 2011, the JRC approved the Final Investment Decision for Segment 1.

The TAMR Post ORD Enhancements Variable Quantity (VQ) Program consists of both hardware and software additions to STARS deployed to replace existing STARS and ARTS IE, IIE, and IIIIE systems. The hardware includes additions of small quantities of items that are already part of the STARS Baseline that have been requested by sites via the Needs Assessment Program (NAP) and approved by the FAA Mission Support Organization, AJV. The software capabilities are those requested by Phase 3 sites to provide capabilities existing in ARTS at the time of transition to STARS. They represent no new capabilities to the NAS, but may be new capabilities to STARS, or may be perfective and/or corrective changes to existing STARS functionality. As requests are identified, validated, prioritized, and approved for implementation, the TAMR Program Office will use existing, mature processes for the engineering, design, development, testing, integration and delivery of these hardware and software additions to Phase 1 and Phase 3 sites. The VQ program was approved at JRC in August 2015.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

As TAMR Programs have deployed STARS to replace ARTS IE, IIE, and IIIIE systems, users have identified gaps in STARS capabilities – namely, instances where the predecessor ARTS provided a capability that is either implemented differently than in STARS, or not implemented at all. The TAMR Post ORD Enhancements Program will meet the need of users, to fill the “gaps” between ARTS and STARS capabilities.

Program Plans FY 2017 – Performance Output Goals

- Complete development of the first release of enhancements.
- Begin test and delivery of the first release of enhancements.
- Begin system engineering of the second release of enhancements.

Program Plans FY 2018 – Performance Output Goals

- Begin development of second release of enhancements.

Program Plans FY 2019 – Performance Output Goals

- Complete development of the second release of enhancements. (Prior year funding)
- Begin test and delivery of the second release of enhancements. (Prior year funding)

Program Plans FY 2020-2021 – Performance Output Goals

- None.

2B05, TERMINAL AUTOMATION PROGRAM

FY 2017 Request \$7.7M

- A, Flight Data Input/Output (FDIO) Replacement, A01.11-01
- B, Terminal Work Package 1, A04.08-01

A, Flight Data Input/Output (FDIO) Replacement, A01.11-01

Program Description

The FDIO system provides standardized flight plan data, weather information, safety related data, and other information to air traffic controllers at more than 650 Terminal NAS facilities. The FDIO system is mainly comprised of computers, servers, monitors, keyboards, printers, and circuit cards that are commercially available. The FDIO system collects data from the En Route Automation Modernization (ERAM) system and provides flight data information to NAS Terminal facilities. The FDIO system prints this information on paper strips for controllers at FAA Terminal Radar Approach Control (TRACON), Air Traffic Control Tower (ATCT), and Radar Approach Control (RAPCON) facilities. This information assists controllers both in tracking aircraft and anticipating the arrival of aircraft in the sector under their control. The FDIO system also receives data from the TRACON, ATCT, and RAPCON facilities and relays this data back to ERAM.

The FDIO Replacement program replaces the end-of-life/obsolete FDIO equipment with fully compatible (form/fit/function) commercial off the shelf (COTS) and modified COTS equipment. Individual components are procured and replaced as they reach their end of life. The program is based on a 5 year replacement cycle for the various components to maintain system operational availability and will also provide a common Internet Protocol infrastructure to support future ERAM and System Wide Information Management (SWIM) architectures.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

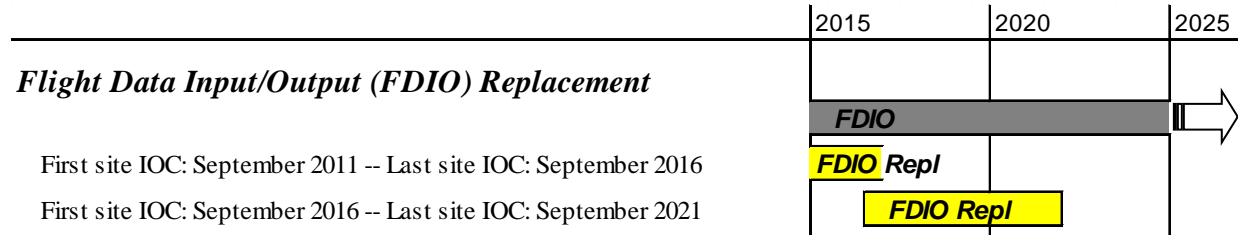
Relationship to Performance Metric

The FDIO program replaces end-of-life, obsolete FDIO equipment with modern and modified COTS equipment, thereby reducing potential outages and delays. The five year replacement cycle that FDIO employs ensures sustained system operational availability at the Core airports and reportable facilities.

Program Plans FY 2017-2021 – Performance Output Goals

- Procure and field replacement FDIO system components (terminal server, keyboard, printer and monitor) at approximately 100 FAA and DoD ATC facilities.

System Implementation Schedule



B, Terminal Work Package 1, A04.08-01

Program Description

Building upon previous investments, Terminal Work Package 1 is the next useful segment for the Standard Terminal Automation Replacement System platform by consolidating terminal automation onto a single platform. As envisioned by NextGen, it will implement the capabilities necessary to enable trajectory-based operations in the terminal environment and identify and address outstanding operational needs.

The Terminal Radar Approach Control (TRACON) domain provides a key opportunity for increased efficiency and improved air traffic control operations as envisioned by the FAA’s Strategic goals and NextGen plans. The current TRACON domain service is hindered during periods of adverse weather events and increased traffic. Today’s air traffic control and traffic management decision support tools have significant limitations in the efficient transfer of flight information and constraint information to other systems, facilities, Certified Professional Controllers, pilots, and airport operators. TRACON automation capabilities must evolve to support mid-term concepts for NextGen.

Terminal Work Package 1 is the first of multiple work packages that contribute to TRACON evolution. The program will refine proposed concepts and validate them as viable additions to the NAS to support NextGen goals. Concept engineering activities include analysis, evaluation, and assessments to develop and mature concepts for changes to TRACON automation as well as identifying the associated procedure changes.

The Surface/Tower/Terminal Systems Engineering, G06A.02-01, program will develop the investment documentation and initial requirements documents in support of the Investment Analysis Readiness Decision (IARD) for Terminal Work Package 1 as well as documents for the Initial Investment Decision (IID) and Final Investment Decision (FID). This program supports the investment activities by providing system engineering analysis and design. The IID is planned for FY 2017 and FID for FY 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The Terminal Work Package 1 program supports greater capacity by developing and implementing automation-based changes that will enable more efficient control and safer movement of air traffic within the Terminal domain and smoother transitions for traffic entering and departing Terminal airspace. It will provide TRACON personnel with the automation tools and support to more efficiently perform inter- and intra-facility coordination and improve air traffic control and management within the TRACON domain.

Continued safe and efficient operations in the NAS require a balanced and synchronized evolution of the NAS as a whole. Capacity of the air traffic control system over any given route is inherently limited by the most restrictive component of that route. The FAA's recent strategic enhancements have emphasized the En Route and Airport Surface domains within the NAS. As traffic flow and management in these areas is improved, it is anticipated that bottlenecks will increasingly occur in the Terminal Area due to unaddressed operational deficiencies. To gain the full benefits of FAA and local jurisdiction investments in the NAS, Terminal area shortfalls must also be addressed.

By addressing operational shortfalls in the Terminal domain, the FAA will be able to leverage the increased use of Performance Based Navigation (PBN) procedures and aircraft capabilities, support Trajectory Based Operations (TBO), and provide support for other NextGen concepts.

Program Plans FY 2017 – Performance Output Goals

- Provide system engineering analysis to develop inputs for the initial program requirements and draft final program requirement documents. System engineering analysis for candidate capabilities will include such activities as prototyping, Human-in-the-Loop assessments, algorithm analyses, and performance analyses.

Program Plans FY 2018-2021 – Performance Output Goals

- Milestones will be developed at FID.

2B06, TERMINAL AIR TRAFFIC CONTROL FACILITIES - REPLACE

FY 2017 Request \$58.8M

**Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON)
Replacement, F01.02-00**

Program Description

The ATCT/TRACON Replacement program replaces towers and TRACONs that no longer meet operational and sustainability requirements. The FAA provides air traffic control services from more than 500 ATCT and TRACON facilities and replaces some of these buildings to meet current and future operational requirements. The average age of control towers is approximately 30 years, and some towers are 60 years old. As the volume and complexity of terminal air traffic control increases, so does the need to have additional positions in the ATCT/TRACON facilities. Control towers built more than 20 years ago often do not have the space to meet today's operational requirements. In addition, some terminal facilities must be upgraded to conform to current building codes and design standards. This program is included in the ATC Facilities Sustainment Strategic Plan.

Tower and TRACON replacements are large capital investments and, given constrained resources, the FAA is focusing on risk-based analysis to ensure those facilities in greatest need are replaced first. Each year, the FAA will conduct analysis on facilities within its inventory of Tower and TRACONs to determine if they should be replaced. As facilities are identified for replacement, they will be added to the list of towers and TRACONs to be replaced in future years.

Projects are funded in five segments and are scheduled based on priority. The five segments are: Advance Requirements and Other Direct Costs; Land Acquisition/Design; Construction; Electronic Systems – Purchase Equipment and Installation; and Disposition. A project typically spans a period of 5-10 years from inception to completion depending on the size of the project. Each segment of a project is fully funded in the year requested but it may take more than one year to complete that segment.

At this time, the FAA is committed to completing a facility replacement for the New York TRACON (N90). The facility's FY 2014 condition index was at 87.9 percent, characterized as poor condition, with \$5.12M of deferred maintenance costs. Due to its condition, the building structure and systems are vulnerable to failure, which could cause air traffic control outages. The FAA is still in the early stages of re-planning this investment, but the outyear

funding tentatively supports the current schedule and assumes that the N90 replacement will cost less than an integrated facility.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The Terminal Air Traffic Control Facilities program contributes to the FAA Strategic Priority of Deliver Benefits through Technology and Infrastructure by replacing ATCTs and TRACONs to meet current and future operational requirements. Some replacements are required to accommodate growth in air traffic; others are needed to provide added space for new equipment. In some cases the tower must be replaced to ensure that controllers have an unobstructed view of the runways and taxiways or a new ATCT must be constructed due to airport expansion. This program will ensure that these facilities are ready to meet both current and forecast levels of demand for air traffic control services and support the sustainment of operational availability of the NAS.

Program Plans FY 2017 – Performance Output Goals

- Complete Land Acquisition for one site (Teterboro, NJ (TEB)).
- Initiate Design activities for two sites (Teterboro, NJ (TEB) and New York, NY (N90)).
- Purchase and Installation of long lead equipment for one site (Charlotte, NC (CLT)).

Program Plans FY 2018 – Performance Output Goals

- Award a design contract for three sites (Baltimore, MD (BWI), Tulsa-Riverside, OK (RVS), and Charleston, SC (CHS)).
- Award construction contracts for three sites (Teterboro, NJ (TEB), Peoria, IL (PIA), and Greensboro, NC (GSO)).
- Complete equipment procurement and / or installation at one site (Charlotte, NC (CLT)).

Program Plans FY 2019 – Performance Output Goals

- Award a design contract for three sites.
- Award two construction contracts.
- Purchase and installation of long lead equipment for one site.
- Complete Disposition at one site.

Program Plans FY 2020 – Performance Output Goals

- Award a design contract for three sites.
- Award a construction contract for one site.
- Complete equipment procurement and / or installation at four sites.

Program Plans FY 2021 – Performance Output Goals

- Award a design contract for one site.
- Award construction contracts for two sites.
- Complete equipment procurement and / or installation at five sites.

2B07, ATCT/TERMINAL RADAR APPROACH CONTROL (TRACON) FACILITIES - IMPROVE
FY 2017 Request \$47.7M

- A, Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Modernization, F01.01-00
- B, Facility Realignment Planning, F02.10-01 / X, Facility Realignment Implementation, F02.10-02

A, Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Modernization, F01.01-00

Program Description

The ATCT/TRACON Modernization program upgrades towers and TRACONs to meet operational and safety requirements. The FAA must continually upgrade and improve terminal facilities and equipment to provide an acceptable level of service and to meet current and future operational requirements. Improvements include replacing facility components that are deteriorating such as:

- Waterproofing – Replace/ Renovate building envelop components (e.g., siding, roof, windows, major sealants, parapets, etc.);
- HVAC and Electrical/Mechanical – Replace/Repair HVAC (e.g., replace handling units, condensing units, controls, pumps, boilers, chillers, and roof top units);
- Electrical/Mechanical – (e.g., replacement/repair of electrical power cable, branch circuits and distribution wiring, light fixtures, outlets, etc.);
- Elevators – Replacement/Major refurbishment of elevators;
- Plumbing – Replacement/Repair of facility plumbing system and components;
- Specialties in Operations Areas – Major Replacement/Repair of Tower Cab or TRACON consoles, major renovation of interior spaces, reconfiguration of operational areas;
- Exterior (Civil Components) – Establishment of new access road/parking, major replacement of access road/parking lot, refurbishment of facility grounds, replacement of curbs, walkways, step, railing, etc.; and
- Interior Finishes – Replacement/Repair Interior finishes in Administrative areas (as part of major renovation or restoration projects).

ATCT/TRACON facilities will also be modernized to address operational and safety issues, including upgrading visibility of the entire airport surface, improving accessibility, removing hazardous materials and upgrading structures to meet seismic standards that didn't exist when they were constructed. Facility improvements must be completed with minimal impact on existing operations. An initial evaluation by the U.S. Army Corps of Engineers found that a number of FAA ATCT/TRACON facilities do not meet current seismic code criteria. This program has initiated building improvements to bring the facilities up to a level to withstand a seismic event by complying with the Interagency Committee on Seismic Safety in Construction standards and the "DOT Policy for Seismic Safety of New and Existing DOT Owned or Leased Buildings". This program is included in the ATC Facilities Sustainment Strategic Plan.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The ATCT/TRACON Modernization program upgrades and improves facilities to support the NAS. This program will enable facilities to meet current operational, environmental, seismic, and safety needs more economically than replacing or relocating the entire facility. This effort will result in a smooth and orderly transition of new equipment into FAA terminal facilities, minimizing disruption of the operating system. This program will improve the operational efficiency and environmental systems of obsolete and deteriorated ATCT/TRACON facilities. The

improvements to facility infrastructure such as electrical distribution systems, heating and air-conditioning, and structural problems will extend the service life of facilities and reduce potential outages that would delay air traffic. Facility Condition Index (FCI) values are based on independent facility assessments or extrapolations. The FAA utilizes the FCI to gain insight into the physical plant condition of our facilities and to help us prioritize facility sustainment, modernize and replacement efforts. In FY 2014, FCI ranged from 81 percent to 100 percent for FAA maintained towers and TRACONs.

Program Plans FY 2017-2021 – Performance Output Goals

- Conduct up to 18 planning activities annually (e.g. Life Cycle Assessments, Condition Assessments, etc.) to determine requirements.
- Initiate an average of 50 Improvement projects per year.
- Complete on average 50 Improvement projects per year that were initiated in previous years.

B, Facility Realignment Planning, F02.10-01 / X, Facility Realignment Implementation, F02.10-02

Program Description

These programs conduct congressionally-mandated facility realignment planning and analysis, and manage the implementation of facility realignment recommendations which have been submitted to Congress by the Administrator as a part of the National Facilities Realignment and Consolidation reports.

Facility Realignment Planning (F02.10-01):

The program conducts facility realignment analysis by gathering requirements; collecting inputs from stakeholders; documenting findings; conducting cost-benefit analyses; and developing facility realignment recommendations for the Administrator's review and approval. The Facility Realignment Planning program operates collaboratively with the Air Traffic Organization (ATO), Federal Aviation Administration (FAA), and labor leadership to draft the National Facilities Realignment and Consolidation reports with the facility realignment recommendations, publish the reports in the Federal Register, and submit the reports and public comments to Congress for review.

Facility Realignment Implementation (F02.10-02):

The Facility Realignment Implementation program manages and executes the implementation of facilities and service realignment recommendations by conducting transition planning, and coordinating with ATO and FAA organizations to initiate and complete facility modifications, install necessary equipment, support realignment-related training, and prepare the workforce for the transition of services.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

Facility realignments are expected to deliver cost savings, cost avoidance, and operational efficiencies upon implementation and continue to accrue over time. The cost benefit estimates are developed as a part of facility realignment analysis, validated by finance, and reviewed by the Administrator. The estimates are submitted to Congress by the Administrator as a part of the National Facilities Realignment and Consolidation reports. The magnitude of cost saving and cost avoidance will depend on the number of recommendations approved by the Administrator, submitted to Congress, and approved for implementation.

Program Plans FY 2017 – Performance Output Goals

Facility Realignment Planning (F02.10-01):

- Develop and present preliminary findings of FY 2017 analysis to ATO and FAA leadership.
- Prepare report containing the FY 2017 recommendations of the Administrator on realignment and consolidation of facilities and services with public comments as appropriate.

Facility Realignment Implementation (F02.10-02):

- None.

Program Plans FY 2018 – Performance Output Goals

Facility Realignment Planning (F02.10-01):

- Develop and present preliminary findings of FY 2018 analysis to ATO and FAA leadership.
- Prepare report containing the FY 2018 recommendations of the Administrator on realignment and consolidation of facilities and services with public comments as appropriate.

Facility Realignment Implementation (F02.10-02):

- None.

Program Plans FY 2019 – Performance Output Goals

Facility Realignment Planning (F02.10-01):

- Develop and present preliminary findings of FY 2019 analysis to ATO and FAA leadership.
- Prepare report containing the FY 2019 recommendations of the Administrator on realignment and consolidation of facilities and services with public comments as appropriate.

Facility Realignment Implementation (F02.10-02):

- Develop and execute the transition of facilities and services approved for realignment by the Administrator.

Program Plans FY 2020 – Performance Output Goals

Facility Realignment Planning (F02.10-01):

- Develop and present preliminary findings of FY 2020 analysis to ATO and FAA leadership.
- Prepare report containing the FY 2020 recommendations of the Administrator on realignment and consolidation of facilities and services with public comments as appropriate.

Facility Realignment Implementation (F02.10-02):

- Develop and execute the transition of facilities and services approved for realignment by the Administrator.

Program Plans FY 2021 – Performance Output Goals

Facility Realignment Planning (F02.10-01):

- Develop and present preliminary findings of FY 2021 analysis to ATO and FAA leadership.
- Prepare report containing the FY 2021 recommendations of the Administrator on realignment and consolidation of facilities and services with public comments as appropriate.

Facility Realignment Implementation (F02.10-02):

- Develop and execute the transition of facilities and services approved for realignment by the Administrator.

2B08, TERMINAL VOICE SWITCH REPLACEMENT (TVSR)

FY 2017 Request \$6.0M

Terminal Voice Switch Replacement (TVSR) II, C05.02-00

Program Description

Terminal voice switching systems direct and control voice communications. This allows the air traffic controllers to select from the various communications paths available to connect to desired locations. The controller can communicate with another controller position at his or her own facility, another air traffic control (ATC) facility, or via radio with a properly equipped aircraft.

The TVSR program replaces and sustains aging, obsolete voice switches in ATC Towers and Terminal Radar Approach Controls to ensure controllers continue to have reliable voice communications in the terminal environment. The program consists of several multiyear equipment contracts for voice switches, including: Small Tower Voice Switches, Enhanced Terminal Voice Switches, Rapid Deployment Voice Switches model IIA, Voice Switch Bypass System, and Interim Voice Switch Replacement. This program also establishes contract vehicles with the flexibility for FAA to procure voice switch equipment for new or modernized terminal facilities.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The TVSR program supports the performance metric to sustain operational availability of the NAS by replacing aging electronic switches with modern digital equipment to improve system reliability of terminal voice communications; reducing outages and preventing delays.

Program Plans FY 2017 – Performance Output Goals

- Deliver 1 terminal voice switch to Dallas Fort Worth, TX (DFW).
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

Program Plans FY 2018 – Performance Output Goals

- Deliver approximately 5 terminal voice switches to various FAA facilities.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

Program Plans FY 2019 – Performance Output Goals

- Deliver approximately 5 terminal voice switches to various FAA facilities.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

Program Plans FY 2020 – Performance Output Goals

- Deliver approximately 8 terminal voice switches to various FAA facilities.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

Program Plans FY 2021 – Performance Output Goals

- Deliver approximately 4 terminal voice switches to various FAA facilities.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

System Implementation Schedule

	2015	2020	2025
<p><i>Small-Tower Voice Switches (STVS), Enhanced Terminal Voice Switches (ETVS), Rapid Deployment Voice Switches (RDVS) model IIA, Voice Switch Bypass Systems (VSBP), and Interim Voice Switch Replacement (IVSR).</i></p> <p>First site IOC: 1994 (2006) -- Last site ORD: TBD</p>			

2B09, NAS FACILITIES OSHA AND ENVIRONMENTAL STANDARDS COMPLIANCE

FY 2017 Request \$42.7M

NAS Facilities Occupational Safety and Health Administration (OSHA) & Environmental Standards Compliance, F13.03-00

Program Description

The Air Traffic Organization (ATO) Environmental and Occupational Safety and Health (EOSH) Program is responsible for developing and implementing risk management initiatives that safeguard FAA personnel from occupational hazards and minimize the impact of NAS activities on the environment. The EOSH Program efforts ensure employee health and safety and environmental protection initiatives are founded upon and promote compliance with regulations, internal/external standards, and Collective Bargaining Agreements.

EOSH Program risk management efforts:

- Protect employees and the environment;
- Prevent damage and loss of FAA resources;
- Preserve the NAS mission by limiting interruptions; and
- Promote a culture of Safety and environmental responsibility.

This program is included in the ATC Facilities Sustainment Strategic Plan.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Goal 4 – Empower and Innovate with the FAA’s People.*
- *FAA Performance Metric 1 – The FAA is rated in the top 25 percent of places to work in the federal government by employees. (FAA Business Planning Metric)*

Relationship to Performance Metric

The EOSH Program supports the Performance Metric by improving the safety of the FAA's workplaces and protection of the surrounding environments. The EOSH Program risk management initiatives result in making the FAA a safer and more healthful place to work, enhancing employee morale and contributing to placing the FAA in the top 25 percent of best places to work in the federal government.

Program Plans FY 2017 – Performance Output Goals

- Fall Protection: Upgrade 280 of the 2500 total identified fall protection systems; total remaining 1720/2500.
- Fire Life Safety (FLS): Upgrade 5 of 369 Air Traffic Control Tower FLS Systems; total remaining 16/369.
- FLS: Develop list of Certificate of Occupancy (COO) for all FAA Control facilities; evaluate 20.
- Electrical Safety: Complete assessment of 100 of 457 NAS Facilities; total remaining 289/457.
- Environmental Compliance: Complete environmental compliance evaluations at 9 facilities; total remaining 1325/1334.

Program Plans FY 2018 – Performance Output Goals

- Fall Protection: Upgrade 280 of the 2500 total identified fall protection systems; total remaining 1440/2500.
- FLS: Upgrade 5 of 369 Air Traffic Control Tower FLS Systems; total remaining 11/369.
- FLS: Complete COO for 20 of 314 FAA control facilities; total remaining 294/314.
- Electrical Safety: Complete assessment of 10 of 457 NAS Facilities; total remaining 279/457.
- Environmental Compliance: Complete environmental compliance evaluations at 9 facilities; total remaining 1316/1334.

Program Plans FY 2019 – Performance Output Goals

- Fall Protection: Upgrade 280 of the 2500 total identified fall protection systems; total remaining 1160/2500.
- FLS: Baseline adjustment ATCT FLS upgrades (369) to Fire Protection Systems Technology Refresh list (250).
- FLS: Complete 10 of 250 Fire Protection System Technology Refreshes; total remaining 240/250.
- FLS: Complete COO for 30 of 314 FAA control facilities; total remaining 264/314.
- Electrical Safety: Complete assessment of 10 of 457 NAS Facilities; total remaining 269/457.
- Environmental Compliance: Complete environmental compliance evaluations at 9 facilities; total remaining 1307/1334.

Program Plans FY 2020 – Performance Output Goals

- Fall Protection: Upgrade 280 of the 2500 total identified fall protection systems; total remaining 880/2500.
- FLS: Complete 15 of 250 Fire Protection System Technology Refreshes; total remaining 210/250.
- FLS: Complete COO for 50 of 314 FAA control facilities; total remaining 214/314.
- Electrical Safety: Complete assessment of 10 of 457 NAS Facilities; total remaining 259/457.
- Hearing Conservation: Achieve 95% enrollment of identified employees with potential work area greater than 85 dBA.
- Environmental Compliance: Complete environmental compliance evaluations at 9 facilities; total remaining 1298/1334.

Program Plans FY 2021 – Performance Output Goals

- Fall Protection: Upgrade 280 of the 2500 total identified fall protection systems; total remaining 600/2500.
- FLS: Complete 15 of 250 Fire Protection System Technology Refreshes; total remaining 210/250.
- FLS: Complete COO for 50 of 314 FAA control facilities; total remaining 164/314.
- Electrical Safety: Complete assessment of 10 of 457 NAS Facilities; total remaining 249/457.
- Environmental Compliance: Complete environmental compliance evaluations at 9 facilities; total remaining 1289/1334.

2B10, AIRPORT SURVEILLANCE RADAR (ASR-9)

FY 2017 Request \$4.5M

**Airport Surveillance Radar Model-9 (ASR-9) Service Life Extension Program (SLEP),
Phase 2, S03.01-09**

Program Description

The ASR-9 SLEP Phase 2 program will implement modifications to the ASR-9 system to sustain primary radar surveillance in terminal airspace. Without the needed modifications, the ASR-9 system will experience decreasing reliability, lower availability, and increasing supportability risk due to the limited commercial availability of some critical components. The ASR-9 was procured in the mid-1980s, fielded between 1989 and 1994, and is intended to remain operational until replacement begins in 2025. The ASR-9 uses hardware and software architectures that are becoming obsolete. The SLEP will procure Digital Remote Surveillance Communication Interface Processor Replacement (DRSR) systems, Transmitter Backplanes, and Radar Data Access Point (RDAP), and replenishment of depot inventory of critical components.

The ASR-9 provides aircraft position and weather information to air traffic controllers. An accurate depiction of this information is a key element in reducing delays and improving safety at high activity airports. The ASR-9 tracks all aircraft within its range and provides those tracks, as well as six-level weather intensity information to terminal automation systems so it can be displayed on the controller's screen. The ASR-9 also provides data to the Airport Movement Area Safety System (AMASS) and to the Airport Surface Detection Equipment – model X (ASDE-X) to aid in the prevention of accidents resulting from runway incursions. The sustainment of the ASR-9 aligns with the NAS Enterprise Architecture Surveillance Roadmap, and the Surveillance and Broadcast Services (SBS) / Automatic Dependent Surveillance Broadcast (ADS-B) backup strategy.

The SLEP Phase 2 Final Investment Decision (FID) was approved on June 27, 2012 to address obsolescence and supply/support issues of system Lowest Replaceable Units (LRUs) and components within the ASR-9 system.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

Currently ASR-9 systems are functioning at an operational availability of 99.3 percent, which does not meet the FAA Performance Metric. Also, the current operational availability of 99.34 percent is below the ASR-9 specifications of 99.9 percent. The ASR-9 service life extension program reduces the risk of unscheduled outages, ensures continuation of service and will improve operational availability.

Program Plans FY 2017 – Performance Output Goals

- Complete installation of DRSR units at 40 TRACONs (130 of 154, 84%).
- Complete installation of the Transmitter Backplanes in 66 ASR-9 systems (100 of 135, 74%).

Program Plans FY 2018 – Performance Output Goals

- Complete installation of DRSR units at 24 TRACONs (154 of 154, 100%).
- Complete installation of the Transmitter Backplanes in 35 ASR-9 systems (135 of 135, 100%).

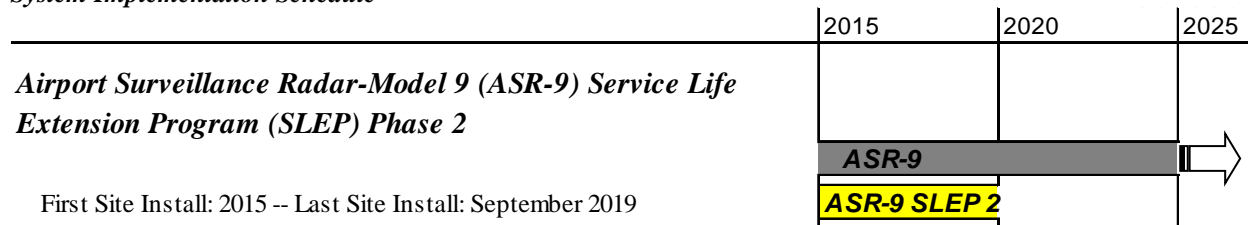
Program Plans FY 2019 – Performance Output Goals

- Installation at last site completed, September 2019. (APB Milestone) (Prior year funding)

Program Plans FY 2020-2021 – Performance Output Goals

- None.

System Implementation Schedule



2B11, TERMINAL DIGITAL RADAR (ASR-11) TECHNOLOGY REFRESH AND MOBILE AIRPORT SURVEILLANCE RADAR (MASR)

FY 2017 Request \$6.1M

- A, Airport Surveillance Radar Model-11 (ASR-11) – Technology Refresh, Segment 2, S03.02-05 / X, Airport Surveillance Radar Model-11 (ASR-11) – Technology Refresh, Segment 3, S03.02-07
- B, Airport Surveillance Radar Model-11 (ASR-11) – Mobile Airport Surveillance Radar (MASR), S03.02-06

A, Airport Surveillance Radar Model-11 (ASR-11) – Technology Refresh, Segment 2, S03.02-05 / X, Airport Surveillance Radar Model-11 (ASR-11) – Technology Refresh, Segment 3, S03.02-07

Program Description

The ASR-11 Technology Refresh program replaces and upgrades obsolete ASR-11 Commercial Off-The-Shelf (COTS) hardware and software to ensure the continued reliable and cost effective operation of the radar system through its designated lifecycle. This is an ongoing program to address obsolescence and maintenance issues and will be accomplished in sequential 5-year segments.

ASR-11 Technology Refresh Segment 2 (S03.02-05):

The ASR-11 Technology Refresh Segment 2 is structured to address the following shortfalls identified in the Segment 2 Shortfall Analysis Report:

- Site Control Data Interface (SCDI) /Operator Maintenance Terminal (OMT) obsolescence
- Uninterruptible Power Supply (UPS) capacitor at end of life expectancy

The objective of the Segment 2 program is to insure continued reliable and cost effective operation of the radar system through its designated lifecycle. The Segment 2 Investment Analysis Readiness Decision (IARD) was approved in November 2012 and the Final Investment Decision (FID) was achieved in December 2013.

ASR-11 Technology Refresh Segment 3 (S03.02-07):

The ASR-11 Technology Refresh Segment 3 will address parts obsolescence, operational performance deficiencies, or other areas requiring technology refresh to ensure continued reliable and cost effective operation of the radar system through its designated lifecycle. The Segment 3 IARD is planned for September 2019 and the FID is planned for September 2020. Future ASR-11 Technology Refreshes are dependent on decisions for Next Generation Surveillance and Weather Radar Capability (NSWRC), which has a planned FID in December 2020.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

Currently ASR-11 systems are functioning at an operational availability of 99.5 percent, which is below the FAA performance metric of 99.7 percent. The ASR-11 Technology Refreshment program replaces obsolete hardware within the system to resolve the problem of loss of operational availability when a repair or replacement is needed.

Program Plans FY 2017 – Performance Output Goals

ASR-11 Technology Refresh Segment 2 (S03.02-05):

- Complete Operational Test & Evaluation (OT&E). (APB milestone)
- Certify first site for operational use for SCDI replacement. (APB milestone)
- Achieve In-Service Decision. (APB milestone)
- Certify for operational use for SCDI replacement, 25% complete.

ASR-11 Technology Refresh Segment 3 (S03.02-07):

- None.

Program Plans FY 2018 – Performance Output Goals

ASR-11 Technology Refresh Segment 2 (S03.02-05):

- Certify for operational use for SCDI replacement, 50% complete.

ASR-11 Technology Refresh Segment 3 (S03.02-07):

- None.

Program Plans FY 2019 – Performance Output Goals

ASR-11 Technology Refresh Segment 2 (S03.02-05):

- Certify for operational use for SCDI replacement, 75% complete. (Prior year funds)

ASR-11 Technology Refresh Segment 3 (S03.02-07):

- Complete draft Implementation Strategy and Planning Document (ISPD).
- Complete draft Business Cases Analysis Report (BCAR).
- Achieve IARD.

Program Plans FY 2020 – Performance Output Goals

ASR-11 Technology Refresh Segment 2 (S03.02-05):

- Certify last site for operational use for SCDI replacement, 100% complete. (APB milestone) (Prior year funds)

ASR-11 Technology Refresh Segment 3 (S03.02-07):

- Complete final BCAR.
- Complete final ISPD.
- Achieve FID.
- Award contract.

Program Plans FY 2021 – Performance Output Goals

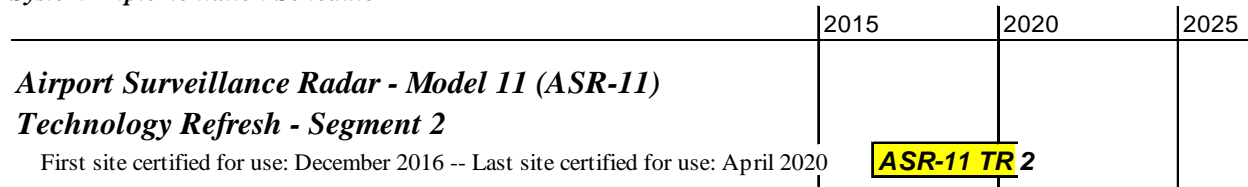
ASR-11 Technology Refresh Segment 2 (S03.02-05):

- None.

ASR-11 Technology Refresh Segment 3 (S03.02-07):

- Output goals will be determined at FID.

System Implementation Schedule



B, Airport Surveillance Radar Model-11 (ASR-11) – Mobile Airport Surveillance Radar (MASR), S03.02-06

Program Description

The MASR is a terminal surveillance radar capability that can be moved from site to site to support radar relocations, temporary planned outages to accommodate installation of upgrades to an existing radar, and emergency operations when existing systems are damaged. This system includes both primary and secondary radar systems that will have the performance capabilities of existing systems and be compatible with all ATCTs, TRACONS, ARTCCs, and their associated automation systems. Loss of primary and secondary surveillance products due to either catastrophic events or long term outages would have a negative impact on FAA's mission capabilities; specifically in the areas of controller situational awareness, safety and capacity. The MASR can be transported by truck, rail, or ship, and installed and certified operational in as few as five days.

The MASR system architecture will support a reusable, service-oriented capability providing terminal surveillance efficiently and quickly. The system will have interfaces for power, mechanical, data, and remote monitoring and control. It will be designed to function as an existing ASR-8, ASR-9 or ASR-11 terminal radar as needed and be interoperable with each of their associated automation interfaces.

The program will be refurbishing two ASR-9 and two Mode S systems and will procure two mobile ASR-11 systems.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The MASR investment will provide a capability that can be installed quickly to maintain operational availability at the goal levels during periods of planned or unplanned outages of terminal surveillance radars.

Program Plans FY 2017 – Performance Output Goals

- In Service Decision for Mobile ASR-11 by December 2016. (APB milestone)

Program Plans FY 2018-2021 – Performance Output Goals

- None.

2B12, RUNWAY STATUS LIGHTS (RWSL)

FY 2017 Request \$4.8M

Runway Status Lights (RWSL) – Implementation – Phase 1, S11.01-02 / X, Runway Status Lights (RWSL) – Technology Refresh & Disposition, S11.01-04

Program Description

The RWSL system integrates runway lighting equipment with approach and surface surveillance systems to provide a visual signal to pilots and vehicle operators indicating when it is unsafe to enter/cross or begin takeoff on the runway. The system is fully automated based on inputs from surface and terminal surveillance systems. Airport surveillance sensor inputs are processed through light control logic that commands in-pavement lights to illuminate red when there is traffic on or approaching the runway. Runway Entrance Lights provides this signal to aircraft planning to cross or enter a runway from an intersecting taxiway. Takeoff Hold Lights provide a signal to aircraft in position for takeoff.

Runway Status Lights (RWSL) – Implementation – Phase 1 (S11.01-02):

The RWSL program received a Final Investment Decision in 2010 from the JRC for 23 operational and three support sites. In July 2013, the FAA re-scoped the program to 17 airports. Additional airports will be considered in the near future for runway safety enhancements. Runway Status Lights systems are operational at Orlando International Airport, Washington Dulles International, Phoenix—Sky Harbor, George Bush International, Minneapolis St. Paul International, Seattle-Tacoma International, Charlotte Douglas International, Las Vegas McCarran International, Ft. Lauderdale/Hollywood Airport, Los Angeles International Airport, LaGuardia Airport and Detroit Metro Wayne County Airport. The FAA plans to have all RWSL systems operational by 2017.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):

The RWSL Technology Refresh program will assess the need to replace and upgrade obsolete Commercial Off-the-Shelf (COTS) hardware and software to ensure the continued reliable and cost effective operation of the system through its designated lifecycle. The RWSL was procured in late 2008, fielded between 2009 and 2017, and is intended to remain operational until replacement begins in 2026. The program is on track for an Investment Analysis Readiness Decision (IARD) by March 2018 and the Final Investment Decision (FID) by March 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 4 – Reduce Category A & B (most serious) runway incursions to a rate of no more than 0.395 per million operations, and maintain or improve through FY 2018.*

Relationship to Performance Metric

Runway incursions pose a significant safety issue. The installation of RWSL will contribute toward reducing the rate of runway incursions by indicating to pilots and vehicle operators the existence, or imminent risk, of a conflict if they cross the hold line for a runway. RWSL also warn pilots or vehicles to stop at the hold line if an aircraft on the runway begins its takeoff. The FY 2014 RWSL projected benefits include a reduction in cumulative A&B runway incursions at the 17 RWSL airports by ~17% (from 9.68 in baseline to 8.02 with RWSL); and a reduction in cumulative runway incursions caused by Pilot Deviations by ~22% (from 41.03 in baseline to 32.17 with RWSL).

Program Plans FY 2017 – Performance Output Goals

Runway Status Lights (RWSL) – Implementation – Phase 1 (S11.01-02):

- Achieve IOC at two of 17 (100%) operational sites.
- Achieve Operational Readiness Date (ORD) at three, including 17th and last, operational sites. (APB Milestone)
- Complete ORD at San Francisco International Airport.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):

- None.

Program Plans FY 2018 – Performance Output Goals

Runway Status Lights (RWSL) – Implementation – Phase 1 (S11.01-02):

- Conduct contract close-out activities.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):

- None.

Program Plans FY 2019 – Performance Output Goals

Runway Status Lights (RWSL) – Implementation – Phase 1 (S11.01-02):

- None.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):

- None.

Program Plans FY 2020-2021 – Performance Output Goals

Runway Status Lights (RWSL) – Implementation – Phase 1 (S11.01-02):

- None.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):

- Milestones will be developed at FID.

System Implementation Schedule



2B13, NEXTGEN – NATIONAL AIRSPACE SYSTEM VOICE SYSTEM (NVS)

FY 2017 Request \$48.4M

NAS Voice System (NVS) – Demonstration & Qualification, G03C.01-01 / X, NAS Voice System (NVS) – Deployment, G03C.01-02

Program Description

The NVS program will replace legacy voice switches at both En Route and Terminal facilities. It will be a critical component of the ATC infrastructure providing connectivity for efficient communications between air traffic controllers, pilots, and ground personnel by connecting both incoming and outgoing communication lines to the

controller's workstation. Using a panel at their workstation, controllers will be able to select the lines needed to communicate with pilots, other controllers, and other facilities.

The current voice system technology deployed in the NAS will not support the future NextGen concept of operations for capabilities such as networked facilities, dynamic resectorization (expanding or contracting a controller's volume of airspace electronically), and off-loading selected sector control to other facilities during non-peak operations, e.g., at night. These capabilities require that communication lines connected to a controller's workstation panel be automatically configured to add or remove lines as the geographical boundaries of the sector change. The NVS program will have the capacity to support both current and future ATC operations.

NVS will replace the service currently provided by 11 different voice switch configurations including Terminal Voice Switches and the En Route Voice Switching and Control System. The focus of NVS will be on designing a replacement system that can be scaled to facility size using standardized components that will reduce both maintenance and parts inventory costs.

The NVS program will be implemented in two segments; Demonstration and Qualification (formerly referred to as Segment 1), and Deployment (formerly referred to as Segment 2). This approach will minimize risk and ensure the new switches will comply with agency requirements.

NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):

The Demonstration and Qualification segment provided funding to award the NVS contract in August 2012 to procure prototypes and conduct demonstrations of the basic functionality and NextGen capabilities. Demonstrations were successful and the program received a Final Investment Decision (FID) for NAS qualification from the Joint Resources Council (JRC) in September 2014. The NAS Qualification phase consists of the development and testing of a production-ready system capable of being deployed in the NAS operational environment, including a three article test systems and three Key Site systems. The program will return to the JRC in FY 2017 to request FID for deployment funding at operational facilities beyond key sites.

NAS Voice System (NVS) – Deployment (G03C.01-02):

The Deployment segment consists of NVS deployments at operational facilities beyond key sites. The NVS deployment schedule will be finalized for the FY 2017 JRC FID for deployment.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The NVS program supports the average daily airport capacity metric by providing an architecture that can handle future growth and load-sharing within a flexible network. NVS will support the NextGen concept of operations for networked facilities, dynamic resectorization and off-loading selected sector control to other facilities during non-peak operations. These capabilities will improve operational efficiency by better balancing workload in response to demand changes.

Program Plans FY 2017 – Performance Output Goals

NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):

- Complete Factory Acceptance Test (FAT) of test article systems.
- Complete Training Development Plan.
- Achieve FID for deployment funding at operational facilities beyond key sites.

NAS Voice System (NVS) – Deployment (G03C.01-02):

- None.

Program Plans FY 2018 – Performance Output Goals

NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):

- Complete Functional and Physical Configuration Audits of test article systems. (APB milestone)
- Deliver first, second, and third article test systems to the William J. Hughes Technical Center (WJHTC) and Mike Monroney Aeronautical Center (MMAC).

NAS Voice System (NVS) – Deployment (G03C.01-02):

- None.

Program Plans FY 2019 – Performance Output Goals

NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):

- Complete Operational Test and Evaluation of test systems at WJHTC and MMAC. (APB milestone)
- Deliver key site systems and initiate key site testing. (APB milestone)
- Complete Initial Operating Capability (IOC) at first key site. (APB milestone)

NAS Voice System (NVS) – Deployment (G03C.01-02):

- Order NVSs in accordance with the FY 2017 FID deployment schedule.

Program Plans FY 2020 – Performance Output Goals

NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):

- Complete In-Service Decision at first key site. (APB milestone)

NAS Voice System (NVS) – Deployment (G03C.01-02):

- Order, deliver and install NVSs in accordance with the FY 2017 FID.

