National Airspace System Capital Investment Plan

FY2016–2020

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Federal Aviation Administration

Federal Aviation Administration National Airspace System Capital Investment Plan for Fiscal Years 2016 – 2020

1 Introduction

1.1 The Capital Investment Plan

The Federal Aviation Administration (FAA) Capital Investment Plan (CIP) describes the planned investments in the National Airspace System (NAS) for the next five years. The Consolidated and Further Continuing Appropriation Act, 2015 (Public Law 113-235) requires submittal of a five year CIP. The language in the 2015 Act states "[U]pon initial submission to the Congress of the fiscal year 2016 President's budget, the Secretary of Transportation shall transmit to the Congress a comprehensive capital investment plan for the Federal Aviation Administration which includes funding for each budget line item for fiscal years 2016 through 2020 with total funding for each year of the plan constrained to the funding targets for those years as estimated and approved by the Office of Management and Budget."

An overview of the CIP was included in the FY 2016 President's Budget submission to Congress. This is the complete CIP which complements that abbreviated version and satisfies the provision in 49 U.S. Code (USC) 44501 that requires FAA to prepare and publish a national airways system plan. Prior to the submission of the FY 2017-2021 CIP, the FAA will be reviewing the requirements of 49 USC 44501 as well as the content and format of the current CIP to identify ways to clarify the document and address any duplication with other documents published by the agency.

The CIP must include the facilities and equipment the Administrator considers necessary to safely meet the forecasted needs of civil aeronautics and the Department of Defense. The plan should contain estimates of the cost and schedules for implementing required facilities and services. In the process of developing the CIP the FAA reviews information from the NextGen Implementation Plan, NAS Enterprise Architecture, acquisition management system and National Aviation Research Plan.

Section 1 of the CIP Introduction discusses FAA's Strategic Priorities and important factors affecting the planning for the future. Section 2 "Key Considerations in Capital Planning" presents the balance that must be addressed to sustain current system performance while transitioning to the Next Generation Air Transportation System (NextGen). Section 3, "NextGen Portfolios and Implementations", describes NextGen Portfolios and the planned Operational Improvements (OIs) that support the portfolio objectives. Section 4, "Enterprise Architecture Infrastructure Roadmaps", contains the Infrastructure Roadmaps, which outline the planned modernization of the NAS and describe the programs and systems included in the NAS architecture.

Appendix A links capital investment programs to FAA strategic priorities and performance metrics. Appendix B provides capital investment program descriptions, describes how programs contribute to performance metrics and provides program milestones and implementation schedules. Appendix C contains budget line items (BLI) included in the FY 2016 President's budget request and estimated outyear funding amounts from FY 2017 through FY 2020 for current and future BLIs. Appendix D provides cost and schedule status on major capital investment programs. Major programs are those classified as Acquisition Category (ACAT) 1, 2 or 3 which typically are programs with total Facilities and Equipment (F&E) costs greater than $100M or have significant impact, complexity, risk, sensitivity, safety or security issues. For more information on ACAT see: http://fast.faa.gov/AcquisitionCategories.cfm?p_title=Special Topics

Appendix E provides acronym and abbreviation definitions.

1.2 Strategic Priorities and the CIP

The FAA Administrator has established a strategic framework to define where the agency will focus its efforts. This framework includes high-level Strategic Priorities, as well as Priority Initiatives and related Performance Metrics that will measure how well FAA achieves the priorities. The four Strategic Priorities are:

- **Make aviation safer and smarter –** There is an imperative to be smarter about how FAA ensures aviation safety because the aviation industry is growing more complex. At the same time, FAA has more safety data than we have ever had before. This provides an opportunity to be more proactive about safety and constantly raise the bar.

- **Deliver benefits through technology and infrastructure –** The NextGen initiative gives FAA the opportunity to redefine the National Airspace System for the future and prove that benefits can be delivered to the users of the system. FAA also needs to safely integrate new types of user technologies into the airspace, as well as rebalance existing services and modernize our infrastructure, which will enable us to reduce our costs and become more efficient in the long run.

- **Enhance global leadership –** Aviation is a global industry. FAA has to continue to be a world leader in aviation and set the safety standard for others to measure against. FAA needs to be at the table to shape international standards to improve aviation safety and efficiency around the world.

- **Empower and innovate with the FAA's people –** The FAA's employees are the ultimate driver behind its success, and FAA needs the best and brightest talent with the appropriate leadership and technical skills to transform the FAA and the aviation system as a whole.

The Strategic Priorities guide the FAA in upgrading NAS systems and operating procedures to meet the demands of current operations and future growth. Performance Metrics are a tool the agency uses to track progress towards accomplishment of the Strategic Priorities. The agency depends on capital investments to meet the Performance Metrics.

The capital investment program summary in Appendix B identifies the primary Strategic Priority and Performance Metric that the program supports. Many FAA programs will contribute to more than one Strategic Priority or Performance Metric; however, the program alignment in the CIP (appendices A and B) is for the program's most significant contribution. In the summary tables in appendix A, several programs normally appear under each performance metric because many programs are interdependent; a single program by itself may not be successful in meeting a performance metric without other supporting programs. Also, in the complex system used for air traffic control (ATC), system and procedure improvements must address several different operating conditions to reach the overall performance metric, and often it takes multiple programs to address each of the variables, which individually contribute to overall system improvements.

Each program in Appendix B has a section titled, "Relationship of Program to FAA Performance Metric", which gives more specific information about how the program contributes to meeting a Performance Metric.