Program Plans FY 2021 – Performance Output Goals

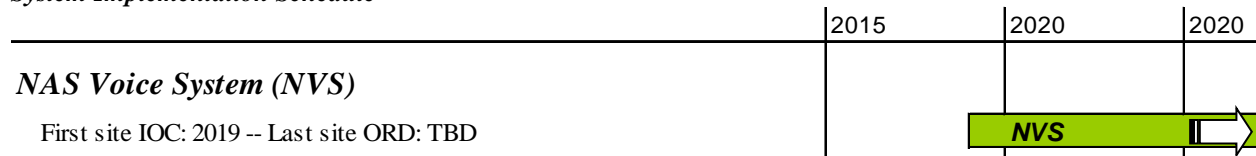
NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):

- None.

NAS Voice System (NVS) – Deployment (G03C.01-02):

- Order, deliver and install NVSs in accordance with the FY 2017 FID.

System Implementation Schedule



2B14, INTEGRATED DISPLAY SYSTEM (IDS)

FY 2017 Request \$7.7M

- A, Integrated Display Systems (IDS) – Replacement, A03.05-01 / Integrated Display Systems (IDS) – Replacement – Technology Refresh, A03.05-02
- B, Enterprise Information Display System (E-IDS), A03.05-03

A, Integrated Display Systems (IDS) – Replacement, A03.05-01 / Integrated Display Systems (IDS) – Replacement – Technology Refresh, A03.05-02

Program Description

The Integrated Display Systems (IDS) program provides rapid retrieval and display of a wide range of weather, operational support, and administrative information for air traffic controllers and other required users in the terminal environment. IDS consolidates operational information to provide a tool for the exchange of information that impacts control of air traffic. The presentation of multiple sources of data on a single display allows for decision making by controllers which increases operational efficiency. The FAA currently has 2,230 IDS-4 workstations

located at approximately 390 FAA facilities nationwide. Recent obsolescence issues and loss of proprietary software support make it necessary to replace this system to sustain its functionality.

IDS Replacement (A03.05-01):

The IDS Replacement program modernizes the IDS-4 system with current technology at 71 existing IDS-4 networks including 1,944 IDS-4 workstations at 256 sites. The prime contract was awarded in May 2010 and design efforts were completed in late 2011. The program was rebaselined in March 2013. The first deployment occurred in 2013 and the last will be in 2017.

IDS Replacement – Technology Refresh (A03.05-02):

The IDS-4 is being replaced with a state-of-the-art system comprised mainly of Commercial-Off-The-Shelf (COTS) components. As with most COTS based systems, a technology refresh of the replacement components is required to sustain system services. The FAA plans to perform a system analysis in FY 2016, approximately 5 years after original COTS components were acquired, to identify affected components before they are no longer replaceable due to obsolescence.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The IDS-4 is experiencing supportability issues with the existing stock levels of motherboards within the IDS-4 computers. The current rate of motherboards beyond economic repair being returned to the FAA Logistics Center is 21%. Commercial sources for IDS-4 compatible computers/motherboards for long term support are not available. By replacing the legacy IDS-4 systems with state-of-the-art equipment, outages are reduced, thereby reducing delays at the 390 FAA facilities nationwide, including 30 core airports.

Program Plans FY 2017 – Performance Output Goals

IDS Replacement (A03.05-01):

- Achieve Initial Operating Capability (IOC) at 21 networks by end of FY 2017 (71 of 71, 100%).
- Achieve Last Site ORD. (APB milestone)

IDS Replacement – Technology Refresh (A03.05-02):

- Complete system analysis for technology refresh of hardware to replace obsolete components.

Program Plans FY 2018 – Performance Output Goals

IDS Replacement (A03.05-01):

- Begin In-Service Management transition.

IDS Replacement – Technology Refresh (A03.05-02):

- None.

Program Plans FY 2019 – Performance Output Goals

IDS Replacement (A03.05-01):

- Complete In-Service Management transition.

IDS Replacement – Technology Refresh (A03.05-02):

- None.

Program Plans FY 2020-2021 – Performance Output Goals

IDS Replacement (A03.05-01):

- None.

IDS Replacement – Technology Refresh (A03.05-02):

- None.

System Implementation Schedule



B, Enterprise Information Display System (E-IDS), A03.05-03

Program Description

The Enterprise Information Display System (E-IDS) will replace obsolete standalone Information Display System (IDS) workstations. These displays are separate from the controller primary displays, and their purpose is to provide controllers with supplemental but operationally essential information for controlling aircraft. Other operators who also rely on IDSs include Front Line Managers, Traffic Management Coordinators, and Technical Operations personnel. There are 6 different types of information display systems currently installed at controller and traffic management positions in large FAA Terminal Radar Approach Control (TRACON), Tower, and Air Route Traffic Control Center (ARTCC) facilities. E-IDS will replace the legacy systems in all these facilities and will add E-IDS system displays at Oceanic controller positions in ARTCCs. Additionally, E-IDS will be provided for administrative use by the TechOps maintenance technicians in TRACONs and ARTCCs.

Access to trusted information sources varies from facility to facility depending upon the IDS model and whether the facility has a direct interface to source data. In some cases vendor supplied information may be the only source available. E-IDS will eliminate differences in the information displayed by obtaining it from trusted sources through the System Wide Information Management (SWIM) program. This information will include: (a) real-time weather, Notices to Airmen (NOTAM), and Pilot Reports, (b) 56-day static digital information (e.g. charts, approach plates, etc.), and (c) administrative information. E-IDS will be an integrated system that uses a common enterprise-based server to collect, store, update, and provide information to thousands of client displays in the field rather than require that each IDS collect, store and update its own information.

The E-IDS system will:

- Combine duplicate management activities under an overarching program;
- Provide capabilities needed to meet NextGen era technologies that cannot be met by today’s IDSs; and
- Provide efficient data access and data management that is not possible with aging IDS systems.

E-IDS will interface with and display data to the air traffic controller from legacy systems like Automated Surface Observing System (ASOS), Automated Weather Sensors System, Digital Altimeter Setting Indicator, Low Level Wind Shear Alert System, Terminal Doppler Weather Radar, and Wind Measuring Equipment. It will also provide the platform to display data from future programs and systems under development such as the Aeronautical Common Service and NextGen Weather Processor.

The scope of E-IDS includes the following:

- replace aging platforms with a central (cloud services) capability;
- create different Computer Human Interface capabilities for individual facilities based upon common functionality and training;
- consolidate information that appears on different sensor readouts onto the E-IDS display;
- integrate existing and future (NextGen FIXM, AIXM, WXXM) data formats;
- employ modern NAS interfaces, NextGen infrastructure, and trusted (authoritative) data sources; and
- reduce cost of training and maintenance by replacing multiple disparate legacy IDSs with a single system.

The following information is (or will be) displayed on E-IDS:

- Dynamic Information
 - NOTAM
 - Special Activity Airspace (SAA)-Schedule and Status
 - Pilot Reports (PIREPS)
 - Weather and Wind
 - Tower sensor data
 - Traffic Management Initiatives (Ground/Departure Stops, Snow Removal, Miles in Trail, etc.)
- Static Information
 - Charts
 - Approach Plates
 - Orders (e.g., FAA 7110.65-Controller's bible)
 - Standard Operating Procedures (SOPs)
 - Letters of Agreement (LOAs)

JRC approval of the Initial Investment Decision (IID) is planned for March 2017, and approval of Final Investment Decision (FID) is planned for March 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Target

The E-IDS will provide controllers, front line managers, traffic managers, and maintenance personnel with the full range of information including aeronautical, weather, and administrative information affecting all phases of flight to assist in efficiently managing airspace. This will improve the use of airspace capacity by reducing voice coordination between operators to resolve differences in reported information.

Program Plans FY 2017 – Performance Output Goals

- Conduct site information surveys to verify the quantity of displays and their data sources/interfaces.
- Complete the following final products in support of the IID:
 - Revise Shortfalls Analysis
 - Alternatives Analysis
 - Initial Business Case Definition (each alternative)
 - Initial Program Requirements (update pPR)
 - Initial Implementation Strategy and Planning Document (ISPD)
 - Safety Assessment
 - Initial Affordability Analysis
 - NAS Enterprise Architecture Products
 - Concept Engineering execution (i.e., HF and technical analysis; prototyping)
- Achieve IID for E-IDS.
- Complete the following draft products in support of the FID:
 - Final Program Requirements documentation;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).

Program Plans FY 2018 – Performance Output Goals

- Complete the following final products in support of the FID:
 - Final Program Requirements documentation;
 - NAS Enterprise Architecture Products;
 - Business Case documentation;
 - Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Complete preparations for Contract Award towards FID:
 - Assess vendor Request For Proposals;
 - Modify vendor proposal relative to cost, technical and management; and
 - Finalize vendor negotiations and obtain final proposal.
- Achieve FID for E-IDS.
- Award contract.
- Other output goals will be determined at FID.

Program Plans FY 2019 – Performance Output Goals

- Generate System Specification Document (SSD) based on Final PRD.
- Assess schedule dependency risks related to SWIM product services: ASOS Controller Equipment (ACS), Common Support Services-Weather (CSS-Wx), and Digital Pubs.
- Review and provide changes to vendor Detailed Specification and Plans, (Management Plan, Engineering Plan, Development Plan, Test Plan & Procedures).
- Complete review of preliminary design documents and attend Preliminary Design Reviews to assure satisfaction of Specifications.
- Collaborate with and conduct 1st tier site installation surveys at 20 of 511 sites scheduled for 2021 installation (3 TRACONs & 17 ATCT Key Sites).

Program Plans FY 2020 – Performance Output Goals

- Complete review of critical design documents and attend Preliminary Design Reviews to assure satisfaction of preliminary Design and Specifications.
- Review Factory Test results, problem reports and problem fixes.
- Conduct prototype testing at the FAA Technical Center.
- Review WJHTC test results, problem reports and problem fixes.
- Assess prototype performance risks and identify mitigations.
- Collaborate with and conduct 2nd tier site installation surveys at 60 of 511 sites scheduled for 2022 installations (3 ARTCC & 3 CERAP Key Sites plus 7 TRACONs & 47 ATCTs).

Program Plans FY 2021 – Performance Output Goals

- Deploy 1st tier systems and conduct Key Site testing: replace IDS-4s / ACE-IDSs at 3 TRACONs and 17 ATCTs.
- Review 1st tier Key Sites test results, problem reports and problem fixes.
- Prepare for readiness to deploy 2nd tier systems by reviewing 1st tier system release documentation to ensure differences in capabilities are satisfied (e.g., database, human factors, SWIM & direct interfaces).
- Install and conduct factory testing of the system release configuration for 2nd tier deployment in FY 2022.
- Assess 2nd tier system configuration risks and identify mitigations prior to deploying in FY 2022.
- Collaborate with and conduct 3rd tier site installation surveys at 96 of 511 sites scheduled for 2023 installations (7 ARTCCs, 15 TRACONs & 74 ATCTs).

2B15, REMOTE MONITORING AND LOGGING SYSTEM (RMLS)

FY 2017 Request \$9.9M

- Remote Monitoring and Logging System (RMLS) – Technology Refresh, M07.04-02
- X, Automated Maintenance Management System (AMMS), M07.05-01

Remote Monitoring and Logging System (RMLS) – Technology Refresh, M07.04-02

Program Description

The RMLS Technology Refresh program will extend the service life of RMLS hardware and software located at the National Operations Control Center (NOCC), Atlantic Operations Control Center (AOCC), Mid-States Operations Control Center (MOCC), Pacific Operations Control Center (POCC), Southern California TRACON (SCT), the William J. Hughes Technical Center (WJHTC), ARTCCs, and the Combined Center Radar Approach Control (CERAP) in Hawaii. Technology refresh began in FY 2015 and is scheduled to be completed in FY 2022. RMLS Technology Refresh replaces the commercial off the shelf (COTS) components of the RMLS.

The RMLS is used for generating, quantifying, analyzing, measuring, and reporting maintenance information. It also reports error levels, maintenance responsiveness, and utilization levels of NAS components, systems, and services. The RMLS maintenance information is used by the FAA to:

- Analyze trends and improve performance;
- Make investment decisions and support budget requests for replacement, relocation, or modification of existing equipment;
- Detect supportability problems;
- Evaluate the efficiency and effectiveness of the overall maintenance program; and
- Provide reports to Congress and FAA management.

RMLS improves the effectiveness of Technical Operations Services (Tech Ops) maintenance processes and practices. The RMLS oversees the entire event management life cycle, from generation of the initial event through assignment, updates, and event closure. The National Logging Network (NLN) subsystem performs maintenance monitoring and logging functions; the National Remote Maintenance Monitoring (RMM) Network (NRN) subnetwork performs monitoring and control of NAS devices function. RMLS is responsible for routing status messages to field operators, as well as routing commands to NAS devices.

RMLS Technology Refresh will upgrade core components to meet the agency's growing need for data storage and bandwidth throughput, and will provide security updates for full network separation between the non-NAS (Mission Support) and NAS (Operations).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The RMLS Technology Refresh supports the FAA operational availability performance metric by upgrading the systems used for generating, quantifying, analyzing, measuring, and reporting maintenance information to determine operational availability. RMLS maintains NAS availability by providing warnings of deteriorating system performance and allowing maintenance staff to respond quickly to outages and other performance issues.

Program Plans FY 2017 – Performance Output Goals

- Complete design, development, and testing at WJHTC Integration Testing/Operational Testing (IT/OT) for NLN implementation at OCCs.

Program Plans FY 2018 – Performance Output Goals

- Complete Operational Test & Evaluation (OT&E) for NLN. (APB milestone)
- Complete deployment of the following at NAS Enterprise Security Gateway (NESG) in Atlanta and Salt Lake City:
 - 12 presentation servers
 - 4 proxy servers
- Complete deployment of the following at POCC, MOCC, AOCC, NOCC:
 - Eight Database (DB) servers
 - Four Storage array
 - Eight DB switches
 - Sixteen presentation servers
 - Sixteen windows management servers
- Complete deployment of the following at POCC, MOCC, AOCC:
 - Twelve Monitor/Message Servers
 - Six DB Servers
 - Three Trace Servers
 - Six Preventive Maintenance Servers
 - Six FTI/OPS Switches
- Complete deployment of the following at POCC, MOCC, AOCC:
 - Six Management Servers
 - Six Load Balancers
 - Three Commercially Available Software/Citrix windows
 - Perform site preparation

Program Plans FY 2019 – Performance Output Goals

- Complete key site acceptance test for NLN at first Operations Control Center. (APB milestone)
- Complete design, development, and testing at WJHTC Integration Testing/Operational Testing/Operational Testing 2 (IT/OT/OT2) for NRN implementation at ARTCCs.

Program Plans FY 2020 – Performance Output Goals

- Complete key site IOC for NLN at first OCC. (APB milestone)
- Complete Operational Test & Evaluation (OT&E) for NRN. (APB milestone)
- Complete deployment of the following at NOCC for the Data Repository (DR/OPS) and Oklahoma City (OKC Training):
 - Three DB Servers
 - Five Presentation Servers
 - Five Windows Management Servers
 - Three System Management Servers
 - Two Storage Array
 - Three DB Switches
 - Three Core Switches
 - Three Load Balancers
 - Three Firewall Appliances w/IDS
 - Two High Capacity Tape Library
 - Five Monitor/Message Servers
 - Three DB Servers
 - Two Trace Servers
 - Three Protocol Management Servers
 - Three FTI/OPS Switches
- Complete deployment of the following at NOCC for the Data Repository (DR/OPS):
 - Two Management Servers

- Complete deployment of the following at Oklahoma City (OKC Training):
 - Two Protocol Converter and Software Licenses
 - Four Protocol Converter Servers
 - Two Rack Management Server
 - Two Network Switches
 - Two Keyboard Video Mouse (KVM)/Terminal Switch
- Complete deployment of the following at Seattle ARTCC (ZSE):
 - Three Protocol Converter and Software Licenses
 - Four Protocol Converter Servers
 - One Rack Management Server
 - Four Network Switches
 - One KVM/Terminal Switch
- Complete deployment of the following at Southern California TRACON (SCT), Anchorage ARTCC (ZAN), Honolulu (ZHN), Salt Lake ARTCC (ZLC), Oakland ARTCC (ZOA) and Denver ARTCC (ZDV):
 - Twelve Protocol Converter and Software Licenses
 - Eighteen Protocol Converter Servers
 - Six Rack Management Server
 - Twelve Network Switches
 - Six KVM/Terminal Switch

Program Plans FY 2021 – Performance Output Goals

- Complete Key site Acceptance Test for NRN at first ARTCC. (APB milestone)
- Complete Key Site Initial Operational Capability (IOC) for NRN at first ARTCC. (APB milestone)
- Achieve In-Service Decision. (APB milestone)
- Complete deployment of the following at Los Angeles ARTCC (ZLA), Jacksonville ARTCC (ZJK), Memphis ARTCC (ZME), Miami ARTCC (ZMA), New York ARTCC (ZNY), Boston ARTCC (ZBW), Atlanta ARTCC (ZTL) and Washington ARTCC (ZDC):
 - Twenty Protocol Converter and Software Licenses
 - Twenty eight Protocol Converter Servers
 - Eight Rack Management Server
 - Twenty two Network Switches
 - Eight KVM/Terminal Switch

System Implementation Schedule

	2015	2020	2025
Remote Monitoring Logging System (RMLS) Technology Refresh			
RMLS Technology Refresh: FY 2015 - FY 2022	RMLS TR		

X, Automated Maintenance Management System (AMMS), M07.05-01

Program Description

The ability to efficiently manage the maintenance of FAA’s equipment and systems is critical to the operation of the NAS. Current stand-alone maintenance systems and processes are labor intensive with limited automated capability. AMMS will allow for the interfacing of maintenance systems through a Service-Oriented Architecture environment utilizing SWIM to create an enterprise infrastructure for sharing data between dispersed maintenance systems. This supports the Risk Based Decision Making initiative through the increased sharing of safety data among FAA organizations. AMMS will develop common enterprise data services for maintenance data and implement data standards for the exchange of data between services, systems and equipment. AMMS will develop common enterprise data services for maintenance data. AMMS will deliver advanced automated maintenance tools that will

provide improved data integrity and increased situational awareness and enable maintenance practices based upon Reliability Centered Maintenance.

AMMS will be implemented in segments consisting of a series of data exchanges between services, systems, and equipment. As these interfaces are established, the exchange of data will be standardized, authoritative data sources will be identified and data exchange services through SWIM will be utilized. AMMS will allow existing maintenance systems to evolve and improve current functionality by focusing on services, systems, and equipment comprising of data related, but not limited to the following categories:

- Maintenance logging Information
- Event coordination Information
- Scheduling Information
- Logistics Information
- Administrative Information
- Safety Information
- Enterprise Monitored NAS Information

The first segment of AMMS will focus on improvements within the maintenance logging, event coordination, and scheduling functionality within maintenance tools. The integration of maintenance logs, event coordination data, Flight Check scheduling data, and NOTAM data will be achieved. Air Traffic Control System Specialists, along with Operations Control Center Specialist, will have an enhanced maintenance logging and event coordination tool.

AMMS will improve maintenance capabilities by automating the following:

- Related maintenance logs to a single maintenance event;
- NOTAM data to an associated maintenance event;
- Scheduling of corrective and periodic maintenance activities;
- Coordinating Flight Check schedules and maintenance activities;
- Access to electronic reference data by Air Traffic System Specialists; and
- Data analysis capabilities to enable transition to a Reliability Centered Maintenance philosophy.

AMMS plans to achieve Initial Investment Decision (IID) in FY 2018. Final Investment Decision (FID) is planned in FY 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The AMMS will support operational availability by providing Technical Operations with more timely and accurate information, and improved maintenance tools that will support the Risk Based Decision Making initiative, and enable more effective and efficient maintenance practices.

Today, Technical Operations faces several critical maintenance challenges as the Agency implements NextGen and service based technologies. Operations Control Center Specialists and Air Traffic System Specialists do not have the required tools needed to provide real-time access to the information needed to maintain and repair NAS services, systems, and equipment. Nor can they efficiently schedule and coordinate maintenance activities.

In order for Technical Operation to continue to maintain an operational availability rating of 99.7%, the implementation of AMMS is required. AMMS will integrate maintenance services, systems and equipment into the enterprise architecture, apply governance towards data exchanges, and provide state of the art tools to maintain the NAS.

Program Plans FY 2017 – Performance Output Goals

- None.

Program Plans FY 2018 – Performance Output Goals

- Develop the following products in support of the IID:
 - Initial Program Requirements;
 - Business Case Analysis Report (BCAR);
 - Enterprise Architecture Artifacts;
 - Implementation Strategy and Planning Document (ISPD); and
 - Chief Financial Officer (CFO) Package.
- Achieve IID.

Program Plans FY 2019 – Performance Output Goals

- Develop the following products in support of the FID:
 - Final Program Requirements documentation;
 - Enterprise Architecture Artifacts;
 - Business Case documentation;
 - Implementation Strategy and Planning Document (ISPD); and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID.

Program Plans FY 2020-2021 – Performance Output Goals

- Output goals will be developed at FID.

2B16, MODE S SERVICE LIFE EXTENSION PROGRAM (SLEP)

FY 2017 Request \$37.9M

- A, Mode Select (Mode S) Service Life Extension Program (SLEP) – Phase 2, S03.01-08
- B, Airport Surveillance Radar Model-9 (ASR-9) and Mode Select (Mode S) Service Life Extension Program (SLEP) – Phase 3 Planning, S03.01-11

A, Mode Select (Mode S) Service Life Extension Program (SLEP) – Phase 2, S03.01-08

Program Description

The Mode S SLEP Phase 2 program will implement modifications to the Mode S system to sustain secondary aircraft surveillance in terminal and en route airspace through 2025. The Mode S uses selective beacon detection technology to provide target data as digital formatted messages and analog video tailored for automation and display systems.

The Mode S is co-located with Airport Surveillance Radar Model 9 (ASR-9) and ASR-8, and Common Air Route Surveillance Radar (CARSR). The Mode S system and the co-located primary radars are capable of providing correlated radar and beacon reports to NAS en route and terminal automation systems at TRACON and ARTCC facilities, the U.S. Department of Defense (DoD), and other users.

The Joint Resources Council (JRC) approved the Final Investment Decision (FID) for the Phase 2 program on June 27, 2012. This program will replace the Beacon Video Reconstitutor (BVR) with more modern components. Critical Lowest Replaceable Units (LRUs) that process radar data will be assessed for sustainability in support of the Mode S SLEP Phase 3. To address obsolescence and supply/support issues, the following will be purchased for depot replenishment: 1) High Gain Open Planar Array (HGOPA) (or refurbishment of existing antennas); 2) Local, Remote and Radar Intelligent Tool (RIT) Maintenance Terminals; 3) Keyboard Cathode Ray Tube (KCRT); and 4) Non-Volatile Memory (NVMEM) chips. The sustainment of the Mode S system aligns with the NAS Enterprise

Architecture (EA) and the Surveillance and Broadcast Services (SBS) Automatic Dependent Surveillance Broadcast (ADS-B) back-up strategy.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

Currently Mode S systems are functioning at an operational availability of 98.86 percent which does not meet the FAA Performance Metric. Also, the current operational availability of 98.86 percent is below the Mode S specifications of 99.9 percent. Providing for the Mode S service life extension modifications reduces the risk of unscheduled outages and ensures the continuation of service capabilities.

Program Plans FY 2017 – Performance Output Goals

- Production of 18 HGOPA or refurbishment of existing antennas and delivery to FAA Logistics Center.

Program Plans FY 2018 – Performance Output Goals

- Production of 18 HGOPA or refurbishment of existing antennas and delivery to FAA Logistics Center.

Program Plans FY 2019 – Performance Output Goals

- Complete Depot replenishment in September 2019. (APB Milestone) (Prior year funding)

Program Plans FY 2020-2021 – Performance Output Goals

- None.

B, Airport Surveillance Radar Model-9 (ASR-9) and Mode Select (Mode S) Service Life Extension Program (SLEP) – Phase 3 Planning, S03.01-11

Program Description

The ASR-9 and Mode S Service Life Extension Program (SLEP) Phase 3 will perform engineering studies to analyze Lowest Replaceable Units (LRUs) identified with major obsolescence issues and continue software development for the Data Communications Equipment (DCE) prototype. There are components of these radar systems that are not supportable through 2025 and analyses are needed to determine the extent of re-engineering and system modifications needed. The program will reduce the risk of unscheduled outages by providing in-service support to improve radar performance, provides engineering and planning to correct performance/operational and reliability issues and resolution of performance issues such as radar interference.

In addition, the ASR-9 and Mode S service life extension modifications will reduce the overall lifecycle operation costs by improving system reliability and maintainability. The sustainment of the ASR-9 and Mode S aligns with the Surveillance Roadmap Decision Points, and the Surveillance and Broadcast Services (SBS)/Automated Dependent Surveillance Broadcast (ADS-B) backup strategy.

ASR-9 and Mode S systems support aircraft separation standards, reduces delays, and improves safety at congested airports. During instrument meteorological conditions the radar provides air traffic controllers with aircraft position and weather information to allow continuation of aircraft operations.

The ASR-9 also provides data under Memoranda of Agreements (MOAs) to the Departments of Defense (DoD) and Homeland Security (DHS) through the Defense Radar Program and to the Department of Treasury and National Weather Service (NWS) through separate agreements. The DoD uses ASR-9 surveillance data to monitor and detect non-transponder equipped “intruders” in terminal airspace.

The Mode S system provides correlated radar and beacon reports and weather map reports to NAS En Route and Terminal Automation, U.S. Department of Defense (DoD) and Department of Homeland Security (DHS) through the Defense Radar Program, and to the Department of Treasury and National Weather Service (NWS) through separate agreements.

A Final Investment Decision (FID) for this program is planned for March 2017. All The ASR-9 and Mode S SLEP Phase 3 activities are currently scheduled for implementation between 2017 and 2022.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

ASR-9 and Mode S systems are currently functioning at an operational availability of 99.14 and 98.80 percent respectively, which indicates the ASR-9 and Mode S are not meeting the FAA Performance Metric. Both the ASR-9 and Mode S current operational availability are also below the ASR-9 specifications of 99.999 and Mode S specifications of 99.9 percent. With SLEP modifications, operational availability for the ASR-9 and Mode S systems will improve.

Program Plans FY 2017 – Performance Output Goals

- Complete Final Program Requirements documentation.
- Complete Implementation Strategy and Planning Document (ISPD).
- Achieve Final Investment Decision (FID) by March 2017.

Program Plans FY 2018-2021 – Performance Output Goals

- Output goals will be established at FID.

2B17, SURVEILLANCE INTERFACE MODERNIZATION (SIM)

FY 2017 Request \$26.8M

Surveillance Interface Modernization (SIM), S13.01-01

Program Description

The Surveillance Interface Modernization (SIM) program will modernize the interfaces between FAA surveillance radar and automation systems for Terminal, En route, and Oceanic Air Traffic Control operations. Surveillance data from today's radars is distributed using Common Digitizer format [version 2] (CD2) over point-to-point serial interfaces to the nearest one or two automation systems. The point-to-point connectivity and CD2 message formats have inherent limitations that restrict the ease in the distribution of surveillance information to users at other facilities and requires additional physical connections. Additionally, CD2 message format limits the amount and type of data that can be distributed to automation systems and limits data precision. The SIM program will implement a common industry standard communication architecture and data format.

SIM Program improvements are achieved by converting the radar and automation systems from the serial interfaces to flexible Internet Protocol (IP) addressable interfaces, over a secure network. Upgrading from serial to IP data transmission formats will simplify circuit management and provide a platform to better enforce security policies, ensure delivery to each customer, and provide direct performance metrics. Additionally, the CD2 data formats will be upgraded to All-Purpose Structure Eurocontrol Radar Information Exchange (ASTERIX) data format, which will be used to carry additional data fields to improve automation platform tracker, display, and safety logic performance, which includes Conflict Probe and Conflict Alert performance in Standard Terminal Automation System (STARS), and En Route Automation Modernization (ERAM), Microprocessor Enroute Automated Radar

Tracking System (MicroEARTS), and Advanced Technologies & Oceanic Procedures (ATOP) automation systems. SIM will upgrade the Operational Internet Protocol Network (OPIP) within the FAA Telecommunications Interface (FTI) network; modify all surveillance radars to output ASTERIX over IP; and modify automation system software to accept the expanded ASTERIX data sets via IP.

In the transition from serial connectivity to IP networks by SIM, the FAA owned Radio Communication Link (RCL) infrastructure related to backup communication from En Route radar sites to Air Route Traffic Control Centers (ARTCC) will be replaced with leased services and remove the aging RCL infrastructure. SIM will provide a more cost effective interface and will result in a large Operations cost reduction compared to the legacy RCL technology and aging RCL infrastructure.

An Initial Investment Decision was approved by the Joint Resources Council on June 17, 2015. A Final Investment Decision (FID) is planned for September 2016.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

As part of NextGen, existing surveillance systems will be required to serve as independent sources of radar data and backup to ADS-B surveillance, and to provide surveillance data critical to other government agency missions (e.g. Department of Defense, Department of Homeland Security). In order to improve the transfer and distribution of existing radar data, these systems must be modernized to incorporate modern interface requirements. To align with future NextGen requirements, additional capabilities will be implemented into existing surveillance systems. These systems will be required to provide data distribution by other than point-to-point connections, using modern networking techniques and transition to standard interface message formats with higher reporting precision that can provide additional target information to support future operational improvements.

Program Plans FY 2017 – Performance Output Goals

- Establish platform Program Level Agreements (PLA) / Service Level Agreements (SLA) for ASR-8, ASR-9, ASR-11, ATCBI-6, Mode-S, ERAM, STARS/TAMR, MEARTS, and ATOP.
- Provide funding in support of planning, designing, and software coding for ATCBI-6 system changes to implement IP and ASTERIX capability.
- Contract award in support of planning, designing, and software coding for MEARTS automation system software changes to implement IP and ASTERIX capability.
- Contract award in support of planning, designing, and software coding for ERAM automation system software changes to implement IP and ASTERIX capability.
- Contract award in support of planning, designing, and software coding for STARS automation system software changes to implement IP and ASTERIX capability.
- Establish procurement request to start development and implementation of the OPIP network under existing FTI contract.

Program Plans FY 2018-2021 – Performance Output Goals

- Output goals will be established at FID.

2B18, NEXTGEN – TERMINAL FLIGHT DATA MANAGER (TFDM)

FY 2017 Request \$42.2M

Terminal Flight Data Manager (TFDM) – Segment 1, G06A.03-01

Program Description

The Terminal Flight Data Manager (TFDM) program will provide tower air traffic controllers and FAA traffic managers with NextGen decision support capabilities that integrate flight, surveillance, and traffic management information. TFDM will provide an integrated approach to maximize the efficient collection, distribution, and update of data including flight information in the terminal area, the status of airspace around an airport and airport surface data to improve access to information necessary for safe and efficient ATC. The use of Electronic Flight Data (EFD) will allow tower controllers to maintain an integrated view of the air traffic environment improving their situational awareness of airport operations. NextGen decision support capabilities will promote safe and efficient airport operations in managing airport surface traffic sequencing and scheduling. TFDM will automate manual flight data processes to enable enhanced data sharing between the Tower, En Route, Approach Control, Traffic Flow Management (TFM) and Flight/Airline Operations Centers (FOC/AOC).

Deployment of TFDM will be comprised of the following functions:

- Migration to electronic flight data exchange, electronic flight strips in the tower and including enhanced tower/TRACON data exchange;
- Enhanced data exchange with flight operators and other airport stakeholders;
- Increased data sharing and Collaborative Decision Making (CDM) based on shared surface situational awareness and automated surface surveillance data; and
- TFDM scheduler/sequencer, including integration of TFMS/Time Based Flow Management (TBFM) information.

As part of the agency's commitment to the RTCA Task Force 5 and the NextGen Advisory Committee, TFDM is deploying some initial capabilities early to select NAS facilities. This achieves a number of benefits for TFDM development, including early industry engagement, achievement of early benefits, and reduction in operational risk.

Early implementation of TFDM will consist of the following:

- Traffic Flow Management System (TFMS) enabled data exchange for additional data elements from the flight operators;
- Deployment of the System Wide Information Management (SWIM) Visualization Tool (SVT) to provide Surface Situational Awareness to TRACON controllers at 11 sites – All completed as of January 31, 2015;
- Sustainment of the Phoenix (PHX) Advanced Electronic Flight Strip System (AEFS) prototype and deployment of additional AEFS prototypes at approximately 5 sites; Cleveland (CLE), San Francisco (SFO), Las Vegas (LAS), Charlotte (CLT) and Newark (EWR). The FAA's Joint Resource Council approved Newark Liberty International Airport (EWR) to receive the AEFS prototype on April 22, 2015. The AEFS converts paper strips to electronic strips displayed to the controller; and
- Technology refresh of the Electronic Flight Strip Transfer System (EFSTS) at 39 sites. This technology refresh involves only the replacement of the keypads which are used operationally at 39 of the 76 sites with EFSTS systems.

A key component of the TFDM system is the transition from paper flight strips to electronic flight data representation and exchange. This will facilitate enhanced flight data exchange between controllers within the tower, those in other ATC facilities, and those overseeing TFM systems. This will also facilitate data exchange with aviation partners such as the airlines' flight operations centers and airport operators to support CDM. Providing flight data in electronic format eliminates the necessity of the physical exchange of flight data, reduces telephone exchange of data between facilities and reduces the manual re-entry of data among multiple ATC systems.

Another key component of the TFDM system is the introduction of a scheduler/sequencer capability that will provide the basis for efficient management of traffic flows on the surface at U.S. airports by transitioning the

performance of airport surface operations from a “first come, first served” model to a more strategic model that allocates taxi clearances to minimize taxi distance and time, thus reducing fuel burn and CO₂ emissions.

Initial Investment Decision was achieved in March 2014. Final Investment Decision (FID) date is planned for April 2016. Once a favorable FID is obtained the program will proceed to contract award and begin solution development and implementation. The program's current notional implementation plan is based on a three build approach and deployment to approximately 89 airports from FY 2022 to FY 2030. Pending FID and the awarded contractor's proposed solution, Build 1 will consist of Electronic Flight Data/Electronic Flight Strips, system interfaces with EFD, and Departure Scheduler; Build 2 will consist of Departure Metering capability; and Build 3 will conclude with Departure Spacing Program system replacement.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

TFDM will automate manual processes; integrate existing terminal flight data systems and decision support tools, and provide new decision support capabilities. This will improve ATC coordination and decision making to facilitate more efficient operations and increased airport capacity. TFDM capabilities will provide multiple NAS benefits, such as reduced surface delay, taxi time, and fuel burn with improved operational and environmental performance that leads to more efficient performance and airport capacity utilization during severe weather and other off-nominal conditions.

Program Plans FY 2017 – Performance Output Goals

- Complete the Preliminary Design Review (PDR) for Build 1 Development and Integration.
- Start TFDM detail design for Build 1 Development and Integration.
- Complete Technology Refresh deployment of EFSTS at 24 of 39 sites (82% complete).

Program Plans FY 2018 – Performance Output Goals

- Complete Critical Design Review (CDR) for Build 1 Development and Integration.
- Begin Build 1 software and hardware development of TFDM Build 1 system.
- Complete Technology Refresh deployment of EFSTS at 7 of 39 sites (100% complete).
- Finalize Program Agreements (including specifications on the funding TFDM will provide) for the modification required for FDIO, TDLS, RMLS and TFMS to support the TFDM implementation.
- Additional performance output goals will be developed at FID.

Program Plans FY 2019 – Performance Output Goals

- Start the site implementation planning for TFDM build 1 key site.
- Conduct an Early User Involvement Event to demonstrate system capabilities and allow the FAA field representatives and the TFDM User Group to formally evaluate the human/system design.
- Additional performance output goals will be developed at FID.

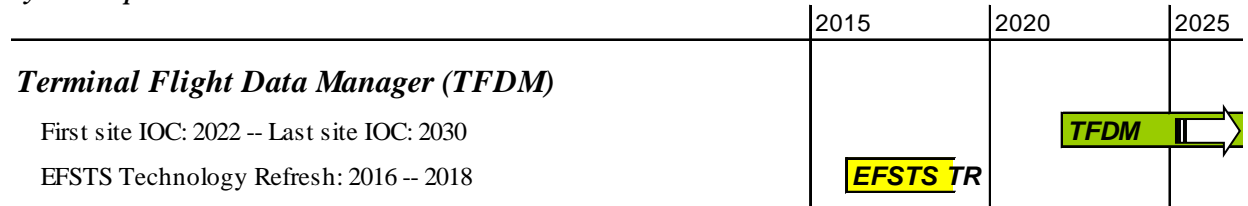
Program Plans FY 2020 – Performance Output Goals

- Complete System Integration of TFDM Build 1.
- Conduct System Requirements Review (SRR) for Build 2 Development and Integration.
- Conduct PDR for Build 2 Development and Integration.
- Start TFDM detail design for Build 2 Development and Integration.
- Additional performance output goals will be developed at FID.

Program Plans FY 2021 – Performance Output Goals

- Complete software and hardware development of TFDM Build 1 system.
- Conduct CDR for Build 2 Development and Integration.
- Begin Build 2 software development of TFDM system.
- Additional performance output goals will be developed at FID.

System Implementation Schedule



2B19, VOICE RECORDER REPLACEMENT PROGRAM (VRRP)

FY 2017 Request \$2.0M

NAS Voice Recorder Program (NVRP), C23.02-01

Program Description

The NAS Voice Recorder Program (NVRP) will replace digital voice recorders to comply with new requirements in the Air Traffic Organization (ATO) safety orders. These orders require risk based monitoring of air traffic operational safety events and were not in effect when the Voice Recorder Replacement Program, Digital Audio Legal Recorder was implemented. NVRP will reduce operational costs, meet increasing demand for improved access to audio data, and provide more expeditious remote audio access. These new recorders will also provide capabilities including:

- increased recording capacity,
- recording of Voice over Intranet Protocol (VoIP) telephones, and
- connectivity to FAA Telecommunications Infrastructure (FTI)'s enterprise Network Time Protocol (NTP).

Voice recorders provide the legally accepted recording capability for conversations between air traffic controllers, pilots, and ground-based air traffic facilities, and are used in all ATC facilities. These recordings are used in the investigation of accidents and incidents and also in the routine evaluation of ATC operations. As the voice recorder technology and voice recorder requirements have evolved, earlier digital voice recorders are now experiencing obsolescence and supportability issues. There are over 460 voice recorders with an operational life of 10 years currently operating in ATC facilities. The existing recorders will start to reach the end of their service life beginning in 2017.

A Final Investment Decision (FID) for NVRP is planned for 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

Voice recorders are used by the FAA for recording conversations between air traffic controllers, pilots, and other personnel at ground-based air traffic facilities. Recorded voice communications are used in the investigation of accidents and incidents and in the routine evaluation of ATC operations. Information from voice recorders is also used for Quality Assurance as part of risk analysis and Quality Control to monitor and measure compliance with regulations and to identify issues for corrective action.

Program Plans FY 2017 – Performance Output Goals

- Develop products in support of the Initial Investment Decision (IID), which may include:
 - Initial Business Case documentation;
 - Enterprise Architecture Products;
 - Initial Program Requirements (iPR);
 - Initial Implementation Strategy and Planning Document (ISPD); and
 - Final Investment Analysis Plan (IAP).
- Achieve IID.
- Complete Screening Information Request (SIR) release and evaluation.

Program Plans FY 2018 – Performance Output Goals

- Develop products in support of the FID, which may include:
 - Final Program Requirements documentation;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final ISPD; and
 - Acquisition Program Baseline (Execution Plan).
- Achieve FID.

Program Plans FY 2019-2021 – Performance Output Goals

- Deliver approximately 150 systems per year; waterfall to be determined at FID.

2B20, INTEGRATED TERMINAL WEATHER SYSTEM (ITWS) TECHNOLOGY REFRESH
FY 2017 Request \$1.0M

Integrated Terminal Weather System (ITWS) – Sustainment & Disposition, W07.01-02

Program Description

The ITWS program provides air traffic managers with graphic, full-color displays of essential weather information affecting major U.S. airports. ITWS integrates weather data from a number of sources and provides a single, easily used and understood display of supported products. ITWS depicts the current weather and generates short-term forecasts of terminal weather through the integration of data from FAA and National Weather Service sensors and systems as well as from aircraft in flight. There are 34 ITWS sites that provide weather information to 75 airports.

In 2010, a supportability study concluded the FAA would be unable to sustain the current generation of ITWS Weather Products after 2015 without a technology refresh. Technology refresh of ITWS would include replacement of Commercial Off-The-Shelf (COTS) system components, including processors, displays, computer operating systems, and commercially available software, to ensure the continued supportability of ITWS through 2015. A technology refresh would also enable ITWS to connect with the NextGen Weather Processor (NWP), the Common Support Services–Weather (CSS-Wx) system, and other NAS users such as airport authorities, airlines, etc. to permit seamless interoperability and common situational awareness in support of collaborative decision-making.

In 2013, it was determined that legacy ITWS could be sustained until 2018 with the purchase of additional, refurbished hardware. A scheduled 2014 Final Investment Decision (FID) for the planned technology refresh of ITWS was delayed pending the outcome of the FID for NWP and CSS-Wx. In March 2015, the Joint Resources Council approved the final investment decisions for NWP and CSS-Wx potentially negating the need for a full technology refresh of ITWS. The ITWS program office developed and presented a plan and budget to the JRC for sustaining ITWS until May 2021 when it expected to be replaced by NWP. This date is based upon the APB milestone for commissioning the first NWP site; and if successful, ITWS decommissioning will begin at that time.

The ITWS program office is funding a lifetime buy of all necessary and available spare parts of the legacy hardware to sustain the current system until it is replaced by NWP. The ITWS program will also fund a contingency plan to mitigate any potential accelerated hardware failures. This effort consists of the adaptation of ITWS software to a

new hardware platform, including key-site testing, but without deployment to the NAS. In the event that the legacy ITWS hardware cannot be sustained until NWP is commissioned, hardware for full replacement will need to be procured and deployed to all ITWS locations; requiring additional funds.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

ITWS sustainment will support the Performance Metric for operational availability by ensuring legacy ITWS equipment is kept operational through 2021. The specification for ITWS requires at least 0.999815 availability which has been maintained at all commissioned sites; including 26 of the 30 core airports where ITWS is currently installed. The planned lifetime buy of spare parts and the software port to a new platform will maintain this availability.

Program Plans FY 2017 – Performance Output Goals

- Complete ITWS Software adaptation to a new platform for ITWS Situation Display Workstation.

Program Plans FY 2018 – Performance Output Goals

- Complete ITWS Software adaptation to a new platform for ITWS Product Generator.
- Complete Key site testing of the Situation Display Workstation.

Program Plans FY 2019 – Performance Output Goals

- Complete Key site testing of the full ITWS platform.

Program Plans FY 2020-2021 – Performance Output Goals

- None.

2B21, NEXT GENERATION: SURVEILLANCE AND WEATHER RADAR CAPABILITY (NSWRC) AND BACKUP SURVEILLANCE CAPABILITY (NBSC)

FY 2017 Request \$1.0M

- A, Next Generation Surveillance & Weather Radar Capability (NSWRC), S14.01-01
- B, Next Generation Backup Surveillance Capability (NBSC), S15.01-01

A, Next Generation Surveillance & Weather Radar Capability (NSWRC), S14.01-01

Program Description

The Next Generation Surveillance and Weather Radar Capability (NSWRC) will provide a cost-effective replacement for primary terminal surveillance and weather radars. The FAA currently operates several models of Airport Surveillance Radars (ASR) and the Terminal Doppler Weather Radars (TDWR) for terminal aircraft surveillance and weather detection. The majority of these systems use technology that is over 20 years old, in some cases it is over 40 years old, most have exceeded their service life. Ongoing technology refresh and Service Life Extension Programs (SLEPs) may keep these radars operating in the near-term; however, as the demands of the NAS increase, the present radars will not be capable of delivering the functionality needed for the future.