1.3 Important Factors Affecting Planning for the Future

1.3.1 Economic Considerations

Aviation plays a significant role in promoting economic growth and accounts for over five percent of the U.S. Gross Domestic Product. As NextGen modernizes the existing ATC system by introducing new technologies and advanced decision support tools to make air travel more efficient, safer and environmentally friendly, it supports growth in our economy. A study by the Air Traffic Organization (ATO) Performance Analysis Service Unit, "The Economic Impact of Civil Aviation on the U.S. Economy," published in June 2014, estimated that aviation accounted for over $1.5 trillion in economic activity in 2012, which is 5.4 percent of the total U.S. economic activity. The spending on aviation-related activities supported an estimated 11.8 million jobs. In support of commercial activities, air carriers transported over 61.2 billion revenue ton-miles of air cargo. A reliable worldwide aviation network is essential for today's economy. Domestic and international commerce rely on the access and passenger and freight capacity it provides to cities around the world to sustain economic growth.

1.3.2 Air Travel Demand

Historically, the demand for air travel is heavily influenced by changes in the economy. Figure 1-1 shows that the growth rate in revenue passenger miles (RPM) over the last 30 years has exceeded the growth rate of Gross Domestic Product (GDP).

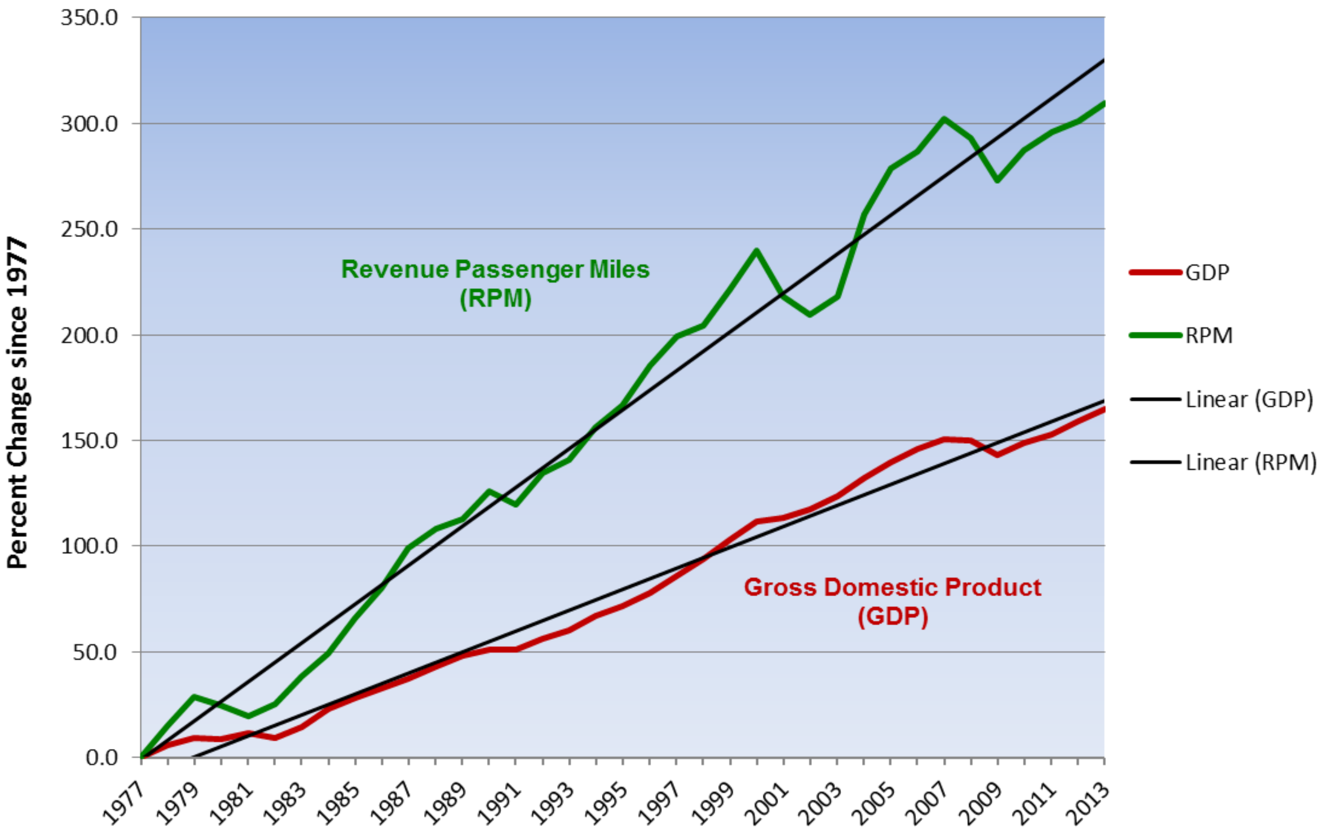

Figure 1-1 Air Travel Demand Growth Compared to Growth in GDP[1]

The U.S. inflation-adjusted (real) economic output long-term growth trend supports the continuing increases in air travel. Recent economic data show growth in GDP is rebounding and the trend lines in figure 1-1 show that continuing growth in the economy is very likely to generate growth in demand for air travel. Currently growth in air travel is being absorbed by larger aircraft and increased load factors, but there are limits to how long that can continue. Increased travel demand at core airports will ultimately result in increased aircraft operations and require that advanced NextGen capabilities be available to handle growth and minimize potential delays.