NSWRC will address all existing primary radar requirements as well as any of the following emerging requirements that may be approved:

- Ability to detect and track aircraft and weather in the presence of extreme clutter, such as wind farm interference;
- Ability to reduce Operations and Maintenance (O&M) costs; and
- Ability to effectively discriminate between different types of hydrometeors (e.g. rain, ice, sleet, hail, etc.).

NSWRC completed the Concept Requirements Definition Readiness (CRDR) in December 2012; and is on track for an Investment Analysis Readiness Decision (IARD) by December 30, 2016. The current plans are to have the Initial Investment Decision (IID) by December 2018 and Final Investment Decision by December 2020.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

Significant cost avoidance will be realized by NSWRC by assuming the mission of the 281 legacy radar systems and reducing the extensive overlapping coverage of those legacy radars. This could reduce the segment of radars needed for terminal surveillance and weather systems from the current total of 281 to a predicted 230 systems. In addition, a common NSWRC platform will consolidate four separate life-cycle support infrastructure capabilities into one common second level engineering, depot and training capability reducing life-cycle support costs.

Program Plans FY 2017 – Performance Output Goals

- Complete draft of Initial Program Requirements Document (iPRD).
- Complete draft of initial Implementation Strategy and Planning Document (ISPD).
- Complete Investment Analysis Plan (IAP) status report update for NSWRC alternatives.

Program Plans FY 2018-2021 – Performance Output Goals

- None.

B, Next Generation Backup Surveillance Capability (NBSC), S15.01-01

Program Description

The Next Generation Backup Surveillance Capability (NBSC) will provide a replacement for existing surveillance systems including ATCBI-5, ATCBI-6, Mode-S and ASR-11 Monopulse Secondary Surveillance Radar (MSSR) systems. The FAA currently operates several models of beacon systems in the NAS. Most of these legacy systems are nearly thirty years old and have exceeded their service life. FAA will need the NBSC as a secondary surveillance system into the future as a back-up to Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance. The NBSC will support cooperative target acquisition and maintain continuity of operations if ADS-B outages should occur. Ongoing technology refresh and Service Life Extension Programs (SLEPs) may keep legacy radars operating in the near-term; however, as the demands of the NAS increase it is becoming increasingly clear that the present radars will not be capable of delivering the required functionality in the future.

The NBSC program plans to complete Concept and Requirements Definition Readiness (CRDR) by December 2016 and is on track for an Investment Analysis Readiness Decision (IARD) by December 2017. An Initial Investment Decision (IID) is expected by December 2018 with a Final Investment Decision (FID) by December 2020.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The NBSC supports costs savings by reducing OPS costs through the elimination of multiple radar configurations in the NAS. Consolidating four separate, near end of life-cycle surveillance capabilities, into one common equipment baseline with integrated second level engineering and depot and training capabilities will reduce life-cycle support costs.

Program Plans FY 2017 – Performance Output Goals

- Complete Concept Requirements Definition Readiness (CRDR).
- Complete draft of the initial Program Requirements Document (iPRD).
- Complete draft of the initial Implementation Strategy and Planning Document (ISPD).

Program Plans FY 2018-2021 – Performance Output Goals

- None.

2B22, FLIGHT AND INTERFACILITY DATA INTERFACE (FIDI)

FY 2017 Request \$15.0M

Flight and Interfacility Data Interface (FIDI) – Phase 1, Segments 1 & 2, G08A.01-01

Program Description

The Flight and Interfacility Data Interface (FIDI) technology refresh program will modernize flight data and interfacility data interfaces between the En Route Automation Modernization (ERAM) systems and Terminal and Oceanic Automation systems including Advanced Technologies & Oceanic Procedures (ATOP), Standard Terminal Automation Replacement System (STARS), Flight Data Input/Output (FDIO), Terminal Flight Data Manager (TFDM), Information Display System (IDS), Tower Data Link System (TDLS) and Micro-En Route Automated Radar Tracking System (MEARTS). FIDI is a multi-system portfolio investment to replace the antiquated legacy communications infrastructure with Internet Protocol (IP) interfaces and modernized flight data management, distribution and presentation between the ERAM system and other interfacing Terminal and Oceanic client ATC systems.

NAS services to be refreshed by the FIDI program are the Flight Data Entry and Printout (FDAT) and the Interfacility Data Transfer (IDAT). The FDAT and IDAT services currently rely on legacy communications technology that is based on Time-Division Multiplexing (TDM)/serial interfaces. The existing TDM serial lines do not allow for the reconfiguration of the communications links between ATC facilities in the event of a facility outage. Moreover, the existing data formats of the FDAT and IDAT services are limited due the legacy interfaces and intermediate equipment that connect en route, terminal, and oceanic automation systems. In the future, more detailed flight information consistent with international standards will be available. Modernizing the data interfaces will enable NextGen operational improvements across the NAS by providing the full range of flight data that controllers and automation systems will require.

The FIDI program will upgrade the FDAT and IDAT interfaces with modernized interfaces requiring only standard FAA Telecommunications Infrastructure (FTI) network services. In conjunction with the Surveillance Interface Modernization (SIM) program, which allows the use of Internet Protocol (IP) switched network communications to relay radar data to automation systems, this program will enable the decision to decommission the ECG equipment at all 20 en route centers.

Benefits of FIDI include:

- Reduced probability of flight data exchange outages between facilities, due to facility outages, and higher system availability during contingency operations, utilizing the reconfiguration capability inherent in IP-based networks;
- Reduced sustainment costs of serial/ TDM communication hardware in end systems by migrating the interfaces to IP/Ethernet standards;
- Enabling the extension of Trajectory-Based operations to terminal airspace by enabling improved access to flight data information in ATCTs and TRACONS, with resultant reduction in reliance on verbal communication to control traffic and growth in throughput/capacity utilization; and
- Reduced NAS lifecycle costs through platform elimination or consolidation, including ECG, FDIO - Gateway, and Electronic Flight Strip Transfer System (EFSTS) systems, and FDIO platforms separate from STARS automation in TRACONS.

The FIDI program will be structured in two overlapping Phases:

- Phase 1 is a Technology Refresh which will convert FDAT and IDAT services from TDM to IP protocols and develop a modern FDAT software interface within ERAM for FDAT clients. Phase 1 will be further structured into two segments. Segment 1 will migrate the following systems to IP communications; ERAM, STARS, TFDM, FDIO, ATOP, and MEARTS. Segment 2 will implement new FDAT software interfaces to the following systems: ERAM, TFDM, FDIO, NAS IDS, TDLS, and Visual Information Display System (VIDS). After achieving the FAA JRC's Investment Analysis Readiness Decision (IARD), the program will proceed with the Final Investment Analysis (FIA) to achieve the FAA JRC's Final Investment Decision (FID).
- Phase 2, which will run concurrently with Phase 1, will focus on integrating the modernized FDAT interface into STARS, replacing TRACON FDIO functions with STARS. After achieving the FAA JRC's IARD, the program will proceed with the final investment analysis to achieve the FAA JRC's FID.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The FIDI program will modernize the flight data exchange services between en route and terminal and oceanic automation systems which will reduce the number of outages and improve the operational availability of flight data exchanges between NAS automation systems.

Program Plans FY 2017 – Performance Output Goals

- Complete the following products to support the FIDI Phase 1 and Phase 2 IARD:
 - Shortfall Analysis;
 - Solution Concept of Operations;
 - Alternatives Analysis;
 - Enterprise Architecture Products; and
 - Preliminary Program Requirements.
- Achieve FIDI Phase 1 and Phase 2 IARD.

Program Plans FY 2018 – Performance Output Goals

- Complete the following products to support the FIDI Phase 1 FID:
 - Final Program Requirements (fPR) Document;
 - Enterprise Architecture Products;
 - Business Case documentation;
 - Final Implementation Strategy and Planning Document (ISPD);
 - Acquisition Program Baseline (Execution Plan).
- Achieve FIDI Phase 1 FID.

Program Plans FY 2019 – Performance Output Goals

- Pending FID approval:
 - Complete initial migration of FDAT/IDAT Communications to FTL.
 - Complete engineering development of enhanced ERAM flight data interface capabilities.
 - Achieve Initial Operating Capability of FDIO enhancement for flight data distribution to automation systems.

Program Plans FY 2020 – Performance Output Goals

- Pending FID approval:
 - Complete engineering design/development of TFDM flight data interface capabilities.
 - Complete operational test of STARS flight data interface capabilities.

Program Plans FY 2021 – Performance Output Goals

- Pending FID approval:
 - Complete operational readiness test of FDIO Connected Systems.
 - Complete operational readiness test of ATOP flight data interface capabilities.

C: Flight Service Programs

2C01, AVIATION SURFACE WEATHER OBSERVATION SYSTEM

FY 2017 Request \$10.0M

Aviation Surface Weather Observation Network (ASWON) – Technology Refresh, W01.03-01

Program Description

The Aviation Surface Weather Observation Network (ASWON) is a portfolio program that consists of the Automated Surface Observing System (ASOS), Automated Weather Observation System (AWOS), Automated Weather Sensor Systems (AWSS), Stand Alone Weather Sensors (SAWS), Digital Altimeter Setting Indicator (DASI), F-420 Wind Sensor, and the AWOS Data Acquisition System (ADAS).

All of these systems, except the ADAS, are located at airports and measure and report weather conditions including temperature, barometric pressure, visibility, precipitation type and amount, cloud height and coverage, and wind speed and direction. The ADAS, located in FAA En Route centers, accepts weather data from ASOS, AWSS, and AWOS and retransmits the data to the Integrated Terminal Weather System (ITWS) and the Weather and Radar Processor (WARP).

The ASWON Technology Refresh program will provide compatible technology upgrades and/or replacements to the five legacy ASWON systems (ASOS, AWOS, AWSS, DASI, and F-420) which are experiencing obsolescence, supportability, and maintainability issues. This technology refresh effort will enable these systems to continue providing weather information to support the safe operation of the NAS. Successful implementation of technology

upgrades will also result in a common hardware platform and software baseline that will reduce development costs, logistics support costs, and software maintenance costs/effort.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Target

ASWON Technology Refresh supports operational availability by replacing obsolete and unsupported equipment experiencing increasing failure rates. Continued failures of weather sensing equipment will result in a loss of ASWON services and subsequent inability to maintain current operational availability levels of 99.7%.

Program Plans FY 2017 – Performance Output Goals

- Install 87 AWOS Technology Refresh mods (187 of 187, 100%).
- Install AWOS Technology Refresh at all remaining sites. (APB milestone)
- Install 50 F-420 Technology Refresh mods (50 of 210, 23%).
- Complete ASOS Operational Test and Evaluation (OT&E).
- Begin ASOS Software Operational Test and Evaluation (OT&E) at key site.

Program Plans FY 2018 – Performance Output Goals

- Install 75 F-420 Technology Refresh mods (125 of 210, 60%).
- Install 90 DASI Technology Refresh mods (90 of 180, 50%).
- Install 100 ASOS Technology Refresh mods (100 of 571, 18%).

Program Plans FY 2019 – Performance Output Goals

- Install 85 F-420 Technology Refresh mods (210 of 210, 100%).
- Complete F-420 Technology Refresh. (APB milestone)
- Install 90 DASI Technology Refresh mods (180 of 180, 100%).
- Complete DASI Technology Refresh. (APB milestone)
- Install 150 ASOS Technology Refresh mods (250 of 571, 44%).

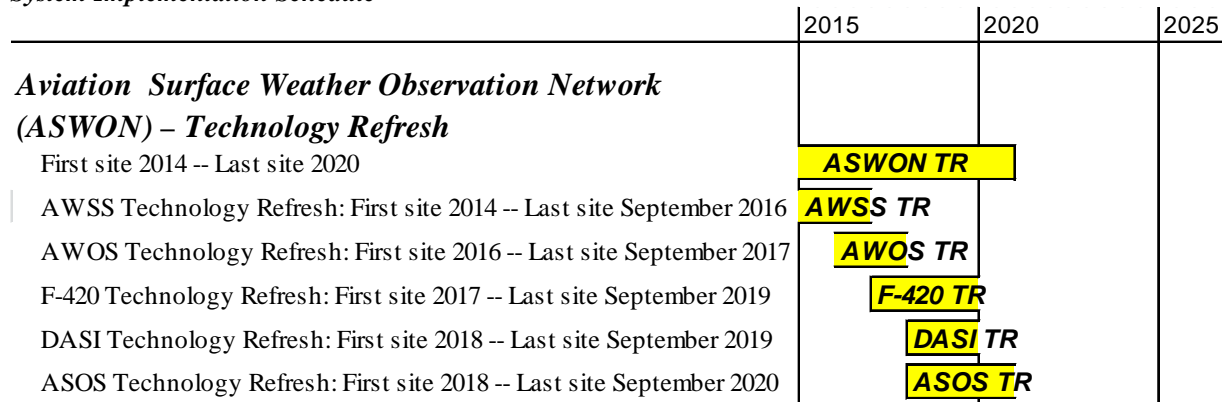
Program Plans FY 2020 – Performance Output Goals

- Install 321 ASOS Technology Refresh mods (571 of 571, 100%).
- Install ASOS Technology Refresh mods at all sites. (APB milestone)

Program Plans FY 2021 – Performance Output Goals

- None.

System Implementation Schedule



2C02, FUTURE FLIGHT SERVICES PROGRAM (FFSP)

FY 2017 Request \$3.0M

Future Flight Services Program, A34.01-01

Program Description

The FAA provides a variety of flight services to the general aviation (GA) community within the Continental US, Puerto Rico, Alaska and Hawaii. Services include pre-flight and in-flight flight planning, flight plan filing, and weather briefing. Additional services include:

- Visual Flight Rules search and rescue operations
- Emergency services to aircraft in distress
- Notices to Airmen (NOTAM) entry and dissemination
- Instrument Flight Rules Clearance relay
- Pilot weather report (PIREP) entry
- Security related to Special Flight Rules Area / Air Defense Identification Zone / Flight Restricted Zone
- Services provided to DoD

Over the past decade, emerging technologies in communications, personal computing, and mobile device capabilities have provided opportunities to deliver flight service capabilities more efficiently to stakeholders. User preferences and demands are reflected by the continuing decline in the use of human assisted-services as users take advantage of automated and enhanced technologies (e.g., integrated weather products, electronic flight bags) available through the FAA and private sector. The Future Flight Services Program (FFSP) will seek to:

- Modernize service delivery methods through the use of a contract structure that will encourage and incentivize continuous innovation, improvement, and cost reduction while providing flight services that meet or exceeds efficiency and safety objectives;
- Continuously assess and adjust flight services based on changes in user needs and performance feedback;
- Leverage and integrate commercial technologies as their capabilities mature and user needs warrant;
- Incorporate FAA Next Generation Air Transportation System capabilities (e.g., Common Support Services – Weather , Aeronautical Information Management Modernization – Segment 2) as they become available; and
- Provide a flexible, scalable, and net centric Voice Communications System using Voice over Internet Protocol technology enabling communication assets to be addressable and shareable to facilitate business continuity and service delivery objectives.

The FFSP will expand the web portion of flight services and reduce or eliminate human delivery of flight services as much as possible. FFSP will seek to discontinue obsolete services and activities as well as redundant activities provided by other FAA service organizations. This will in turn reduce the overall cost associated with delivering flight services and increase the efficiency of service delivery.

Currently, flight services are delivered by a combination of systems and contractor provided services:

- The Automated Flight Service Station (AFSS) contract with Lockheed Martin Corporation, provides the full range of flight services to users in the continental United States, Hawaii and Puerto Rico. The contract provides certified Flight Service Specialists to deliver preflight, inflight and flight data services (e.g. weather observation entry, PIREP entry, management of the NOTAM system) to users via telephone and radios. Lockheed Martin provides personnel, equipment and facilities to provide flight services under the AFSS contract. The FAA provides Lockheed Martin with access to, and use of its air-to-ground radio and telecommunications infrastructure to facilitate inflight communications. In April 2015, the FAA

announced its intent to award a contract extension for up to 42 months to continue AFSS services and allow time for a new Future Flight Services (FFS) contract award and the transition of services.

- The Direct User Access Terminal Service (DUATS) II contracts with Computer Sciences Corporation (CSC) and Lockheed Martin Corporation, provide users with internet-based preflight services (self-briefings and flight plan filing) without the aid of a flight service specialist.
- The Operational and Supportability Implementation System (OASIS) II contract with Harris Corporation, provides an integrated computer-based system used by FAA flight service specialists in Alaska. OASIS provides integrated textual and weather graphics products, flight plan processing, emergency services, law enforcement, flight planning and regulatory information and other services as defined in FAA Joint Order 7110.10.

The AFSS contract period of performance will expire in September 2019 and the DUATS II contract period of performance will expire in April 2020. In order to transition to a new service provider prior to both the AFSS and DUATS II contract expirations, one or more Flight Service contracts must be awarded. The new service provider will need to establish new flight service facilities; develop, integrate, test and deploy automation and voice communication systems; and hire, train and certify new flight service specialists. Parallel operations will be required to allow for transition from the incumbent to the non-incumbent service provider.

This program supports the transition to one or more new FSS contract(s), which is planned to be awarded in the 1st quarter FY 2018. The primary objective of the program is to use automation to improve the delivery of flight service, and reduce the overall cost to the FAA. The Initial Investment Decision is planned in FY 2016 and the Final Investment Decision (FID) is planned in the 1st quarter FY 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter.*
- *FAA Performance Metric 2 – Reduce the general aviation fatal accident rate to no more than one (1) fatal accident per 100,000 flight hours by 2018.*

Relationship to Performance Metric

The program will enhance GA and NAS users' safety awareness by providing more accurate and efficient updates to changing weather conditions, allowing pilots to make better decisions regarding how to avoid hazardous weather. FFSP will also seek to enable faster initiation of Search and Rescue.

Program Plans FY 2017 – Performance Output Goals

- Develop the following products in support of the FID:
 - Final Program Requirements documentation;
 - Enterprise Architecture Artifacts;
 - Final Implementation Strategy and Planning Document; and
 - Acquisition Program Baseline (Execution Plan).

Program Plans FY 2018 – Performance Output Goals

- Finish development of FID business case documentation.
- Conclude Investment Planning and Analysis and senior management review.
- Achieve a FID.
- Award new FFS contract(s).

Program Plans FY 2019-2021 – Performance Output Goals

- Performance Output Goals will be developed at FID based on the contract transition strategy selected.

2C03, ALASKA FLIGHT SERVICE FACILITY MODERNIZATION (AFSFM)

FY 2017 Request \$2.7M

Alaska Flight Service Facility Modernization (AFSFM), F05.04-02

Program Description

The AFSFM program modernizes or replaces Flight Service facilities in Alaska to ensure security, sustainment and continuity of Flight Service operations. Over 1/3 of the 17 Alaska facilities were constructed in the 1970's and require extensive renovations to meet current building codes, fire life safety, Architectural Barriers Act Accessibility Standard (ABAAS) and electrical standards. Specifically, Flight Service buildings will be updated to meet Occupational Safety and Health Administration (OSHA) and Americans with Disabilities Act (ADA) requirements, and the electrical and safety systems will be upgraded to ensure they meet Industry Standards.

The program corrects deficiencies such as substandard lightning, grounding and bonding protection, electrical systems, and/or heating and cooling systems that could disrupt Flight Service operations. These conditions could endanger FAA personnel health and safety and increase the risk of service outages.

The AFSFM program team, comprised of Flight Service, Alaska Technical Operations and Western Service Center personnel, conducts on-going analysis of Alaska facilities to identify and prioritize actions required to maintain and sustain them. Site plans and schedules are developed for projects at each facility.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The AFSFM program will directly contribute to the FAA's Strategic Priority to Deliver Benefits through Technology and Infrastructure by increasing operational availability and capabilities by providing facilities upgrades and addressing quality of life issues in existing Alaska Flight Services Facilities.

Program Plans FY 2017 – Performance Output Goals

These actions may be superseded if a higher priority need is entered into the Corporate Work Plan (CWP) prior to its start:

- Complete roof replacement at Kenai Flight Service Station (FSS).
- Complete roof replacement at Juneau FSS.
- Refurbish/upgrade building interior (break room, pilot briefing room, rest rooms, etc.) at Talkeetna FSS.

Program Plans FY 2018 – Performance Output Goals

These actions may be superseded if a higher priority need is entered into the CWP prior to its start:

- Upgrade Heating System Boilers at Fairbanks FSS.
- Complete roof replacement at Deadhorse FSS.
- Complete roof replacement at Talkeetna FSS.
- Complete refurbishment of the Heating, Ventilation, and Air Conditioning (HVAC) system at Deadhorse FSS.

Program Plans FY 2019 – Performance Output Goals

These actions may be superseded if a higher priority need is entered into the CWP prior to its start:

- Complete roof replacement at Nome FSS.
- Complete roof replacement at Kotzebue FSS.
- Complete refurbishment of the HVAC system at Nome FSS.

Program Plans FY 2020 – Performance Output Goals

These actions may be superseded if a higher priority need is entered into the CWP prior to its start:

- Refurbish/upgrade building interior (break room, pilot briefing room, rest rooms, etc.) at Deadhorse FSS.
- Complete refurbishment of the HVAC system at Kotzebue FSS.

Program Plans FY 2021 – Performance Output Goals

These actions may be superseded if a higher priority need is entered into the CWP prior to its start:

- Refurbish/upgrade building interior (break room, pilot briefing room, rest rooms, etc.) at Kotzebue and Nome FSSs.
- Replace Lighting in the Operations Area at Juneau FSS.
- Upgrade HVAC System at Talkeetna FSS.

2C04, WEATHER CAMERA PROGRAM

FY 2017 Request \$2.2M

Weather Camera Program – Future Segments, M08.31-02

Program Description

The Weather Camera Program sustains the operational Weather Cameras which are installed at airports and strategic en route locations in Alaska to provide pilots, dispatchers and flight service station specialists with real-time video weather information. The program ensures that camera network services are available, reliable, responsive, and accessible to the aviation pilots and aviation user groups. The program provides: camera facility monitoring and restoral activities, replacement of defective equipment identified in trouble tickets, and logistics, spares, and technician training. The Weather Camera Program also manages all of its procurement and other contract requirements including equipment procurement, telecommunication contracts, site facility lease contracts, site maintenance contracts, and maintains and reports on required program performance metrics.

The Program Office also funds the renovation of structures that house the camera systems and provides upgrades to poor performing sites. These sites must be refurbished periodically due to age, outdated equipment, and damages caused by and exposure to environmental elements such as extreme cold weather, high winds, and other weather conditions.

Images are updated every 10 minutes and stored for six hours to be used in a loop function for weather trending analysis by pilots. These images are made available through a user-friendly, web-enabled application: <http://avcams.faa.gov>. In addition to improving aviation safety benefits, the cameras improve operator efficiency by reducing unnecessary flight time caused by weather-related deviations while in-flight. According to the Post Implementation Review, aviation efficiency in flight time and fuel savings has improved by 63%. Over the life cycle of the Weather Camera Program, this will save millions of dollars in fuel expenses and reduce the overall carbon footprint.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 2 – Reduce the general aviation fatal accident rate to no more than one (1) fatal accident per 100,000 flight hours by 2018.*

Relationship to Performance Metric

In the state of Alaska, flying is equivalent to driving in the contiguous US, making the use of small aircraft essential to everyday life. Many times flying is the only means to get children to/from school activities; to transport service providers such as clergy, doctors, dentists, and nurses; to deliver patients to medical facilities; and to supply the communities with groceries, fuel, and mail. While flying is essential to daily life in Alaska, rapidly changing

weather presents challenges that negatively affect the accident rate. FAA data indicates accident rates in Alaska have been nearly 400 percent above the national average.

The limited availability of weather information in Alaska contributes to a higher risk of accidents and can result in flight inefficiencies. Without weather information about their destination airport and route of flight, pilots cannot make informed decisions on whether it is safe to fly or if they should continue their flight. This can lead to accidents or unnecessary fuel costs, caused by the need to circumvent bad weather or, in some cases, to land at an alternate airport. There is a need for real-time views of current weather conditions accessible to the aviation community in Alaska. The FAA Weather Camera Program has installed aviation weather cameras as an aid to Visual Flight Rule pilots operating in Alaska.

Between 1990 and 2006, there were 1497 commuter and air taxi crashes in the United States. Of these accidents, 520 occurred in Alaska (35% of the total). Historically, the National Transportation Safety Board (NTSB) has stated that on a national average, 22.6% of all accidents are in some way weather related. For the State of Alaska, this would translate into an average of 7.3 weather related accidents per year within the 1990-2006 time frames. Two of the Weather Camera Program's, internal goals are to help reduce weather related accidents in Alaska. The first goal is to reduce the En Route or Approach and Landing Low visibility related accident rate per 100,000 operations for Non-IFR capable commercial and general aviation aircraft within the state of Alaska. To date, and according to the Post Implementation Review, the Weather Camera Program is exceeding its expected performance metrics in Alaska by reducing weather-related aviation accidents from 0.28 accidents per 100,000 operations to 0.13 accidents (53% reduction). The second goal is to reduce the number of unnecessary flight hours caused by lack of weather information.

Program Plans FY 2017 – Performance Output Goals

- Replace legacy and failing cameras/routers at five sites.
- Refurbish mountain pass high-sites at: Lake Clark Pass East and Lake Clark Pass West.

Program Plans FY 2018 – Performance Output Goals

- Replace legacy and failing cameras/routers at five sites.
- Refurbish remote powered camera sites: Misty Fiords, Cape Fanshaw and Skwentna.

Program Plans FY 2019 – Performance Output Goals

- Replace legacy and failing cameras/routers at five sites.
- Refurbish remote powered camera site: Grave Point.

Program Plans FY 2020 – Performance Output Goals

- Replace legacy and failing cameras/routers at five sites. (Prior year funding)
- Refurbish remote powered camera site: Summit. (Prior year funding)

Program Plans FY 2021 – Performance Output Goals

- None.

D: Landing and Navigation Aids Programs

2D01, VHF OMNIDIRECTIONAL RADIO RANGE (VOR) WITH DISTANCE MEASURING EQUIPMENT (DME)

FY 2017 Request \$7.0M

- A, Very High Frequency Omni-Directional Range (VOR) Collocated with Tactical Air Navigation (VORTAC), N06.00-00
- B, Very High Frequency Omni-Directional Range (VOR) – Minimum Operational Network (MON) Implementation Program, N06.01-01

A, Very High Frequency Omni-Directional Range (VOR) Collocated with Tactical Air Navigation (VORTAC), N06.00-00

Program Description

This program replaces, relocates, or improves VOR and VORTAC facilities. The VOR and VORTAC, a combination of VOR and Tactical Air Navigation (TACAN) system, provide navigational guidance for civilian and military aircraft in both the en route and terminal areas. Decisions concerning the VOR Minimum Operational Network (MON) will determine, whether VOR or TACAN systems will remain in service or be shut down. If retained, they will serve as a backup to satellite navigation and continue to define VOR routes and procedures for legacy users. Until that transition is complete, VORTACs must remain in service and may be relocated, technologically refreshed, or replaced. Currently 60% of the VORTAC systems are over 30 years old. It is projected that within 10-15 years all existing VORTAC systems will be beyond their estimated service life.

There are approximately 967 VORTACs or VORs with Distance Measuring Equipment (DME) currently operating in the United States. They are used by pilots as a primary navigation aid, and direct lines between VORs are used to define established air routes. The VOR provides its direction from the aircraft and the DME provides its distance; slant range because of the aircraft's altitude.

This program also procures and installs Doppler VOR (DVOR) electronic kits and DVOR antenna kits to dopplerize a conventional VOR. There are numerous VORs that have signal restrictions due to encroachment of obstacles that block the transmission of VOR signals. These restrictions are having a serious impact on en-route, arrival and departure procedures. Natural encroachment also comes from trees located outside the boundaries of the FAA controlled area where the VOR is located which have grown tall enough to cause electromagnetic interference. Many manmade obstacles can cause the same interference. Examples include newly constructed tall buildings; nearby industrial parks with a high concentration of metal buildings; overhead transmission lines; towers for radio, television and cell service; and more recently, wind farms. Dopplerizing a VOR eliminates the signal reflection restrictions caused by most of these obstacles.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The service life of VOR/VORTAC facilities is either near or past the designed useful life of these systems. Sustaining, relocating, or dopplerizing these facilities maintains their operational availability at or above 99.7%.

Program Plans FY 2017 – Performance Output Goals

- Procure one DVOR Doppler Antenna Kits.
- Complete one on-going DVOR project.
- Initiate one new start DVOR project.

Program Plans FY 2018-2021 – Performance Output Goals

- Procure two DVOR Doppler Antenna Kits.
- Complete two on-going DVOR projects.
- Initiate one new start DVOR project.

B, Very High Frequency Omni-Directional Range (VOR) – Minimum Operational Network (MON) Implementation Program, N06.01-01

Program Description

The VOR Minimum Operational Network (MON) Implementation Program will perform the work required to downsize the VOR network to the minimum required for use as a backup navigation system in the event of an unplanned Global Positioning System (GPS) localized outage and allow aircraft not equipped with GPS to navigate and land under Instrument Flight Rules (IFR). This program supports the NAS transition from the current VOR airways to Performance Based Navigation (PBN) consistent with NextGen goals.

NextGen initiatives rely on PBN enabled by GPS and Distance Measuring Equipment (DME). PBN consists of Area Navigation (RNAV) and Required Navigation Performance (RNP) capabilities. PBN provides more efficient use of en route and terminal airspace to improve capacity and efficiency. This transition strategy is described in the Federal Register Notice/Volume 76, Number 241, which was approved for public release in December 2011.

The VOR MON will enable pilots to:

- Revert from PBN to VOR navigation;
- Tune and identify a VOR at an altitude of 5,000 feet above ground level;
- Navigate using VOR procedures through a GPS outage area;
- Navigate using VOR procedures to a MON airport within 100 nautical miles to an ILS or VOR instrument approach for landing; and
- Navigate along VOR Airways especially in mountainous terrain where surveillance services are not available.

This program will transition the legacy network of approximately 957 VORs to a MON of approximately 649 VORs by 2025.

The Investment Analysis Readiness Decision (IARD) was approved in March 2014. The program consists of two Phases. Phase 1 Final Investment Decision (FID) was approved on September 30, 2015 to discontinue approximately 74 VORs by the end of September 2020 and Phase 2 is scheduled for FID September 2020.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 6 – Optimize airspace and Performance Based Navigation (PBN) procedures to improve efficiency an average of 10 percent across Core airports by 2018. (FAA Business Planning Metric)*

Relationship to Performance Metric

The FAA is transitioning from the current navigation system enabled by VOR to PBN using RNAV and RNP instrument flight procedures. RNAV and RNP navigation relies on GPS, so the need for VORs will decline as the transition to PBN progresses; however, a MON needs to be maintained so pilots have a backup capability if GPS is unavailable. The FAA is planning to implement a layered backup navigation strategy relying on DME/DME navigation as an RNAV backup and VOR MON as a conventional backup navigation capability to provide service in case of a GPS outage.

Program Plans FY 2017 – Performance Output Goals

- Complete discontinuing four to thirteen VORs.
- Perform removal, redesign, or replacement of VOR instrument flight procedures and routes tied to VORs planned for discontinuance.
- Provide support to the Services Centers in conducting Safety Risk Management (SRM) activities required prior to VOR discontinuance.
- Conduct Service Volume flight checks on MON VORs.

Program Plans FY 2018 – Performance Output Goals

- Complete discontinuing four to eighteen VORs.
- Perform removal, redesign, or replacement of VOR instrument flight procedures and routes tied to VORs planned for discontinuance.
- Provide support to the Services Centers in conducting SRM activities required prior to VOR discontinuance.
- Conduct Service Volume flight checks on VORs.
- Begin VOR MON Program Phase 2 Investment Analysis.

Program Plans FY 2019 – Performance Output Goals

- Complete discontinuing 25 VORs.
- Perform removal, redesign, or replacement of VOR instrument flight procedures and routes tied to VORs planned for discontinuance.
- Provide support to the Services Centers in conducting SRM activities required prior to VOR discontinuance.
- Conduct Service Volume flight checks on VORs.

Program Plans FY 2020 – Performance Output Goals

- Complete discontinuing 36 VORs.
- Perform removal, redesign, or replacement of VOR instrument flight procedures and routes tied to VORs planned for discontinuance.
- Provide support to the Services Centers in conducting SRM activities required prior to VOR discontinuance.
- Conduct Service Volume flight checks on VORs.
- Complete VOR MON Program Phase 2 Investment Analysis.
- Achieve the VOR MON Phase 2 FID.

Program Plans FY 2021 – Performance Output Goals

The activities listed below are contingent upon achieving the VOR MON Phase 2 FID in FY 2020.

- Complete discontinuing VORs.
- Perform removal, redesign, or replacement of VOR instrument flight procedures and routes tied to VORs planned for discontinuance.
- Provide support to the Services Centers in conducting SRM activities required prior to VOR discontinuance.
- Conduct Service Volume flight checks on VORs.

2D02, INSTRUMENT LANDING SYSTEMS (ILS) – ESTABLISH

FY 2017 Request \$7.0M

Instrument Landing Systems (ILS), N03.01-00

Program Description

This program supports the installation of ILS and/or High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) for the establishment of new Category II/III precision approach procedures. An ILS precision approach system is comprised of a grouping of electronic devices such as Localizer, Glide Slope, marker beacons and, in some cases, ancillary aids Distance Measuring Equipment, Approach Lighting System, Runway Visual Range, etc. that provide landing aircraft with both electronic guidance and visual landing aids. These systems allow aircraft to land safely with a stabilized approach to a runway which improves both system safety and the capacity for landing properly equipped aircraft in adverse weather conditions at runways equipped with an ILS.

The ILS provides both vertical and lateral guidance information for the pilot to allow safe landings to touchdown and rollout. The ILS sends information to instruments in the cockpit so that the pilot can maintain a predetermined flight path to the runway even in low visibility. Some aircraft are equipped with an autopilot which can use signals from a Category IIIc ILS to automatically guide the plane to a safe landing.

The ALSF-2 is a lighting system installed along the extended centerline extending a distance of 2,400' outward into the approach zone and ending at the runway threshold. ALSF-2 provides visual cues to help the pilot see the runway when the aircraft is at or above ILS minimum altitude.

There are three categories of ILS. Each category is defined by the lowest altitude at which a pilot is able to decide whether to land or abort, the decision height, and how far away the pilot can see the runway, or runway visual range. With some exceptions for unique geography around an aircraft, the definitions for ILS categories are:

- Category I: Decision Height (DH) 200 feet and Runway Visual Range (RVR) 2,400 feet (with touchdown zone and centerline lighting, RVR 1,800 feet)
- Category II: DH 100 feet and RVR 1,200 feet
- Category IIIa: No DH or DH below 100 feet and RVR not less than 700 feet
- Category IIIb: No DH or DH below 50 feet and RVR less than 700 feet but not less than 150 feet
- Category IIIc: No DH and no RVR limitation, requires an autopilot

This program supports ILS sustainment activities at airports that meet the following criteria: 1% or more of total U.S. enplanements ("Large Hub"), 0.75% or more of total U.S. non-military itinerant operations. In addition, airports that have between 0.25% and 0.99% of total U.S. enplanements ("Medium Hub") or between 0.50% and 0.74% of U.S. non-military itinerant operations.

Approximately 55 ILSs are more than 25 years old. Currently, the ILSs are being replaced because they have exceeded their expected service life and/or the manufacturer no longer provides support. The FAA is aggressively pursuing implementation of satellite navigation but until that transition is complete, the ILS remains the world standard for providing approach and landing services.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Establishing ILS precision approach capability allows for lower minimums for landings and helps to maximize the use of the NAS. Lowering minimums allows airport operations to safely continue in poor weather conditions beyond what would otherwise be possible; effectively increasing the airport capacity.

Program Plans FY 2017 – Performance Output Goals

- Procure five ILS systems and ancillary equipment.
- Complete approximately five ILS replacement projects.
- Complete one on-going ALSF-2 establishment project.

Program Plans FY 2018 – Performance Output Goals

- Procure four ILS systems and ancillary equipment.
- Complete approximately four ILS replacement projects.

Program Plans FY 2019 – Performance Output Goals

- Procure seven ILS systems and ancillary equipment.
- Complete approximately seven ILS replacement projects.
- Complete one on-going ALSF-2 establishment project.

Program Plans FY 2020 – Performance Output Goals

- Procure seven ILS systems and ancillary equipment.
- Complete approximately seven ILS replacement projects.

Program Plans FY 2021 – Performance Output Goals

- Procure seven ILS systems and ancillary equipment.
- Complete approximately seven ILS replacement projects.

2D03, WIDE AREA AUGMENTATION SYSTEM (WAAS) FOR GPS

FY 2017 Request \$85.0M

- A, Wide Area Augmentation System (WAAS) – Phase IV Segment 1, N12.01-07 / X, Wide Area Augmentation System (WAAS) – Phase IV Segment 2, N12.01-08
- B, Global Positioning System (GPS) Civil Requirements, N12.03-01

A, Wide Area Augmentation System (WAAS) – Phase IV Segment 1, N12.01-07 / X, Wide Area Augmentation System (WAAS) – Phase IV Segment 2, N12.01-08

Program Description

WAAS consists of a network of 38 precisely located ground reference stations distributed across the United States, Canada and Mexico that monitor the global positioning system (GPS) satellite signals. Three master stations collect reference station data and calculate corrections and integrity messages for each GPS satellite. The WAAS messages are broadcast to user receivers via leased navigation transponders on three commercial geostationary (GEO) satellites. The receiver on the aircraft applies the corrections and uses the integrity information from the WAAS message to ensure the validity and obtains a precise navigation position.

Phase IV, Dual Frequency Operations, began in 2014 to leverage the improvements the Department of Defense (DoD) will make as part of its GPS modernization program.

WAAS addresses the following performance gaps:

- Lack of precise navigation capabilities (airports/runways that do not have conventional ground-based navigation aids to support precise navigation); and
- Lack of stable vertical guidance for precision approaches to airports not equipped with Instrument Landing System (ILS).

WAAS provides or supports the following improvements and capabilities:

- WAAS provides precise aircraft position information that enables the realization of several NextGen operational improvements;
- The WAAS program will continue to develop full Localizer Performance with Vertical guidance (LPV)/Localizer Performance (LP) procedures for all remaining qualified runways enabling more approaches and access into airports under low visibility conditions;
- WAAS supports the redesign of airspace to establish Area Navigation (RNAV) routes in the terminal and en-route environments (T and Q routes) increasing efficiency and capacity;
- WAAS enables Alaskan users to operate under Instrument Flight Rules (IFR) on routes currently classified as uncontrolled airspace due to lack of radar coverage improving operator efficiency, access and safety; and
- WAAS is currently supporting near-term demonstrations/validations of operational improvements for vertical flight aircraft, business/regional jets, and legacy air carriers that are made possible by airspace redesign and WAAS LPV approaches.

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

In May FY 2014, the WAAS program obtained a Final Investment Decision (FID) from the Joint Resources Council for Phase IV Segment 1, Dual Frequency Operations (DFO). In 2008, the DoD notified the GPS user community through a Federal Register Notice (Vol. 73, NO. 96) that the accessibility of the L2 P(Y) signal cannot be assured beyond December 2020. In order to sustain WAAS operations, the FAA must replace the use of the GPS L2 P(Y) signal with the second civil frequency (L5). DFO Segment 1 incorporates WAAS infrastructure upgrades to support

the use of the new L5 frequency and to prepare for the full dual frequency user capability planned for implementation in DFO Segment 2. DFO Segment 1 will include continued sustainment of the GEO constellation required to provide the broadcast of the WAAS signal. In May of 2015 the DOT, DoD and DHS released the 2014 Federal Radionavigation Plan stating that GPS L2 P(Y) would not be discontinued until two years after GPS L5 reaches full operational capability. Per the current GPS launch estimates, the GPS L2 P(Y) signal would be discontinued circa 2026 at the earliest. Efforts are underway to revise program plans for Segment 2 based on the GPS incurred delays.

WAAS Phase IV Segment 1 includes the following activities:

- **Technology Refresh:** Ongoing technology refresh to include integration of a new WAAS reference receiver and safety computer, upgrades to the terrestrial communication system (TCS) and development and fielding of new processors. There will be continuing need for replacement GEOs throughout the WAAS lifecycle to ensure current and future WAAS signal in space remains available. WAAS requires a minimum of three GEO satellites to meet performance requirements;
- **NAS Implementation:** Includes feasibility studies, procedure design, procedure development, flight inspection and surveys for WAAS procedures. Additionally, this includes data collection by operators, benefits analysis, avionics integration and development of WAAS-specific procedures within the NAS; and
- **Technology Evolution:** Research activities to support current WAAS capability (threat model assessments, ionospheric effects analysis, safety analyses and improving/maintaining interoperability with international Satellite Based Augmentation Systems (SBAS)) and research future capabilities to extend satellite navigation supported operations. Support studies for the development and validation of standards supporting integration of modernized signals and services such as Advanced Receiver Autonomous Integrity Monitoring (ARAIM).
- **GEO Satellite Acquisitions:** Develop satellite payloads and associated ground infrastructure for replacement GEO satellites. This activity covers satellite payload and ground uplink station design, development, testing and operational cutover into WAAS.

For the WAAS Lease Services portion of the program see N12.01-09.

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- Segment 2 will develop and deploy a WAAS Dual Frequency User Service that will provide user data allowing usage of the L5 signal. This new capability is contingent on having a full constellation of GPS satellites (>24) broadcasting the L5 signal and the availability of new dual frequency (L1/L5) avionics. Users who equip with new dual frequency (L1/L5) avionics will be able to process both GPS frequencies to correct for signal delays caused by the ionosphere resulting in improved availability and reliability of WAAS LPV-200 service. The expectation is that users will equip with dual frequency (L1/L5) avionics when the Segment 2 upgrades are completed and operational. For those users who do not upgrade their avionics, WAAS will continue to support single frequency users during Phase IV. DFO Segment 2 will include continued sustainment of the constellation of communication satellites required to provide the broadcast of the WAAS signal. WAAS will support FAA NextGen initiatives to meet new & growing air transportation demands through identification of WAAS equipage benefits for users through 2025.

The FID for WAAS Phase IV Segment 2 is planned in FY 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 2 – Reduce the general aviation fatal accident rate to no more than one (1) fatal accident per 100,000 flight hours by 2018.*

Relationship to Performance Metric

WAAS provides vertical and horizontal guidance enabling pilots to make stable, vertically guided approaches to all qualified runway ends in the continental United States and most of Alaska, in most meteorological conditions. The WAAS navigation signal allows pilots to fly with reduced position uncertainty regardless of location within the NAS, enhancing safety. In terminal area and approach operations, a Flight Safety Foundation Report found that

there is nearly an 8 fold reduction in approach accident rates (53 per million for non-precision approaches vs. 7 per million for precision approaches) when precision vs. non-precision approaches were used. Specifically, 141 accidents could be prevented over a 20 year time period and saving over 250 lives when using WAAS for vertically guided approaches at airports where stable vertical guidance is not available or not used today. Currently, ILS provides precision vertically guided approaches at only 1,284 of the nation's 19,000 runway ends. WAAS is able to provide the same level of precision with 3,567 LPVs, as of September 2015.