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[1] Sources: U.S. Department of Commerce, Bureau of Economic Analysis and U.S. Department of Transportation, Bureau of Transportation Statistics

1.3.3 Airport Expansion Projects

Ongoing efforts to increase airport capacity with runway infrastructure improvements also affect the need for capital investment, especially at large hub airports, where flights are concentrated. Fort Lauderdale/Hollywood International Airport recently completed a runway extension to support air carrier operations. At Chicago O'Hare International Airport, a new runway opened in 2014 and another is scheduled to open in 2015. Further runway improvements are proposed at the airport for the north airfield. Philadelphia International Airport is extending a primary runway, as part of a long-term major airport reconfiguration program. John F. Kennedy International Airport has a runway reconstruction, widening, and extension project underway. Increasing capacity at large, congested airports is critical to overall NAS performance because delays at the large hub airports often propagate to other airports throughout the system. The 30 large hub airports handle about 72 percent of airline enplanements. The combined total of 63 large and medium hubs supports about 88% of all U.S. passenger enplanements. Clearly delays at large and medium hubs affect a significant number of passengers waiting to depart, as well as passengers waiting to board aircraft at the delayed flight's destination.

When airport authorities (in coordination with FAA) build new runways or otherwise expand capacity, these changes often require additional supporting navigation and surveillance equipment. New procedures may also be needed to make new capacity fully usable. New or relocated runways often require that airspace around the airports be reconfigured to accommodate new approach and departure patterns. Reconfiguration requires installing new navigational aids and precision landing systems to guide pilots in the approach patterns for the runways. When new or relocated precision approach guidance systems are installed, approach lights and visibility sensors must be positioned along the runway so that these systems can be used down to the lowest visibility approved for that airport. Some airports need new surveillance systems to cover expanded departure and approach patterns. Capital investment may also be needed to expand or relocate air traffic control facilities. In cases where significant increases in demand result from the airport improvements, additional controller positions may eventually be needed.

2 Key Considerations in Capital Planning

Capital investments normally involve extensive planning and development time. They often take several years to implement because the systems being purchased are technologically complex and require development of both new software and hardware. New systems also require extensive testing to ensure that they meet the reliability standards before they can be used for air traffic control. To be prepared for future increases in air traffic, capital investments to improve the capacity, as well as efficiency, predictability, and flexibility of the NAS must be made many years in advance of the anticipated growth.

Capital investing must also be balanced between adding new capabilities and ensuring the existing systems operate reliably until they can be replaced. FAA must sustain the performance of the current air traffic control system until a more capable system to handle future growth is in place.

2.1 Sustaining Current System Performance while Transitioning to NextGen

The air traffic control system requires very high reliability and availability. Aircraft on the ground and airborne in controlled airspace must maintain separation from other aircraft, and that depends on reliable operation of communication, navigation and surveillance systems. Each system in the NAS has a high level of redundancy to support system reliability and to minimize service disruptions. Much of this equipment must be replaced regularly to avoid the problems of obsolescence and to reduce the potential for system failures due to aging components that cause deterioration in system performance.

The air traffic control infrastructure is a complex system made up of several thousand components. There are 21 Air Route Traffic Control Centers (ARTCC) that house automation equipment used by air traffic controllers to control en route air traffic. There are over 500 Air Traffic Control Towers (ATCT) and 168 Terminal Radar Control (TRACON) facilities that control air traffic approaching, landing at and departing airports. The flow of air traffic is dependent on several hundred surveillance and weather radars; navigation systems for en route and airport approach guidance, and thousands of communication radios that allow pilots and air traffic controllers to be in continuous contact during an aircraft's flight.

NextGen will incrementally replace and improve much of this equipment to introduce new efficiencies in handling air traffic control, but some existing systems such as communication, navigation and surveillance equipment will stay in operation in the future to supplement or back up NextGen capabilities. Many of the buildings housing existing ATC equipment will also remain in service to house the new replacement NextGen systems. To sustain the high level of reliability and availability required for the safety and efficiency of flight, a continued level of investment in this valuable infrastructure is necessary.

The air traffic control infrastructure has an estimated $4.4B backlog of requirements for sustaining its facilities. Goals, objectives, strategies, processes, and priorities are being established to meet this challenge. Eight systemic issues have been identified that need to be addressed across the ATO: Mold remediation, Fire Life Safety, Fall Protection, Arc Flash, Power Cable, Engine Generators, Fuel Storage Tanks, and ARTCC Chiller replacement.

As requested in the FY 2016 Budget, the ATC Facilities Strategic Sustainment Plan was developed to support the following programs for emphasis in sustaining the NAS:

- ARTCC Building Improvements/Plant Improvements, BLI 2A04;
- Air Traffic Control En Route Radar Facilities Improvements, BLI 2A07;
- Terminal Air Traffic Control Facilities – Replace, BLI 2B06;
- ATCT/TRACON Facilities – Improve, BLI 2B07;
- NAS Facilities Occupational Safety and Health Administration (OSHA) and Environmental Standards Compliance, BLI 2B09;
- Fuel Storage Tank Replacement and Monitoring, BLI 2E01;
- Unstaffed Infrastructure Sustainment, BLI 2E02;
- Facilities Decommissioning, BLI 2E06;
- Electrical Power Systems - Sustain/Support, BLI 2E07;
- FAA Employee Housing and Life Safety Shelter System Service, 2E08;
- Energy Management and Compliance (EMC), BLI 2E09;
- Hazardous Materials Management, BLI 3A01;
- Facility Security Risk Management, BLI 3A05; and
- Mobile Assets Management Program, BLI 3A12.

In addition to air traffic control infrastructure, the FAA has other facilities that support the NAS. The Mike Monroney Aeronautical Center includes facility space used for Air Operations, Engineering, Training (Radar/Navigational Aids (Navaids)), NAS Logistics, Airmen/Aircraft registration, Civil Aeromedical research, Safety, and Business Services. The William J. Hughes Technical Center supports research, test and evaluation of safety systems and new equipment. The infrastructure at these locations requires building system and telecommunications replacement.