Program Plans FY 2017 – Performance Output Goals

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

- Technology Refresh:
 - Complete release package for DFO Release 1, Processor Upgrade. (APB milestone)
 - Transition of WAAS Mexico Connectivity (Ring 2) to Federal Telecommunications Infrastructure (FTI) Gateways.
 - Replace WAAS Assurance Level D Processors and upgrade Operating System (OS) and Compiler at first and last sites. (APB milestones)
 - Complete Maintenance Release development and deployment to include antenna position updates as well as minor software modifications necessary to continue WAAS operations.
- NAS Implementation:
 - Develop and publish 25 WAAS LPV/LP approach procedures with possible additional LPV procedures due to changes in Flight Standards criteria.
- Technology Evolution:
 - Conduct initial evaluation of Prototype Dual Frequency Algorithms.
 - Conduct research of issues identified in ARAIM Milestone 3 report.
- GEO Satellite Acquisition:
 - Complete GEO 6 Radio Frequency Uplink (RFU) Site Acceptance Test (SAT).

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- None.

Program Plans FY 2018 – Performance Output Goals

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

- Complete draft investment analysis documentation for WAAS Phase IV Segment 2: Acquisition Program Baseline and execution plans; Program Requirements document; Business Case; Implementation Strategy and Planning Document; Program Management Plan; and other documents as necessary.
- Technology Refresh:
 - Complete GEO 6 integration and testing of ground and satellite components.
 - Establish GEO 7 Contract.
 - Complete release package for DFO Release 2, GEO 5. (APB milestone)
 - Complete release package for DFO Release 3, G-III Multicast Structure. (APB milestone)
 - Establish contract for Ground Uplink Station (GUS) receiver.
 - Transition of WAAS Mexico Connectivity (Ring 1) to FTI Gateways.
 - Complete Statement of Work and ancillary documents for DFO Segment 2.
 - Conduct Market Survey for DFO, Segment 2.
 - Complete Maintenance Release development and deployment to include antenna position updates as well as minor software modifications necessary to continue WAAS operations.
- NAS Implementation:
 - Develop and publish 25 WAAS LPV/LP approach procedures with possible additional LPV procedures due to changes in Flight Standards criteria.
 - Establish a project and demonstrate helicopter low-level IFR infrastructure to include Helicopter RNAV Point-in-Space approach procedures in support of FAA Helicopter EMS Safety Mandate.
- Technology Evolution:
 - Complete system level evaluation of Prototype Dual Frequency Algorithms.
 - Complete Dual Frequency Antenna Minimum Operational Performance Standards (MOPS).
 - Commence ARAIM safety case.

- GEO Satellite Acquisition:
 - Conduct GEO 6 integration and testing of ground and satellite components.
 - Release GEO 7 Screening Information Request (SIR).

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- None.

Program Plans FY 2019 – Performance Output Goals

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

- Achieve FID for WAAS Phase IV Segment 2 from the JRC.
- Technology Refresh:
 - Complete release package for DFO Release 4, Corrections & Verification (C&V) Safety Computer Validation. (APB milestone)
 - Field new Safety Computer at first and last WAAS Master Station (WMS). (APB milestones)
 - Complete DFO Release 5 deployment and integration of GEO 6 into operational WAAS.
 - Award contract for new generation Signal Generator (SIGGEN).
 - Complete release package for DFO Release 5, GUS Processor Type 1 (GPT) Safety Computer Validation and GEO 6. (APB milestone)
 - Release DFO, Segment 2 SIR.
 - Complete Maintenance Release development and deployment to include antenna position updates as well as minor software modifications necessary to continue WAAS operations.
- NAS Implementation:
 - Develop and publish 25 WAAS LPV/LP approach procedures with possible additional LPV procedures due to changes in Flight Standards criteria.
- Technology Evolution:
 - Develop technical papers and reports in support of RTCA development and evaluation of Dual Frequency MOPS.
 - Develop prototype of ARAIM offline ground monitors.
- GEO Satellite Acquisition:
 - Complete GEO 7 Preliminary Design Review (PDR).

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- None.

Program Plans FY 2020 – Performance Output Goals

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

- None.

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- Technology Refresh:
 - Conduct WAAS Phase IV Segment 1 Post Implementation Review.
 - Complete design changes for new GUS receiver and SIGGEN.
 - Award DFO Segment 2 Contract.
 - Complete Maintenance Release development and deployment to include antenna position updates as well as minor software modifications necessary to continue WAAS operations.
- NAS Implementation:
 - Develop and publish 25 WAAS LPV/LP approach procedures with possible additional LPV procedures due to changes in Flight Standards criteria.
- Technology Evolution:
 - Complete design of L5 algorithm changes.
 - Establish draft MOPS for ARAIM and conduct testing of ARAIM system elements.
 - Develop draft Dual Frequency Multiple Constellation SBAS MOPS.
- GEO Satellite Acquisition:
 - Complete GEO 7 Critical Design Review (CDR).

Program Plans FY 2021 – Performance Output Goals

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

- None.

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- Technology Refresh:
 - Output goals to be developed at FID.
- NAS Implementation:
 - Develop and publish 25 WAAS LPV/LP approach procedures with possible additional LPV procedures due to changes in Flight Standards criteria.
 - Initiate Industry Partnership to expand WAAS to a new aviation sector.
- Technology Evolution:
 - Conduct integrated testing of ARAIM.
 - Conduct L5 algorithm testing with avionics and prototype WAAS Dual Frequency Service.
 - Use prototype avionics to validate system performance for WAAS L5 messages.
- GEO Satellite Acquisition:
 - Complete integration and testing of GEO 7 ground components.

B, Global Positioning System (GPS) Civil Requirements, N12.03-01

Program Description

GPS Civil Requirements program provides system design and development for a network of GPS monitoring stations and processing facilities to monitor quality of the GPS signal for civil users. The Global Positioning System (GPS) is a satellite-based system that provides position, navigation, and timing (PNT) service for use by the U.S. government and world-wide users with no direct user charges. GPS provides two PNT services; the Precise Positioning Service, using the dual L1-C/A (L band signal - Coarse Acquisition) and L2 signals, and the Standard Positioning Service (SPS), using the single L1-C/A signal. Only the SPS is available for worldwide use by the civil community. The GPS program currently consists of second generation satellites (GPS-II) and the Operational Control Segment. GPS is entering a period of transition from GPS-II to the third generation satellites (GPS-III) and the modernized operational control segment (OCX).

The National Space-based PNT policy (NSPD-39) requires civil agencies to fund new and unique civil GPS capabilities beyond the civil signals already contained in the current GPS, which includes the L1C signal and civil signal monitoring. DOT is serving as the lead civil agency.

The civil signal monitoring requirements are documented in the Civil Monitoring Performance Standard. Implementation of Civil Signal Monitoring will consist of system design and development activities performed by the GPS-III and OCX prime contractors, managed by the USAF GPS Directorate. The GPS Signal Monitoring system will consist of a worldwide network of 18-21 GPS monitor stations connected to two processing facilities. The monitor stations must be installed at worldwide geographically dispersed locations such that every GPS satellite can be continuously monitored from at least two monitor stations. The monitor stations will collect real-time measurements of the GPS signals from L1C, L1-C/A, L2C, and L5. L5 will be added on the next generation satellites. The stations will forward this information to processing facilities where software algorithms will monitor the signal for accuracy, integrity, continuity, and availability of performance to verify modernized GPS is performing properly.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

GPS-based navigation contributes to aircraft arrivals supporting average daily capacity for airports. GPS Civil Signal Monitoring enables GPS operators on the ground to quickly identify a civil signal anomaly and determine if the cause is due to either a satellite or a control segment failure and take corrective action to restore service. GPS Civil Signal Monitoring also enables the GPS community to assess the performance of civil signals to ensure that they meet the commitments made by the United States Government in the GPS SPS Performance Standard.

Program Plans FY 2017 – Performance Output Goals

- GPS technical oversight: MITRE support, Technical Assistance Support, Volpe, and National Coordination Office (NCO) support.
- Provide oversight of GPS safety assurance of the satellite vehicles and next generation OCX.
- Provide oversight of GPS spectrum protection analyses pertaining to GPS civil signals.
- Provide assessment of requirements and performance of modernized GPS signals and their impact on civil GPS aviation applications.
- Perform configuration control functions for GPS Civil Applications office to include review and approval of all requests for change.
- Support program management reviews and design reviews for the satellite vehicle and OCX programs.

Program Plans FY 2018-2021 – Performance Output Goals

- None.

2D04, RUNWAY VISUAL RANGE (RVR) & ENHANCED LOW VISIBILITY OPERATIONS (ELVO) PROGRAM

FY 2017 Request \$6.5M

- A, Runway Visual Range (RVR) – Replacement/Establishment, N08.02-00
- B, Enhanced Low Visibility Operations (ELVO) – Phase II, N08.03-01

A, Runway Visual Range (RVR) – Replacement/Establishment, N08.02-00

Program Description

The RVR program replaces older RVR equipment with PC-Based RVR equipment. RVR provides air traffic controllers with a measurement of the visibility at key points along a runway; touchdown, midpoint and rollout. That data is used to decide whether it is safe to take off or land during limited visibility conditions. During reduced visibility weather conditions, RVR system measurements are used by Air Traffic to establish airport operating categories. Properly equipped aircraft with a trained crew may continue operations under reduced visibility Category I, Category II and Category III conditions. Depending on the category of approach, the runway may require multiple visibility sensors to achieve the lowest minimums. The acquisition of more visibility sensors are required for a Category II/III approach. Each category is defined by the lowest altitude at which a pilot is able to decide whether to land or abort (decision height) and visibility conditions on the runway.

- Category I operations may use a rollout sensor of an RVR system.
- Category II operations require a touchdown and rollout sensor of an RVR system.
- Category III operations require a touchdown, midpoint and rollout sensor of an RVR system.

The RVR decreases diversions and delays at an airport by providing an accurate measure of the runway visibility. The RVR information affects airline scheduling decisions and air traffic management decisions regarding whether flight plans should be approved for an aircraft to fly to or take off from an airport with low visibility. There are 280 airports in the NAS that have RVR systems.

The new-generation RVR and PC-based RVR are safer than the older systems, because the equipment is mounted on frangible structures that break away if accidentally struck by an aircraft during take-off or landing. Replacement decisions are prioritized based on the level of activity at the airport and life-cycle issues. This program also provides equipment to upgrade qualified runways from Category I to a Category II/III precision approach.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

Older RVR systems are maintenance intensive, resulting in excessive downtime impacting airport capacity and reduces adjusted operational availability. The replacement or upgraded equipment requires less maintenance and repair time, which reduces system downtime, and supports the performance measure to maintain operational availability of the NAS.

Program Plans FY 2017 – Performance Output Goals

- Procure eight RVR systems.
- Install RVR systems at eight locations.

Program Plans FY 2018 – Performance Output Goals

- Procure eight RVR systems.
- Install RVR systems at eight locations.

Program Plans FY 2019 – Performance Output Goals

- Procure 12 RVR systems.
- Install RVR systems at 12 locations.

Program Plans FY 2020 – Performance Output Goals

- Procure 12 RVR systems.
- Install RVR systems at 12 locations.

Program Plans FY 2021 – Performance Output Goals

- Procure 12 RVR systems.
- Install RVR systems at 12 locations.

B, Enhanced Low Visibility Operations (ELVO) – Phase II, N08.03-01

Program Description

The Enhanced Low Visibility Operations (ELVO) program Phase II provides the equipment and procedures to allow for reduced minimums for landing and takeoff during periods of low visibility at selected airports. Phase 1 of the program established the criteria for low visibility operations and implemented more than 985 new procedures not requiring infrastructure investment. These reduced minimums require that visibility as measured by the Runway Visual Range (RVR) system be at or above the specified levels when Instrument Flight Rules (IFR) required under Instrument Meteorological Conditions (IMC) exist. ELVO Phase II continues the work initiated by Flight Standards to put into place additional low visibility capabilities within the NAS. These additional capabilities include: RVR1800, Special Authorization (SA) Category (CAT) I, SA CAT II, and lower than standard IFR take off minimums. These low visibility flight operations were shown to provide significant additional benefit to operations and increase NAS efficiency. In addition to the lower than standard IFR take off minimums (as low as 500RVR), the table below shows the low visibility flight operations ELVO Phase II allows for landing.

Enhanced Low Visibility Operations (ELVO) – Lower RVR Minimums			
Flight Operation	Minimums	Decision Height (DH) / Decision Altitude (DA)	Required Avionics
CAT I	1800RVR	200 ft DA	Flight Director; or Head-Up Display (HUD); or Autopilot
Special Authorization (SA) CAT I	1400RVR	150 ft DH	HUD
SA CAT II	1200RVR	100 ft DH	Autoland or HUD

Examples of operational benefits realized from ELVO implementations:

- Portland International Airport (PDX) avoided diversion of 58 arrivals with ~3,700 passengers on Christmas Eve, 2009 using SA CAT I;
- Operations continued at Boston Logan International when the primary runway was out of service and SA CAT II was implemented on the cross wind runway. This resulted in an estimated \$5.7M in avoided delay costs while the primary runway was out of service. A recurring annual benefit of \$530,000 is expected by providing an alternative runway when winds and visibility are unfavorable; and
- San Francisco has experienced a 22-25% increase in throughput through implementation of lower take off minima.

The low visibility conditions ELVO addresses often result from fog. These conditions can cause delays not only at the site of occurrence but at connecting sites, and throughout the NAS. If these delays are in the early part of the day, the NAS schedule impact through delayed, diverted, or cancelled flights can be significant. ELVO results in fewer disruptions to scheduled operations and reductions in secondary delays.

The program is baselined to provide ELVO capabilities at a minimum of 15 sites within the NAS at locations in need of additional CAT II level of service. Additionally, this program will support the congested New York/New Jersey (NY/NJ) region by implementing a regional approach within the next 5 years. The ELVO Program is a less expensive way to achieve CAT II level of service, because it relies on the advanced avionics onboard the aircraft, rather than investing in a CAT II Instrument landing System. Airports that would benefit from ELVO were identified for ELVO Phase II during Investment Analysis. Using the list of potential sites, the program schedule and key milestones will be updated annually to reflect the sites funded.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

Enhanced low visibility operations support the capacity metric by:

- Increasing the number of arrivals and/or departures during IMC;
- Decreasing the number of flight delays, cancellations, and/or diversions that occur during IMC conditions;
- Allowing airlines to maintain schedule reliability in marginal weather conditions (since both the primary and alternate routes must be approved within the flight plan);
- Providing SA CAT II more cost effectively and rapidly than Standard CAT II; and
- Allowing airports that have only one CAT II/III runway to cost effectively add SA CAT II capability on an additional runway to provide back-up service.

Program Plans FY 2017 – Performance Output Goals

- Initiate establishment of new low visibility services at a minimum of four locations.
- Obtain full operational capability for low visibility services at three sites.

Program Plans FY 2018 – Performance Output Goals

- Initiate establishment of new low visibility services at a minimum of four locations. (Prior year funds)
- Obtain full operational capability for low visibility services at three sites. (Prior year funds)

Program Plans FY 2019 – Performance Output Goals

- Obtain full operational capability for low visibility services at five sites. (Prior year funds)

Program Plans FY 2020-2021 – Performance Output Goals

- None.

2D05, APPROACH LIGHTING SYSTEM IMPROVEMENT PROGRAM (ALSIP)

FY 2017 Request \$3.0M

Approach Lighting System Improvement Program (ALSIP) Continuation, N04.03-00

Program Description

The ALSIP improves approach lighting systems built before 1975. It upgrades the equipment to current standards and reduces the potential severity of take-off and landing accidents by replacing rigid structures, and the entire approach lighting system, with lightweight and low-impact structures that collapse or break apart upon impact (frangible). There are approximately 30 Approach Lighting System with Runway Alignment Indicator Lights (MALSR) and 1 High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) systems that do not meet the frangible requirements.

The ALSF-2 provides visual information on whether the pilot is aligned with the runway centerline, the aircraft's height above the runway plane, roll guidance, and horizontal reference for Category II and III Precision Approaches. The MALSR provides the pilot with visual information on whether the aircraft is aligned with the runway, height perception, roll guidance, and horizontal references for Category I Precision and Special Authorization Category II Approaches. An operational MALSR or ALSF-2, in conjunction with an ILS, will support continued airport operations (with lower minimums) during conditions of low visibility.

The number of installations indicated in the performance output goals reflects only the scheduled installations, the actual number will vary because FAA will take advantage of cost saving opportunities in coordinating needed replacements with airport financed projects and some replacements must be done on an emergency basis when existing systems are damaged.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

To meet current standards, this program replaces legacy rigid structure approach lighting systems with lightweight, low-impact frangible structures that collapse or break apart upon impact. This reduces both the potential damage to an aircraft, and the risk of a fatality, should a collision occur with a frangible structure during take-off or landing.

Program Plans FY 2017 – Performance Output Goals

- Procure approximately five MALSR systems and ancillary equipment
- Complete MALSR replacement at approximately five locations.

Program Plans FY 2018 – Performance Output Goals

- Procure approximately five MALSRS systems and ancillary equipment.
- Complete MALSRS replacement at approximately five locations.

Program Plans FY 2019 – Performance Output Goals

- Procure approximately five MALSRS systems and ancillary equipment.
- Complete MALSRS replacement at approximately five locations.

Program Plans FY 2020 – Performance Output Goals

- Procure approximately five MALSRS systems and ancillary equipment.
- Complete MALSRS replacement at approximately five locations.

Program Plans FY 2021 – Performance Output Goals

- Procure approximately five MALSRS systems and ancillary equipment.
- Complete MALSRS replacement at approximately five locations.

2D06, DISTANCE MEASURING EQUIPMENT (DME)

FY 2017 Request \$3.0M

Sustain Distance Measuring Equipment (DME), N09.00-00

Program Description

DME is a radio navigation aid used by pilots to determine the aircraft's slant distance from the DME location. The program is procuring and installing state-of-the-art DME systems to support replacement of DMEs that have exceeded their service life expectancy; establish new DMEs at qualifying airports; to relocate DME facilities; and establish DMEs in lieu of Instrument Landing System markers.

The program supports a Commercial Aviation Safety Team (CAST) recommendation to implement DME on various airport runways. The CAST includes FAA, airline and airport personnel, and it has identified 451 runway ends that require implementation of DME capability. These systems will support efforts to reduce the number of controlled-flight-into-terrain (CFIT) accidents at the most vulnerable locations in the NAS. The FAA has agreed to implement the 177 highest priority CAST DME installations.

For safety reasons, the aviation industry wants to discontinue using step-down non-precision approach procedures in which a pilot descends to the minimum allowable altitude to visually locate the runway. Using DMEs reduces the need for this type of approach. Due to the continuous ranging information provided by a DME, procedure designers have greater flexibility of where step down fixes are located and how many are needed; this leads to better specification and control over the vertical descent profile and reduces CFIT risk.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The new DME can respond to more than 250 interrogators from aircraft simultaneously without being saturated, potentially doubling the number of aircraft that can simultaneously interrogate a DME. The new configuration will eliminate the need for training and maintenance of multiple DME systems within the NAS, provide improved reliability compared to existing DME systems and have a positive impact on airport capacity.

The new DME meets all user operational needs with increased capacity, efficiency, and predictability, while enhancing safety, mitigating environmental impacts, and operating in a seamless global environment by:

- Increasing current interrogation capacity by 150%
- Reducing training and maintenance costs
- Eliminating the need for step-down non-precision approach procedures
- Reducing the need for off-airport facilities
- Providing a world-wide standard for navigation equipage
- Serving as a back-up system for GPS/WAAS

Program Plans FY 2017 – Performance Output Goals

- Procure 25 DME systems.
- Complete 25 DME establish/sustainment projects.

Program Plans FY 2018 – Performance Output Goals

- Procure 25 DME systems.
- Complete 25 DME establish/sustainment projects.

Program Plans FY 2019 – Performance Output Goals

- Procure 35 DME systems.
- Complete 35 DME establish/sustainment projects.

Program Plans FY 2020 – Performance Output Goals

- Procure 35 DME systems.
- Complete 35 DME establish/sustainment projects.

Program Plans FY 2021 – Performance Output Goals

- Procure 40 DME systems.
- Complete 40 DME establish/sustainment projects.

2D07, VISUAL NAVAIDS - ESTABLISH/EXPAND

FY 2017 Request \$2.0M

Visual Navaids for New Qualifiers, N04.01-00

Program Description

This program supports the procurement, installation, and commissioning of Precision Approach Path Indicator (PAPI) systems and Runway End Identification Light (REIL) systems at new qualifying runways.

A PAPI provides visual approach glide slope information to pilots and enables them to make a stabilized descent with a safe margin of approach clearance over obstructions. The PAPI system consisting of four light assemblies arranged perpendicular to the edge of the runway. The PAPI system projects a pattern of red and white lights along the desired glide slope enabling pilots to confirm they are on the glide slope; and if not, to determine if they are above or below it to correct their rate of descent.

A REIL is a visual aid that provides the pilot with a rapid and positive identification of the approach end of a runway. The REIL system consists of two simultaneously flashing white lights, one on each side of the runway landing threshold.

The program also supports a Commercial Aviation Safety Team (CAST) recommendation to implement a visual glide slope indicator approach capability on various airport runways including those affected by Land and Hold Short Operations (LAHSO) requirements. The CAST includes FAA, airline and airport personnel, and it has

identified 781 runway ends that require implementation of a visual glide slope indicator approach capability. This capability will reduce the number of the controlled flight into terrain accidents during approach and landing.

LAHSO is an air traffic control tool used to increase airport capacity by allowing coordinated approaches on intersecting runways. Vertical guidance is required for air carrier operations on the hold short runway to avoid landing long and conflicting with operations on the other runway.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

Installing PAPI lights at both CAST and non-CAST locations enhances system safety by reducing the probability of a Controlled Flight into Terrain accident during approach and landing. Installing the REIL system reduces accidents because the system clearly identifies the runway end to the pilot, especially in the presence of multiple lights in the runway environment.

Program Plans FY 2017 – Performance Output Goals

- Procure five PAPI systems.
- Install PAPI systems at five locations.

Program Plans FY 2018 – Performance Output Goals

- Procure five PAPI systems.
- Install PAPI systems at five locations.

Program Plans FY 2019 – Performance Output Goals

- Procure five PAPI systems.
- Install PAPI systems at five locations.

Program Plans FY 2020 – Performance Output Goals

- Procure five PAPI systems.
- Install PAPI systems at five locations.

Program Plans FY 2021 – Performance Output Goals

- Procure five PAPI systems.
- Install PAPI systems at five locations.

2D08, INSTRUMENT FLIGHT PROCEDURES AUTOMATION (IFPA)

FY 2017 Request \$9.4M

Instrument Flight Procedures Automation (IFPA) – Technology Refresh, Segment 1, A14.02-02 / Instrument Flight Procedures Automation (IFPA) – Technology Refresh, Segment 2, A14.02-03

Program Description

IFPA is a suite of Information Technology tools, consisting of the Instrument Procedure Development System (IPDS), Instrument Flight Procedures (IFP) database, Airports and Navigations Aids database (AirNav), Obstacle Evaluation (OE) system, and the Automated Process Tracking System (APTS). These tools are used to develop and publish new and revised instrument flight procedures. IFPA includes functionality for developing approaches,

missed approaches, circling approaches, airways, and departures. In addition, IFPA contains an integrated obstacle evaluation application that replaces a manual dependent process.

As additional runways are equipped to handle instrument operations, new and revised instrument flight procedures must be developed and published. New approach and departure procedures are being developed to take advantage of Required Navigation Performance (RNP) capabilities and GPS assisted approaches that can reduce the flight path distance before landing or after takeoff. FAA's Aeronautical Navigation (AeroNav) Products directorate maintains more than 21,000 instrument flight procedures in use at over 4,000 paved runways. The procedures are available to pilots through a printed booklet and electronic media to determine the appropriate altitude, heading, and other information needed to fly precision and non-precision approaches and departures into and out of a selected airport.

A technology refresh of IFPA hardware and software will be accomplished segments, according to the baselined lifecycle (FY 2012-2032).

IFPA – Technology Refresh, Segment 1 (A14.02-02):

In November 2010, the IFPA Technology Refresh Segment 1 cost and schedule baseline was approved by the Joint Resources Council (JRC). Beginning in FY 2012 extending through FY 2016, the legacy APTS workflow software was planned to be replaced with new commercial-off-the-shelf (COTS) business process workflow software. The APTS system will be renamed to AeroNav Products Workflow System (APWS) during the technology refresh. The new APWS will complete replacement of the core workflow processes which flow and meter new IFP development requests, IFP amendments, IFP NOTAMs, and IFP Obstacle Evaluations (OE's). APWS will provide new workflow processes associated with FAA's NAV Lean initiative that streamlines the process for requesting, prioritizing, developing and implementing IFPs; and provide new business management functions integrated with the new workflow system.

In FY 2013, the IPDS software tool was upgraded for COTS architecture changes, including conversion for the Windows-7 operating system, and was deployed in Q4 FY 2015. Technology Refresh of the IFPA server infrastructure began in FY 2013 and was completed in FY 2014.

While originally planned for completion in FY 2016, development of the APWS experienced technical difficulties in FY 2015. The APWS prime contractor experienced high rates of development and testing defects requiring additional funding which exceeded the program's ability to absorb the cost within the approved baseline. The work was stopped in August 2015 and an assessment initiated to investigate options for continuing the program. In Q1 of FY2016, the program office obtained approval for a solicitation for a new solution. A revised program baseline to extend development of a new solution to Q4 FY 2018 will be presented to the JRC in FY 2016.

IFPA – Technology Refresh, Segment 2 (A14.02-03):

A study began in early FY 2015 to determine the type of computer equipment and associated software tools that will be included in the IFPA Technology Refresh Segment 2 effort and to develop a schedule with milestones for that segment. A final investment decision (FID) is planned for FY 2016 to coincide with expected JRC approval of the Segment 1 revised baseline.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The IFPA system ensures continued progress toward increasing instrument flight procedures development and maintenance productivity. Approved capital investment business case productivity gains of 32% were achieved by FY 2011. IFPA continues to improve the quality of products through process reengineering and elimination of manual processes. It provides the ability to produce 250+ Performance Based Navigation (PBN) IFP's annually, 3,000+ IFP amendments annually, perform 70,000+ obstacle evaluations annually, and maintain a 1% production error rate.

Program Plans FY 2017 – Performance Output Goals

IFPA – Technology Refresh, Segment 1 (A14.02-02):

- Complete APWS Test Readiness Review (TRR).

IFPA – Technology Refresh, Segment 2 (A14.02-03):

- Complete IPDS Critical Design Review (CDR) for COTS software technology refresh. NOTE: All program milestones for FY 2017-21 will be determined and finalized in the Approved Program Baseline (APB) at FID in FY 2016.

Program Plans FY 2018 – Performance Output Goals

IFPA – Technology Refresh, Segment 1 (A14.02-02):

- Complete APWS Development Test (DT).
- Complete APWS Operational Test (OT).
- Complete APWS Initial Operating Capability (IOC).

IFPA – Technology Refresh, Segment 2 (A14.02-03):

- Complete Requirements Analysis and Documents from System Engineering efforts and begin software programming for COTS software technology refresh of IPDS.
- Procure and install new IPDS computers.

Program Plans FY 2019 – Performance Output Goals

IFPA – Technology Refresh, Segment 1 (A14.02-02):

- None.

IFPA – Technology Refresh, Segment 2 (A14.02-03):

- Complete Development Test (DT) of COTS software technology refresh for IPDS.
- Procure and install computer monitors.
- Complete technology refresh of server infrastructure.

Program Plans FY 2020 – Performance Output Goals

IFPA – Technology Refresh, Segment 1 (A14.02-02):

- None.

IFPA – Technology Refresh, Segment 2 (A14.02-03):

- Complete Operational Test (OT) for IPDS.

Program Plans FY 2021 – Performance Output Goals

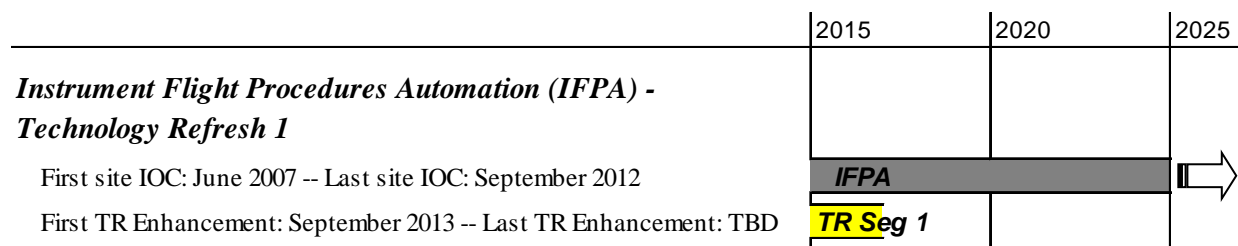
IFPA – Technology Refresh, Segment 1 (A14.02-02):

- None.

IFPA – Technology Refresh, Segment 2 (A14.02-03):

- Achieve Initial Operating Capability (IOC) for IPDS. (Prior year funding) NOTE: All program milestones for FY 2017-21 will be determined and finalized in the APB at FID in FY 2016.

System Implementation Schedule



2D09, NAVIGATION AND LANDING AIDS – SERVICE LIFE EXTENSION PROGRAM (SLEP)
FY 2017 Request \$3.0M

Nav aids – Sustain, Replace, Relocate, N04.04-00

Program Description

This program sustains and/or replaces Approach Lighting Systems (ALS) at sites where there is a high risk for failure of these systems and where failure would result in increased visibility minima which can cause NAS schedule impact through delayed, diverted, or cancelled flights not only at the site of occurrence but at connecting sites, and throughout the NAS. The ALS include Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) for Category I approaches and High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) for Category II/III approaches.

Instrument Landing Systems (ILS) will be replaced at airports that provide less than 0.25% of total US enplanements and at airports with less than 0.50% of total US non-military itinerant operations. ILS components include electronic devices such as localizers, glide slopes and marker beacons. In some cases, Mark-1F ILSs that are removed from an airport will be relocated and installed at another airport to replace existing Mark-1D and Mark-1E ILSs.

This program also replaces Runway End Identifier Lights (REIL); a visual aid that provides the pilot with a rapid and positive identification of the approach end of a runway. The REIL system consists of two simultaneously flashing white lights, one on each side of the runway landing threshold.

In addition, this program supports the Replacement Lamp Monitoring System (RLMS) project which provides service life extension for ALSF-2 (CAT II/III systems) by replacing the constant current regulators and installing an improved monitoring system at some locations. These changes have successfully increased the system's adjusted operational availability from 98.4 to 98.7.

This program also supports product improvements, modifications, and technology upgrades to visual lighting system components. Ongoing efforts include:

- Improve approach lighting system semi-flush fixtures;
- Replace existing MALSR green threshold and white steady burning lights with LED lights; and
- Replace existing ALSF-2 threshold light bar lamp holder fixtures that are susceptible to misalignment caused by jet blast.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The older electronic guidance systems and lighting systems are maintenance intensive, resulting in excessive downtime, which negatively impacts airport capacity. Replacement or upgraded equipment requires less maintenance and repair time, reducing system downtime and contributing to maintaining the operational availability of the NAS.

Program Plans FY 2017 – Performance Output Goals

- Procure three ALSF-2 RLMS kits.
- Complete approximately three ALSF-2 RLMS installations.
- Complete approximately 10 REIL replacement projects.

Program Plans FY 2018 – Performance Output Goals

- Complete two ILS replacement projects.
- Procure three ALSF-2 RLMS kits.
- Complete approximately three ALSF-2 RLMS installations.
- Replace approximately 10 REIL replacement projects.

Program Plans FY 2019 – Performance Output Goals

- Complete approximately four ILS replacement projects.
- Complete approximately two MALSR replacement projects.
- Procure five ALSF-2 RLMS kits.
- Complete approximately five ALSF-2 RLMS installations.
- Complete approximately 10 REIL replacement projects.

Program Plans FY 2020 – Performance Output Goals

- Complete approximately eight ILS replacement projects.
- Complete approximately two MALSR replacement projects.
- Procure six ALSF-2 RLMS kits.
- Complete approximately six ALSF-2 RLMS installations.
- Complete approximately 10 REIL replacement projects.

Program Plans FY 2021 – Performance Output Goals

- Complete approximately eight ILS replacement projects.
- Complete approximately two MALSR replacement projects.
- Procure six ALSF-2 RLMS kits.
- Complete approximately six ALSF-2 RLMS installations.
- Complete approximately 10 REIL replacement projects.

2D10, VASI REPLACEMENT – REPLACE WITH PRECISION APPROACH PATH INDICATOR

FY 2017 Request \$5.0M

Replace Visual Approach Slope Indicator (VASI) with Precision Approach Path Indicator (PAPI), N04.02-00

Program Description

The International Civil Aviation Organization (ICAO) has recommended that all international airports replace the Visual Approach Slope Indicator (VASI) lights with Precision Approach Path Indicators (PAPI) lights. This standardizes the equipment used by pilots to visually determine they are on the proper glide slope for landing. The program supports the procurement, installation, and commissioning of PAPI systems in order to comply with this ICAO recommendation.

The VASI and PAPI systems have a set of lights that are arranged so that the pilot sees all red lights when the aircraft is below the glideslope and all white lights when the aircraft is above the glideslope. This visual reference helps the pilot maintain the appropriate descent rate to the runway.

At the inception of this program, there were approximately 1,387 older (pre-1970's) VASIs at international and other validated locations requiring replacement. There are now 877 VASI systems remaining in the NAS. The first priority of the program is to replace VASI systems at approximately 329 ICAO designated runway ends. This will be completed in fiscal year 2018. The replacement of the remaining VASI systems at non-ICAO airports in the NAS will be completed in fiscal year 2051.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

Replacing VASI with PAPI improves on-time performance by increasing the availability of the visual approach slope guidance systems used to help pilots touch down at the appropriate location on the runway.

Program Plans FY 2017 – Performance Output Goals

- Procure 18 Precision Approach Path Indicator systems.
- Replace the Visual Approach Slope Indicator lights with Precision Approach Path Indicators lights at 18 locations.

Program Plans FY 2018 – Performance Output Goals

- Procure 18 Precision Approach Path Indicator systems.
- Replace the Visual Approach Slope Indicator lights with Precision Approach Path Indicators lights at 18 locations.

Program Plans FY 2019 – Performance Output Goals

- Procure 36 Precision Approach Path Indicator systems.
- Replace the Visual Approach Slope Indicator lights with Precision Approach Path Indicators lights at 36 locations.

Program Plans FY 2020 – Performance Output Goals

- Procure 36 Precision Approach Path Indicator systems.
- Replace the Visual Approach Slope Indicator lights with Precision Approach Path Indicators lights at 36 locations.

Program Plans FY 2021 – Performance Output Goals

- Procure 54 Precision Approach Path Indicator systems.
- Replace the Visual Approach Slope Indicator lights with Precision Approach Path Indicators lights at 36 locations.

2D11, RUNWAY SAFETY AREAS – NAVIGATION MITIGATION

FY 2017 Request \$14.0M

Runway Safety Area – Navigation Mitigation, N17.01-01

Program Description

The FAA's runway safety program improves the overall safety of the Runways and Runway Safety Area (RSA). The RSA must be free of all objects that are three inches above the grade and are not frangible. The relocation or removal of existing rigid objects will decrease the potential for damage to aircraft and minimize injuries or fatalities to aircraft passengers and crew members if an aircraft has to use the RSA in an emergency. One key element of this program is RSA Sterilization which includes provisions for clear areas, surface drainage, and weight supportability.

The FAA currently owns and operates numerous NAVAIDs that need to be modified to satisfy the language of Title 14 Code Federal Regulations (CFR) Part 139 (Certification of Airports). Although measured incremental progress has been made to restructure these FAA-owned NAVAIDs, a concerted, focused initiative will be necessary to comply with the current RSA airport design standards by December 31, 2015. Legislation requires FAA to report on the agency's progress toward RSA improvements.

The program corrects FAA-owned NAVAIDs in RSAs by taking action on those navigation systems that are not in compliance with the RSA requirements. The scope of the work to be accomplished will range from the installation of frangible connections on identified structures to the relocation of facilities within RSA if no other solution is available. The FAA is committed to clearing all safety improvements by December 31, 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

RSA compliance provides a measure of safety to reduce the extent of personal injury and/or aircraft damage in the unlikely event an aircraft should unintentionally leave a runway or RSA, either before takeoff or during/following landing, by relocating or removing existing rigid objects that pose a potential hazard. This program will modify any FAA-owned equipment that does not conform to current RSA standards to ensure compliance with Part 139 in Title 14 of the US CFR.

Program Plans FY 2017 – Performance Output Goals

- Complete 70 Facilities & Equipment (F&E)-funded RSA improvements.

Program Plans FY 2018 – Performance Output Goals

- Complete 11 F&E-funded RSA improvements.

Program Plans FY 2019-2021 – Performance Output Goals

- None.

2D12, NAVAIDS MONITORING EQUIPMENT

FY 2017 Request \$2.0M

NAVAIDS Monitoring Equipment, M08.41-02

Program Description

The Nav aids Monitoring Equipment (NME) program will deploy a system that provides consolidated monitoring and control of navigational aid equipment by replacing multiple independent control and monitoring units located in air traffic control towers with a single integrated interface. NME will consist of a display located in the tower that interfaces to various navigational aids such as instrument landing systems (ILS), runway visual range (RVR) equipment, runway end identifier lights (REIL), precision approach path indicator (PAPI) light arrays, and airport lighting systems that are located on the airfield. By monitoring NME system displays, air traffic control specialists and technical operations will have the ability to change the state and status (e.g. on/off, brightness) of Nav aid equipment. Through consolidated monitoring using NME system displays, technical operations will be able to more efficiently monitor the state and condition of Nav aids equipment.

The NME program will provide efficiencies by combining the control and monitoring functionality currently being provided by legacy systems into a single solution with one common software, training and logistics platform. The NME system will be installed at approximately 32 airports across the NAS.

An Investment Analysis Readiness Decision (IARD) is planned for September 2016, Initial Investment Decision (IID) for September 2017 and Final Investment Decision (FID) for September 2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily airport capacity for Core airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

The NME system will provide an interface to navigational aid equipment that is used by air traffic controllers and pilots during daily arrivals and departures at airports throughout the NAS. The NME system will be deployed at certain core airports and will assist in maintaining average daily airport capacity by providing an integrated display that will be used by air traffic controllers to monitor and control multiple navigational aid systems such as ILS, RVR equipment, and PAPI from a single location. Air traffic control will be able to configure the interfaced navigational aids equipment to support multiple airport flows. The NME system will also be responsible for managing the interlocking functionality of the instrument landing systems to ensure that frequencies on the opposing ends of runways are not transmitted concurrently.

Program Plans FY 2017 – Performance Output Goals

- Complete Initial Program Requirements Document (iPRD).
- Complete Business Case Analysis Report (BCAR).
- Complete Initial Implementation Strategy and Planning Document (ISPD).
- Achieve IID.

Program Plans FY 2018 – Performance Output Goals

- Complete Final Program Requirement Document (fPRD).
- Complete Final Business Case Analysis Report (BCAR).
- Complete Final Implementation Strategy and Planning Document (ISPD).
- Achieve FID.
- Award NME contract for system development and implementation.
- Begin system development.

Program Plans FY 2019 – Performance Output Goals

- Output goals will be developed at FID.

Program Plans FY 2020-2021 – Performance Output Goals

- None.

E: Other ATC Facilities Programs

2E01, FUEL STORAGE TANK REPLACEMENT AND MANAGEMENT

FY 2017 Request \$22.7M

Fuel Storage Tank Replacement Management, F13.01-00

Program Description

The FAA Fuel Storage Tank (FST) Replacement and Management program replaces, modernizes, upgrades, and sustains bulk liquid and pressure vessel storage systems that support FAA operations across the NAS. The FST systems include the storage tank (both above ground and underground tanks containing a variety of liquids: gasoline, diesel, propane, oils, glycol, etc.); the flow control devices (pipe, hoses, pumps, valves, etc.); electronic leak detection and inventory control devices (fuel monitoring systems); and electronic/electrical system operation devices (control boards, technician operations stations, switched relays, etc.). The FAA active tank system inventory

includes over 3,800 units that must store and provide adequate fuel for the systems being supported and be prevented from leaking. Historical data is retained on over 1,900 previously closed/removed systems.

The majority of FAA storage tanks support electrical generator operations. Standby generators provide NAS facilities with an alternative power supply during periods of commercial power outages. Prime generators provide the sole source electrical power for NAS operations where no commercial power is available. A loss of integrity on any FST component will affect the operation of the generator systems which could ultimately result in a total loss of power at an air traffic control facility.

Fuel storage tanks contain substances that if accidentally released could cause an adverse environmental impact or result in personal injury. In response to the risk of accidental release, the federal government, various state legislatures, county governments and city jurisdictions have passed statutes specifying the minimum requirements for the construction, installation, removal, operation and maintenance of storage tank systems. Additional regulations have been established by state, local and international building codes, fire protection codes, airport operating authority requirements and Occupational Safety and Health Administration (OSHA) mandates. Failure to comply with all elements of these regulatory requirements exposes FAA to the risk of fines and other penalties including loss of the right to use or refill the systems.

Program costs are based on an average 20 year system lifecycle for FST systems. Annually; an average of 190 FST system replacements are required to sustain the portfolio and maintain NAS operational integrity. System components have differing lifecycles so component replacements continue during full 20 year system lifecycles. Additionally, changes in the regulatory environment require immediate response to assure fielded units meet current standards. This program is included in the ATC Facilities Sustainment Strategic Plan.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The FST Replacement and Monitoring program reduces the potential for delays by ensuring uninterrupted service of navigation aids, automation systems and other air traffic control systems due to a loss of power. Fuel system component replacements are prioritized based on a successful ranking application, which evaluates the system's critical operation requirements to assure operational availability is sustained. Fuel systems are electronically monitored to assure system integrity and to minimize adverse impacts to personal and environmental safety.

Program Plans FY 2017-2021 – Performance Output Goals

- Replace, modernize or upgrade 114 fuel systems per year at facilities selected under the FST Program Prioritization Scheme and validated through the Air Traffic Control Facilities / Engineering Services (ATCF/ES) directorate Portfolio Model.

2E02, UNSTAFFED INFRASTRUCTURE SUSTAINMENT

FY 2017 Request \$40.5M

Unstaffed Infrastructure Sustainment (UIS), F12.00-00

Program Description

There are approximately 12,500 unstaffed facilities within the NAS. The Unstaffed Infrastructure Sustainment (UIS) program provides for the modernization of NAS buildings, structures, supporting electrical and heating/air conditioning equipment, and other real property assets that make up each facility. This helps to ensure the reliable delivery of Air Traffic Control services and is an important component of the ATC Facilities Sustainment Strategic Plan.

A portfolio analysis of unstaffed facilities revealed that many:

- Are not compliant with applicable FAA regulations and standards;
- Cannot protect vital air traffic control systems or equipment against premature failure due to Environmental impacts (e.g., roof leaks, air conditioner failures, etc.);
- While operable, have a fair to poor overall facility condition index (FCI) (Good Condition is 1.0 – 0.95, Fair Condition is 0.95 – 0.90, Poor Condition is below 0.90);
- Have impaired or poor facility accessibility, and;
- Have very old radio towers / tower components that need major modernization or replacement.

The UIS program includes the replacement and/or upgrade of real property and unstaffed structures. These projects include upgrades, modernizations, refurbishments, and replacements of:

- NAS antenna and equipment towers;
- Heating, ventilating, and air conditioning (HVAC) equipment;
- Buildings and shelters;
- Roofs;
- Electrical panels and distribution wiring;
- Locks and alarm sensors and lighting;
- Access roads, grounds, fencing, and;
- Safety components including ladders and railings.

Infrastructure improvements help protect electronic equipment to ensure the reliable delivery of air traffic services.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The FAA Unstaffed Infrastructure Sustainment Program supports the FAA's Strategic Priority to Deliver Benefits through Technology and Infrastructure by renovating or replacing existing FAA-owned unstaffed facilities and structures serving the NAS. The NAS requires reliable and continuous operation of surveillance, navigation, communication, and weather equipment. In addition, the infrastructure protects the electronic equipment from weather hazards, radio interference, and unauthorized entry. Failure of the infrastructure can result in NAS equipment failures, which may result in a reduction of available capacity to the NAS.

Program Plans FY 2017 – Performance Output Goals

- Complete 150 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 120 antenna towers to improve maintenance and safety conditions for FAA employees.

Program Plans FY 2018 – Performance Output Goals

- Complete 150 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 120 antenna towers to improve maintenance and safety conditions for FAA employees.

Program Plans FY 2019 – Performance Output Goals

- Complete 150 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 120 antenna towers to improve maintenance and safety conditions for FAA employees.

Program Plans FY 2020 – Performance Output Goals

- Complete 150 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 120 antenna towers to improve maintenance and safety conditions for FAA employees.

Program Plans FY 2021 – Performance Output Goals

- Complete 160 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 120 antenna towers to improve maintenance and safety conditions for FAA employees.

2E03, AIRCRAFT RELATED EQUIPMENT PROGRAM

FY 2017 Request \$13.0M

- A, Aircraft Related Equipment (ARE) Program, M12.00-00
- B, NextGen Flight Simulation Testing and Research Technologies (Flight START) – Technology Refresh Program - Additional Projects, M12.01-04

A, Aircraft Related Equipment (ARE) Program, M12.00-00

Program Description

The Aircraft Related Equipment (ARE) program supports the FAA’s worldwide Flight Inspection (FI) mission to evaluate and certify Instrument Flight Procedures (IFPs) and ground-based and space-based navigational equipment. This mission includes some facilities for the Department of Defense, other Federal, State, private, and international customers. The FAA is currently operating a fleet of 29 FAA-owned and two leased aircraft to support the Flight Inspection Services (FIS) mission. The aircraft consist of: 17 Beechcraft 300; 5 Learjet 60; 6 Challenger 600 series; 1 Gulfstream IV; and 2 Citation XL (leased). The Gulfstream IV and the leased aircraft are operated by the Washington Flight Program (Hangar 6) at Ronald Reagan Washington National Airport. The ARE program outfits and updates the FIS aircraft fleet with the systems required for inspecting, certifying, modernizing and sustaining the NAS and to meet NextGen requirements. The FIS aircraft must also be equipped with modern avionics to operate in the evolving global environment.

The ARE program provides FI aircraft with specialized test equipment to meet current and future performance requirements such as the Automated Flight Inspection System (AFIS) and the Next Generation Automated Flight Inspection System (NAFIS). ARE also provides a communication system for data gathered while airborne. The Flight Operations Management System (FOMS) is used to schedule and manage the inspection process and to handle the dissemination of post flight inspection results.

The new test equipment and avionics provides the capability for the flight validation & inspection of:

- Wide Area Augmentation System (WAAS)/Localizer Performance with Vertical Guidance (LPV/LP) approaches;
- Required Navigation Performance (RNP) IFPs;
- Area Navigation (RNAV) Standard Instrument Departures (SIDs);
- RNAV Standard Terminal Approach Routes (STARs);
- Distance Measuring Equipment (DME/DME) and Global Positioning System (GPS) routes;
- Automatic Dependent Surveillance – Broadcast (ADS-B);
- Wide Area Multilateration (WAM); and
- GPS Landing System (GLS).

The ARE program is grouped into three activities:

Aircraft Modernization:

Projects support avionics technology refresh and new/changing regulatory requirements for operating aircraft in domestic and international airspace.

Flight Inspection System (Sustainment):

Projects support mission equipment technology refresh and new/changing regulatory requirements necessary to continue flight inspection of legacy NAS systems.

Flight Inspection System Modernization:

Projects support new mission equipment requirements and new/changing regulatory requirements necessary to provide flight inspection of Performance Based Navigation and implementation of evolving NextGen systems.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The FAA sustains system availability by ensuring the accuracy of navigational aid electronic signals, as well as validating and certifying the approach/departure flight procedures and terminal routes at all airports within the NAS and at military facilities world-wide. To perform this mission the fleet of FI aircraft must be modernized and updated to be compatible with the latest equipment and procedures. In FY 2015, a total of 12,926 flight inspections were conducted of existing ground-based navigational aids and existing IFPs and 1,107 had reportable discrepancies. This equates to 8.6% of published IFPs and associated ground-based navigational aids requiring further attention. A total of 2,496 IFPs required flight inspection in order to publish a new or amended flight procedure. The results of those flight inspections required 431 IFPs to be adjusted or were found to be unsatisfactory. Of the new or amended IFPs, 17.3% required correction and thereby avoided potentially unsafe IFPs from being published.

Program Plans FY 2017 – Performance Output Goals

Aircraft Modernization:

- Acquire, install, or complete:
 - Equipment to establish connected aircraft based on the multi-fleet, multi-year schedule updated in FY 2016.
 - ADS-B Transponders for the Beech 300 fleet.
 - Transponder Attenuator replacements for all Beech 300 aircraft.
 - Inertial Reference Unit (IRU) update for the one Challenger 604 and three Challenger 601 aircraft.
 - Advanced Avionics package on one of two Challenger 605 aircraft.
 - Very High Frequency (VHF) and GNSS Radio Frequency Interference (RFI) sensors for the Beech 300 and Challenger 600-series aircraft.
 - Interior modification and FANS 1A+ avionics package for the one Challenger 604 aircraft.

Flight Inspection System Sustainment:

- Execute NAFIS interim updates for deployed aircraft.

Flight Inspection System Modernization:

- Deploy NAFIS Phase II on seven Beech 300 aircraft.

Program Plans FY 2018 – Performance Output Goals

Aircraft Modernization:

- Acquire, install, or complete:
 - Equipment to establish connected aircraft based on the multi-fleet, multi-year schedule updated in FY 2017.
 - ADS-B Transponders for the Beech 300 fleet.
 - Global Navigation Support System (GNSS) Landing System (GLS) CAT II/III equipment for Challenger 600-series.
 - Heads Up Display (HUD) / Enhanced Vision System (EVS) for the two Challenger 605 aircraft.
 - Advanced Avionics package on one of two Challenger 605 aircraft.
 - Fusion avionics upgrade on the one Challenger 604 aircraft.
 - Very High Frequency (VHF) and GNSS Radio Frequency Interference (RFI) sensors for the Beech 300 and Challenger 600-series aircraft.
 - Flight Inspection Transponder & Lo-Power Selection for the two Challenger 605 aircraft.

Flight Inspection System Sustainment:

- Complete NAFIS updates for deployed aircraft.

Flight Inspection System Modernization:

- Deploy NAFIS Phase II on two Beech 300 aircraft.

Program Plans FY 2019 – Performance Output Goals

Aircraft Modernization:

- Acquire, install, or complete:
 - Equipment to establish connected aircraft based on the multi-fleet, multi-year schedule updated in FY 2018.
 - ADS-B Transponders and Controller Pilot Data Link Capability (CPDLC) for the three Challenger 601 aircraft.
 - GPS antennas to include the L5 band on all aircraft types.

Flight Inspection System Sustainment:

- Install NAFIS Phase II updates for the fleet.
- Install NAFIS Phase II Block Upgrades.

Program Plans FY 2020 – Performance Output Goals

Aircraft Modernization:

- Acquire, install, or complete:
 - Equipment to establish connected aircraft based on the multi-fleet, multi-year schedule updated in FY 2019.
 - Flight Management System (FMS) upgrade for the Beech 300 fleet.
 - Avionics system upgrades for the Challenger 601 fleet and the Lear 60 fleet.

Flight Inspection System Sustainment:

- Install NAFIS Phase II updates for the fleet.

Program Plans FY 2021 – Performance Output Goals

Aircraft Modernization:

- Acquire, install, or complete:
 - FMS upgrade for the Beech 300 fleet based on the multi-year schedule established in FY 2020.
 - Avionics system upgrades for the Challenger 601 fleet and the Lear 60 fleet based on the multi-year schedule established in FY2020.

Flight Inspection System Sustainment:

- Install NAFIS Phase II updates for the fleet.

B, NextGen Flight Simulation Testing and Research Technologies (Flight START) – Technology Refresh Program - Additional Projects, M12.01-04

Program Description

The NextGen Flight Simulation Testing and Research Technologies Technology Refresh Program will upgrade specific components of the Boeing and Airbus aircraft simulators used by the Flight Operations Simulation Branch. The FAA is responsible for approving special instrument approach procedures and the introduction of new concepts and technologies for aircraft navigation. The upgrade of these aircraft simulators will enable FAA to analyze and test the viability of new concepts and technologies and develop appropriate regulations for their use in the NAS.

The FAA acquired a Boeing narrow-body simulator (M12.01-01) and an Airbus wide-body Fly-By-Wire (FBW) simulator (M12.01-02) to support the implementation of new technology and changes to procedures. Both are 6-axis, full flight aircraft simulators that are configurable to the performance and handling characteristics of a narrow-body aircraft with two jet engines (Boeing 737), or a wide-body aircraft with two/four jet engines (A330/A340), utilizing electronic FBW flight control technologies. In Q4 FY 2015 the FAA installed an A320 flight package capability into the existing Airbus 330/340 simulator as part of the M12.01-03 CIP program.

The Airbus A320/330/340 simulator with side-stick control complements the narrow-body Boeing 737-800 next generation 6-axis full flight aircraft simulator in performing realistic, high fidelity operational evaluation activities to support vital research and development projects such as Closely Spaced Parallel Operations, Required Navigation Performance, and Human-in-the-Loop (HITL) pilot/controller/aircraft terminal operations performance.

A final investment decision (FID) is planned in FY 2017 for approval of the specific software or components to be replaced or upgraded in each simulator scheduled for technology refresh.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9-year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

The flight simulators improve air safety by providing the FAA with the capability to conduct NextGen operational evaluations on the impact of introducing new technologies and integrating advanced systems within the NAS. The simulators can also be connected with an air traffic control lab to support on-going and future research and development projects to provide Flight Standards Service regulators with analysis data to ensure the safe implementation of new technologies. The aircraft simulators will improve safety by providing accident investigators, other inspectors, and analysts with the capability to replicate and analyze both incident and trend data for potential input and evaluation of procedure and/or equipment modifications.

Program Plans FY 2017 – Performance Output Goals

- Purchase and install the Boeing 737 MAX features; Roll Control Alerting System (RCAS), updated Cockpit Display System software.
- Purchase and install latest Flight Management System version for the Boeing simulator.
- Complete update of the High Level Architecture for both simulators; integrate the NextGen Prototyping Network (NPN).
- Complete update of the Boeing Motion system.

Program Plans FY 2018 – Performance Output Goals

- Purchase and install updated Visual System for both simulators.
- Complete update of the High Level Architecture for both simulators.

Program Plans FY 2019 – Performance Output Goals

- Purchase and install the upgraded input/output Interface (currently R3, transition to XR) including a new host computer for the Airbus simulator.
- Purchase and install the latest industry standard aircraft flight data update for the A320 Flight Package.
- Purchase and install the latest industry standard aircraft flight data update for the A330 Level D simulator.
- Complete FAA training for the updated I/O (XR) interface.

Program Plans FY 2020 – Performance Output Goals

- Purchase and install the upgraded input/output interface (XR) including a new host computer for the Boeing simulator.
- Complete update of the High Level Architecture (XR) for both simulators.

Program Plans FY 2021 – Performance Output Goals

- Purchase and install A320 New Engine Operations Flight Package.
- Purchase and install A330 New Engine Operations Level D simulator update.
- Purchase and install the Boeing 737 Max 8 update.

2E04, AIRPORT CABLE LOOP SYSTEMS – SUSTAINED SUPPORT

FY 2017 Request \$8.0M

Airport Cable Loop Systems Sustained Support, F10.00-00

Program Description

This program replaces existing on-airport, copper-based, FAA-owned signal/control cable lines that have deteriorated. These lines feed airport surveillance radar, air/ground communications, and landing systems data and information to the tower, and operational and maintenance information to FAA-staffed facilities. The primary emphasis will be on projects at airports with high traffic counts and enplanements. The obsolete underground telecommunications cable infrastructure systems are vulnerable to failure and could cause flight delays related to outages. Where cost-effective, the program will install fiber-optic cable in a ring formation to provide redundancy and communications diversity. The ring configuration allows information to flow from either side if there is a break in the cable. The airport cable loop program takes advantage of opportunities to save cost by coordinating projects with major construction projects (e.g. tower relocations and runway projects).

Aeronautical Mobile Airport Communications System (AeroMACS) is an all Internet Protocol (IP) based wireless broadband network. AeroMACS typically consists of Commercial-Off-The-Shelf (COTS) base stations and mobile subscriber units equipped with small-sized antennas and standardized air interfaces. AeroMACS can be installed at FAA locations for airport surface communications as it provides extremely reliable high-density data rates at a low cost to the FAA.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

Airport Cable Loop Systems Sustained Support will reduce the number of unplanned outages attributed to deteriorating on-airport copper cables by replacing existing unsupported communications equipment and deteriorated FAA-owned underground cable. The program improves signaling and communications, which allows for increased operational availability of infrastructure systems. There have been 981 delays associated with cable loop outages from 1998 to 2012 for the 35 largest airports in the NAS. The number of associated delays has decreased an average of 2% annually since that time.

Program Plans FY 2017 – Performance Output Goals

- Complete electronics installation at Ontario, CA (ONT).
- Complete construction at Ft Lauderdale, FL (FLL) and Oakland, CA (OAK).
- Develop detailed plan for engineering and construction for Houston, TX (IAH).
- Complete four smaller scale projects (regionals), sites to be determined at the A/G Communications Integrated Requirements Team (AGIRT) in FY 2017.

Program Plans FY 2018 – Performance Output Goals

- Start electronics installation at Houston, TX (IAH), Ft Lauderdale, FL (FLL) and Oakland, CA (OAK).
- Complete electronics installation at Denver, CO (DEN).
- Develop detailed plan for engineering and construction for Salt Lake City, UT (SLC).
- Complete four smaller scale projects (regionals), sites to be determined at the AGIRT in FY 2018.

Program Plans FY 2019 – Performance Output Goals

- Start electronics installation at Salt Lake City, UT (SLC).
- Complete electronics installation at Ft Lauderdale, FL (FLL) and Oakland, CA (OAK).
- Complete engineering and start construction at two airports whose plan was developed in FY 2018.
- Develop plan for two airports determined in FY 2017.
- Develop detail plan for engineering and construction for Omaha, NE (OMA).
- Complete four smaller scale projects (regionals), sites to be determined at the AGIRT in FY 2019.

Program Plans FY 2020 – Performance Output Goals

- Start electronics installation at Omaha Airport, NE (OMA).
- Complete engineering and start construction at two airports whose plan was developed in FY 2019.
- Develop plan for two airports determined in FY 2018.
- Develop detail plan for engineering and construction for San Diego, CA (SAN).
- Complete four smaller scale projects (regionals), sites to be determined at the AGIRT in FY 2020.

Program Plans FY 2021 – Performance Output Goals

- Complete construction at Houston, TX (IAH).
- Complete construction and electronics installation at Salt Lake City, UT (SLC).
- Start engineering for two airports whose plan was developed in FY 2020.
- Develop plan for two airports determined in FY 2019.
- Complete four smaller scale projects (regionals), sites to be determined at the AGIRT in FY 2021.

2E05, ALASKAN SATELLITE TELECOMMUNICATION INFRASTRUCTURE (ASTI)

FY 2017 Request \$6.0M

Alaskan Satellite Telecommunication Infrastructure (ASTI), C17.02-01

Program Description

The ASTI program will upgrade the FAA owned and operated communications network, using satellite transmissions of data, to provide Alaska with critical, essential and routine air traffic control telecommunications services including:

- Remote Control Air Ground and Remote Communications Outlets for voice communication with pilots;
- En Route and Flight Service Station Radio Voice Communications;
- En Route and Terminal Radar Surveillance Data, Digitized Radar Data and Digitized Beacon Data;
- Flight Service Station Flight Service Data processing System and the Digital Aviation Weather Network;
- Weather Advisories, Briefings, and Products supporting Automatic Surface Observation System (ASOS), Automated Weather Observation System (AWOS), and AWOS Data Acquisition System (ADAS);

- WAAS Reference Station; and
- Automatic Dependent Surveillance-Broadcast (ADS-B).

The ASTI network consists of hub earth stations, remote earth stations, leased transponder space segment, and a Network Operations Control Center (NOCC). ASTI uses primary and alternate satellites to provide service diversity. The remote earth stations are linked to their respective hubs and the NOCC through leased transponders.

The ASTI program will acquire and provide Commercial off-the-Shelf equipment and associated support services. The modernization efforts will yield several important benefits:

- Improvements in network availability to required levels (.9999 for Phase I sites and .999 for Phase II sites)
- Improve information system security to meet Federal standards;
- Reduce number and duration of outages;
- More efficient use of satellite transponder bandwidth;
- Contain Operations and Maintenance (O&M) costs; and
- Improve life cycle support (i.e., training, second level engineering support, radome maintenance and depot level supply support).

The ASTI Modernization program achieved its final investment decision on June 2011. Subsequently the ASTI Modernization program achieved its first two APB milestones by November 2011. The following year the program began experiencing delays primarily attributed to the prime contractor and technical challenges with solution development. Some of the major delays included the following:

- The prime contractor made a business decision to acquire GDC multiplexer subcontractor due to financial challenges experienced by subcontractor;
- ASTI is required to support the legacy system communications interfaces which was developed in the 1970's and must be in compliance with the latest information security standards as well as support higher data rates required by newer systems;
- Component swaps proved more complex requiring integration between the Multiplexer, the Network Management Control System (NMCS), and security monitoring functions;
- Additional time required for development due to the complexity of the legacy Time-division multiplexing (TDM) technology and hardware;
- GDC Multiplexer component upgrades required longer time to develop; and
- Integration between legacy hardware and modem software is more complex than anticipated.

In November 2015, the ASTI program requested, and was given approval by the Joint Resources Council (JRC) to prepare a Baseline Change Decision (BCD) by the 1st quarter of FY 2017. During the JRC discussions, the program presented the results of an Analysis of Alternatives that accessed the direction of the program and how to best mitigate the technical challenges. The ASTI program was determined to be the only viable solution for the timely replacement of the nearly unsustainable legacy Alaskan NAS Interfacility Communications System (ANICS) system. Efforts are currently underway by the prime contractor and FAA management to address these challenges by providing additional resources; applying more stringent oversight of the GDC Multiplexer card production; and implementing more robust test procedures.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

ASTI supports maintaining operational availability of the NAS. ASTI system availability has fallen below 0.9999 and is declining. Aviation access in the NAS is improved by minimizing outages for critical and essential communications links between pilots and air traffic controllers. These links between FAA facilities and pilots are essential to ensure the flow of accurate and reliable information on air traffic movement, weather, and radar data.

Program Plans FY 2017 – Performance Output Goals

- Complete the site familiarization required for Key Site pending approval of the ASTI re-plan.

Program Plans FY 2018 – Performance Output Goals

- Complete training required for 21st Site pending approval of the ASTI re-plan.

Program Plans FY 2019 – Performance Output Goals

- Complete training required for 64th Site pending approval of the ASTI re-plan.

Program Plans FY 2020-2021 – Performance Output Goals

- None.

2E06, FACILITIES DECOMMISSIONING

FY 2017 Request \$6.2M

Decommissioning – Real Property Disposition, F26.01-01

Program Description

The Decommissioning – Real Property Disposition program works with other FAA program offices to identify and plan for the timely disposition of real property assets that are no longer required by the agency. When the FAA decommissions a site or system, this program is responsible for conducting an assessment of the property and determining the best course of action for its disposal. When a program office identifies excess property at a decommissioned site, this program provides the technical expertise to plan and initiate disposal of the unneeded real property assets. Planning for the orderly disposition of property at multiple locations is prioritized nationally considering cost, available technical resources for site restoration and disposal, and potential environmental or safety impacts to surrounding communities, if disposition is delayed. With the implementation of NextGen, demand for disposal of real property is expected to increase as sites no longer needed for NAS operations are decommissioned.

The NAS Enterprise Architecture identifies the transition of many systems that will require disposal. For example:

- Many ground to ground communication systems such as Radio Communication Links (RCL) are transitioning to the FAA Telecommunications Infrastructure service;
- Some locations of ground based navigation systems will no longer be required as the transition to satellite navigation continues;
- Surveillance and weather radar systems will be transitioning to the NextGen Surveillance and Weather Radar Capability requiring disposal of existing radars; and
- Consolidation of air traffic control facilities may require disposal of existing buildings.

The four services provided by the program are:

- Identifying, verifying, and scheduling the disposition and needed site restoration;
- Investigating and documenting the structures to be removed at each site, determining the required restoration associated with the site, and developing scopes of work and schedules with milestones;
- Final disposition of decommissioned infrastructure and property restoration including infrastructure removal or demolition, removal and disposal of debris and hazardous materials, and evaluation of impact upon cultural and historic preservation, wetlands, and natural resource protection; and
- Conducting Phase I Environmental Due Diligence Audits (EDDA) reports for government-owned properties, as required by the General Services Administration (GSA) and applicable laws.

The program serves a critical role in the removal of these facilities from the FAA's asset inventory and the subsequent reduction of Operations and Maintenance (O&M) costs, lease costs (where applicable), and associated liabilities. This program is included in the ATC Facilities Sustainment Strategic Plan.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

This program improves management of FAA’s real property assets by reducing maintenance costs and disposing of excess assets. Cost savings averaging \$5M per year have been achieved through the termination of leases and avoided maintenance costs resulting from the disposal of real property that is no longer needed by the FAA.

Program Plans FY 2017 – Performance Output Goals

- Complete approximately 50 Real Property Disposal Projects. These projects typically include, Visual Aids Navigational Aids, Radio Communications sites including Towers. This will include disposal of Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.
- Dispose of 3 Very High Frequency Omnidirectional Range (VOR) sites

Program Plans FY 2018 – Performance Output Goals

- Complete approximately 75 Real Property Disposal Projects, approximately 25 per Service Area. These projects typically include, Visual Aids Navigational Aids, Radio Communications sites including Towers. This will include disposal of RCLR / RCLT Tower sites.
- Dispose of 8 VOR sites.

Program Plans FY 2019 – Performance Output Goals

- Complete approximately 75 Real Property Disposal Projects, approximately 25 per Service Area. These projects typically include, Visual Aids Navigational Aids, Radio Communications sites including Towers. This will include disposal of RCLR /RCLT Tower sites.
- Dispose of 12 VOR sites.

Program Plans FY 2020 – Performance Output Goals

- Complete approximately 75 Real Property Disposal Projects, approximately 25 per Service Area. These projects typically include, Visual Aids Navigational Aids, Radio Communications sites including Towers. This will include disposal of RCLR /RCLT Tower sites.
- Dispose of 12 VOR sites.

Program Plans FY 2021 – Performance Output Goals

- Complete approximately 75 Real Property Disposal Projects, approximately 25 per Service Area. These projects typically include, Visual Aids Navigational Aids, Radio Communications sites including Towers. This will include disposal of RCLR /RCLT Tower sites.
- Dispose of 12 VOR sites.

2E07, ELECTRICAL POWER SYSTEMS – SUSTAIN/SUPPORT

FY 2017 Request \$105.0M

Power Systems Sustained Support (PS3), F11.01-01 / X, Power Systems Sustained Support (P3S) – Future Segments, F11.01-02

Program Description

The Electrical Power Systems Sustained Support (PS3) program funds the purchase and installation of components for backup electric power systems and power regulation and protection equipment. Backup electrical power systems are necessary to allow continued operation of air traffic control facilities when there is an interruption in commercial power sources. These disruptions can result in grounded flights, are placed in airborne holding patterns, or are re-

routed to other airports. Reliable backup power systems are installed so air traffic control electronics can maintain required availability and capability and prevent disruptions. These power systems also prevent damage to sensitive electronic equipment due to commercial power surges and fluctuations. The Power program replaces and refurbishes components of existing power systems and cable infrastructure when necessary to maintain and improve the overall electrical power quality, reliability, and availability. The type of power system deployed at a site varies by load sensitivity and the criticality of the equipment that it supports. This program is included in the ATC Facilities Sustainment Strategic Plan.

Power Systems Sustained Support (PS3) (F11.01-01):

PS3 sustains the following components and services:

- **NAS Batteries:** Large scale battery complexes serve as backup power sources for key NAS electronic installations at en route, terminal, and General National Airspace System (GNAS) facilities. These batteries provide power for a limited time during major power system disruptions and maintain the function of key systems. The PS3 program replaces Air Route Traffic Control Centers (ARTCC) Critical and Essential Power System (ACEPS) and GNAS battery installations every 5- to 7-years to assure reliability.
- **Power Conditioning System (PCS) / Uninterruptible Power Supply (UPS):** The PCS/UPS is a power quality and backup system that conditions commercial power and provides a short duration power source that prevents power disruptions and surges from adversely affecting electronic system performance and critical NAS infrastructure. The PS3 program sustains PCS/UPS systems that reach their expected useful life of 20 years.
- **Direct Current Backup System (DC BUS):** A DC BUS stores power in batteries, providing a low cost, short term power source at facilities with limited electrical loads. The PS3 sustains DC BUSes that have a useful life of up to 20 years.
- **ARTCC Critical and Essential Power System (ACEPS):** Because of the critical role of the En Route and large Terminal Control Centers, they require high quality and reliable power provided by ACEPS. The FAA operates ACEPS at 21 ARTCCs, two Combined Center Radar Approach Control (CERAPs) and three large Terminal Radar Approach Control (TRACONs). ACEPS is comprised of engine generators, switchgear, and UPS. PS3 sustains ACEPS where the engine generators have a useful life of 24 years and other components have useful lives that range from 7 to 20 years.
- **Lightning Protection, Grounding, Bonding and Shielding (LPGBS):** LPGBS minimizes electrical hazards to personnel, facilities and electronic equipment caused by lightning, voltage surges, electrostatic discharge (ESD), and power faults. Sites are hardened sufficiently to prevent NAS delay or loss of service, to minimize or preclude outages, and to enhance personnel safety. Useful life of LPGBS elements is 25 years.
- **Electrical Line Distribution (ELD):** ELD is the infrastructure at airports and ancillary facilities that distributes commercial and backup power to key NAS equipment. The ELD is comprised primarily of distribution cable, transformers, and switchgear. The PS3 program replaces components that have exceeded their useful life of 25 years.
- **Engine Generators:** Engine generators at GNAS facilities provide backup power (and are the primary source of power at some remote locations) for essential NAS electronic systems when commercial power is unavailable or becomes unreliable. Engine generators have a 24-year useful life.
- **Critical Power Distribution System (CPDS):** The CPDS is comprised of components such as electrical distribution equipment, transfer switches, engine-generators, UPS, and batteries. The FAA has a family of standardized CPDS types, and each type is optimally matched to the criticality and activity level of the NAS facility it serves. The PS3 program replaces all CPDS components except for the engine-generators, UPS and batteries.
- **Alternative Energy Systems (AES):** This activity integrates a broad range of clean energy technologies to meet NAS operational demands. Using AES technologies reduces the Agency's carbon footprint and helps to achieve Executive Order 13514 goals for reduction of fossil fuel dependencies. Alternative energy generation systems used within the FAA include: solar energy, wind energy, and fuel cells. PS3 sustains AES installations that provide power to NAS equipment.
- **Environmental Remote Monitoring System (ERMS):** ERMS provides the interface between power systems (EG's, DC BUS, PCS/UPS) and remote monitoring systems to provide system status to the Operations Control Centers. The status information allows a timely response to system related issues.

- **PS3 Program Management and System Engineering:** Systems engineering within the Power Services Group defines and documents customer requirements for power systems and administers those requirements through the design phase, system validation, quality control, quality assurance, safety improvement, and the useful life. Systems engineering also addresses sustaining established alternative energy generation systems, establishing and administering test facilities, and developing procedures for enhanced system designs.

Power Systems Sustained Support (P3S) – Future Segments (F11.01-02):

The Future Segments program will continue the same activities as the base program starting in FY 2019. The Final Investment Decision (FID) is planned for the 3rd quarter in FY 2016.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

All NAS facilities depend on the availability, reliability, and quality of electrical power. Power systems sustain operational availability by reducing the incidence of NAS delays caused by equipment outages. The PS3 program replaces and improves electrical power equipment at airports, terminal facilities, and en route facilities, minimizing disruption of air traffic and maximizing availability and reliability of NAS systems.

Program Plans FY 2017 – Performance Output Goals

Power Systems Sustained Support (PS3) (F11.01-01):

Sustain existing NAS power systems by completing these projects (Actual may vary based upon validation and priority for year):

- NAS Battery set replacement (76 Sets).
- PCS / UPS (21 Sets).
- DC BUS (27 Sets).
- ACEPS (2 Sets).
- LPGBS elements (9 Sets).
- ELD Replacements (7 Sets).
- Engine Generators Replacement (69 Sets).
- CPDS (6 Sets).
- AES (6 Sets).
- ERMS (70 Sets).
- PS3 Program Management and System Engineering (10 Sets).

Power Systems Sustained Support (PS3) – Future Segments (F11.01-02):

- None.

Program Plans FY 2018 – Performance Output Goals

Power Systems Sustained Support (PS3) (F11.01-01):

Sustain existing NAS power systems by completing these projects (Actual may vary based upon validation and priority for year):

- NAS Battery set replacement (96 Sets).
- DC BUS (1 Set).
- ACEPS (4 Sets).
- LPGBS elements (1 Set).
- ELD Replacements (12 Sets).
- Engine Generators Replacement (47 Sets).
- CPDS (1 Set).
- ERMS (81 Sets).

Power Systems Sustained Support (PS3) – Future Segments (F11.01-02):

- None.

Program Plans FY 2019 – Performance Output Goals

Power Systems Sustained Support (PS3) (F11.01-01):

- None.

Power Systems Sustained Support (PS3) – Future Segments (F11.01-02):

Sustain existing NAS power systems by completing these projects (Actual may vary based upon validation and priority for year):

- NAS Battery set replacement (70 Sets).
- PCS / UPS (16 Sets).
- DC BUS (23 Sets).
- ACEPS (2 Sets).
- LPGBS elements (5 Sets).
- ELD Replacements (8 Sets).
- Engine Generators Replacement (69 Sets).
- CPDS (6 Sets).
- AES (7 Sets).
- ERMS (70 Sets).

Program Plans FY 2020 – Performance Output Goals

Power Systems Sustained Support (PS3) (F11.01-01):

- None.

Power Systems Sustained Support (PS3) – Future Segments (F11.01-02):

Sustain existing NAS power systems by completing these projects (Actual may vary based upon validation and priority for year):

- NAS Battery set replacement (76 Sets).
- PCS / UPS (35 Sets).
- DC BUS (57 Sets).
- ACEPS (3 Sets).
- LPGBS elements (23 Sets).
- ELD Replacements (11 Sets).
- Engine Generators Replacement (104 Sets).
- CPDS (9 Sets).
- AES (7 Sets).
- ERMS (90 Sets).
-

Program Plans FY 2021 – Performance Output Goals

Power Systems Sustained Support (PS3) (F11.01-01):

- None.

Power Systems Sustained Support (PS3) – Future Segments (F11.01-02):

Sustain existing NAS power systems by completing these projects (Actual may vary based upon validation and priority for year):

- NAS Battery set replacement (76 Sets).
- PCS / UPS (35 Sets).
- DC BUS (57 Sets).
- ACEPS (3 Sets).
- LPGBS elements (23 Sets).
- ELD Replacements (11 Sets).
- Engine Generators Replacement (104 Sets).
- CPDS (9 Sets).
- AES (7 Sets).
- ERMS (90 Sets).

2E08, ENERGY MANAGEMENT AND COMPLIANCE (EMC)

FY 2017 Request \$2.0M

Energy Management and Compliance (EMC), F13.04-02

Program Description

The Energy Management and Compliance (EMC) program centrally orchestrates cost-effective reductions of energy and water use at Air Traffic Organization (ATO) facilities. This is accomplished by coordinating policies, technical support, targeted infrastructure investments, and data analysis and reporting. By upgrading older facility infrastructure, such as mechanical and electrical systems, the EMC program not only reduces operational costs to the ATO but also increases reliability of the NAS by reducing the likelihood of facility outages and disruptions. The EMC program promotes energy and water-use efficiency and the use of off-grid power and non-polluting energy sources for all activities and acquisitions. This program is included in the ATC Facilities Sustainment Strategic Plan.

The EMC program also contributes to FAA's progress toward meeting federal greening mandates, including:

- National Energy Conservation Policy Act,
- Energy Policy Act of 2005 (EPACT),
- Energy Independence and Security Act of 2007 (EISA),
- Executive Order 13693, and
- DOT/FAA Strategic Sustainability Performance Plan (SSPP).

The EMC program provides a coordinated approach for identifying and implementing cost effective investments in FAA infrastructure to reduce ongoing utility expenses. The EMC program achieves this by focusing on five specific capability areas:

1. **Improving monitoring of ATO energy performance** including engineering, designing, planning and testing a cost-effective approach for installing advanced electric meters to comply with the provisions of 42 U.S. Code Section 8253.
2. **Implementing energy and water efficiency projects** at targeted sites to improve ATO performance including infrastructure improvements with the greatest cost to benefit ratios and shortest payback periods.
3. **Increasing the number of high performance sustainable buildings** in ATO's portfolio by implementing targeted infrastructure improvements at selected large staffed facilities in compliance with Executive Order 13693.
4. **Improving building operating performance by designating trained ATO Energy Managers** for the highest energy-using ATO facilities to monitor energy and water consumption and develop cost-effective recommendations to reduce energy and water use.
5. **Benchmarking ATO performance and documenting progress** by completing 10 annual data call reports mandated by Executive Orders and Legislative statutes.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The EMC program supports the FAA Performance Metric to implement cost efficiency initiatives by reducing the utility expenditures (energy and water) of ATO facilities. The EMC program achieves this by providing technical expertise on energy and water management, implementing targeted infrastructure investments, training ATO personnel on optimizing facility performance, and tracking and reporting on energy and water usage. The EMC

program has the potential to reduce electrical costs annually by approximately 2.5% at facilities where advanced meters are installed, 12-13% at facilities where energy improvements are performed, and 14% at facilities where High Performance Sustainable Building (HPSB) upgrades are performed.

Program Plans FY 2017 – Performance Output Goals

- Install advanced electric meters at one facility.
- Perform energy and water improvements at three facilities.
- Perform HPSB upgrades at two facilities.
- Provide required quarterly and annual reports on progress against legislative and executive order mandates to the Department of Energy (DOE) and the Office of Management and Budget (OMB).

Program Plans FY 2018 – Performance Output Goals

- Install advanced electric meters at two facilities.
- Perform energy and water improvements at three facilities.
- Provide required quarterly and annual reports on progress against legislative and executive order mandates to the Department of Energy (DOE) and the Office of Management and Budget (OMB).

Program Plans FY 2019 – Performance Output Goals

- Perform energy and water improvements at three facilities.
- Perform HPSB upgrades at one facility.
- Provide required quarterly and annual reports on progress against legislative and executive order mandates to the Department of Energy (DOE) and the Office of Management and Budget (OMB).

Program Plans FY 2020 – Performance Output Goals

- Perform energy and water improvements at seven facilities.
- Perform HPSB upgrades at four facilities.
- Provide required quarterly and annual reports on progress against legislative and executive order mandates to the Department of Energy (DOE) and the Office of Management and Budget (OMB).

Program Plans FY 2021 – Performance Output Goals

- Perform energy and water improvements at seven facilities.
- Perform HPSB upgrades at four facilities.
- Provide required quarterly and annual reports on progress against legislative and executive order mandates to the Department of Energy (DOE) and the Office of Management and Budget (OMB).

2E09, CHILD CARE CENTER SUSTAINMENT

FY 2017 Request \$1.0M

Child Care Centers – Infrastructure Improvements, F22.01-01

Program Description

The child care centers were constructed and furnished in the early 1990's and now need to be upgraded and modernized to provide for the ongoing, growing needs of employees and to ensure that safety systems are up to date. Many require refurbishment including: roof replacements, HVAC system upgrades, fire suppression system replacement and other facility infrastructure system upgrades. The program will also modernize the child care centers to meet safety and building code requirements. This is a multi-year modernization program that will address facility requirements for 13 FAA operated Child Care Centers located at Air Route Traffic Control Centers (ARTCCs) and Terminal Radar Approach Control (TRACON). Available onsite child care greatly enhances the FAA's ability to recruit and retain a highly qualified, diverse work force.

Federal agencies are authorized to support provisioning of child care centers under the Tribble Amendment (Public Law 99-591). These sites were established and approved based on formal needs assessments of employees, surveys

of surrounding private child care availability, and employee and management support. The child care centers are managed as non-profit corporations by boards of directors consisting of Agency employees/parents. Tuition and fund raising efforts by the nonprofit corporation pay for the child care center's staff and operations costs (exclusive of maintenance and utilities).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 4 – Empower and Innovate with the FAA’s People.*
- *FAA Performance Metric 1 – The FAA is rated in the top 25 percent of places to work in the federal government by employees.*

Relationship to Performance Target

Support of work-site child care centers has a direct positive correlation with the OPM Employee Viewpoint survey. The top ten GSA child care center customers all score within the top 20 on the Employee Viewpoint survey. The Child Care Center program supports the current metric of improving the FAA's ranking in the OPM Federal Viewpoint survey.

Access to high quality, accessible child care programs and resources provides a sense of stability for parents and results in increased employee productivity. Survey research indicates onsite child care also results in less absence and stress related to child care issues. Availability of on-site child care allows FAA employees to focus on the agency's mission and the critical job responsibilities involved, rather than having to worry about child care concerns.

Program Plans FY 2017 – Performance Output Goals

- Complete upgrade/modernization projects at 13 centers including but is not limited to access systems, playground turf, remaining building/structural renovations, fire alarm panels, finger/access gates, and mechanical controls. The number of projects will be based on a facility condition survey.

Program Plans FY 2018 – Performance Output Goals

- Complete upgrade/modernization projects at 13 centers including but is not limited to sprinkler systems, storage cabinets, and remaining appliances. The number of projects will be based on a facility condition survey.

Program Plans FY 2019-2021 – Performance Output Goals

- None.

2E10, FAA TELECOMMUNICATIONS INFRASTRUCTURE 2

FY 2017 Request \$10.4M

FAA Telecommunications Infrastructure – 2, C26.01-02

Program Description

Telecommunications is essential to the operations of the NAS and the FAA. The FTI-2 program will be the successor to the existing FTI program through which the FAA currently obtains approximately 25,000 telecomm services to more than 4,000 locations. FTI telecommunications services are designed, engineered, and provisioned to meet FAA-specific availability, latency, and security requirements. In addition to “traditional” telecommunications services, FTI also provides enterprise messaging services based upon Service-Oriented Architecture technologies and specialized infrastructure services such a domain name service, network time protocol service and security gateway services. The FTI-2 program will provide all of the capabilities currently available from the current FTI contract plus the next generation of telecommunications, messaging, and infrastructure services required by FAA programs during the FTI-2 program life cycle. The FTI-2 program will also address challenges associated with the phase-out of telecommunication services offered by commercial carriers that are based upon time division multiplexing (TDM). Today, nearly 90% of the FAA’s telecommunications services are dependent upon TDM-based technology. It is unlikely that all FAA systems that rely upon these services will be able to modernize their telecommunications interfaces by the target phase-out date of 2020. The FTI-2 program will need

to address the challenge of continuing to support the legacy interfaces when TDM-based services are no longer available as a commercial offering.

In planning for FTI-2, the FAA is currently assessing opportunities to use new technology and service delivery models to improve the quality and efficiency of telecommunications services. It has not yet been determined whether the scope of services to be addressed by the FTI-2 program will be obtained through one or more competitive procurements. While there are economies of scale provided by a single consolidated procurement, there may be other benefits to partitioning the services into groupings with similar performance characteristics. The program has begun market research and analysis activities to assess telecommunications industry and technology trends and the ability to satisfy critical FAA requirements.

A strategy decision point is planned for Q4 of FY 2016 to brief the JRC on the findings from the market research and recommendations will be made for tailoring the program for future investment decisions.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Target

This program enables FAA to begin initial planning for the FTI-2 program to acquire telecommunications services as a commercial commodity rather than as the specialized services obtained under the legacy FTI program tailored to support unique NAS interfaces. Analysis is under way to determine the potential cost benefits of the program.

Program Plans FY 2017 – Performance Output Goals

- Develop artifacts required by the Joint Resource Council to achieve Initial Analysis Readiness Decision (IARD):
 - Preliminary Program Requirements
 - Initial Investment Analysis Plan
- Other output goals determined at the strategy decision point.

Program Plans FY 2018 – Performance Output Goals

- Develop artifacts required by the Joint Resource Council to achieve IID:
 - Enterprise Architecture Products/Views
 - Safety Assessment Plan
- Other output goals determined at the strategy decision point.

Program Plans FY 2019-2021 – Performance Output Goals

- None.

2E11, SYSTEM CAPACITY, PLANNING AND IMPROVEMENTS

FY 2017 Request \$6.5M

System Capacity, Planning and Improvements – ATDP, M08.28-00

Program Description

The System Capacity, Planning, and Improvements program provides data and analyses on the NAS operations to FAA executives and managers to help them identify deficiencies and develop proposals to improve NAS performance.