Key investments in air traffic control systems that support current and future operation of the NAS are:

- **Terminal Automation –** Older terminal systems must be upgraded to accept Automatic Dependent Surveillance-Broadcast (ADS-B) position reporting and also modernized to a common automation platform to support NextGen and reduce maintenance costs;
- **En route Automation –** The new En Route Automation Modernization (ERAM) platform is operational at all sites. This new platform will require continuing enhancements to support implementation of many NextGen operational enhancements;
- **Navigation/Landing –** The Wide Area Augmentation System (WAAS) program will continue to augment the Global Positioning System (GPS) to support the implementation of improved procedures that are dependent on satellite navigation capabilities. Instrument Landing System (ILS) and other Navigation aids (Navaid) systems will be installed as necessary to replace older unreliable and unsupportable systems; and
- **Surveillance/Weather –** Modernization of en route and terminal primary and secondary surveillance radars will be implemented to upgrade or replace aging unsupportable systems. Weather sensing and processing equipment will also be modernized.

More details on all of the systems and infrastructure are provided in Appendix B.

2.2 Planning for the Future through NextGen Investments

NextGen is an umbrella term for the ongoing, wide-ranging transformation of the NAS to ensure that future safety, capacity and environmental needs are met. NextGen will fundamentally change the way air traffic is managed by combining new technologies for surveillance, navigation, and communications with automation system enhancements, workforce training, procedural changes, and airfield development, while facilitating the introduction and integration of new types of vehicles and operations, such as commercial space operations and unmanned aircraft systems.

NextGen advances will enable precise monitoring of aircraft on the ground and in flight, allow direct routes for travel between cities, improve decision support to manage traffic flows strategically on busy routes, and take advantage of precise navigation aids for fuller use of existing airspace and runway capacity. Having already implemented many of the milestones needed for this transformation, we are reaping the benefits of NextGen today.

The NextGen Implementation Plan provides more information concerning the vision, benefits and implementation details. http://www.faa.gov/nextgen/library/

Development of NextGen OIs can include concept development, modeling the changes in ATC performance, safety analyses, demonstrations of new capabilities, international coordination, standards development, and other pre-implementation activities. When a new concept is adopted, the improvement is implemented by procedure changes, system enhancements, air space changes, training, and upgrades to aircraft avionics as necessary. Development of OIs involves participation by all FAA organizations in cooperation with NAS users. Capital investment programs support the activities leading up to the initial investment management decisions for implementation. A solution, when fully developed, is baselined for acquisition and implementation. More information can be found on OIs in section 3.

Some of the larger NextGen programs that provide the foundation for the introduction of new NextGen OIs are:

- **En Route Automation Modernization (ERAM) – System Enhancements and Technology Refresh** – This program will be upgrading the ERAM software to support NextGen OIs and provides replacement hardware for the ERAM system (BLI 2A01);
- **System Wide Information Management (SWIM)** – SWIM provides the standards, hardware and software to enable information management and data sharing required to support NextGen. This includes Common Support Services – Weather (CSS-Wx) which provides access for NAS users to a unified aviation weather picture (BLI 2A11);
- **ADS-B NAS Wide Implementation (ADS-B)** – ADS-B provides more accurate and timely surveillance data needed to allow direct routing and conflict free routes (BLI 2A12);
- **NextGen Weather Processor (NWP) –** This program will establish a common weather processing platform which will provide improved weather products and support more efficient operations (BLI 2A17);

- **Data Communications in support of NextGen –** Data Comm provides data link communications between controller and pilot to facilitate information transfer, reduce workload and minimize potential errors in communication flight plan adjustments (BLI 2A19);
- **National Airspace System Voice System (NVS) –** NVS will provide a nationwide network of digital voice switches for terminal and en route air traffic facilities. These new systems will provide voice switch configuration flexibility required to support facility backup (BLI 2B13); and
- **Aeronautical Information Management (AIM) Program –** AIM provides digital aeronautical information to NAS users (BLI 4A09).

3 NextGen Portfolios and Implementations

This section contains descriptions of the fundamental changes FAA wants to accomplish with NextGen investments. Before planning the future systems architecture of the air traffic control system, goals must be established regarding the types of performance improvements that will be achieved. Those goals are defined by Operational Improvements listed in the NextGen portfolios described below and represent specific enhancements to present levels of performance that will be possible with NextGen investments.

As NextGen has progressed, pre-implementation work has transitioned into the implementation phase. The NextGen concept development and pre-implementation work is now focused on the next useful segments of capabilities developed in base programs. The efforts described in this section include the engineering and acquisition work to add functionality to base systems and the complementary and necessary effort in standards, guidance and operational descriptions/procedures.

To address RTCA Task Force 5 and NAS working group recommendations, the structure of NextGen planning documents has shifted to focus on implementation portfolios in the NAS Segment Implementation Plan (NSIP) and the NextGen Implementation Plan (NGIP).

The OIs included in this section are targeted for implementation within the 2016-2020 timeframe. Each portfolio section and its corresponding OI descriptions are followed by a list of the portfolio programs that support the OIs. For information concerning the implementing systems, refer to the NAS Enterprise Architecture Infrastructure Roadmap descriptions in Section 4. To obtain more information on NextGen accomplishments visit the following site: http://www.faa.gov/nextgen/snapshots/

Each OI has a 6 digit number assigned and these numbers are included as a reference in the text below. The first 3 digits identify the FAA Service, for example, Air Traffic Management (ATC) Separation Assurance/ Separation Management. The second 3 digits are a unique ID. Additional information can be found on the NAS Enterprise Architecture Web site at: https://nasea.faa.gov

3.1 Separation Management Portfolio

This portfolio provides controllers and pilots with tools and procedures for performing separation management in all of the airspace and airports within the NAS. The aircraft separation assurance service is the cornerstone of ATC operations, and the investments tied to this portfolio provide the tools, procedures, standards and guidance to better manage aircraft in a mixed environment with varying navigation equipment and wake performance capabilities. Enhancements to separation management are articulated in the following Operational Improvements:

Flight Management with Trajectory

Develops and maintains all information about a flight and makes that information available to all decision support tools to improve strategic flight planning and tactical flight management. Users may also supply trajectory option sets that represent their route preferences in the event of a constraint, such as weather. Trajectory flight data will continue to be updated for changes and made available to subscribers so that tactical and strategic plans are developed with the most up to date 4D flight trajectory. (OI: 101202)

Oceanic In-trail Climb and Descent

Air navigation service provider (ANSP) automation enhancements take advantage of improved communication, navigation and surveillance coverage in oceanic airspace to allow climbs and descents with lower separation between the two aircraft. When authorized by the controller, pilots of equipped aircraft can reach more optimal flight altitudes earlier. (OI: 102108)

Initial Conflict Resolution Advisories

The ANSP automation supports the controller in predicting and resolving conflicts. Automation is enhanced not only to recognize conflicts but also to provide rank-ordered resolution advisories to the ANSP. (OI: 104104)

Automation Support for Separation Management

ANSP automation provides the controller with tools to manage aircraft separation in a mixed navigation and wake performance environment. Advances in Performance Based Navigation and additional wake separation categories leads to the use of more sophisticated separation rules between aircraft and the need for advisory support to the controller. (OI: 102137)

Wake Re-Categorization

The current set of pairwise wake separation requirements have been updated and expanded based on analysis of wake generation, wake decay and encounter effects for the current fleet of aircraft. These new separation standards are programmed into the automation systems to allow the controllers to use more accurate aircraft separation standards to increase both flight efficiency and runway capacity utilization. (OI: 102154)

Interactive Planning Using 4D Trajectory Information in the Oceanic Environment

Interactive planning between the airspace user and FAA automation both before and after departure enhances the ability of the flight to fly closer to the user's preferred 4D trajectory. Given the long duration of oceanic flights, there are often changes to wind and weather conditions while the flight progresses which change the flight's progress along the route. The exchange of the route information from the aircraft provides the FAA with more up to date location information. Automation improvements allow the user to more easily request trajectory changes to better fit the new conditions. (OI: 104102)

Integrated Arrival/Departure Airspace Management

This capability expands the use of terminal separation standards and procedures into current en route airspace (horizontally and vertically). A redesign of the airspace where a flight transitions from en route to terminal control will permit a greater number of Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures to allow for increased throughput. (OI: 104122)

Reduced Horizontal Separation Standards, En Route - 3 Miles

By taking advantage of advances in surveillance and surveillance data processing, the ANSP provides reduced separation (down to 3 miles) in greater portions of en route airspace. These reductions will allow procedures with lower separation minima and enable controllers to use more flight efficient clearances to manage conflict resolution. (OI: 102117)

Automated Support for Conflict Resolution

Automated assistance is provided to probe pilot 4D trajectory change requests considering flow requirements and constraints, and identifies potential conflicts. Resolution alternatives provided to the ANSP are improved by including flow constraints in order to safely resolve conflicts while supporting both tactical and strategic objectives. (OI: 104127)

Improved Management of Special Activity Airspace (SAA)

Special Activity Airspace availability is optimized and managed in real-time, based on actual flight profiles and real-time operational use parameters. Assignments, schedules, coordination, and changes to status of SAA are made readily available for operators and ANSPs using automation systems. (OI: 108212)

Current En Route Separation

Current En Route Separation services will be provided to Unmanned Aircraft Systems (UAS) through the seamless integration of communications between pilots-in-command of UAS and air traffic controllers. (OI: 102112)

Capital Investments That Support Separation Management

Pre-implementation activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B, BLI 1A05.

- ADS-B In Applications – Flight Interval Management, G01S.02-01
- Modern Procedures, G01A.01-01
- Alternative Positioning Navigation and Timing, G06N.01-06
- Wake Turbulence Re-Categorization, G06M.02-02
- Oceanic Tactical Trajectory Management, G01A.02-02
- Unmanned Aircraft Systems (UAS) Concept Validation & Requirements Development, G01A.01-09
- Reduced Oceanic Separation, G02S.04-01
- Separation Automation System Engineering, G01A.01-06
- Separation Management Concepts & Analysis, G01M.02-04
- NextGen Oceanic Capabilities, G01A.01-07
- Conflict Advisories, G01A.02-03

3.2 Improved Surface/ Terminal Flight Data Manager (TFDM) Portfolio

The NextGen Improved Surface/TFDM portfolio addresses airport surface/tower shortfalls associated with the lack of timely and accurate operational data exchange and the inability to efficiently manage traffic flows into, on, and departing from airports when airspace restrictions exist. The portfolio focuses on improved airport surveillance information, automation to support airport configuration management and runway assignments, and enhanced cockpit displays to provide increased situational awareness for controllers and pilots.

Provide Full Surface Situation Information

Automated broadcast of aircraft and vehicle position to ground and aircraft sensors/receivers provides a digital display of the airport surface. Aircraft and vehicles are identified and tracked to provide a comprehensive picture of the surface environment to ANSPs, equipped aircraft, and flight operations centers. (OI: 102406)

Initial Surface Traffic Management

Departures are sequenced and staged to maintain throughput. ANSP uses automation to integrate surface movement operations with departure sequencing to ensure aircraft meet departure schedule times while optimizing the physical queue in the movement area. (OI: 104209)

Enhanced Separation Services to Small Community Airports

Improved surveillance and communication capabilities at or near smaller community airports allow for increased capacity in previous non-radar environments providing improvements over non-radar separation guidelines. (OI: 102138)

Enhanced Departure Flow Operations

Efficient departure operations are achieved through the improved ability to quickly revise departure clearances in the event that changing weather, winds or system constraints requires amendments to the pre-departure clearance. Traffic managers create route amendments and send the updated flight data to air traffic controllers for delivery to affected flights. Revised departure clearances are issued electronically to equipped aircraft. (OI: 104208)

Capital Investments That Support Improved Surface/TFDM

Pre-implementation activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B, BLI 1A06.