This work includes:

- Airport modeling and analysis using actual data collected from ATC systems in the field to determine the value of potential improvements in airspace or airfield modifications;
- Enhancements of the Performance Data Analysis and Reporting System (PDARS) through the implementation of the Data Visualization and Reporting System (DVARs), a fully integrated performance measurement tool designed to help the FAA improve the NAS by tracking the daily operations of the ATC system and their environmental impacts;
- Using PDARS/DVARs operational data to baseline the measurement and analysis of Next Generation Air Transportation System (NextGen) capability improvements such as the efforts to support Optimization of Airspace and Procedures in the Metroplex (OAPM);
- Leveraging new technologies to enhance capabilities of PDARS/DVARs;
- Development of new agency level metrics to enhance management awareness of, and response to, system performance. Maintain and enhance the FAA Operational Metrics Web Page;
- Benchmarking ATO performance with other Air Navigation Service Providers to support joint projects with EUROCONTROL and as part of International Civil Aviation Organization (ICAO), Civil Air Navigation Services Organization and Aerospace Transportation Advisory Group work plans. These efforts are performed to respond to inquiries on global flight efficiency performance targets for Air Traffic Management (ATM) or more general inquiries on the overall flight inefficiency that may be attributed to ATM;
- Provide analytical and modeling support for Commercial Space initiatives;
- Airport capacity studies that provide assessment of procedural, technology, or infrastructure improvements; and,
- Provide performance modeling and economic analysis to develop a business case with ICAO member states for reduced oceanic separation using ADS-B.

The program provides a collaborative means for experts from the FAA, academia, and industry to develop recommendations for improving capacity and system efficiency, and to reduce delays at specific airports. Using performance-based measurement systems and operations research capability, this group is able to quantify the efficiency of the NAS to form the basis of recommendations for system improvements.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core Airports of 57,975, or higher, arrivals and departures.*

Relationship to Performance Metric

This program will facilitate the modeling, measurement, and analysis of airfield improvements, air traffic procedures, and other technological implementations to improve airport capacity and system efficiency. In advance of large-scale airport construction projects, capacity and delay impacts are also assessed in order to improve coordination between airports, aircraft operators, and ATC.

Program Plans FY 2017 – Performance Output Goals

- Implement PDARS/DVARs web-based access capabilities.
- Integrate available SWIM data products into the PDARS/DVARs system.
- Implement upgraded PDARS/DVARs processing system.
- Produce Annual Joint Performance Benchmark Report with EUROCONTROL/European Commission.
- Deliver performance modeling and economic analysis information to support the development of a business case with ICAO member states in the North Atlantic region for reduced oceanic separation using ADS-B (Out).

Program Plans FY 2018 – Performance Output Goals

- Complete implementation of PDARS/DVARS into a net centric system.
- Implement new SWIM data products into the PDARS/DVARS system.
- Implement upgraded PDARS/DVARS visualization products.
- Conduct a workshop to examine development and coordination of international standardized measurement of system capacity, through-put, predictability and efficiency.
- Produce Joint Performance Benchmark Report with EUROCONTROL/the European Commission.
- Complete PDARS/DVARS implementation.
- Deliver performance modeling and economic analysis information to support the development of a business case with ICAO member states in the North Atlantic region for reduced oceanic separation using ADS-B (Out).

Program Plans FY 2019 – Performance Output Goals

- Produce Joint Performance Benchmark Report with EUROCONTROL/the European Commission.
- Deliver performance modeling and economic analysis information to support the development of a business case with ICAO member states in the North Atlantic region for reduced oceanic separation using ADS-B (Out).
- Identify DVARS system enhancements to meet user needs.
- Implement Tier 1 objective requirements of the DVARS system.

Program Plans FY 2020 – Performance Output Goals

- Produce Joint Performance Benchmark Report with EUROCONTROL/the European Commission.
- Implement identified DVARS system enhancements.
- Implement Tier 2 objective requirements of the DVARS system.
- DVARS system review for identification of system modernization and enhancement.
- Deliver performance modeling and economic analysis information to support the development of a business case with ICAO member states in the North Atlantic region for reduced oceanic separation using ADS-B (Out).

Program Plans FY 2021 – Performance Output Goals

- Produce Joint Performance Benchmark Report with EUROCONTROL/the European Commission.
- Initiate DVARS system modernization and enhancement.

2E12X, INDEPENDENT OPERATIONAL TEST AND EVALUATION

FY 2017 Request \$0.0M

X, Independent Operational Assessment (IOA), M25.00-00

Program Description

The Independent Safety Assessments Team conducts Independent Operational Assessments (IOA) of designated systems and system modifications in an operational environment in support of productions and in-service decisions to ensure operational readiness and compliance with Safety Risk Management. These in-service decisions allow nationwide deployment and operational use of the system and ensures that the associated operational and safety risk is minimized, therefore, reducing system lifecycle operations cost and improving the safety of the NAS. The IOA Team may monitor portions of Development Test (DT), Operational Test (OT), Site Acceptance Test (SAT), and Field Familiarization, system assessments conducted prior to contract award, and R&D demonstrations of designated programs. To maintain its independence, the IOA Team does not directly participate in these activities, but instead monitors them to identify potential safety risks and operational concerns, as well as possible areas of improvement in the assessment process.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

This program supports the safety performance metric of reducing commercial air carrier fatalities by conducting and ensuring operational assessments of designated NAS systems, processes and procedures are within acceptable levels of safety risk prior to deployment and implementation in the NAS. This independent oversight contributes to the proactive identification of safety risk and the follow up actions to increase safety.

Program Plans FY 2017-2021 – Performance Output Goals

A specific list of designated systems or modifications to be assessed will be determined at the beginning of each fiscal year.

- Develop final IOA report(s).

ACTIVITY 3: NON-AIR TRAFFIC CONTROL FACILITIES AND EQUIPMENT

A: Support Programs

3A01, HAZARDOUS MATERIALS MANAGEMENT

FY 2017 Request \$31.0M

Environmental Cleanup / Hazardous Materials (HAZMAT), F13.02-00

Program Description

The Hazardous Materials Management (HAZMAT) program remediates FAA owned or leased sites that were contaminated by FAA or previous owner activities. As of the beginning of FY 2016, the FAA has identified approximately 697 contaminated sites nationwide that require investigation, remediation, and closure activities. Environmental Cleanup site investigations have indicated that toxic contamination resulted from a variety of hazardous substances including: cleaning solvents, fuels, pesticides, asbestos, polychlorinated biphenyls (PCBs), and heavy metals. FAA organizations, including the Mike Monroney Aeronautical Center and the William J. Hughes Technical Center, have mandatory remediation and monitoring schedules in place as part of negotiated agreements with regulatory agencies. These agreements require the FAA to remediate contaminated soil and groundwater. Extensive contamination at the FAA Technical Center prompted the Environmental Protection Agency (EPA) to place the site on the EPA National Priorities List, indicating its status as one of the Nation's most environmentally dangerous sites (i.e., a Superfund site). In addition, contaminated sites and past noncompliance with requirements of the HAZMAT program account for a large portion of the unfunded environmental liabilities documented in the FAA's Financial Statement. This program is included in the ATC Facilities Sustainment Strategic Plan.

The FAA publishes annually the Environmental Site Cleanup Report (ESCR). This document contains current and expected future cleanup activities for the 697 contaminated sites mentioned above. An estimate of out-year Environmental Remediation (ER) Liabilities is also included in this report. At the beginning of FY 2016 the ER Liability was estimated at approximately \$650 million; with contingency and inflation added the ER Liability was estimated at approximately \$1 billion. We continue to make good progress toward remediating these sites; however, additional sites are also added each year and some higher cost remediation sites are expected to remain open for many years or decades. During FY 2015, 129 sites were closed from the program and 118 additional sites were added to the program.

The HAZMAT program cleans these contaminated sites to comply with applicable environmental regulations. The FAA must continue mandated program activities to achieve compliance with all Federal, State and local environmental cleanup regulations, including the Resource Conservation and Recovery Act of 1976, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the Superfund Amendment and Reauthorization Act (SARA) of 1986. FAA program activities include conducting site investigations; managing hazardous materials (including hazardous waste accumulation, handling and disposal); installing groundwater monitoring wells; remediating site contamination; and operating air pollution controls. The FAA performs assessment, remediation and closure activities as aggressively and proactively as funding will allow. Future planned efforts include conducting contaminant investigations, implementing site remediation projects and completing required regulatory closures.

The following activities are covered under the Environmental Cleanup program:

- Site cleanups required under CERCLA;
- Site cleanups required by State or local cleanup or spill regulations;

- Fuel Storage Tank (FST) site remediation for cleanup efforts beyond incidental contamination associated with normal FST operations (e.g., greater than 25 gallons or a foot into native soil beyond the limits of the tank pit);
- Asbestos, lead, and polychlorinated biphenyl (PCB) cleanups for spills or other releases into the environment (not including the abatement of these materials on either the interior or exterior surfaces of a structure unless the abatement is required as part of an environmental cleanup action);
- Corrective actions and hazardous waste spill responses pursuant to the Resource Conservation and Recovery Act (RCRA);
- Hazardous waste site identification activities and characterization of environmental past practices; and
- Environmental Cleanup program management, policy, and oversight support.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The HAZMAT program supports the FAA's Performance Metric to implement cost efficiency initiatives by continuing to improve financial management of cleanup activities for contaminated sites within existing NAS land and structures. The program achieves this objective through continued refinement of project cost estimating as well as progress tracking of assessment, remediation, and closure activities for contaminated sites. These activities result in a safe and environmentally sound workplace, and protection of the natural resources of surrounding communities.

Program Plans FY 2017-2021 – Performance Output Goals

- Complete remediation activities at five percent (5%) of the total locations listed in the Environmental Site Cleanup Report, resulting in a finding that no further resources need to be applied to these sites.

3A02, AVIATION SAFETY ANALYSIS SYSTEM (ASAS)

FY 2017 Request \$11.3M

Regulation and Certification Infrastructure for System Safety (RCISS) – Segment 3, A17.01-03

Program Description

RCISS is an existing technology refresh program to upgrade and maintain the Information Technology (IT) enterprise infrastructure that supports the Aviation Safety (AVS) safety workforce. This IT infrastructure includes automation hardware, software, and communication components which support AVS safety data and applications. Most current and planned capital investment initiatives for AVS rely on the IT infrastructure being deployed by RCISS, including the Aviation Safety Knowledge Management Environment (ASKME-A26.01-01), System Approach for Safety Oversight (SASO-A25.02-02), and Aerospace Medicine Safety Information System (AMSIS-A35.01-01) programs.

RCISS Segment 3 will perform technology refresh on the AVS IT infrastructure established by Segments 1 and 2 and enhance delivery of IT infrastructure services in accordance with government and industry best practices. For example, where applicable, RCISS will invest in Cloud-based solutions to provide the safety workforce with access to data and applications that is secure, reliable, and cost-effective.

Segment 3 program activities include technology refresh of the following IT infrastructure components and continues support to AVS's Safety Workforce of over 6,000 people:

- Mobile toolkits (consisting of mobile tablet computers and peripherals);
- Telecommunications solutions;

- Application servers and data storage devices hosting national AVS safety applications;
- COTS Software licenses; and
- Cloud-based solutions.

RCISS technology refresh is based on the service life of individual components and incrementally performed each year. For example, mobile toolkits deployed to the safety workforce have a service life of four years and approximately 25% of mobile toolkits are replaced each year.

The program will also procure contractor support services to provide specialized technical expertise in modernizing and maintaining the RCISS enterprise infrastructure.

Scope and activities for this segment will be defined in Q1 FY 2017 at Final Investment Decision (FID).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

Inspection and review of airline safety programs and practices are integral to the FAA safety program. The IT infrastructure provided by the RCISS program will enable real-time access by the safety workforce while working in the field (e.g. inspectors, engineers, investigators, and medical examiners) to airline safety records and the required actions to meet regulations and directives. In Segment 2, RCISS enabled the realization of the quantifiable safety benefits claimed by the SASO and ASKME investments by providing the IT infrastructure on which these AVS business applications reside. Approximately 20% of the combined SASO and ASKME benefits are attributed to RCISS. Segment 3 analysis of the RCISS contribution to ASKME, SASO, and AMSIS quantifiable safety benefits is expected to yield similar results.

Program Plans FY 2017 – Performance Output Goals

- Achieve RCISS Segment 3 FID.
- Complete technology refresh of 25% of the safety workforce mobile toolkits with enhanced telecommunications services.
- Complete Mobility Deployment 10 contract award for annual technology refresh of safety workforce mobile toolkits.
- Complete Enterprise Data Center Deployment 10 contract award for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment.
- Begin migration of select AVS safety data and applications to the cloud.

Program Plans FY 2018 – Performance Output Goals

- Complete technology refresh of 25% of the safety workforce mobile toolkits with enhanced telecommunications services.
- Complete Mobility Deployment 11 contract award for annual technology refresh of safety workforce mobile toolkits.
- Complete Enterprise Data Center Deployment 11 contract award for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment.
- Complete 50% migration of select AVS safety data and applications to the cloud.

Program Plans FY 2019 – Performance Output Goals

- Complete technology refresh of 25% of the safety workforce mobile toolkits with enhanced telecommunications services.
- Complete Mobility Deployment 12 contract award for annual technology refresh of safety workforce mobile toolkits.
- Complete Enterprise Data Center Deployment 12 contract award for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment.
- Complete migration of select AVS safety data and applications to the cloud.

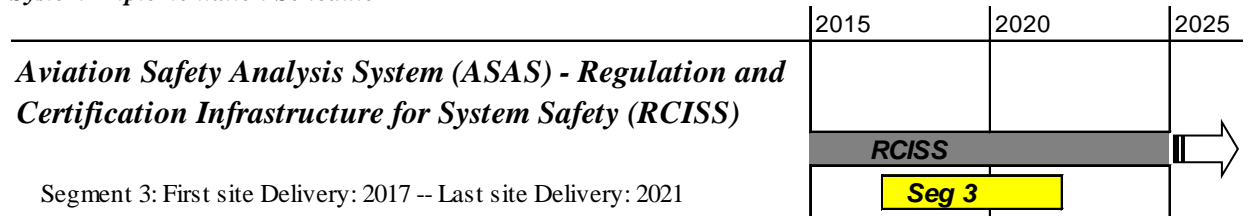
Program Plans FY 2020 – Performance Output Goals

- Complete technology refresh of 25% of the safety workforce mobile toolkits with enhanced telecommunications services.
- Complete Mobility Deployment 13 contract award for annual technology refresh of safety workforce mobile toolkits.
- Complete Enterprise Data Center Deployment 13 contract award for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment.

Program Plans FY 2021 – Performance Output Goals

- Complete technology refresh of 25% of the safety workforce mobile toolkits with enhanced telecommunications services.
- Complete Mobility Deployment 14 contract award for annual technology refresh of safety workforce mobile toolkits.
- Complete Enterprise Data Center Deployment 14 contract award for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment.

System Implementation Schedule



3A03, NATIONAL AIRSPACE SYSTEM (NAS) RECOVERY COMMUNICATIONS (RCOM)
FY 2017 Request \$12.0M

NAS Recovery Communications (RCOM), C18.00-00

Program Description

The RCOM program provides the technical expertise to manage the technology and equipment acquisition for FAA’s emergency Command and Control Communications (C3) system. This system enables the FAA Administrator and staff to directly manage the NAS during local, regional, and national emergencies should normal communications with facilities be interrupted for any reason. The C3 system provides and enhances communication capabilities through a variety of fixed-position, portable, and transportable emergency communications systems to support crisis management and enables the FAA and other Federal agencies to exchange both classified and unclassified information to protect national security during an emergency. The C3 system also supports and modernizes the Washington Operations Center Complex and several FAA “continuity of operations” sites to ensure that FAA executives have command, control, and communications available at all times. The C3 system includes the following:

- VHF/FM and HF Radio Equipment
- Emergency Operations Network (EON)

- Emergency Operations Facility
- Communications Support Team (CST)
- Secure Communications (COMSEC)
- Information Technology Support
- Satellite Telephone Emergency Network (STEN)

In addition to the above, there are classified systems, facilities and projects that the RCOM program either manages or supports that are not named or described in this document. These support both intra and interagency agreements and initiatives.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 7 – Exceed Continuity Communications activation levels, as identified in the Federal Continuity Directive (FCD) Annex H, by 5 percent. (FAA Business Planning Metric)*

Relationship to Performance Metric

The RCOM program contributes to the FAA Strategic Priority “Make Aviation Safer and Smarter” by ensuring that the FAA’s C3 capability can provide classified and unclassified, time-critical, public and NAS information for the FAA Administrator during emergencies. The C3 system provides collaborative communications and adaptive situational awareness for enhanced decision making. The FAA Administrator shares this information with staff members, key regional managers, the Secretary of Transportation, and other national-level executive personnel.

Program Plans FY 2017 – Performance Output Goals

- Complete the site preparation and installation of VHF/FM equipment for the Cleveland District, OH.
- Complete VHF/FM network engineering, design, and equipment procurement for the Philadelphia District, PA.
- Develop a major EON application to incorporate the latest changes in requirements and technology innovation.
- Complete refresh of Audio/Visual and IT Network at Primary Alternate Facility (PAF).
- Perform vehicle upgrades and quarterly testing for CST.
- Procure secure cellular phones.
- Complete technology refresh of Project 1 Network at seven sites.
- Complete technology refresh of STEN equipment for Alaskan, Southern, and Western-Pacific Regions.
- Procure fixed satellite test system.

Program Plans FY 2018 – Performance Output Goals

- Complete the site preparation and installation of VHF/FM equipment for the Philadelphia District, PA.
- Complete the VHF/FM network engineering, design, and equipment procurement for the Columbia District, SC.
- Complete technology refresh of the Disaster Recovery site.
- Perform vehicle upgrades and quarterly testing for CST.
- Complete technology refresh of Project 1 Network at 3 sites.
- Complete technology refresh of STEN equipment for HQ, New England, and Southwest Regions and the Mike Monroney Aeronautical Center.
- Complete technology refresh of EON Geographic Information System (GIS) hardware and software.
- Complete technology refresh of STEN Iridiums.

Program Plans FY 2019 – Performance Output Goals

- Complete the site preparation and installation of VHF/FM equipment for the Columbia District, SC.
- Complete the VHF/FM network engineering, design, and equipment procurement for the Washington District, WA.
- Develop EON GIS application for use on mobile phones and tablets.
- Perform vehicle upgrades and quarterly testing for CST.
- Complete technology refresh of Project 1 Network at 3 sites.
- Complete technology refresh of STEN equipment for Eastern, Central, Great Lakes, and Northwest Mountain Regions.
- Complete technology refresh of M10i (Juniper) network routers.

Program Plans FY 2020 – Performance Output Goals

- Complete the site preparation and installation of VHF-FM equipment for the Washington District, WA.
- Complete the VHF/FM network engineering, design, and equipment procurement for the Fort Worth District, TX.
- Procure data feeds and develop software to enhance EON's internal and external data sharing capabilities.
- Complete technology refresh of CST Emergency Response Vehicle communications equipment.
- Complete technology refresh of secure facsimile equipment.
- Complete technology refresh of Storage Area Network (SAN) and network switches.

Program Plans FY 2021 – Performance Output Goals

- Complete site preparation and installation of VHF-FM equipment for the Fort Worth District, TX.
- Complete the VHF/FM network engineering, design, and equipment procurement for the Chicago District, IL.
- Complete technology refresh of network servers, firewalls, routers, and video monitors.
- Perform technology refresh on facility equipment at the PAF.
- Perform EON infrastructure refresh (servers and software) to provide an enhanced resilient platform for collaborative communications, continuity of operations, and decision support
- Complete technology refresh on Homeland Security Data Network (HSDN) system.
- Complete technology refresh of COMSEC equipment.

3A04, FACILITY SECURITY RISK MANAGEMENT

FY 2017 Request \$21.0M

Facility Security Risk Management (FSRM) – Two, F24.01-02

Program Description

The FSRM program was established in response to Presidential Decision Directive 63, Critical Infrastructure Protection which has been superseded by Homeland Security Presidential Directive (HSPD) 7, Critical Infrastructure Identification, Prioritization and Protection which requires all Federal agencies to assess the risks to their critical infrastructure and take steps to mitigate that risk. The program provides risk mitigation at all FAA staffed facilities. The program provides an integrated security system that includes access control, surveillance, x-ray machines, metal detection, and intrusion detection. Other upgrades include adding guardhouses, visitor parking, fencing, perimeter hardening, window blast protection, and lighting. This program is included in the ATC Facilities Sustainment Strategic Plan.

The objective of the program is to comply with Public Law 106-528, Airport Security Improvement Act of 2000 and complete security upgrades at approximately 1075 staffed facilities. Approximately 423 of the 1075 facilities still require upgrades to install equipment to read Personal Identity Verification (PIV) access cards. Improved security is accomplished through the installation and maintenance of physical security systems and guard services at designated FAA facilities using the System Security Design and Integration (SSDI), Corrective Maintenance Contract (CMC) II, and National Security Officer Services (NSOS) contracts.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The FSRM program provides the infrastructure enhancements needed to reduce the risk of disruption of operations at facilities critical to the NAS. These enhancements reduce the risk of unauthorized access and provide early identification of potential security problems. This program supports the operational availability metric because enhanced security prevents or reduces the probability of a loss of NAS service.

Program Plans FY 2017 – Performance Output Goals

- Complete PIV retrofit (405 sites). (APB milestone)
- Complete installation of X-ray machines (15 sites) by September 30, 2017.
- Complete technical refresh (30 sites).

Program Plans FY 2018 – Performance Output Goals

- Complete perimeter hardening at 12 Security Level 3 and Security Level 4 facilities.
- Complete implementation of standardized facility protective measures at remaining sites (148 sites). (APB milestone)
- Complete technical refresh (40 sites).
- Complete installation of X-ray machines (5 sites) by September 30, 2018.

Program Plans FY 2019 – Performance Output Goals

- Complete perimeter hardening at 12 Security Level 3 and Security Level 4 facilities.
- Complete technical refresh (40 sites).

Program Plans FY 2020 – Performance Output Goals

- Complete perimeter hardening at 12 Security Level 3 and Security Level 4 facilities.
- Complete technical refresh (40 sites).

Program Plans FY 2021 – Performance Output Goals

- Complete perimeter hardening at 12 Security Level 3 and Security Level 4 facilities.
- Complete technical refresh (125 sites).

3A05, INFORMATION SECURITY

FY 2017 Request \$25.0M

Information Systems Security, M31.00-00

Program Description

The FAA must ensure the integrity and availability of all critical systems, networks, and infrastructure under conditions of increased cyber terrorism and malicious activities by hackers and other unauthorized personnel. The Homeland Security Presidential Policy Directive 21 identifies the NAS as one of 16 critical infrastructure sectors and directs FAA to protect and ensure the integrity, confidentiality, and availability of all NAS Information Systems. Under the Federal Information Security Management Act of 2002, FAA must identify and provide information security protection commensurate with the risk and magnitude of potential harm that could result from unauthorized access, use, disclosure, disruption, modification, or destruction of information that supports the agency, aviation safety and security, and the NAS.

The FAA Information Security & Privacy (IS&P) Directorate is a partnership between the FAA Chief Information Officer's organization and other FAA lines of business and staff offices (LOBs/SOs) with a focus on protecting FAA information and infrastructure. The Security Operations Center (SOC) provides the following services:

- Support continued cybersecurity research and development;
- Security architecture and engineering;
- Manage and support-year round 24 hours a day security operations;
- Support policy, compliance, standards, and cybersecurity requirements;
- Support for system certification and compliance through utilization of security vulnerability scanning, code review, and penetration testing;
- Continuous monitoring support by providing technical solutions;
- Leverage technologies, which provides input for risk profile management;
- Perform cyber forensics analysis;
- Provide advanced threat analysis;
- Detect, report, and track cyber security events; and
- Monitor cyber security events and initiate appropriate activities.

This comprehensive cybersecurity effort provides products and services for FAA's three operating domains; NAS, Research and Development (R&D), and Mission Support, to protect FAA's information and infrastructure, and respond to computer security incidents. The SOC is comprised of facilities and security technologies, and uses FAA and contract personnel working as a unified entity to provide extremely effective, enterprise-focused cyber security services to its clients. The SOC is a 24x7x365 day operation supporting the FAA as well as all other modes within the Department of Transportation (DOT). It is the central reporting point for all cyber events occurring within the FAA and DOT. The SOC also represents the DOT as the single source provider of the cyber "big picture" when reporting to the Department of Homeland Security.

The office of the Chief Information Officer takes a comprehensive, proactive approach to preventing and isolating intrusions in the FAA's infrastructure. This cyber defense strategy involves hardening of the individual system and network elements, and isolating and backing-up those elements to avoid services disruptions.

Advanced Persistent Threat (APT) events are targeted attacks on federal government systems, which pose a serious and imminent threat to those systems. These are events specific in nature, objective and patterned. The development of the term "Advanced Persistent Threat" allows the recording of these events and the identification of systems that have been compromised or affected by both opportunistic and targeted cyber-attacks. The APT events are one type of event the SOC detects, analyzes and responds to daily in defense of the FAA infrastructure. In addition to the APT events the FAA must respond to a myriad of attacks on its systems. The FAA is evolving towards a risk-based approach to computer network defense integrating new technologies into the cyber security program to protect the FAA and enhance the capability to respond to emerging cyber threats.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 6 – Address 80% of high value risks within 30 days. Continue to provide information to the Cybersecurity Steering Committee to assure consistent risk acceptance decisions. Visualize vulnerabilities on all IP based systems.*

Relationship to Performance Metric

The FAA supports and implements security strategies and plans through: (1) effective preparation, detection, response, and recovery regarding cyber-attacks; (2) integration of information security efforts into all acquisition and operation phases to protect FAA people, buildings, and information; and (3) support for efforts to safeguard homeland security, in particular the FAA's component of the nation's critical infrastructure and industry.

Program Plans FY 2017 – Performance Output Goals

- Evaluate solutions and services to achieve Continuous Diagnostics and Mitigation (CDM) Phase 2 goals such as network access control management, credentials and authentication management, account access management, and security-related behavior management.
- Evaluate and deploy new technologies to combat APT.
- Validate full packet capture capability at two new strategic network points.
- Integrate advanced and evolved vulnerability and United States Government Configuration Baseline (USGCB) scanning within the FAA's IP based networks.
- Evaluate new technologies to address complex and rapidly changing cyber threats and vulnerabilities.
- Deploy Wireless Intrusion Detection/Wireless Application Protocol (WID/WAP) to 91 FAA facilities.
- Conduct software code vulnerability security analysis on 120 legacy and developmental agency systems.
- Develop architecture and engineering efforts for alternative solutions to secure new FAA systems.
- Implement PIV Card requirement for non-NAS networks to access internal FAA network (i.e. Virtual Private Network (VPN)).

Program Plans FY 2018 – Performance Output Goals

- Implement solutions and services to achieve CDM Phase 2 goals including management of access control, credentials and authentication, account access, and security-related behavior.
- Evaluate and deploy new technologies to combat APT.
- Deploy full packet capture capability at two new strategic network points.
- Deploy Wireless Intrusion Detection/Wireless Application Protocol (WID/WAP) to 91 FAA facilities.
- Evaluate new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.
- Complete software code vulnerability security analysis on 150 legacy and developmental agency systems.

Program Plans FY 2019 – Performance Output Goals

- Evaluate solutions and services to achieve CDM Phase 3 to manage events to prepare for and respond to incidents and contingencies.
- Evaluate and deploy new technologies to combat APT.
- Deploy full packet capture capability at two new strategic network points.
- Deploy Wireless Intrusion Detection/Wireless Application Protocol (WID/WAP) to 91 FAA facilities.
- Evaluate new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.
- Complete software code vulnerability security analysis on the remaining legacy and developmental agency systems.

Program Plans FY 2020 – Performance Output Goals

- Implement solutions and services to achieve CDM Phase 3 to manage events to prepare for and respond to incidents and contingencies.
- Evaluate and deploy new technologies to combat APT.
- Deploy full packet capture capability at two new strategic network points.
- Evaluate new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.

Program Plans FY 2021 – Performance Output Goals

- Implement solutions and services to achieve CDM Phase 3 capabilities to manage events in preparing for and responding to incidents and contingencies.
- Evaluate and deploy new technologies to combat APT.
- Deploy full packet capture capability at two new strategic network points.
- Evaluate new technologies to address evolving cyber threats and vulnerabilities, to include wireless technologies.

3A06, SYSTEM APPROACH FOR SAFETY OVERSIGHT (SASO)

FY 2017 Request \$17.2M

System Approach for Safety Oversight (SASO) – Phase 2b, A25.02-02

Program Description

The SASO Program improves, automates, and standardizes the FAA’s Flight Standards Service (AFS) safety oversight and inspection processes by implementing the International Civil Aviation Organization (ICAO) Safety Management System (SMS). Within AFS, SMS consists of four primary components: Safety Assurance (SA), Safety Risk Management (SRM), Safety Policy (SPO) and Safety Promotion (SPR).

Safety Assurance (SA): The Flight Standards Safety Assurance System (SAS), supports the SA component of SMS by introducing a new proactive systems safety approach that will significantly improve FAA’s ability to identify and address hazards and safety risks before they result in accidents. Obsolete or redundant systems and data will be consolidated or removed and replaced with an integrated suite of databases and analysis tools that provide both more accurate and critical information needed to make timely safety decisions. The program will exchange information from these systems with national and international government and industry organizations throughout the aviation community to increase awareness of systemic safety risks and maximize levels of safety. The SAS will provide easier and quicker access to safety information for FAA employees that certify and monitor the aviation industry.

Safety Risk Management (SRM): SASO SRM activities include specific enhancements to the SAS toolset to support SRM, particularly with respect to the development and assessment of risk controls and the implementation of functional and data interfaces. These interfaces will interconnect the AFS SRM functions with SRM functions of other FAA Office of Aviation Safety (AVS) services and offices, most notably the Aircraft Certification Service (AIR). This will be done in conjunction with updating internal AFS policy and procedures in accordance with SMS constructs and requirements.

Safety Policy (SPO): SASO Safety Policy improvements will focus on integrating safety planning, organizational structure and responsibilities, and operational procedures and controls. SASO will put in place processes for the establishment of acceptable levels of safety for both individual certificate holders and applicable aviation industry segments viewed as a whole. SASO will develop a methodology for establishing an acceptable level of risk for particular industry segments and types of operations, and procedures to continuously monitor and aggregate industry level risk. Finally, references and process controls will be updated to support integration into the overall AVS SMS.

Safety Promotion (SPR): SASO Safety Promotion initiatives include five primary activities:

- Developing a positive safety culture between AVS, AFS and certificated and non-certificated entities;
- Communicating ongoing SMS efforts and outputs to all employees;
- Establishing personnel competency requirements and training for SMS activities;
- Building knowledge of safety issues and incorporating it into the aerospace system; and
- Updating product/service provider SMS requirements.

SASO is divided into three phases. SASO Phase I (FY 2006 – FY 2009) consisted of a planning and engineering effort designed to develop and test the SAS concept, i.e. using automation to guide and support the FAA’s safety oversight and inspection process. It also demonstrated the benefits of system safety to AFS and the aviation community. SASO Phase II is further developing and implementing the SAS concept for other CFR Parts pertaining to aviation. SASO Phase II is divided into two phases: Alpha and Beta. Phase II Alpha will be completed in FY 2016.

SASO Phase II Beta covers the period from FY 2015 through FY 2024. SASO Phase II Beta will address additional requirements of FAA Order VS 8000.367A. SASO Phase II Beta is divided into two segments:

- **Segment 1 (FY 2015 - FY 2024)**. This segment includes the effort to enhance the basic SAS framework developed and deployed in Phase II Alpha to accommodate additional Title 14 CFR Parts. These include,

but are not limited to, other air operators, Pilot Schools and Training Centers, Aviation Maintenance Technical Schools and other operations such as helicopter external load, and agriculture/crop dusting. This represents an additional 7,500+ certificate holders for a combined total of over 13,000 certificates. Segment 1 also includes the development and implementation of the three remaining components of the SMS: Safety Risk Management, Safety Policy, and Safety Promotion. SASO Phase II Beta Segment 1 has been further subdivided into Segment 1a and Segment 1b. Segment 1a will focus on the highest AFS priorities, which will include SAS development for Title 14 CFR Parts 141, 142, 147 and 183. SAS functionality is also enhanced in the areas of activity recording, office workload list, risk profile, and the Certificate Services Oversight Process. Segment 1a develops and implements efficiencies in the repair station assessment process and develops SMS safety promotion through a variety of means and communication mechanisms to enhance industry collaboration. Segment 1a includes a planning effort to prepare for Segment 2, which includes an analysis of AFS business processes, systems, data management, and developing a business case. The Phase II Beta, Segment 1a Final Investment Decision (FID) is scheduled for Q2, FY 2016. Segment 1b will focus on AFS's remaining requirements, as defined in the SASO final program requirements document to complete the AFS SMS.

- **Segment 2 (FY 2018 - FY 2024).** This segment includes the implementation of an approved AFS business consolidation plan which includes: 1) system/business process consolidation; 2) system procurement and system decommissioning; 3) policy, documentation and training development; and 4) instruction to support AFS business, system consolidation and efficient data management. Upon completion of this segment, AFS business processes, systems and data management will be standardized and consolidated, thus creating efficiencies that significantly enhance AFS oversight capability. The Phase II Beta, Segment 2 FID is planned for FY 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

SASO supports the metric for reducing the air carrier fatal accident rate by implementing a SMS that will assist aviation safety inspectors with their statutory oversight of the aviation industry. SASO Phase II Alpha implemented an automation system that fulfills the first of four SMS components, Safety Assurance. SASO Phase II Beta implements the remaining three SMS components, Safety Promotion, Policy and Risk Management. After completion of both phases, the aviation safety inspector workforce will be better informed and prepared to improve enforcement of safety regulations and continue to protect the flying public.

Program Plans FY 2017 – Performance Output Goals

- Segment 1a: Complete Office Workload IPT Critical Design Review (CDR).

Program Plans FY 2018 – Performance Output Goals

- Segment 1a: Complete Critical Design Review (CDR) for SAS Functional Release 1.
- Segment 1a: Complete Development Testing 1 for SAS Functional Release 1.

Program Plans FY 2019 – Performance Output Goals

- Segment 1a: Complete Development Testing 2 for Functional Release 1.
- Segment 1a: Complete Beta Testing for SAS Functional Release 1.
- Segment 1b: Achieve Phase II Beta, Segment 1b FID.
- Segment 2: Achieve Phase II Beta, Segment 2 FID.

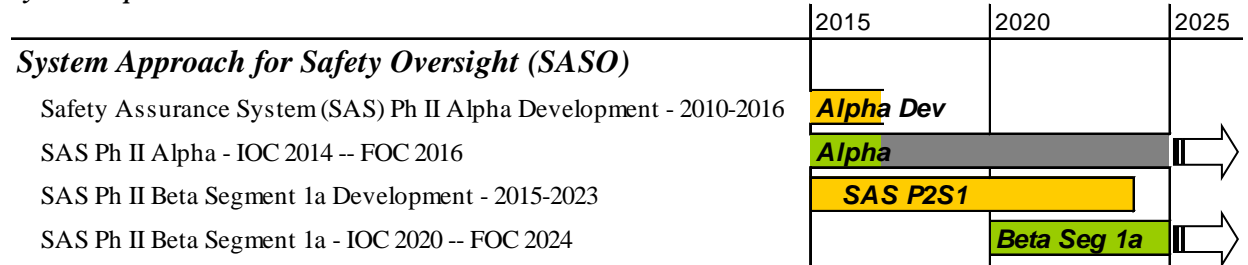
Program Plans FY 2020 – Performance Output Goals

- Segment 1b: Output goals will be determined at FID.
- Segment 2: Output goals will be determined at FID.

Program Plans FY 2021 – Performance Output Goals

- Segment 1b: Output goals will be determined at FID.
- Segment 2: Output goals will be determined at FID.

System Implementation Schedule



3A07, AVIATION SAFETY KNOWLEDGE MANAGEMENT ENVIRONMENT (ASKME)

FY 2017 Request \$4.2M

Aviation Safety Knowledge Management Environment (ASKME) – Segment 2, A26.01-01

Program Description

The ASKME program is a suite of functional components designed to support and enable the FAA Aircraft Certification Service (AIR) to more efficiently certify new aircraft and modifications to existing aircraft. The program provides a comprehensive automation environment for critical safety business processes for Aviation Safety (AVS) through the deployment of integrated business solutions. ASKME – Segment 1, was approved by the Joint Resources Council (JRC) in 2007 for project work from FY 2008 – 2012. ASKME – Segment 2 was approved by the JRC in September 2011 to continue development and deployment of these business solutions through FY 2017.

ASKME 2 projects will provide digital storage and retrieval of FAA safety data and information from FAA technical documentation, including lessons learned from previous certifications that involved aircraft design and manufacturing safety issues, so that they can be accessed quickly and shared more efficiently. ASKME will provides a comprehensive automated system and a suite of electronic tools for capturing key safety related data resulting from rulemaking and policy development, airworthiness directives, engineering design certification, production/ manufacturing certification, airworthiness certification, and compliance and enforcement.

Additional ASKME capabilities will help inspectors in approving new operating certificates, and ensuring that design or modification of aircraft meets aircraft safety regulations. These capabilities will also aid in designee management, compliance and evaluation (audit) of certification activities, responses to external inquiries, support for necessary compliance and enforcement actions, continued operational safety management, and international coordination.

ASKME Segment 2 will complete the iterative design, development, testing, and release of the ASKME Segment 2 Integrated System, deliverables include:

- Electronic File System (EFS) – Production Support and Historical Scanning;
- Work Tracking Software – Budget Management (WTS-BMgmt);
- Airworthiness Directives Development (ADD);
- Airworthiness Certifications; and
- Compliance and Enforcement Actions (CEA).

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

The AIR is responsible for ensuring that civil aircraft are designed and manufactured to operate safely within the NAS. ASKME will provide the automated systems to conduct safety data analysis and data gathering, as well as the collection of lessons learned as it applies to AIR's safety-related responsibilities (e.g. aircraft certification and certificate management, regulatory development, designee supervision and oversight, and operational safety). ASKME will provide AIR with a comprehensive mechanism aimed at: 1) the early identification and resolution of accident precursors; 2) the promotion of systematic and structured risk assessment/risk management practices; and 3) the proactive management of safety issues throughout the lifecycle of an aircraft and its components. The projected benefit from FY 2013 to FY 2023 is estimated at 77.26 avoided fatalities.

Program Plans FY 2017 – Performance Output Goals

- Complete the portion of the ASKME Segment 2 integrated system required to provide the CEA (Compliance & Enforcement Actions) functionality. (APB milestone)
- Complete the portion of the ASKME Segment 2 integrated system required to provide the AC (Airworthiness Certification) functionality.
- Complete the portion of the ASKME Segment 2 integrated system required to provide the BMGMT (Budget Management) functionality.
- Conduct user in service training.
- Complete development, implementation and release of ASKME Segment 2. (APB milestone)

Program Plans FY 2018-2021 – Performance Output Goals

- None.

3A08, AEROSPACE MEDICAL EQUIPMENT NEEDS (AMEN)

FY 2017 Request \$3.0M

- Aerospace Medical Equipment Needs (AMEN) – Phase 2, M53.01-02
- X, Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3, M53.01-03

Aerospace Medical Equipment Needs (AMEN) – Phase 2, M53.01-02

Program Description

The Civil Aerospace Medical Institute (CAMI), located at the FAA Mike Monroney Aeronautical Center (MMAC) in Oklahoma City, OK, is the medical certification, education, research, and occupational medicine wing of the Office of Aerospace Medicine (AAM) within the FAA's Aviation Safety Organization (AVS). CAMI's personnel work in sophisticated research laboratories and testing facilities and require modern scientific, engineering, simulation, and medical systems. Much of the laboratory equipment used by CAMI's scientists, physicians, and engineers is becoming obsolete. This aging equipment places several accreditations at risk (i.e., American Board of Forensic Toxicologists and Quality Management Systems – ISO 9001:2008) and does not allow the FAA to keep up with science and technological advances currently available in the market.

Phase 2 includes the replacement of CAMI Human Factors Research Division's old and obsolete research laboratory assets. AMEN Phase 2 will replace 12 equipment items, all of which are Commercial-Off-The-Shelf (COTS) or modified COTS products. The equipment to be replaced includes five computer-based flight operations and Air Traffic Control (ATC) simulators, two biochemistry/forensic toxicology testing systems, two specialized cameras,

one anthropometric test dummy, one engineering calibration device, and a data acquisition and processing system. The AMEN Phase 2 program achieved a Final Investment Decision (FID) in October 2015 for the replacement of this equipment.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

Modern equipment supports human safety and performance research areas that are associated with reducing aviation accidents and fatalities. Examples of how the equipment will be utilized to perform research are:

- Development of procedures to detect aeromedically unsafe conditions and trends (biochemistry equipment);
- Assessment of crash environments to determine restraint performance and safety device effectiveness (crash survival equipment);
- Evaluations of human factors concerns associated with advanced multifunction displays and controls used in general aviation and air traffic control: General Air Traffic and Technical Operations Research Laboratory (GATTOR), Air Traffic Control Advanced Research Simulator (ATCARS), Technically Advanced General Aviation Research Simulator (TAGARS), Advanced Unmanned Aircraft System (AURS) Research Simulator, and Advanced Rotorcraft Simulator (ARS);
- Evaluation of NextGen technologies and procedures including human-in-the-loop (HITL) simulation studies concerning the usability of proposed automation concepts and the effects of those concepts on ATC workload, situational awareness, and performance (GATTOR, ATCARS, and TAGARS); and
- Development and assessment of performance measures for ATC and technical operations specialists (GATTOR, ATCARS, and TAGARS).

Program Plans FY 2017 – Performance Output Goals

- Complete documentation for acquisition of the following items:
 - TAGARS
- In Service (available for use): Engineering Calibration Device (CAL)

Program Plans FY 2018 – Performance Output Goals

- Complete documentation for acquisition of the following items:
 - GATTOR
 - ARS
- In Service (available for use):
 - Anthropometric Test Device (ATD)
 - Miniature Data Acquisition System (mDAS)
 - Ultraviolet and Visible Absorption Spectroscopy (UV/VIS)
 - micro gas chromatograph (mGC)

Program Plans FY 2019 – Performance Output Goals

- In Service (available for use): ATCARS (Prior year funds)

Program Plans FY 2020 – Performance Output Goals

- In Service (available for use): TAGARS (Prior year funds)

Program Plans FY 2021 – Performance Output Goals

- In Service (available for use): (Prior year obligations)
 - GATTOR
 - ARS
 - AURS

X, Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3, M53.01-03

Program Description

The Civil Aerospace Medical Institute (CAMI), located at the FAA Mike Monroney Aeronautical Center (MMAC) in Oklahoma City, OK, is the medical certification, education, research, and occupational medicine wing of the Office of Aerospace Medicine (AAM) within the FAA's Aviation Safety Organization (AVS). CAMI's personnel work in sophisticated research laboratories and testing facilities and require modern scientific, engineering, simulation, and medical systems. Much of the laboratory equipment used by CAMI's scientists and engineers is becoming obsolete. This aging equipment places several accreditations at risk and does not allow the FAA to keep up with science and technological advances currently available in the market.

AMEIN Phase 3 – Aerospace Medical Equipment & Infrastructure Needs (AMEIN) (Wind & Wave Evacuation and Survival (WiWAVES) Program) will provide for the continued technology refresh of CAMI aerospace medical divisions' laboratory assets.

Phase 3 of this program will replace the aging Water Survival Research Facility (WSRF) at CAMI, which was installed in 1967 and last renovated in 1983. The WSRF failed structurally in 2012 and was out of service for several months causing the suspension of all research and safety analysis activities during that time. While the WSRF was being repaired some education activities were temporarily performed at a local college swimming pool which has since been closed. Continuing deterioration of the WSRF presents a high risk of catastrophic structural failure which will result in the WSRF tank becoming completely unusable in the near future.

CAMI plans to construct a new WiWAVES facility housed in an approximately 50,000 sq. ft. building. The WiWAVES facility will consist of a water survival tank surrounded by the structural and mechanical apparatus required to support fuselage placements, aircraft attachments for multiple escape slides, deployment of water survival inflatables, wind machines to emulate high-fidelity windstorm operating environments, and the wave generating capability necessary to challenge the design and function of water safety and survival equipment, and procedures.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

Modern equipment supports human safety and performance research areas that are associated with reducing aviation accidents and fatalities. WiWAVES facility will replace the old and obsolete WSRF to fully restore capabilities necessary for evaluation and development of equipment, systems, and procedures used for the protection and survival of aircrews, cabin crews, and the flying public. Architectural and functional enhancements beyond the design elements of the legacy WSRF will bring state-of-the-art functionality to address existing and advanced cabin safety requirements in a relevant virtual environment.

Program Plans FY 2017 – Performance Output Goals

- None.

Program Plans FY 2018 – Performance Output Goals

- Award architecture and engineering design contract for WiWAVES facility.
- Complete Engineering and Ground Studies.
- Complete Environmental Studies.

Program Plans FY 2019 – Performance Output Goals

- Complete architecture and engineering design for WiWAVES facility.
- Complete acceptance of Type B Architectural Drawings.
- Award construction contract for Phase 1a of WiWAVES facility to include site preparation and relocation of utilities.

Program Plans FY 2020 – Performance Output Goals

- Award construction contract for Phase 1b of WiWAVES facility to include construction of survival tank and wind testing area.
- Acquire and complete installation of Wave Generation equipment.

Program Plans FY 2021 – Performance Output Goals

- Award construction contract for Phase 2 (of 2) of WiWAVES facility to include construction of briefing room and support spaces (i.e., locker rooms, support equipment, control room, etc.).

3A09, NEXTGEN – SYSTEM SAFETY MANAGEMENT PORTFOLIO

FY 2017 Request \$17.0M

- A, Aviation Safety Information Analysis and Sharing (ASIAS), G07A.02-01
- B, Systems Safety Management Transformation (SSMT), G07M.02-01

A, Aviation Safety Information Analysis and Sharing (ASIAS), G07A.02-01

Program Description

The ASIAS program is an information safety analysis and data sharing collaboration involving industry and government to proactively analyze broad and extensive data to advance aviation safety. The primary objective of ASIAS is to provide a national resource for use in discovering common, systemic safety problems that span multiple airlines, fleets and regions of the global air transportation system. ASIAS uses internal FAA datasets, airline proprietary safety data, publicly available data, manufacturers' data and other data. ASIAS links together these data sources to identify safety trends in the NAS, leading to a comprehensive and proactive approach to aviation safety in conjunction with implementation of NextGen capacity and efficiency capabilities.

The ASIAS information analysis and sharing mission directly supports safety promotion and safety assurance initiatives providing analytical results such as baseline information and trends; and indirectly supports safety risk management through issue identification, information, and tools for analysis of hazards. System wide analysis and modeling support risk assessment and management by identifying potential systemic risks associated with both new systems in NextGen and existing systems. To fully realize the benefits of the Safety Management System (SMS) approach to safety and reach the level of safety demanded by the public, it will be necessary to:

- Replace inadequate, informal communication with comprehensive and timely exchange of aviation safety information;
- Coordinate and share the resources required to promote effective tool development and issue analysis; and
- Establish a collaborative approach to identifying and mitigating system safety issues posing the highest risk.

ASIAS supports these objectives by aggregating and sharing data among ASIAS participants to more clearly understand the precursors that may lead to accidents. ASIAS aggregates multiple sources of aviation safety data in a central repository, increasing its potential value for analysis-based insight and providing some insights that are only discoverable through shared data. ASIAS also has advanced safety analytical capabilities and performs analyses that would not otherwise be available to participants performing similar analyses on their own data.

ASIAS has initiated the process of proactively analyzing, identifying and monitoring the data for potential high risk safety issues sooner than some that may remain hidden until being uncovered later in post-incident investigations. New automated processes will facilitate advanced analysis of comprehensive data which will provide new insights about potential safety risks in both the current NAS and as the NAS implements NextGen capabilities.

The activities in the program include:

- Research to develop ASIAS capabilities that build upon and extend existing capabilities for managing and processing aviation safety and performance data;
- The development of tools that convert both unstructured textual and digital data into information; and
- The creation of visualization capabilities that aid causal/contributing factor analyses and risk assessment.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter.*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

ASIAS is a vital component needed to support FAA's Strategic Priority to Make Aviation Safer and Smarter. Safety insights from ASIAS analyses are communicated to the ASIAS participants and, as authorized by the ASIAS Executive Board (AEB), to others in the aviation community. Participants will leverage insights from ASIAS to identify risk-reducing alternatives or changes to operations or processes to improve NAS safety. Safety insights from ASIAS will be applicable to a broad range of aviation communities including commercial, general aviation (GA), helicopters, and civilian agencies involved with aviation operations such as airport operators, airport authorities, and specifically to the FAA as it develops and implements NextGen. As a FAA-industry partnership and data-driven safety program, ASIAS supports promotion and expansion of safety information efforts to identify, prioritize and address risks and/or vulnerabilities before they lead to accidents.

Program Plans FY 2017 – Performance Output Goals

- Establish an initial data sharing agreement with at least one Rotorcraft operator.
- Establish a data collection and sharing capability for the GA community using GA Flight Data Monitoring (GA-FDM) acquisition systems.
- Complete transition to AIRINC 717-based Flight Operational Quality Assurance (FOQA) analysis capability to improve big data processing efficiency.
- Develop Models and Metrics to access human factors issues related to NAS accident and incident risks.
- Develop machine learning frameworks that actively recalibrate safety metrics as behaviors change in the NAS.
- Deploy automated capabilities to alert ASIAS participants on atypical flight and system behavior using fused digital and textual data.

Program Plans FY 2018 – Performance Output Goals

- Incorporate avionics manufacturers' data into the ASIAS data set.
- Incorporate available Unmanned Aircraft Systems (UAS)/Remotely Piloted Aircraft (RPA) data into the ASIAS data set to characterize UAS operations in the NAS.
- Transition non-protected ASIAS data to a FAA cloud-based architecture for improved data storage and analytical capabilities, and for enhancing data sharing and access to other ASIAS stakeholders.
- Develop models to simulate Terrain Awareness Warning System (TAWS) alerts for both simulated and radar flight tracks; integrate capability into the FAA Terminal Area Route Generation and Traffic Simulation (TARGETS) tools for testing of new procedures.
- Develop a capability to support the distribution, collection, and management of ASIAS information through the ASIAS Tagging, Tracking, and Integration of Knowledge (ATTIK) system for improved safety analysis.

Program Plans FY 2019 – Performance Output Goals

- Incorporate engine manufacturers’ data into the ASIAS data set.
- Establish a Low-Cost Helicopter Flight Data Monitoring (LC-HFDM) capability for rotorcraft participants.
- Develop capability to monitor and assess data quality for ASIAS participants’ Safety Management System (SMS) and other Safety Reporting Programs.
- Develop improved risk models for trend/anomaly detection capabilities to find high-risk and anomalous flights, leveraging new data sources such as GA and Rotorcraft operational information.

Program Plans FY 2020 – Performance Output Goals

- Develop adaptive analytics (updatable models) to support near real-time and historical analysis of safety risks, leveraging other relevant FAA safety capabilities such as System Safety Management Transformation (SSMT).
- Deploy advanced visualization (e.g. 3-D) tools on the ASIAS portal that include user customized parameters and displays for improved safety analysis.
- Deploy text-mining capability enhancements to enable automatic alerting and supplement analytical models using fused ASIAS data sources to improve the efficiency and effectiveness of ASIAS safety analyses.
- Conduct Directed Studies using tailored analytical techniques using available ASIAS data in support of NextGen system changes (e.g., Air Traffic Management procedures, airspace redesign) and community changes (e.g., fleet changes, avionics upgrades) in support of the FAA’s Risk-Based Decision Making initiatives.

Program Plans FY 2021 – Performance Output Goals

- Establish participation of local government aviation and airport authorities in the sharing of safety information with ASIAS and the receiving of applicable metrics and studies.
- Conduct ASIAS studies and analyses, and develop metrics in support of the Commercial Aviation Safety Team (CAST), the GA-Joint Steering Committee (GA-JSC), and rotorcraft community safety risk mitigation activities.
- Develop analytical capabilities that leverage new information in NextGen, such as data from commercial space operations.
- Enhance UAS hotspot monitoring capability to enable automated alerting for ASIAS community members.

B, Systems Safety Management Transformation (SSMT), G07M.02-01

Program Description

This program develops a comprehensive and proactive approach to aviation safety; especially as it relates to the implementation of NextGen. This work enables safety assessments of proposed NextGen concepts, algorithms, and technologies that address economic, implementation, operational and performance impacts, of NextGen system alternatives. This program supports the development and implementation of integrated safety management systems across the air transportation system to ensure that the safety risk throughout the NAS is managed to meet FAA’s safety goals. A demonstration of a National Level System Safety Assessment working prototype will be conducted that will proactively identify emerging risks as NextGen capabilities are defined and implemented. Hazard identification and tracking systems developed within the FAA will be linked to the Integrated Safety Assessment Model (ISAM) to support operational safety analyses. Mechanisms to define and support integrated risk-based approaches to safety and safety oversight will be prototyped to monitor operational safety and to determine the safety implications to the air transportation system of operational changes primarily driven by NextGen.

The activities included in the Systems Safety Management Transformation program include:

Terminal, EnRoute and Oceanic Risk Baseline and Forecast:

Terminal Area, EnRoute and Oceanic risk baseline and risk forecasts will be periodically calculated and reported through the development, validation and implementation of software for surface operations and terminal areas at all 35 major airports.

Integrated Safety Assessment Model (ISAM) Baseline and Forecast:

Software programs to establish an integrated system risk analysis baseline with standardized baseline safety metrics for all aspects of the NAS will be developed, validated and implemented. Integrated Safety Assessment Forecast will develop, validate and implement system risk analysis forecasting software and periodic metrics reporting of the potential impact of both planned and implemented NextGen initiatives on current and future safety baselines for all aspects of the NAS. The ISAM model will also be extended to cover worldwide accident rates and incident data through coordination with EUROCONTROL to support research conducted by the Single European Sky Air Traffic Management Research (SESAR) program.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

The planned growth and complexity in the air transportation system requires a fundamental change in the way the air transportation community manages safety. System safety management research provides a shared, proactive approach to identifying, assessing, and mitigating risk to make all stakeholders more effective in their approach to managing safety. Processes will be reengineered, safety cultures will change, and new technologies that prevent and mitigate incidents and accidents will be deployed within the air transportation system.

The Systems Safety Management Transformation program delivers prototype systems, functioning models, safety tools, information sharing environments and safety management analyses. Capabilities will be integrated using multiple data sources and shared across the aviation community through the deployment of local system safety risk baseline tools, risk prediction tools, and integrated forecasts. Ultimately, NAS stakeholders will use the tools to identify precursors and contributing factors to accidents, allowing interventions to be developed and implemented before system safety issues manifest as accidents.

Program Plans FY 2017 – Performance Output Goals

Terminal, EnRoute and Oceanic Risk Baseline and Forecast:

- Produce validated end-to-end estimate of complete flight track risk baselines, airport, terminal, and enroute by incorporating threaded track data.
- Produce safety risk baseline for typical Oceanic Operations – North Atlantic incorporating EUROCONTROL Integrated Risk Model inputs.
- Produce applied forecast case analysis for one complete flight track demonstration.
- Produce integration report with ISAM model.

Program Plans FY 2018 – Performance Output Goals

Integrated Safety Assessment Model Risk Baseline and Forecast:

- Produce integrated world-wide risk analysis through integration with the EUROCONTROL Risk model.
- Produce monthly NAS-wide risk metrics and report including system baselines and operational impacts of NextGen changes.
- Quantify risk analysis for a manufacturing process using an Event Sequence Diagrams and Fault Trees related to a new concept such as additive manufacturing.

Program Plans FY 2019 – Performance Output Goals

Integrated Safety Assessment Model Risk Baseline and Forecast:

- Produce daily risk analysis report for NAS-wide risk metrics including airport surface, terminal and enroute risks with wake encounter and weather related risks.
- Produce revised monthly NAS-wide risk metrics and report including system baselines and trends, reflecting commercial, general aviation and Unmanned Aircraft Systems (UAS) operations.
- Produce revised monthly commercial operations report for ATO and contract tower operations.
- Produce revised monthly NAS-wide risk forecasts, trend modeling and reporting.

Program Plans FY 2020 – Performance Output Goals

Integrated Safety Assessment Model Risk Baseline and Forecast:

- Produce daily risk analysis report for NAS-wide risk metrics including airport surface, terminal and enroute risks with wake encounter and weather related risks.
- Produce revised monthly NAS-wide risk metrics and report including system baselines and trends, reflecting commercial, general aviation and UAS operations.
- Produce revised monthly commercial operations report for ATO and contract tower operations.
- Produce revised monthly NAS-wide risk forecasts, trend modeling and reporting.

Program Plans FY 2021 – Performance Output Goals

Terminal, EnRoute and Oceanic Risk Baseline and Forecast:

- Produce validated weekly end-to-end estimate of complete flight track risk baselines, airport, terminal, and enroute, linked to threaded track data using SWIM data feed.
- Produce applied forecast case analysis for one complete flight track demonstration based upon SWIM data feed.

3A10, NATIONAL TEST EQUIPMENT PROGRAM

FY 2017 Request \$5.0M

National Test Equipment Program, M17.01-01

Program Description

The National Test Equipment Program (NTEP) manages the modernization, distribution, and maintenance of test, measurement, and diagnostic equipment required to perform preventive and corrective maintenance in support of NAS systems. Test equipment allows technicians to safely evaluate the condition of NAS systems, identify and isolate defects, and correct and return systems to full operational capacity. Having modern and reliable test equipment is crucial to communication, automation, surveillance, power, navigation, and weather platforms that must be maintained within specific tolerances. Failure to achieve and maintain certification of critical NAS systems could result in flight delays.

A Final Investment Decision for NTEP was approved in June 2013. The program will update and replace aging and obsolete test equipment used at approximately 27,000 facilities throughout the NAS. Results of the analysis conducted as part of that FID decision, indicates that between 19% and 25% of the 77,000 pieces of test equipment require replacement, with an estimated cost of approximately \$320 million. Some existing test equipment requiring replacement is more than 30 years old and spare parts are no longer available. There is a critical need for communication test sets, telephone test sets, radio test sets, signal generators, and oscilloscopes. In addition, some analog test equipment must be replaced with digital test equipment to be compatible with new digital technology now being deployed to support NextGen initiatives and other FAA programs.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

Inadequate access to modern test equipment may increase the mean-time-to-repair and restore a system back to operation following an outage. NTEP identifies, acquires, and deploys the test equipment required to maintain the systems critical to the operational availability of the NAS.

Program Plans FY 2017 – Performance Output Goals

- Procure and deliver 100 communication test sets.
- Procure and deliver 80 telephone test sets.
- Procure and deliver 204 cable and antenna analyzers.

Program Plans FY 2018 – Performance Output Goals

- Procure and deliver 40 communication test sets.
- Procure and deliver 80 telephone test sets.
- Procure and deliver 60 cable and antenna analyzers.

Program Plans FY 2019 – Performance Output Goals

- Procure and deliver 60 communication test sets.
- Procure and deliver 80 handheld vector network analyzers.

Program Plans FY 2020 – Performance Output Goals

- Procure and deliver 50 communication test sets.
- Procure and deliver 150 universal data test sets.
- Procure and deliver 158 oscilloscopes.

Program Plans FY 2021 – Performance Output Goals

- Procure and deliver 100 telephone test sets.
- Procure and deliver 400 communication test set.

3A11, MOBILE ASSETS MANAGEMENT PROGRAM

FY 2017 Request \$5.8M

Mobile Asset Management Program, F31.01-01

Program Description

The Mobile Asset Management Program (MAMP) provides transportable NAS equipment to restore certain operations during periods of extended equipment outages, to ensure continuity of NAS operations. Mobile NAS equipment provides for the continuity or restoral of air traffic control when an air traffic control tower (ATCT) or other NAS system is out of service due to a disaster or an extensive repair/modernization/upgrade. Mobile NAS equipment may also be required to augment air traffic control functions at some locations during major public events to ensure safe operations. The MAMP provides mobile assets that function as ATCTs, TRACON facilities, remote transmitter/receiver (RTR) sites, remote communications air/ground (RCAG) sites, and other systems that experience unexpected outages or planned system downtime for non-routine maintenance, modernization, or upgrade.

The FAA's inventory of mobile assets are in a serious state of disrepair and are often incapable of providing their intended service without first undergoing significant maintenance or repair before they can be deployed. The inventory consists of 104 assets, of which 45 are directly involved with controlling aircraft. The assets range from 30 kilowatt Mobile Engine Generators (MX) to four-position, mobile ATCTs (MATCTs). The near term priorities are to replace eight obsolete large four-position MATCTs and prioritize and restore the remaining assets in the inventory to a full operational capability. The MATCTs, which were acquired in the 1990s are experiencing material failures and must be replaced. With an increase in the frequency of ATCT modernization projects, the requirements for the use of MATCT's, and MATCT's with TRACON capability have also increased. MAMP is currently developing an additional modular air traffic control tower type with ability to incorporate TRACON positions and equipment. This new version, referred to as a Deployable Air Traffic Control Facility (DATCF), will be an OSHA/EOSH code compliant temporary facility designed specifically for longer term deployments of 12 months or more. Long range planning is to have and maintain an inventory of nine large MATCTs and a minimum of three DATCFs. This quantity and mix may change as the FAA's Terminal modernization projects increase.

Presently, development of a lifecycle management program for mobile assets is ongoing, but not fully operational. As a result of this deficiency, the FAA is experiencing difficulty in providing functional mobile assets when emergency conditions require their use. MAMP will provide the mobile assets and the means to manage those assets. This program is included in the ATC Facilities Sustainment Strategic Plan.

A National Mobile Asset Deployment Center (MADC) has been established in the Central Service Area. The MAMP will assist the Eastern Service Area and Western Service Area in the development of designs for their Mobile Asset Deployment Centers in FY 2015. These designs are under development and efforts are ongoing to develop a business case for their construction. The Systems Support Centers (SSCs) affiliated with respective Deployment Centers will serve as property custodians of the mobile assets. Sheltered storage is mandatory. The Deployment Centers will arrange for transportation of the mobile assets to and from the event location, and verify inventory/assess condition with the receiving custodian. The Deployment Center will maintain a website schedule of the mobile assets deployments within their area of responsibility using the Mobile Asset eXchange (MAX) tool. The mobile assets will be maintained by SSC personnel supporting the MAMP Deployment Center in advance of a deployment.

Efforts are underway to develop a set of requirements for all mobile assets. These requirements will be the basis for building an inventory of mobile assets that will enable the FAA to respond to planned and unplanned outages in the NAS.

The MAMP is not dependent upon other CIP programs. The mobile assets that are acquired are provisioned with NAS systems that are provided by other program offices. The MAMP office coordinates its system requirements with the appropriate program offices to ensure that the program is on the acquisition waterfall of the NAS system program offices.

The JRC approved the Final Investment Decision for MAMP on June 5, 2013.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The MAMP program supports NAS operational availability by providing augmentation, continuity or restoral service for air traffic control towers, radars, and communications systems. Hurricane Katrina and the Haiti earthquake revealed that the FAA had limited capability to provide rapid, onsite restoral of NAS service for disaster response. Each year there are 10-15 ATCT modernization efforts in progress, many of which require mobile assets to maintain operations. Assets are not always available, requiring the development and use of “work around” procedures that extend the duration of the projects. Additionally, the majority of the 264 FAA owned permanent ATCTs are over 50 years old resulting in an increasing number of both modernization projects and unforeseen outages requiring mobile assets to maintain uninterrupted NAS operations.

Program Plans FY 2017 – Performance Output Goals

- Acquire one DATCF.
- Acquire one medium MATCT.
- Upgrade / modernize two MATCTs.

Program Plans FY 2018 – Performance Output Goals

- Acquire one DATCF.
- Upgrade / modernize two MATCTs.

Program Plans FY 2019 – Performance Output Goals

- Acquire one medium self-contained MATCT.

Program Plans FY 2020-2021 – Performance Output Goals

- None.

3A12, AEROSPACE MEDICINE SAFETY INFORMATION SYSTEM (AMSIS)

FY 2017 Request \$12.0M

Aerospace Medicine Safety Information System (AMSIS) – Segment 1, A35.01-01

Program Description

The AMSIS program will develop a new information system for tracking and analyzing medical information associated with pilots, air traffic controllers and other aviation related personnel.

The Office of Aerospace Medicine (AAM) is responsible for maintaining information relating to the following responsibilities:

- Medical Certification of Airmen;
- Medical Clearance of Air Traffic Control Specialists (ATCSs);
- Oversight of the Aviation Industry’s Drug and Alcohol Testing Programs;
- Designation, Training, Oversight and Surveillance of Aviation Medical Examiners;
- FAA Employee Substance Abuse Testing;
- Airmen Aviation Physiology and Survival Training and Education;
- FAA Employee Health Awareness; and
- Aerospace Medicine and Human Factors Research.

AAM processes the medical certification applications of approximately 450,000 pilots and ATCSs each year and maintains millions of medical records as part of AAM’s role in the oversight of approximately 600,000 airmen and nearly 17,000 ATCSs. AAM has designed, developed and implemented information systems to efficiently process and manage safety, health and research information collected by FAA’s regulatory programs.

The information systems currently in use today were developed in the 1990’s. The technology and architecture of these systems are becoming unsupportable and will soon be obsolete. The AMSIS program will design, develop, procure and deploy the next generation information system. The information technology must be aligned with OMB/DOT/FAA information systems architecture and security standards. AAM must also align these systems with the national health information technology standards and security requirements for medical information systems developed by the Federal government, private sector and voluntary standards organizations, including the International Organization for Standardization (ISO). The systems must successfully and securely interface with approximately 4,250 health care providers designated by the FAA, known as Aviation Medical Examiners, who perform pilot and ATCS medical examinations.

Based upon review of the AAM Business Process Reengineering effort and coordination with key stakeholders, the AMSIS program determined additional analysis is required to fully mature all program requirements. As a result, AMSIS will use a segmented implementation approach. Mature requirements will be included in Segment 1, and requirements that require additional analysis will be included in Segment 2.

The scope of each Segment is:

Segment 1 (Mature Requirements)

- Common Module
- Medical Certification (Airman) & Medical Clearance (ATCS) Module
- Industry Substance Abuse Module
- Workflow Management Module
- Reporting & Data Services Module

Segment 2 (Additional Analysis Required)

- Internal Substance Abuse Module
- Aerospace Medical Analysis Module
- Budget Module

AMSIS received an affirmative Initial Investment Decision (IID) on December 17, 2014, and the segmentation strategy was approved by the JRC at that time. The AMSIS Preferred Alternative for final investment analysis was approved by the JRC on September 16, 2015. The Segment 1 Final Investment Decision (FID) is planned for Q4 FY2016; the Segment 2 FID is planned for FY2018.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

AMSIS will provide better data accessibility and a greater ability to analyze medical information and denial data to identify safety trends that could impact system safety.

Specifically, AMSIS will reduce accidents and improve safety by:

- Reducing falsification of health records and preventing pilots or ATCSs from operating in the NAS when they have medical conditions that do not meet aviation safety requirements;
- Improving the ability to analyze medical data and identify and mitigate hazards related to specific and/or systemic airmen and ATCS health issues;
- Providing the ability to match airmen and ATCS medical records with the electronic health records of other government agencies and departments;
- Ensuring the accuracy and integrity of airmen and ATCS medical data;
- Improving the surveillance and oversight of designees and aviation industry substance abuse programs;
- Improving the ability to conduct more inspections of industry substance abuse programs per year, and prioritize inspections of high-risk entities; and
- Improving the traceability of discovered substance abuse infractions and investigation of offenders.

Program Plans FY 2017 – Performance Output Goals

- Prime solution contract award.
- Complete System Design (Segment 1).

Program Plans FY 2018 – Performance Output Goals

- Initiate System Development (Segment 1).
- Initiate Integration and Testing (Segment 1).
- Achieve Final Investment Decision (FID) (Segment 2).

Program Plans FY 2019 – Performance Output Goals

- Complete System Design (Segment 2).
- Initiate System Development (Segment 2).
- Initiate Integration and Testing (Segment 2).

Program Plans FY 2020 – Performance Output Goals

- Complete System Development (Segment 1).
- Complete Integration and Testing (Segment 1).
- Achieve Final Operational Capability (FOC) (Segment 1).

Program Plans FY 2021 – Performance Output Goals

- Achieve Final Operational Capability (FOC) (Segment 2).
- Complete program close-out.

3A13, TOWER SIMULATION SYSTEM (TSS) TECHNOLOGY REFRESH

FY 2017 Request \$3.0M

National Airspace System (NAS) Training - Equipment Modernization – Training Simulators – Tower Simulation System, M20.01-04

Program Description

The Tower Simulation System (TSS) equipment modernization program will update obsolete tower simulation equipment and analyze the potential for adding new airport locations and satellite facilities. The TSS is currently deployed at 32 sites and supports 117 tower facilities. The TSS supports controller qualification and skill enhancement training at each site.

The TSS is a full-scale tower simulator providing an interactive, highly realistic environment for controller training. The TSS supports up to four simultaneous trainee positions including local, ground, flight data/clearance delivery, and coordinator. Trainees achieve initial proficiency in the simulator; when training is complete they begin work in an operational facility as a “developmental” in preparation for certification. The simulator provides synthetic voice response and voice recognition to allow the student to interact with the simulator. The voice recognition system interprets the student's commands and translates them into actual aircraft movement depicted visually on the screen. A recorded playback feature allows instructors to review and evaluate performance and provide feedback to the student after the training session.

The TSS is also used in non-training applications. It aids in site surveys for proposed new construction on or near the airfield as well as assisting in the planning of new runways or changes in local arrival or departure procedures in an accurate and safe simulated environment.

The current system is over nine years old and is becoming more expensive to operate and maintain. The projection system needs to be replaced with updated visual technology and video processors to increase fidelity, processing power, and reduce maintenance costs. The program will replace equipment at the 32 sites and procure mobile platforms to provide training capability at locations that do not require a permanent system. The mobile platforms will provide training at a greatly reduced cost.

The Investment Analysis Readiness Decision was completed and approved 1Q FY 2016. Final Investment Decision is planned for 1Q FY 2017.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The current TSS may become inoperable due to equipment failures which would increase the cost of operation, maintenance, and training. A TSS technology update will reduce operational, maintenance, and training costs by providing newer and more reliable equipment. A 12% average reduction in training times has been experienced to date at airport locations using TSS.

Program Plans FY 2017 – Performance Output Goals

- Procure and install updated TSS equipment at 11 locations.

Program Plans FY 2018 – Performance Output Goals

- Procure and install updated TSS equipment at 18 locations.
- Procure 6 Small Mobile Systems and 6 Suitcase Systems.

Program Plans FY 2019-2021 – Performance Output Goals

- None.

3A14X, LOGISTICS SUPPORT SYSTEM AND FACILITIES (LSSF)

FY 2017 Request \$0.0M

X, Logistics Center Support System (LCSS) – Technology Refresh, M21.04-02

Program Description

The Logistics Center Support System (LCSS) is a mission support IT procurement that re-engineers and automates the FAA’s logistics management processes. LCSS is a modern Commercial Off-the-Shelf (COTS) Enterprise Resource Planning (ERP) system, utilizing object-oriented software design, service-oriented architecture, relational databases, and a web-based user interface. The program modernizes the FAA’s supply chain management by refreshing the COTS system starting in 2021.

The FAA Logistics Center (FAALC) at the FAA Mike Monroney Aeronautical Center (MMAC) in Oklahoma City manages the central NAS inventory warehouses and distribution facilities for the FAA. It provides logistics support for more than 48,000 systems nationwide, by providing parts, services, supplies and emergency restoration services. The FAALC tracks and accounts for over 62,000 national stock numbers with a total value of \$900 million. It provides routine and emergency logistics products and services to over 8,091 FAA customers at facilities nationwide, as well as, to the Department of Defense (Air Force, Navy, and Army), state agencies, and foreign countries.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 1 – Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.*

Relationship to Performance Metric

The LCSS program supports the Strategic Priority to Deliver Benefits through Technology and Infrastructure with enhanced capability to accurately manage NAS spares and repair requirements using a centralized and automated process. This enables the agency to meet customer expectations by providing rapid delivery of the correct NAS components and parts with low error and/or defect rates.

Program Plans FY 2017-2020 – Performance Output Goals

- None.

Program Plans FY 2021 – Performance Output Goals

- Develop program plans and requirements document for the Technology Refresh phase of the program.

B: Training, Equipment, and Facilities

3B01, AERONAUTICAL CENTER INFRASTRUCTURE MODERNIZATION

FY 2017 Request \$14.0M

Aeronautical Center Infrastructure Modernization, F18.00-00

Program Description

The Aeronautical Center Infrastructure Modernization program funds renovation and restoration of critical leased and owned facilities at the Aeronautical Center in Oklahoma City to ensure they remain viable for the mission of present and future FAA employees, students, and contractors. Funding from this program allows renovation of facility space used by Air Operations, Engineering, Training (Radar /Navigational Aids), NAS Logistics, airmen/aircraft registration, safety, and Business Services. Program funding will be used for facility renovation, building system replacement, and telecommunications infrastructure upgrade.

The Aeronautical Center is the FAA's centralized location that supports the FAA NAS and comprises 1,100 acres of leased land with approximately 3.4 million square feet of space under roof and is home to the largest concentration of FAA personnel outside of Washington D.C. Each day the Aeronautical Center provides the space and infrastructure needed to support the work of 7,100 FAA employees, students, and contractors; approximately 11,000 visitors annually, and is the largest concentration of FAA personnel outside of Washington D.C. Many of the buildings at the Aeronautical Center are nearing 50 years of age and require structural renovation and replacement of aging building systems (e.g. Heating, Ventilation Air Conditioning (HVAC), plumbing, electrical, roofs, etc.).

Some NAS support functions are conducted in outdated structures and in buildings that do not meet current building codes. Delays to renovation and replacement of building systems have consequences that include leaking roofs, deteriorating plumbing, malfunctioning heating, ventilation, air conditioning, and non-compliance with life safety codes that can disrupt work, cause NAS automation and technology failures, risk occupant health and safety, require emergency repairs, and result in a loss of productivity.

Aging infrastructure, in combination with ongoing growth and improvements to the NAS and business services, affects the work environment of Aeronautical Center personnel and the requirements for the facilities in which they work. This program will extend the useful life of facilities at the Aeronautical Center for the next 25 to 30 years providing a safe and modern infrastructure for current and future generations of the FAA work force.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The Aeronautical Center Infrastructure Modernization program sustains a cost effective workplace for Air Operations, Engineering, and Training that contribute to the FAA's Performance Metric to implement cost efficiency initiatives. This program reduces the cost of Air Traffic Organization (ATO) operations by providing facilities that are lower in cost when compared with Oklahoma City General Services Administration (GSA) metropolitan leased facilities and GSA national averages for leased facilities.

This program enhances financial discipline by providing Technical Operations and Air Traffic training through updated training facilities for both on-site resident and computer-based distance learning and development. In addition, Aeronautical Center space provides business service facilities for the DOT/DELPHI/Prism/Castle Data Center Operations, consolidated Accounting Operations services, Acquisition, ATO Data Center Operations, and Aviation Safety (AVS/ Civil Aerospace Medical Institute (CAMI)).

Program Plans FY 2017 – Performance Output Goals

- Complete renovation construction of Bldg 152, the Environmental Systems Support facility.
- Award Phase 1 (of 2) renovation construction contract for Multi-Purpose Building #24 to add seismic and wind bracing to mitigate earthquake and high wind damage.
- Complete relocation and construction of Common Air Route Surveillance Radar (CARSR) classrooms and laboratories to the west side of the campus.
- Award contracts for Phase (6 of 6) telecom network design, test, reconfigure network for redundancy, reliability, and security in 9 of 74 buildings. Includes security upgrades, disaster recovery testing, installation of communication duct banks, fiber/copper cable for southeast campus network diversity and availability.
- Complete network design, test, reconfiguration, security upgrades, disaster recovery testing and installation of communication duct banks/fiber cable.

Program Plans FY 2018 – Performance Output Goals

- Award construction design contracts to relocate classrooms and laboratories for the Air Surveillance Radar (ASR) to the west side of the campus.
- Award Phase 2 (of 2) renovation construction contract for Multi-Purpose Building #24 to add fire detection/suppression systems, replace electrical distribution, windows, elevators, add insulation that complies with industry standards, provide energy efficient lighting, replace plumbing, and HVAC. The building is the workplace for approximately 500 FAA employees and contractors.
- Complete Phase 1 (of 2) Multi-Purpose Building #24 renovation to add seismic and wind bracing to the building to mitigate earthquake and high wind damage.
- Award contracts for Phase 1 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, security in 14 of 74 buildings. Includes security upgrades, disaster recovery testing and installation of fiber/copper cable for central campus network diversity and availability.
- Complete network design, test, reconfiguration, security upgrades, disaster recovery testing, and installation of communication duct banks/fiber cable.

Program Plans FY 2019 – Performance Output Goals

- Award contracts for Phase 2 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, and security in 13 of 74 buildings. Includes security, upgrades, and disaster recovery testing and fiber/copper cable for northwest campus network diversity and availability.
- Complete network design, test, reconfiguration, security upgrades, disaster recovery testing, and installation of communication duct banks/fiber cable.

Program Plans FY 2020 – Performance Output Goals

- Award construction contract to relocate classrooms and laboratories for the Air Surveillance Radar (ASR-9/Secondary surveillance and communication system (Mode S)), to the west side of the campus.
- Award contracts for Phase 3 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, and security in 10 of 74 buildings. Includes security upgrades, and disaster recovery testing and fiber/copper cable for east campus network redundancy and availability.
- Complete network design, test, reconfiguration, security upgrades, disaster recovery testing, and east campus communication duct banks/fiber installation.

Program Plans FY 2021 – Performance Output Goals

- Complete construction to relocate classrooms and laboratories for the Air Surveillance Radar (ASR/Mode S) to the west side of the campus.
- Complete Phase 2 (of 2) of Multi-Purpose Building #24 renovation construction to add fire detection/suppression systems, replace electrical distribution, windows, elevators, add insulation that complies with industry standards, provide energy efficient lighting, replace plumbing, and HVAC.
- Award contracts for Phase 4 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, and security in 11 of 74 buildings. Includes security upgrades, and disaster recovery testing and fiber/copper cable for west campus network redundancy and availability.
- Complete network design, test, reconfiguration, security upgrades, disaster recovery testing, and north campus communication duct banks/fiber installation.

3B02, DISTANCE LEARNING

FY 2017 Request \$1.5M

Distance Learning, M10.00-00

Program Description

The Distance Learning program will provide for technology refresh of Distance Learning Platforms (DLP) (previously Computer-Based Instruction Platforms) at all DLP learning centers, to increase connectivity, and upgrade network multimedia support and services. The system consists of about 1,100 learning centers located at virtually every FAA facility around the world: 2,275 DLPs at 610 Air Traffic Sites (includes 235 Federal Contract Towers (FCTs)) and 490 technical operations sites). The FAA is providing the technology refresh of the DLPs for two reasons: (1) to support high-performance media and simulations required in many lessons; and (2) because replacement parts for current platforms are becoming obsolete and hard to obtain.

The technology refresh is accomplished in a phased, multi-year approach. The FY 2014 technology refresh began a new technology refresh cycle which covers the years FY2014 – FY2017. A new five year technology refresh cycle will begin in FY 2018 and will run through FY 2022.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The major benefit of distance learning is the substantial reduction in student time away from work, student travel, and per diem costs associated with resident-based training. In addition, distance learning delivery methods increase training effectiveness and opportunities for all FAA employees, as well as provide flexibility in training schedules through local management control. The FAA DLP system and the Aviation Training Network (ATN) must deliver initial operator, transition, and maintenance training for many NAS programs. By providing a standard training delivery and equipment simulation platform across all NAS programs, the need for such equipment and the space it would occupy is reduced. All of these factors contribute to a reduction in the unit cost of service for en route, terminal, and flight service. The program contributes well over \$18M savings in travel and per diem each year.

Program Plans FY 2017 – Performance Output Goals

- Award contract for technology refresh of remaining 400 DLPs (2275 of 2275, 100%) at Air Traffic Control-Technical Operations (ATO-TO) FCT learning centers by Sept-2017.
- Provide updates to courseware and applications via network and/or DVD's to 2275 DLPs by Sept-2017.

Program Plans FY 2018 – Performance Output Goals

- Award contract for technology refresh of initial 475 DLPs (475 of 2275, 21%) at En Route Air Traffic Facilities (ARTCC, TRACONS) and FCT DLP Learning Centers by Sept-2018.
- Provide updates to courseware and application via network and/or DVD's to 2275 DLPs by Sept-2018.

Program Plans FY 2019 – Performance Output Goals

- Award contract for technology refresh of additional 450 DLPs (925 of 2275, 41%) at Air Traffic Facilities (ARTCC, Terminal) and FCT DLP Learning Centers by Sept-2019.
- Provide updates to courseware and application via network and/or DVD's to 2275 DLPs by Sept-2019.

Program Plans FY 2020 – Performance Output Goals

- Award contract for technology refresh of additional 450 DLPs (1375 of 2275, 60%) DLPs at Air Traffic Facilities (ARTCC, Terminal) and FCT DLP Learning Centers by Sept-2020.
- Provide updates to courseware and application via network and/or DVD's to 2275 DLPs by Sept-2020.

Program Plans FY 2021 – Performance Output Goals

- Award contract for technology refresh of additional 450 DLPs (1,875 of 2275, 80%) at Air Traffic Facilities (ARTCC, Terminal), technical operations facilities, and FCT DLP Learning Centers by Sept-2021.
- Provide updates to courseware and application via network and/or DVD's to 2275 DLPs by Sept-2021.

System Implementation Schedule



ACTIVITY 4: FACILITIES AND EQUIPMENT MISSION SUPPORT

4A01, SYSTEM ENGINEERING (SE2020) AND DEVELOPMENT SUPPORT

FY 2017 Request \$35.0M

- A, CIP Systems Engineering & Development Support – SE2020, M03.03-01
- B, Provide Air Navigation Facilities (ANF)/Air Traffic Control (ATC) Support (Quick Response), M08.01-00

A, CIP Systems Engineering & Development Support – SE2020, M03.03-01

Program Description

The System Engineering 2020/2025 (SE2020/SE2025) program manages a portfolio of contracts providing technical support services for research, analysis, systems engineering and integration for both NextGen and non-NextGen initiatives. It provides access to research, technical, engineering and programmatic resources that support the FAA's NextGen transformational programs and further improves the legacy systems in the NAS. The portfolio of contracts was awarded in two major categories: Research and Mission Analysis; and Systems Engineering.

Research and Mission Analysis: Supports the full range of NextGen Research & Mission Analysis services in one or more functional task areas related to NextGen and activities necessary to reach the Concept and Requirements Definition Readiness Decision (CRDRD) phase in the Acquisition Management System (AMS) Lifecycle. Research and Mission Analysis includes the following service support activities:

- Concept and Requirements Definition Planning
- Early Life Cycle Concepts and Prototyping
- Early Life Cycle Human Factors Research
- Early Life Cycle Concepts of Operations Research
- Early Life Cycle Human Performance Analysis
- Proof of Concept Research
- Pre-Operational Concept Demonstration Trials
- Cost Benefit Analysis
- Operational Demonstration Trials
- Concept Integration
- Rapid Prototyping/Fast-Time Modeling
- Real-Time Simulations
- Real-Time Human In-the-Loop Simulations
- Full-Scale Concept Demonstrations
- Cognitive Task Analysis Methods
- Conceptual Operations Verification and Validation

Systems Engineering: Supports systems engineering activities that occur throughout the AMS Lifecycle for both NextGen and non-NextGen programs in support of AMS decisions. Systems Engineering supports the following activities:

- Final Requirements Documents
- Enterprise Architectural Products
- Safety and Regulatory Evaluations
- Business Continuity Planning

- Portfolio Analyses
- Maintenance, Operation and Enhancements of Financial Systems
- Investment Planning & Analysis
- Acquisition Support
- Schedules
- Human Factors
- Concepts of Operations
- Human Performance Analysis
- Proof of Concept Validation
- Pre-Operational Trials and Operational Trials
- System Integration
- Rapid Prototyping/Fast-Time Modeling
- Pre-Development Real-Time Simulations
- Real-Time Human In-the-Loop Simulations
- Full-Scale Prototype Demonstrations
- Verification and Validation
- Engineering Analysis
- Cyber Security Research, Development, and Implementation
- NextGen Business Case Development
- NextGen Enterprise Risk Management
- NAS Software Assurance
- JRC Investment Decisions

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The SE2020/SE2025 program contributes to FAA's Strategic Priority to Deliver Benefits through Technology and Infrastructure. The program supports the metric for cost efficiency by providing support for designing and managing NAS modernization and in particular the NextGen activities. With contractor assistance, the FAA is able to plan, analyze and manage NAS system improvements more efficiently and effectively.

Program Plans FY 2017-2021 – Performance Output Goals

SE2020/SE2025 Contract:

- Conduct Monthly meetings with 2020/2025 vendors.
- Conduct Quarterly Vendor Program Management Reviews.
- Conduct CFO Quarterly Reviews.
- Develop Contract and Financial Status Report (monthly basis).
- Develop 2020/2025 Update to FAA NextGen Executive Team (monthly basis).
- Conduct Monthly briefings for NextGen Directorates with SE2020/SE2025 task orders.
- Exercise Second Option Period for 2020 Full and Open prime vendors.
- Issue new full and open contract awards.
- Develop and provide multiple performance databases used in tracking the effects of NextGen projects that improve flight trajectories.
- Develop modeling tools used for setting capacity targets and the system effects of FAA initiatives such as Metroplex.
- Develop tools to support management dashboards and their relation to NextGen Advisory Council metrics.
- Conduct Post Implementation Reviews (PIR).
- Improve Quality Management including verification and validation of documents, standard operating procedures and other products.

- Provide NAS Software Assurance upon delivery and implementation.
- Conduct and enhance Cyber Security Research, Development, and Implementation.

Program Evaluation:

- Conduct cost and benefits analysis on all FAA NAS and NextGen Investments. This includes benefits estimating, cost estimating, operations research, risk and schedule analysis, market surveys, and business case development.
- Conduct Engineering Analysis on NextGen systems.

Computer Services:

- Design, develop, maintain, train, and report on all aspects of Simplified Program Information Reporting and Evaluation (SPIRE), FAA Acquisition System Toolset (FAST), Financial Management System (FMS), and other management tools.

Air Traffic Control (ATC) / Aviation Financial (AFN) Systems Support:

- Enhance financial management and oversight of F&E and R, E&D appropriations. This includes business management, technical management, budget formulation, systems engineering, cost accounting, labor distribution, budget execution, acquisition management.