- Terminal Flight Data Manager (TFDM) – Segment 1, G06A.03-01
- Surface Tactical Flow, G02A.01-01
- Surface Conformance Monitoring, G02A.01-02

3.3 On-Demand NAS Portfolio

This portfolio ensures that NAS and other aeronautical information is consistently provided across all NAS applications and locations using common net enabled access to aeronautical and flight information utilizing global standards – Aeronautical Information Exchange Model (AIXM) and Flight Information Exchange Model (FIXM).

Improved Management of Special Activity Airspace

Special Activity Airspace availability is optimized and managed in real-time, based on actual flight profiles and real-time operational use parameters. Assignments, schedules, coordination, and changes to status of SAA are made readily available for operators and ANSPs using automation systems. (OI: 108212)

On-Demand NAS Information

NAS and aeronautical information will be available to users on demand. This information is consistent across applications and locations that are available to authorized subscribers and equipped aircraft. Proprietary and security-sensitive information is not shared with unauthorized agencies or individuals. (OI: 103305)

Enhanced Traffic Advisory Services

Aircraft equipped with Automatic Dependent Surveillance-Broadcast (ADS-B) and UAS equipped with sense and avoid avionics broadcast their position, and other aircraft and UAS operators that are properly equipped receive these broadcasts and display traffic data to flight crews and UAS operators. Ground-based systems can also rebroadcast this information to aircraft that are not equipped with ADS-B In. (OI 103209)

Tailored Delivery of On-Demand NAS Information

The delivery of selected NAS and aeronautical information data elements will be available to users and tailored based on the information that pertains to their flight trajectory. (OI 103306)

NAS Wide Sector Demand Prediction and Resource Planning

NAS wide capacity resource drivers, such as airspace and runway access, route availability, and controller workload, modeled in parallel with systemic and dynamic changes to user demand are integrated into one decision support tool. (OI 105104)

Capital Investments That Support On-Demand NAS

Pre-implementation activities and future programs which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B, BLI 1A07.

- Flight Object, G05A.02-03
- Common Status and Structure Data, G05A.02-01
- Flight Object Exchange Services (FOXS), G05A.02-08
- Dynamic Airspace, G05A.04-01
- Advanced Methods, G05A.02-02
- Collaborative Information Management (CIM), G05M.02-01
- Airspace Resource Management System (ARMS), G05A.02-09

3.4 Environment Portfolio

This portfolio focuses on investigations, demonstrations and development of methods to integrate environmental impact mitigation and energy efficiency into the NextGen infrastructure. Integrating impact mitigation and energy efficiency with NextGen improvements to support aviation growth will ensure that FAA goals for environmental issues are met. The establishment and implementation of the NextGen Environmental Management System Framework develops the strategy for integrating environment considerations into decision making for system improvements. It also provides a foundation for facilitating effective and efficient environmental reviews to assess compliance with the National Environmental Policy Act.

Integrated Environmental Modeling - Phase I

Develop an integrated aviation environmental analysis tool suite that is based on the best available scientific knowledge and use this capability to evaluate both the environmental impacts of aviation as well as the performance of potential mitigation. (OI: 701102)

Environmental Policies, Standards and Measures - Phase I

Develop and implement appropriate policies, programs, and mechanisms to mitigate the environmental impacts of aviation. Enable the use of the NextGen Environmental Management System (EMS) framework to address, plan and mitigate environmental issues, through development of an initial EMS framework, pilot analysis, and outreach programs. (OI: 704102)

Integrated Environmental Modeling - Phase II

Enhance the integrated aviation environmental analysis tool suite to reflect new scientific information and use this capability to evaluate both the environmental impacts of aviation as well as the performance of potential mitigation options. (OI: 701103)

Environmental Policies, Standards and Measures - Phase II

Continue to develop and implement appropriate policies, programs, and mechanisms to mitigate the environmental impacts of aviation. The NextGen Environmental Management System (EMS) framework will be used to address, plan and mitigate environmental issues. (OI: 704103)

Capital Investments That Support Environment

The Environment Portfolio is a combination of research related to fuels, engines and airframes and investigating the impact of implementing NextGen changes on the NAS and air traffic management. Pre-implementation activities in F&E which provide developmental engineering, standards, implementation guidance include this program which is described in Appendix B, BLI 1A08.

- Environmental Management System and Noise/Emission Reduction, G06M.02-01

3.5 Improved Multiple Runway Operations Portfolio

The Improved Multiple Runway Operations portfolio enables the FAA to more efficiently use runway capacity through the use of improved technology, updated standards, safety analysis, and air traffic tools and operating procedures to enable more arrival and departure operations.