B, Provide Air Navigation Facilities (ANF)/Air Traffic Control (ATC) Support (Quick Response), M08.01-00

Program Description

This program provides quick response support for ATO organizations to solve unforeseen issues that arise. These issues may be related to immediate needs such as: corrective action in information technology, e.g., installing a communications link for a new facility or service; or accommodating new requirements that require adjusting financial management systems to create new cost accounting reports. It also covers responding to emergency unforeseen regional problems such as relocating an antenna for a remote communication facility. These projects are unexpected and must be done to maintain efficient services and operations.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

This project supports cost efficiency initiatives by providing the ability to respond quickly to unforeseen needs, issues or situations that, if left unresolved, could result in higher operating or future replacement costs.

Program Plans FY 2017-2021 – Performance Output Goals

- Implement projects as required and approved in the budget year.

4A02, PROGRAM SUPPORT LEASES

FY 2017 Request \$46.6M

Program Support Leases, M08.06-00

Program Description

The Program Support Leases office is responsible for managing over 2,800 leases needed in support of air traffic operations. The FAA leases land and commercial space necessary for the operation of communication, surveillance and navigation systems (this includes obtaining air rights restrictions around the facilities), for Air Traffic Control Towers (ATCT), for system support, and for other mission related activities. This program is responsible for funding program management and execution of existing and new leases, surveys, appraisals and the purchase of land when necessary for required sites. New leases are required when Air Traffic Control (ATC) facilities are relocated; when airspace redesign requires new sites for the installation of additional navigation and communications equipment within the NAS; and when ATCTs or service area technical facilities are built to meet new mission requirements. The program offices are responsible to fund leases for new facilities for the first two years after which Program Support Leases provides the lease funds.

Lease terms are typically negotiated for 5 to 20 years and should be renegotiated prior to expiration. However; on average, approximately 500 leases expire each year. It is not uncommon for leases to enter holdover status, a situation in which the FAA continues to occupy the space or land without the execution of a renewed lease; sometimes due to resistance by lessors to negotiate fair and reasonable terms. Existing leases are examined prior to expiration to validate a continuing FAA need and to ensure that the lease provisions are both cost effective and equitable to both the lessor and the FAA. Lease arrangements can sometimes be complex requiring negotiations with multiple owners regarding cost, arrangements for personnel and equipment relocation, and stringent site specific requirements related to operational needs. Lease costs normally escalate because the market value of land continues to increase. When land lease costs increase substantially the program determines if it is more cost effective to purchase a property or to continue the lease agreement. A business case assessment, supplemented by a market analysis of real estate values in the area, will determine whether it is more advantageous to lease or buy a property. If the decision is made to purchase, the program provides the funds to the service area to negotiate the purchase of the land. The number of purchases continues to increase and 10% of our budget is allocated to purchases. The agency currently has about 200 lease agreements in a holdover status due to an impasse with the lessor over the terms of the contract which may encompass a variety of reasons since the last agreement was signed including changes in ownership or market value.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

In support of the FAA Performance Metric for implementing cost efficiency initiatives, this program is improving management of the FAA's real property assets and contributing to the cost effectiveness of air navigation infrastructure. Real property costs are being effectively controlled through:

- Implementing cost effective alternatives such as downsizing and colocation as leases expire,
- Converting leases to ownership where feasible, and
- Terminating leases that are not needed for future operations.

Program Plans FY 2017-2021 – Performance Output Goals

- Conduct six or more site surveys of available facilities within an area to identify cost effective alternatives to pursue regarding expiring leases.
- Conduct quarterly teleconference meetings with service areas on Facilities & Equipment portfolio issues.
- Complete reviews of funding requests to conduct property surveys and provide a decision within 48 hours.

4A03, LOGISTICS SUPPORT SERVICES (LSS)

FY 2017 Request \$11.0M

NAS Regional/Center Logistics Support Services, M05.00-00

Program Description

The Logistics Support Services (LSS) program uses contractor support services at the Mike Monroney Aeronautical Center (MMAC), the William J. Hughes Technical Center, the three FAA Service Areas, and FAA Headquarters. This contractor support assists the FAA in contracting, real estate, and materiel management tasks. The contract is managed by the FAA's Aviation Logistics Division in direct support of Capital Investment Plan (CIP) projects, accounting system capitalization, and property control-related activities.

The LSS program supplements the workforce for acquisition, real estate, and materiel management in the three Logistics Service Areas and at the Aeronautical and Technical Centers. The LSS program is responsible for providing logistics support in the planning, documentation and oversight required for establishing new or upgraded facilities, including Air Traffic Control Towers (ATCTs) and Terminal Radar Approach Control Facilities (TRACONs) throughout the NAS. LSS resources will also continue to be used for asset tracking and documentation efforts to obtain and maintain a clean audit opinion.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 4 – Empower and Innovate with the FAA's People*
- *FAA Performance Metric 2 – Achieve a 90% success rate in the areas of financial management and human resources management: Receive annual Unqualified Audits with no material weaknesses. Maintain the competitive status of all FAA employees within the federal personnel system. Improve the “effective leadership” index score on OPM Employee Viewpoint survey by 8 percent. Improve the “talent management” index score on the OPM Employee viewpoint survey by 8 percent. (FAA Business Planning Metric)*

Relationship to Performance Metric

The program will support FAA objectives by improving financial management while delivering quality customer service. Specifically, the LSS program provides required support functions that enable the FAA to manage real property assets, maintain a clean audit opinion, and plan the execution of critical acquisition activities supporting the NAS. These functions are performed throughout the three Logistics Service Areas, FAA Technical Center, and FAA Aeronautical Center.

Related project management goals include:

- Complete 80% of the annual real property Office of Management and Budget (OMB) inventory validation effort.
- Designate 75% of the disposed real property assets as "retired" within 30 days of the date the disposal forms are received.
- Capitalize 92% of all personal and real property capital assets within 65 days of date placed in service.
- Award at least 90% of all formal contracts within 180 calendar days; award 90 % purchase orders within 45 calendar days and 80% of Task Orders/Delivery orders within 60 calendar days, from the time a purchase request is received from the requiring organization.

Program Plans FY 2017 – Performance Output Goals

- Complete 92% of the work assignments in support of:
 - The annual real property OMB inventory validation effort;
 - The "retired" real property disposal effort; and
 - Capitalization efforts for both real and personal property assets.
- Complete Option Year acquisition activities to fully fund the program-funded task orders on the LSS contract.
- Contract actions are awarded within time to award metric.

Program Plans FY 2018 – Performance Output Goals

- Complete 93% of the work assignments in support of:
 - The annual real property OMB inventory validation effort;
 - The "retired" real property disposal effort; and
 - Capitalization efforts for both real and personal property assets.
- Complete Option Year acquisition activities to fully fund the program-funded task orders on the LSS contract.
- Begin acquisition actions for a follow-on LSS contract to be awarded in FY 2019.
- Contract actions are awarded within time to award metric.

Program Plans FY 2019 – Performance Output Goals

- Complete 94% of the work assignments in support of:
 - The annual real property OMB inventory validation effort;
 - The "retired" real property disposal effort; and
 - Capitalization efforts for both real and personal property assets.
- Complete 100% of acquisition activities for a follow-on LSS contract to be awarded in FY 2019.
- Contract actions are awarded within time to award metric.

Program Plans FY 2020 – Performance Output Goals

- Complete 95% of the work assignments in support of:
 - The annual real property OMB inventory validation effort;
 - The "retired" real property disposal effort; and
 - Capitalization efforts for both real and personal property assets.
- Complete Option Year acquisition activities to fully fund the program-funded task orders on the LSS contract.
- Contract actions are awarded within time to award metric.

Program Plans FY 2021 – Performance Output Goals

- Complete 95% of the work assignments in support of:
 - The annual real property OMB inventory validation effort;
 - The "retired" real property disposal effort; and
 - Capitalization efforts for both real and personal property assets.
- Complete Option Year acquisition activities to fully fund the program-funded task orders on the LSS contract.
- Contract actions are awarded within time to award metric.

4A04, MIKE MONRONEY AERONAUTICAL CENTER LEASES

FY 2017 Request \$19.3M

Aeronautical Center Lease, F19.00-00

Program Description

The Aeronautical Center lease program pays the annual rent for leased land and approximately 80 percent of Aeronautical Center space, which encompasses 2.8M square feet of leased space and 1,100 acres of land, having a replacement value of \$696M.

The Aeronautical Center is the FAA's centralized location that supports FAA Air Operations/flight checks fleet of aircraft, engineering, system testing, training (Radar/Navigational Aids (Nav aids)), NAS logistics, aviation regulation, registration, certification, aviation and transportation safety research, and Business Services in Oklahoma City.

The Center facilities support the work of 7,100 employees, students, and contractors on a daily basis, and accommodate approximately 11,000 visitors annually. It has the largest concentration of FAA personnel outside of Washington D.C.

The lease is comprised of:

- Master Lease land/building rent, sustainment and insurance
- Thomas Road warehouse lease
- Tower space for Terminal Doppler Weather Radar (TDWR) target generators

The Aeronautical Center requires large parcels of land as NAS test sites for surveillance radar, communications, weather, and navigation/landing systems, as well as warehouse, administrative office space, and training facilities. It is a high level security site (Level IV) based on numbers of employees, facility square footage, sensitivity of records, volume of public contact, and mission-essential facilities whose loss, damage, or destruction may have serious or catastrophic impact on the NAS.

The lease will expire in 2028.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The Mike Monroney Aeronautical Center Lease sustains a cost effective workplace for Air Operations, Engineering, and Training. Eighty percent (80%) of Aeronautical Center space is used for direct support of the Air Traffic Organization (ATO) by Engineering Organizations, Aviation System Standards (AVN) operations and flight check, the Logistics Center, Air Traffic Control training, ATO Technical Operations Training and Certification, and system testing of Radar and Nav aids. An additional 13% of Aeronautical Center space provides business service facilities for DOT/DELPHI/Prism/Castle Data Center Operations, consolidated Accounting Operations services, Acquisition, ATO Data Center Operations, and Aviation Safety (AVS/Civil Aeromedical Institute (CAMI)). The current lease is cost efficient, \$17.63 per net square foot compared to the \$25.04 General Services Administration (GSA) rate for Oklahoma City; a \$14.1M cost avoidance in FY 2015. Leasing is more cost effective than investing in the \$696M replacement cost of the leased facilities.

Program Plans FY 2017 – Performance Output Goals

- Complete monthly lease payments on time.
- Award renovation construction contracts to replace lighting, insulation in Building 2; replace elevators in Bldgs 22 and 25, replace Heating, Ventilation, Air Conditioning (HVAC) in Hangars 8 & 9; replace windows, HVAC and electrical systems (Boiler, Chillers), and install fire suppression in Building 15.
- Award construction contract for north loop roadway for student and employee access to east side of campus.
- Award renovation design contract for the Radar Training Facility (RTF) to replace mechanical systems, (HVAC), electrical systems, plumbing, and provide energy efficiency in lighting and insulation.

Program Plans FY 2018 – Performance Output Goals

- Complete monthly lease payments on time.
- Award contracts for energy management improvement that includes renovation design for solar panels to conform to Executive Order to improve efficiency in federal facilities.
- Award renovation design of the Systems Training Building (STB) annex to replace interior finishes, electrical distribution, mechanical systems (HVAC); telecommunications, lighting and insulation.

Program Plans FY 2019 – Performance Output Goals

- Complete monthly lease payments on time.
- Award renovation construction contract for STB annex.
- Award renovation design contract to remove the Airmen Records Building (ARB) exterior façade, install insulation/vapor barrier, and replace panels for energy efficiency.
- Award construction of solar panels (Phase 1 of 2).
- Complete renovation construction in Building 15.

Program Plans FY 2020 – Performance Output Goals

- Complete monthly lease payments on time.
- Award renovation construction contract for the RTF building.
- Award exterior façade construction contract for the ARB building.
- Award construction of solar panels (Phase 2 of 2).
- Complete north loop roadway to access east campus.

Program Plans FY 2021 – Performance Output Goals

- Complete monthly lease payments on time.
- Award contracts for lease holder improvements that include replacement of windows, HVAC, electrical systems, and lighting.

4A05, TRANSITION ENGINEERING SUPPORT

FY 2017 Request \$24.1M

- A, NAS Integration Support Contract (NISC), M22.00-00
- B, Configuration Management Automation (CMA), M03.01-02

A, NAS Integration Support Contract (NISC), M22.00-00

Program Description

NISC provides technical expertise to assist the FAA in deploying, implementing, and integrating many different components and equipment critical to the safety and efficiency of the NAS. NISC also provides expertise and technical support to maintain agency compliance with laws, regulations and Congressional directives during transition, implementation, and integration activities. Examples of the work products include: equipment installation schedules for power systems, weather cameras, etc.; engineering site preparation packages and site implementation plans for installation of new towers, repair of unstaffed infrastructure (fences, remote site roads, power back-up systems, etc.); analysis and assessment of environmental impacts; test procedures for validating components and equipment placed into the NAS meet rigorous safety requirements; site test monitoring to ensure compliance with various rules and regulations; FAA employee occupational safety and health (OSHA) compliance; and corporate work planning to track and report on capital investment programs.

NISC also supports FAA's Aviation Safety line-of-business (AVS) by installing Information Technology systems such as automation of the safety rulemaking process and automation of the collection and storage of safety data used by inspectors to develop recommendations that may result in safer aircraft and better trained air personnel. NISC also provides technical support to automated systems that generate and track commercial and general aviation licenses for pilots; systems that enable engineers and inspectors to certify commercial aircraft to transport passengers and cargo; and systems that enable automation of records management. To provide these services the NISC program requires over 1,000 Full Time Equivalent (FTE) technical support personnel annually.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The NISC program has provided numerous innovations that have provided cost savings to the FAA and to industry. For example, the NISC program is providing an Intelligent Records Management system to AVS. By integrating Commercial-off-the-Shelf (COTS) software with some custom software, the FAA will realize a cost savings of \$340,000 during development. Additionally, on-going support costs will be lower since the solution incorporates COTS with only limited use of proprietary software. The FAA's NISC contract provides experienced personnel at a current average cost of \$71 per hour. This cost effective rate supports the ATO service centers, headquarters offices and AVS with the planning and coordination of various programs. The NISC program has also implemented an affordability methodology across all Task Orders which involves workforce alignment, infrastructure resizing, and process improvements which has resulted in both significant cost savings and cost avoidance.

Program Plans FY 2017-2021 – Performance Output Goals

- Achieve 100% of the quality requirements as defined in the NISC Task Orders.

B, Configuration Management Automation (CMA), M03.01-02

Program Description

The CMA program will procure a commercial-off-the-shelf (COTS) industry standard tool designed to support both NAS and Non-NAS FAA assets, as mandated by FAA order 1800.66, Configuration Management Policy. CMA establishes systems and processes that support the five tenets of Configuration Management (CM):

- CM planning and management,
- Configuration identification,
- Configuration control,
- Configuration status accounting, and
- Configuration audits.

The goal of configuration management is to record technical information, including system specifications and installation data, on all systems installed in FAA facilities. CM also requires documentation for all proposed and actual changes to these systems so that maintenance workers and replacement programs have accurate and up to date information for maintaining or replacing existing systems.

CMA will provide:

- An automated and integrated enterprise solution to support CM of FAA assets and investments;
- Functionality and data previously provided by legacy CM tools;
 - WebCM provides an automated system for reviewers to view proposed changes
 - Replacement Documentation and Configuration Identification System (RepCON) collects NAS configuration data and associated status to maintain the as-is NAS configuration
- A single point of access with insight and traceability to configuration baselines reflected in the FAA NAS Enterprise Architecture (NAS EA);
- Seamless interfacing with other related CM information; and
- Ability to effectively manage business rules, trace, predict and manage an asset's status, opportunities, and risks, during any phase of the lifecycle and incorporate necessary current and future changes as the Agency continues to transition to NextGen.

In addition, the program will host the CMA servers and provide associated training for users, and supply maintenance to the system.

CMA will be implemented in two Segments:

Segment I replaces the legacy systems (WebCM and RepCON) that support the NAS with a modern CM COTS tool that delivers current capabilities and offers all the advantages of today's technology. In addition to implementing a new tool to replace current capabilities, Segment I will provide:

- A closed-loop NAS Change Proposal (NCP) process, where approved configuration changes and implementation actions are reflected in tools and stakeholders are notified
- A CM environment with a single point of access for users to obtain accurate, traceable and up-to-date CM information from the following systems:
 - Remote Monitoring and Logging System (RLMS), Facility Power Panel Schedule (FPPS), Safety Risk Management Tracking System (SRMTS), Technicians Network (TechNET), NAS Documentation (NASDOC), NAS Technical Library, ProjectWise Electronic Drawing Management System (EDMS), Federal Identity Credential and Access Management (FICAM), Active Directory, and NAS EA).

Segment II includes requirements for the development of system interfaces and workflows necessary to support CM for Non-NAS systems. Segment II will leverage the Business Process Management (BPM) functionality and document management technology implemented in Segment I to deliver an integrated approach to configuration management across various FAA lines of business. Segment II will include interfaces with Supply Chain Optimization Portfolio to work toward a Reliability Centered Maintenance (RCM) philosophy. Each phase will be implemented in a separate fiscal year to accommodate limited funding resources.

A Final Investment Decision is planned for June 2016.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The decommissioning of legacy NAS systems as NextGen equipment is installed requires accurate records of the configuration of present systems. Knowing the configuration of present systems and the changes needed to install new systems will result in FAA cost savings in both the short and long term. CMA is the tool that supports the planning required for both the removal of older equipment and fielding of new systems.

CMA will move FAA from a process that relies heavily on CM practitioners' institutional knowledge to giving them a scalable, network-centric architecture. The existing lack of a closed-loop CM system requires multiple manual processes to retrieve information related to the proposed change, which can lead to time-consuming duplication of effort and inaccurate results. CMA will create the infrastructure necessary to leverage process-to-process integration, minimize redundancy, and cluster processes around a single integration point.

CMA maps to the Performance Metric of implementing cost efficiency initiatives by:

- Reducing costs associated with delay risks during the implementation of new systems and technology by providing the ability to identify configuration problems early in the development process;
- Reducing equipment maintenance costs through a coordinated systems approach that identifies maintenance issues early in the procurement process;
- Providing a cost efficient seamless enterprise-wide access to a repository of validated, real-time CM data which will reduce reviewers time and effort; and
- Standardizing CM processes which will result in a more efficient and effective management of the change process.

Program Plans FY 2017 – Performance Output Goals

- Achieve Final Operational Capabilities and In-Service Decision for Segment I.

Program Plans FY 2018 – Performance Output Goals

- Achieve implementation of Segment II capability to achieve enterprise visibility of Non-NAS IT assets.

Program Plans FY 2019 – Performance Output Goals

- Achieve implementation of Segment II to move to a deeper level of configuration management (from system to level to Lowest Replaceable Unit level).

Program Plans FY 2020-2021 – Performance Output Goals

- None.

4A06, TECHNICAL SUPPORT SERVICES CONTRACT (TSSC)

FY 2017 Request \$23.0M

Technical Support Services Contract (TSSC), M02.00-00

Program Description

The TSSC program provides a contract vehicle to augment FAA’s workforce with professional engineering, technical, and construction services to assist FAA project implementation. TSSC performs site surveys and selection; engineering; environmental; fire/life safety; equipment installation; and removal of asbestos and obsolete equipment. Other services include testing; drafting; staging, warehousing and distribution; and contract surveillance and oversight. The TSSC program helps the FAA ensure timely completion of projects for NAS modernization. TSSC will provide approximately 500 Full Time Equivalent (FTE) of technical employee workforce capability and will monitor \$35M in non-labor costs for projects such as fixed price subcontracts for site preparation construction. The number of FTEs provided by TSSC will vary depending upon the amount of industrial funding received from other CIP programs that utilize TSSC support. Program funds are applied to the TSSC contract to support specific projects and tasks for which programs funds were appropriated. In a typical year, more than 3,700 separate projects are completed by FAA using the TSSC Program.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

The TSSC program contributes to cost control by helping the FAA install new equipment on a timely basis. This avoids added costs for holding and storing equipment and allows the FAA and the aviation industry to receive equipment and system modernization benefits on schedule. The TSSC Program Office collaborates with the NAS Integration Support Contract (NISC) Program Office to share development of a contract tracking programs and program office support contracts to reduce management costs.

Additional cost savings by the TSSC program may also result by moving TSSC regional management counterparts into unused FAA space when available. This can save FAA tens of thousands of dollars in lease agreements that would have otherwise been paid through the contract vehicle. This cost effective strategy has been implemented at several offices within all three FAA Service Area organizations.

Program Plans FY 2017-2021 – Performance Output Goals

- Two award fee performance ratings per year, which measure FAA satisfaction with Contractor performance with regard to cost, schedule and quality. Periodically adjust performance metrics to promote excellent contractor performance based on customer feedback.

4A07, RESOURCE TRACKING PROGRAM (RTP)

FY 2017 Request \$6.0M

Resource Tracking Program (RTP), M08.14-00

Program Description

The RTP/Corporate Work Plan (CWP) is a computer management system (including hardware, software, development, training, and support) used by the FAA Service Units, Service Centers, the Technical Center, and the Aeronautical Center for identifying requirements, internal budget preparation, implementation planning, resource estimating, project tracking, and measuring performance of projects. The CWP helps users to share and coordinate FAA's project data during the various stages of implementation (i.e., planning, scheduling, budgeting, execution, and closeout). The CWP system and its supporting data are continuously used for reporting project metrics to project managers, responsible engineers, program offices, and various other customers.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 8 – 90% of major baselined acquisition programs must be maintained within 10% of their current acquisition cost, schedule and technical performance baseline as of the end of fiscal year 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

The RTP/CWP contributes to FAA performance metric to maintain 90% of major system investments within 10% variance by providing an enterprise level project management system that allows field and headquarters' office to use consistent data for managing capital programs.

Program Plans FY 2017-2021 – Performance Output Goals

- Deliver quarterly software upgrades to optimize project/program management.
- Provide monthly project management reports.

4A08, CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

FY 2017 Request \$60.0M

CIP Systems Engineering & Technical Assistance – MITRE, M03.02-00

Program Description

The Center for Advanced Aviation System Development (CAASD) is an FAA-sponsored Federally Funded Research and Development Center (FFRDC) operated under a Sponsoring Agreement with the MITRE Corporation. The latest Sponsoring Agreement was executed in September 2015 and provides for continued FFRDC operations through FY 2020. The FAA has funded the CAASD FFRDC's support efforts under a series of support contracts since 1990. Currently FFRDC support is provided under the CAASD Contract's Option running from FY 2016 through FY 2020.

CAASD high quality research, systems engineering, and analytical capabilities help FAA meet the technically complex challenges in the NAS. CAASD provides independent advanced research and development required by the FAA to obtain technical analyses, prototypes and operational concepts needed to fulfill the agency's Strategic Initiatives, develop the NAS Enterprise Architecture, and create the National Aviation Research Plan (NARP).

The CAASD *Product-Based Work Plan* (PBWP) defines an outcome-based program of technically complex research, development, and system engineering activities. Benefits of CAASD work are detailed in the *CAASD*

Long Range Plan for each program outcome. Individual CAASD deliverables provide FAA stakeholders with important data and recommendations that support FAA decision making and contribute to objective accomplishment.

The Work Plan is categorized in the following areas.

NAS Concept of Operations, Architecture and Integration: Develop the NAS Concept of Operations. Integrate Next Generation Air Transport System (NextGen) enhancements into the NAS Architecture. Anticipate the impact of planned improvements on future capacity based on demand at airports and for use of airspace. Develop and integrate the NextGen Enterprise Architecture (EA), operational concepts, capability action plans, and roadmaps to ensure an integrated evolution that aligns with the agencies enterprise architectures.

Air Traffic Management (ATM) Operational Evolution: Provide analysis of the NAS mission needs, system requirements and proposed system design to identify critical enhancement needs and ensure that system enhancements will meet operational needs in a cost-effective manner. Provide an understanding of the benefits associated with capability enhancements. Provide assessments of concept maturity, operational feasibility and implementation risks, including identification of cross-domain dependencies. Advance the maturity of emerging ATM improvement concepts, and conduct Human-in-the-Loop (HITL) evaluations. Develop and validate cross domain operational evolution plans.

Airspace and Performance-Based Navigation: Take advantage of the precision, reliability, predictably, and efficiencies of improved navigation and procedures through Area Navigation (RNAV). Conduct research on new concepts for achieving a performance-based NAS including the closely spaced Paired Approach concept. Model and simulate operational improvements and impacts to address mid-term and far-term Performance-Based Navigation (PBN) requirements. Perform system-wide optimization analyses of airspace and procedures for NextGen. Design and execute technical analyses on airspace security incidents on the NAS. Perform airspace concept development for mitigating airspace security incidents.

Safety and Training: Develop safety assurance processes as an integral part of normal operations. Perform technical analyses of NAS-wide accident and runway incursion risks to identify airports or specific types of operations with the highest risk. Develop metrics and processes that allow FAA to proactively identify potential safety issues. Identify and assess the feasibility of new or advanced capabilities and standards that mitigate safety issues in the NAS. Enhance the quality and efficiency of Terminal Radar Approach Control (TRACON) and En Route controller training.

Communications, Navigation, Surveillance (CNS), and Cyber-Security Infrastructure: Develop and evaluate advanced NAS CNS system concepts and requirements, and assess alternative technological approaches to meeting requirements. Perform research, modeling, simulation, and demonstration of prototypes of technical and operational enhancements to the NAS CNS and cyber security systems. Conduct spectrum analysis focusing on strategic issues related to the availability of adequate spectrum resources. Participate in the development of international standards and harmonization. Develop transition strategies for the FAA's NextGen Voice Communications System (NVS).

Unmanned Aircraft Systems: Provide technical analyses supporting strategic solutions for managing UAS integration into the NAS and NextGen. Partner with other Government Agencies' FFRDCs in actively researching improved access for public UASs and facilitating cross-agency joint solutions. Implement standards for safe operation of UASs without compromising the safety or efficiency of the NAS.

Special Studies, Laboratory and Data Enhancements: Provide an integrated research environment that ensures individual research activities, prototypes, and capabilities can be brought together with the appropriate mixture of fidelity and flexibility to facilitate integrated investigations, compressed spiraling of operational concepts and procedure development. Develop and sustain the Aviation Integrated Demonstration & Experimentation for Aeronautics (IDEA) laboratory infrastructure. Provide a data repository system that allows efficient access to aviation data and associated tools.

Mission-Oriented Investigation and Experimentation (MOIE): Develop tools and techniques for studying NAS capacity, throughput, performance, system dynamics and adaptation to technology and policy-driven change.

Identify opportunities for innovative solutions to NAS problems and enhancements to NAS capabilities and procedures. Explore new approaches including complexity theory, agent-based modeling, and productivity modeling.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

The CAASD provides independent advanced research and development required by the FAA to develop operational concepts, technical analyses, prototypes, procedures, and systems requirements needed to fulfill the vision for the NAS Enterprise Architecture and ensure that the FAA's mission of positioning the NAS for the future by building an Air Traffic Management System capable of efficiently meeting future demand while ensuring the NAS current safety record is sustained. FAA adoption of the new systems and procedures in the NAS improves on-time performance and provides a more efficient global air transportation system.

Program Plans FY 2017-2021 – Performance Output Goals

- Complete on-time 90% of the activities identified in the Product-Based Work Plan for the year.
- Update the Long Range Plan budget exhibit each year.
- Conduct Quarterly Reviews of CAASD progress.
- Conduct two FFRDC Executive Board milestone meetings per year.

4A09, NEXTGEN – AERONAUTICAL INFORMATION MANAGEMENT PROGRAM

FY 2017 Request \$10.4M

Aeronautical Information Management (AIM) Modernization Segment 2, G05A.02-05 / X, Aeronautical Information Management (AIM) Modernization Segment 3, G05A.02-06

Program Description

The AIM Modernization program will provide aviation users with digital aeronautical information that conforms to international standards and supports NextGen objectives. Digital aeronautical data enables near real-time processing of data to improve access to, and the quality of static and planned NAS constraint data including Notice to Airmen (NOTAM), airport, Special Activity Airspace (SAA), and other relevant Aeronautical Information such as Standard Operating Procedure Letter of Agreement constraints, procedures, and obstacles data. This constraint information will be provided through enterprise support services and will support better decision-making by NAS operators.

AIM Modernization Segment 2 (G05A.02-05):

AIM Modernization Segment 2 will build on pre-implementation efforts that were performed in the NextGen Common Status and Structure Data program (G05A.02-01), part of the Collaborative ATM portfolio, to baseline and implement suitably mature AIM technologies and tools for Aeronautical Information exchange. Aeronautical Common Services (ACS) will:

- Provide a foundational enterprise level infrastructure platform leveraging SWIM, internationally recognized exchange standards, and web services to deliver aeronautical information across the NAS with native functionality to process, transform, filter, and publish tailored aeronautical information as services to end use applications;
- Improve distribution of SAA relevant information among stakeholders. Digital management of SAAs will also facilitate calculation of airspace usage and availability metrics in support of efficiency of air traffic management, analysis of SAA usage, integration with industrial partners, and scheduling automation;
- Provide access to Airports Geographic Information System (GIS) data for critical information about airports including airport mapping and status; and

- Fully leverage the SWIM Common Support Services infrastructure to deliver quality aeronautical information using common standards and services.

AIMM S2 will be done in three releases:

- Release 1 establishes the ACS infrastructure and provides portal and data orchestration for the NAVLean program (Navigation Procedures Project published September 2010);
- Release 2 provides the capabilities associated with SAA and other types of aeronautical information, including the Federal NOTAM System; and
- Release 3 subsumes the NAS Resource (NASR) system and finalizes remaining capabilities.

Schedule to meet Final Investment Decision (FID):

- Investment Analysis Readiness Decision – Completed in February 2013
- AIM Modernization Segment 2 Initial Investment Decision – Completed in November 2013
- Release of the Screening Information Request for software development contract supporting AIM Modernization Segment 2 – Completed in January 2014
- AIM Modernization Segment 2 FID – Approved August 20, 2014

AIM Modernization Segment 3 (G05A.02-06):

AIM Modernization Segment 3 (S3) will modernize and expand on the ACS enterprise service and initial SAA and GIS capabilities developed by AIM Modernization Segment 2 by adding performance capability, increased level of integration with NAS automation to integrate or fuse the static aeronautical information with operational data feeds for updates on the activation status of SAA, and active runway/airport configuration data from the authoritative source. AIMM S3 will provide value added services using aeronautical status information such as fused airspace, NOTAMs, and airport reference data in a common data model for improved flight planning and briefing services. Examples of value added services include Aeronautical Information visualization/mapping and relational filtering such as airspace affected by a given NOTAM, Standard Operating Procedures or Letter of Agreement constraints affecting a given geographic location, and airspace affected by SAA schedule and status. Additional capabilities will include the processing of static airspace constraints and business intelligence services to provide fused and integrated data products on demand to end use applications. This will be done via SWIM through web services which, when fully implemented, will provide improved access and increased functionality embedded in the information services with respect to filtering and data fusion (visualization of airspace, relational delivery and display of features and maps, geospatially referenced NOTAM data, etc.) so that end user applications and decision support tools may take advantage of these services to provide a significantly enhanced user experience.

The Common Status and Structure Data program (G05A.02-01) will prepare the acquisition management products to support the investment decisions for the AIMM S3 program. The schedule for AIMM S3 is:

- Concept and Requirements Definition Readiness Decision is scheduled for Q2 FY 2016;
- The Investment Analysis Readiness Decision is scheduled for FY 2017;
- The Initial Investment Decision is scheduled for FY 2018; and
- The FID is scheduled for FY 2019.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter*
- *FAA Performance Metric 1 – Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.*

Relationship to Performance Metric

AIM Modernization Segments 2 and 3 will improve and expand AIM services. The program will improve the accuracy and timeliness of information regarding NOTAM, SAA and Airport data. Analyses are underway to quantify legacy systems current delivery performance to establish the baseline and metrics for measuring the benefit provided. NAS safety depends upon the timely and accurate exchange of information between internal and external users.

Program Plans FY 2017 – Performance Output Goals

AIM Modernization Segment 2 (G05A.02-05):

- Complete Release 2 Operational Test and Evaluation. (APB Milestone)
- Achieve Operational Capability for Release 2. (APB Milestone)
- Complete Release 3 code development and development of test procedures.

AIM Modernization Segment 3 (G05A.02-06):

- None.

Program Plans FY 2018 – Performance Output Goals

AIM Modernization Segment 2 (G05A.02-05):

- Complete Release 3 Operational Test and Evaluation. (APB Milestone)
- Achieve Operational Capability for Release 3. (APB Milestone)
- Complete delivery of FNS information into NAS Automation.

AIM Modernization Segment 3 (G05A.02-06):

- Develop documents related to pre-implementation for AIMM S3, including:
 - Statement of Work
 - Independent Government Cost Estimate

Program Plans FY 2019 – Performance Output Goals

AIM Modernization Segment 2 (G05A.02-05):

- Complete post implementation review for any identified trouble reports.

AIM Modernization Segment 3 (G05A.02-06):

- Complete acquisition activities including:
 - Acquisition strategy
 - Statement of Work
 - Proposal Evaluations
 - Contract Award
- Complete System Requirements Review that includes the draft System Segment Specification (SSS) and Verification Requirements Traceability Matrix (VRTM).

Program Plans FY 2020 – Performance Output Goals

AIM Modernization Segment 2 (G05A.02-05):

- None.

AIM Modernization Segment 3 (G05A.02-06):

- Exercise contract option for Segment 3.
- Complete PDR for Release 1 that includes the final SSS and VRTM, and draft Release 1 SRS, SDD and WSDD.
- Complete DDR for Release 1 that includes the final Release 1 SRS, SDD and WSDD.

Program Plans FY 2021 – Performance Output Goals

AIM Modernization Segment 2 (G05A.02-05):

- None.

AIM Modernization Segment 3 (G05A.02-06):

- Complete PDR for Release 2 that includes draft Release 2 SRS, SDD and WSDD.
- Complete DDR for Release 2 that includes the final Release 2 SRS, SDD, and WSDD.
- Complete Release 2 code development and development of test procedures.
- Achieve Operational Capability for Release 1.

4A10, NEXTGEN – CROSS AGENCY NEXTGEN MANAGEMENT

FY 2017 Request \$2.0M

Cross Agency NextGen Management, G08M.04-01

Program Description

The development of NextGen is a priority for the Administration. Modernizing the air transportation system and safely managing forecasted growth in the air traffic system requires the active participation of FAA's NextGen partners; the Department of Commerce, Department Of Homeland Security, National Aeronautics and Space Administration, and Department of Defense. Activities conducted under Cross Agency NextGen Management program will continue to identify, facilitate, and integrate activities, commitments and contributions of Federal partner agencies and other key stakeholders to ensure the NextGen transformation is realized.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016. (FAA Business Planning Metric)*

Relationship to Performance Metric

Upgrading current NAS technology and infrastructure to support NextGen requires collaboration with both industry and partner agencies. Without a dedicated interagency focus, increased costs and schedule delays are possible if data sharing and all Federal surveillance requirements for NextGen are not identified when required. The Cross Agency NextGen Management program will provide the timely coordination needed between all Federal NextGen partners. Without this program FAA's ability to leverage potentially cost saving research and expertise from other agencies would also be reduced.

Program Plans FY 2017 – Performance Output Goals

- Complete Multiagency Aviation Cyber Exercise After Action Report 2017 edition including recommendations, cyber R&D, and shortfall analysis (e.g. Annual National-level CYBERGUARD).
- Complete and submit the NextGen Research-to-Operations (R2O) Projects 2017 progress report to NextGen Executive Weather Panel (NEWP).
- Complete Multiagency Integrated Surveillance Strategy and progress reports 2017 edition.
- Complete and submit the Research Transition Team status report for NextGen Executive Board report 2017 edition.
- Develop Partner Agency Unmanned Aircraft System (UAS) RE&D Roadmap
- Cross Agency NextGen 2016 initiatives integrated in the NAS Enterprise Architecture. Includes development of an FAA Enterprise Information System Security Architecture; and NAS EA Service and Infrastructure Roadmap Annual Update.
- Conduct Cybersecurity studies to ensure safe data exchange of NAS with our Partner Agencies.
- Incorporate long-term NASA Air Traffic Management (ATM) concepts into the NextGen cost-benefit analysis.

Program Plans FY 2018-2021 – Performance Output Goals

- Coordinate across partner agencies on the future of the aviation transportation system through collaboration on architecture and work plans.
- Complete coordination of a multi-agency plan for NextGen research to include up-to-date schedules and dependencies for activities endorsed by the Senior Policy Committee and approved by the NextGen Executive Board.
- Complete coordination of a multi-agency plan for research (including schedules and dependencies), and integrate the transition of high-priority multiagency NextGen R&D to support NextGen implementation.
- Complete coordination of a multi-agency plan in the architecture framework for NextGen implementation to include schedules and dependencies.

- Complete coordination of a multi-agency plan for the NAS Enterprise Architecture to support NextGen implementation to include schedules and dependencies.
- Manage inter-agency special studies and activities to mitigate risk and ensure that critical NextGen interoperability requirements are established for cross-agency harmonization.
- Develop and conduct Cybersecurity evaluations.
- Develop cost/benefit analyses in support of high-priority multi-agency planning and R&D initiatives.

ACTIVITY 6: ADS-B SERVICES AND WAAS GEOS

6A01, ADS-B SERVICES AND WAAS GEOS

FY 2017 Request \$150.3M

- A, Automatic Dependent Surveillance Broadcast (ADS-B) – Sustain Leased Services, G02S.03-05
- B, Wide Area Augmentation System (WAAS) – Phase IV Segment 1 Sustain Leased Services, N12.01-09 / X, Wide Area Augmentation System (WAAS) – Phase IV Segment 2 Sustain Leased Services, N12.01-10

A, Automatic Dependent Surveillance Broadcast (ADS-B) – Sustain Leased Services, G02S.03-05

Program Description

This program continues the FAA subscription for ADS-B Baseline Services delivered by the prime contractor utilizing contractor owned and operated ADS-B infrastructure in place in the NAS. Performance-based service fees support the operation of the system, any necessary upgrades, and modernization. Subscription charges to the prime contractor consist of Service Establishment Charges for new service volumes and annual subscription charges to provide essential services to existing service volumes.

The program also provides for the Colorado WAM project which is operating a Multilateration surveillance service capability providing aircraft location information to the automation system at Denver ARTCC, allowing controllers to provide separation services at four Colorado airports (Durango, Gunnison, Montrose and Telluride).

ADS-B consists of a network of more than 630 Ground-Based Transceivers broadcasting across more than 300 service volumes. Service volumes are pre-determined volumes of airspace where ADS-B services are provided by using one or more ground-based transmitters. Each control area, Terminal or En Route Control, is made up of one or more service volumes.

ADS-B is an advanced surveillance technology that provides highly accurate and comprehensive surveillance information. Aircraft position, longitude, latitude, altitude, and time, is determined using the Global Navigation Satellite System, and/or an internal inertial navigational reference system, or other navigation aids. The aircraft's ADS-B equipment processes this position information along with other flight parameters for a periodic broadcast transmission, typically once a second, to airborne and ground-based ADS-B receivers. The information will be used to display aircraft position on en route and terminal automation systems such as Common Automated Radar Tracking System, Standard Terminal Automation Replacement System, Microprocessor En Route Automated Radar Tracking System, En Route Automation Modernization, and Advanced Technologies and Oceanic Procedures.

This system is an essential element of NextGen and supports implementation of the Operational Improvements that make air travel more efficient and safe. See also the main ADS-B program under G02S.03-01.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.*

Relationship to Performance Metric

ADS-B is a technology that will allow implementation of new air traffic control procedures based on more accurate aircraft position information that will allow better use of existing airspace. This should result in more efficient use

of airspace capacity, result in fewer delays, and enable optimal routing for aircraft. Other efficiency benefits include reductions in weather deviations, and reduced cancellations resulting from increased access to some Alaskan regions during reduced weather conditions. The efficiency benefits translate to savings in aircraft direct operating costs and to passenger value of time. The Business Case Analysis Report dated May 15, 2012 shows \$3.2B in capacity and efficiency benefits.

Program Plans FY 2017-2020 – Performance Output Goals

- Provide service at more than 630 radio stations and more than 300 service volumes within specified requirements.

Program Plans FY 2021 – Performance Output Goals

- None.

B, Wide Area Augmentation System (WAAS) – Phase IV Segment 1 Sustain Leased Services, N12.01-09 / X, Wide Area Augmentation System (WAAS) – Phase IV Segment 2 Sustain Leased Services, N12.01-10

Program Description

The WAAS requires a minimum of three commercial geostationary satellites (GEOs) to meet its performance requirements. This program funds the required leased services for the 3 WAAS GEOs.

WAAS consists of a network of 38 precisely located ground reference stations distributed across the continental United States, Mexico and Canada that monitor global positioning system (GPS) satellite signals. Three master stations collect the reference station data and calculate corrections and integrity messages for each GPS satellite. The WAAS messages are broadcast to user receivers via leased navigation transponders on three GEOs. The receiver on the aircraft applies the corrections and uses the integrity information from the WAAS message to ensure the validity and obtains a precise navigation position. See also the main WAAS program under N12.01-07 and N12.01-08.

WAAS – Phase IV Segment 1 Sustain Leased Services (N12.01-09):

The Sustain Lease Services program funds the leases for the GEOs needed for WAAS.

WAAS – Phase IV Segment 2 Sustain Leased Services (N12.01-10):

The Sustain Lease Services program funds the leases for the GEOs needed for WAAS.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 1 – Make Aviation Safer and Smarter.*
- *FAA Performance Metric 2 – Reduce the general aviation fatal accident rate to no more than one (1) fatal accident per 100,000 flight hours by 2018.*

Relationship to Performance Metric

WAAS provides vertical and horizontal guidance enabling pilots to make stable, vertically guided approaches to all qualified runway ends in the continental United States and most of Alaska, in most meteorological conditions. The WAAS navigation signal allows pilots to fly with reduced position uncertainty regardless of location within the NAS, enhancing safety. In the terminal area and while conducting approach operations, a Flight Safety Foundation Report found that there is nearly an 8 fold reduction in approach accident rates (53 per million for non-precision approaches vs. 7 per million for precision approaches) when precision vs. non-precision approaches were used. Specifically, 141 accidents could be prevented over a 20 year time period and saving over 250 lives when using WAAS for vertically guided approaches at airports where stable vertical guidance is not available or not used today. Currently, ILS provides precision vertically guided approaches at only 1,284 of the nation's 19,000 runway ends. WAAS is able to provide the same level of precision with 3.567 LPVs, as of September 2015.

Program Plans FY 2017-2019 – Performance Output Goals

WAAS – Phase IV Segment 1 Sustain Leased Services (N12.01-09):

- Provide leases for three WAAS geostationary satellites.

WAAS – Phase IV Segment 2 Sustain Leased Services (N12.01-10):

- None.

Program Plans FY 2020-2021 – Performance Output Goals

WAAS – Phase IV Segment 1 Sustain Leased Services (N12.01-09):

- None.

WAAS – Phase IV Segment 2 Sustain Leased Services (N12.01-10):

- Provide leases for three WAAS geostationary satellites.