Wake Turbulence Mitigation for Departures (WTMD): Wind-Based Wake Procedures

Procedures are developed at applicable locations based on the results of analysis of wake measurements and safety analysis to reduce the time delay necessary for an aircraft waiting to depart to insure it will not be adversely affected by wake turbulence from an aircraft departing before it. During peak-demand periods, these procedures allow airports to maintain airport departure throughput during favorable wind conditions. (OI: 102140)

Improved Parallel Runway Operations

This improvement will explore concepts to recover lost capacity through reduced separation standards, increased applications of advanced dependent and independent procedures, and enabling operations in lower-visibility conditions. (OI: 102141)

Improved Parallel Runway Operations with Airborne Applications

Improved flight deck capabilities allow for increased arrival capacity for parallel runway operations in Instrument Meteorological Conditions. Reduced separation for dependent approaches of closely spaced parallel runways will be enhanced through the use of aircraft avionics that assist pilots in maintaining the required interval from other aircraft. Ground automation identifies opportunities to the controller who can provide a clearance to the flight crew for specific lateral and longitudinal separation distance from other aircraft. (OI: 102157)

Wake Turbulence Mitigation for Arrivals: CSPRs

Initially, dependent separation between aircraft on parallel approach courses to Closely Spaced Parallel Runways (CSPRs) will be procedurally reduced in Instrument Meteorological Conditions (IMC) in all crosswind conditions to something less than today's wake separation behind heavy or B757 aircraft based on a safety analysis of the airport geometry, local meteorology and other factors at each airport. Further separation reduction will be permitted down to radar minima for dependent approaches (1.5 nm stagger) using wind sensing and prediction systems to determine when crosswinds are sufficiently stable and strong enough that wake turbulence drift and decay will ensure safe separation reduction. (OI: 102144)

Ground Based Augmentation System (GBAS) Precision Approaches

Global Positioning System (GPS)/GBAS support precision approaches to Cat I and eventually Cat II/III minima for properly equipped runways and aircraft. GBAS can support approaches at airports which require fewer restrictions to surface movement and offers the potential for curved precision approaches. GBAS may also support high-integrity surface movement requirements. (OI: 107107)

Capital Investments That Support Improved Multiple Runway Operations

Pre-implementation activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B, BLI 1A09.

- Wake Turbulence Mitigation for Arrivals (WTMA), G06A.01-02
- Closely Spaced Parallel Runway Operations, G06N.01-02
- Ground Based Augmentation System (GBAS), G06N.01-01
- Enhanced Service Small Communities (ESSC), G03M.04-02

3.6 NAS Infrastructure Portfolio

Success in the functional portfolios is often dependent upon changes made to existing systems or the implementation of new systems. This portfolio provides cross-cutting research, early system engineering activities, development, and analysis of capabilities that have substantial cross-portfolio dependencies.

Current Oceanic Separation

The use of ATOP will be expanded into domestic-to-oceanic transition sectors to provide the controllers with integrated rules for setting up transitioning traffic to/from oceanic airspace. Enhancements include modifications needed to handle tactical 5 nautical mile separations. (OI: 102105)

Automated Support for Initial Trajectory Negotiation

En Route sector capacity and throughput are increased through the ability to send route changes and instructions to the cockpit over data communications. Trajectory management is enhanced by automated assistance to negotiate pilot trajectory change requests with properly equipped aircraft operators. (OI: 102158)

On-Demand NAS Information

An integrated set of weather information will be available to users on demand. This information is consistent across applications and locations that are available to authorized subscribers and equipped aircraft. (OI: 103305)

Initial Integration of Weather Information into NAS Automation and Decision Making

Advances in weather information content and dissemination provide users and/or their decision support tools with the ability to identify specific weather impacts on operations (e.g., trajectory management and impacts on specific airframes, arrival/departure planning) to ensure continued safe and efficient flight. (OI: 103119)

Full Improved Weather Information and Dissemination

Weather information will be translated into constraint information to be fully integrated into decision-support technologies. Advanced impact assessment tools improve ANSP and user tactical and strategic planning by providing consolidated weather processing of observational and forecast capabilities to produce consistent weather information for ATM decision-making. (OI: 103121)

Full Integration of Weather Information into NAS Automation and Decision Making

Consistent and improved weather data integrated into decision support tools will enable more effective and timely decision making by both ANSPs and flight operators for meeting capacity, efficiency, and safety objectives. (OI: 103123)

Capital Investments That Support NAS Infrastructure

Pre-implementation activities which provide developmental engineering, standards, implementation guidance and operational descriptions/procedures include these programs which are described in Appendix B, BLI 1A10.

- Weather Observation Improvements, G04W.02-01
- Weather Forecast Improvements, G04W.03-01
- NextGen Navigation Engineering, G06N.01-03
- New ATM Requirements, G01M.02-02
- Surface/Tower/Terminal Systems Engineering, G06A.02-01

3.7 NextGen Support Portfolio at WJHTC

This portfolio will continue to explore new technologies at the NextGen laboratories and support operational assessment for system performance.

Capital Investments That Support NextGen Support Portfolio at WJHTC

The NextGen Support Portfolio provides the laboratories and test beds needed for the development of systems to support operational improvements. The portfolio also provides for the assessment of operational benefits from the NextGen implementation. The program is described in Appendix B, BLI 1A11.

- NextGen Laboratories, G03M.02-01

3.8 Performance-Based Navigation & Metroplex Portfolio

The Performance Based Navigation (PBN) portfolio leverages satellite navigation technology and improved aircraft navigation performance to improve access and flexibility for point-to-point navigation using RNAV and RNP. It also supports the more flexible approaches and departures that save fuel and allow more efficient use of runway capacity. It improves operational efficiency for airports located in metroplexes.

Area Navigation (RNAV) Standard Instrument Departure (SID), Standard Terminal Arrival Routes (STAR), and Approaches

This improvement will develop RNAV routes, SIDs and STARs to allow more efficient flights, saving fuel and time. RNAV will be available throughout the NAS using satellite-based avionics equipment and systems. (OI: 107103)

Increase Capacity and Efficiency Using RNAV and Required Navigation Performance (RNP)

This improvement will allow use of RNAV and RNP to enable more efficient aircraft trajectories. Combined with airspace changes, RNAV and RNP increase airspace efficiency and capacity. Further efficiencies will be gained through the development and implementation of advanced RNP criteria. RNAV and RNP will permit the flexibility of point-to-point operations and allow for the development of routes, procedures, and approaches. (OI: 108209)

Capital Investments That Support Performance Based Navigation & Metroplex

The Performance Based Navigation & Metroplex Portfolio is implemented through these programs described in Appendix B, BLI 1A12.

- NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP), G05N.01-01
- Concept Development for Integrated NAS Design and Procedure Planning, G05A.02-04

3.9 Collaborative Air Traffic Management Portfolio

The Collaborative Air Traffic Management portfolio addresses shortfalls in modeling strategic traffic management initiatives, using decision support tools, supporting collaboration between traffic managers and airspace users and establishing capabilities to manage traffic flow strategically. It helps NAS operators and FAA traffic managers, using advanced automation to manage daily airspace and airport capacity issues such as congestion, special activity airspace and weather. Updated automation will deliver routine information digitally.

Provide Full Flight Plan Constraint Evaluation with Feedback

Constraint information that impacts the proposed route of flight is incorporated into ANSP automation, and is available to users. A user can adjust the flight plan based on available information. (OI: 101102)

Provide Interactive Flight Planning from Anywhere

Flight planning activities are accomplished from the flight deck as readily as at any other location. Airborne and ground automation provide the capability to exchange flight planning information and negotiate flight trajectory agreement amendments in near real-time. (OI: 101103)

Interactive Planning Using 4D Trajectory Information in the Oceanic Environment

Interactive planning between the oceanic airspace user and FAA automation both before and after departure enhances the ability of the flight to fly closer to the user’s preferred 4D trajectory. Users can receive feedback on intended Oceanic trajectory and adjust plans if desired. (OI: 104102)

Enhanced Departure Flow Operations

Efficient departure operations are achieved through the improved ability to quickly revise departure clearances in the event that changing weather, winds or system constraints requires amendments to the pre-departure clearance. Traffic managers create route amendments and send the updated flight data to air traffic controllers for delivery to affected flights. (OI: 104208)

Full Collaborative Decision Making

Timely, effective, and informed decision-making based on shared situational awareness is achieved through advanced communication and information sharing systems. (OI: 105207)

Traffic Management Initiatives with Flight Specific Trajectories

This capability will increase the agility of the NAS in adjusting and responding to dynamically changing conditions such as severe weather, congestion and system outages through the automated generation and dissemination of route changes. (OI: 105208)

Continuous Flight Day Evaluation

Continuous (real-time) constraints are provided to ANSP traffic management decision-support tools and the NAS users which improves system constraint predictions and assessments of proposed mitigation strategies. The FAA, in collaboration with users, develops mitigation strategies that consider the potential constraints. (OI: 105302)

Capital Investments That Support Collaborative Air Traffic Management

Activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B, BLI 2A14.

- Collaborative Air Traffic Management Technologies (CATMT) – Work Package 3, G05A.05-02
- Collaborative Air Traffic Management (CATM) – Work Package 4, G05A.05-03
- Strategic Flow Management Application, G05A.01-01
- Strategic Flow Management Engineering Enhancement, G05A.01-02

3.10 Time-Based Flow Management (TBFM) Portfolio

The Time-Based Flow Management portfolio enhances system efficiency by:

- Implementing Time-Based Metering (TBM) capability and its trajectory modeler at additional locations;
- Enhancing departure capabilities; and
- Merging a larger proportion of approaching air traffic into the terminal environment to enhance efficiency of PBN procedures and better balance demand with capacity.

Improved Management of Arrival/Surface/Departure Flow Operations

This improvement integrates advanced arrival/departure flow management with advanced surface operation techniques to improve overall airport capacity and efficiency. (OI: 104117)

Point-in-Space Metering

The ANSP uses scheduling tools and trajectory-based operations to assure smooth flow of traffic and increase the efficient use of airspace. Point-in-space metering can be associated with a departure fix, arrival fix, or any other point-in-space, such as airspace boundaries or other flow converging points. Decision support tools will allow traffic managers to develop scheduled arrival times for constrained resources and allow controllers to manage aircraft trajectories to meet the scheduled meter times. (OI: 104120)

Time Based Metering Using RNAV and RNP Route Assignments

RNAV, RNP and time-based metering provide efficient use of runways and airspace in high-density airport environments. Metering automation will manage the flow of aircraft to meter fixes that are the point for aircraft to enter the pattern for runway approaches, thus permitting efficient use of runways and airspace. (OI: 104123)

Time-Based Metering in the Terminal Environment

This OI extends current metering capabilities into the terminal environment and furthers the pursuit of end-to-end metering and trajectory-based operations. It also supports capabilities designed to expand the use of terminal separation standards in transition airspace, and solidifies the foundation for future advanced airborne-based applications that will depend upon ground-based automation to maintain the complete sequence of aircraft into and out of high density terminal locations. (OI: 104128)

Interval Management-Spacing (IM-S)

This OI enables controllers to identify, initiate, and monitor the spacing between aircraft, when they direct flight crews to establish and maintain a given time or distance from a designated aircraft. Controllers will be assisted with ground automation and a new set of voice or datalink procedures. (OI: 102118)

Capital Investments That Support Time Based Flow Management

Activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B, BLI 2A15.

- Time Based Flow Management Work Package 3, G02A.01-06
- Time Based Flow Management Technology Refresh, G02A.01-07
- Time Based Flow Management Work Package 4, G02A.01-08

3.11 System Safety Management Portfolio

This portfolio contains activities that ensure that changes introduced with NextGen deliver benefits and either enhance or, at a minimum, do not degrade safety. These changes include the development and implementation of policies, processes and analytical tools that the FAA and industry will use for more efficient operations.

Safety Information Sharing and Emergent Trend Detection

Information analysis and sharing directly supports safety promotion and safety assurance initiatives. It supports analytical efforts such as the comparison of baseline information and trends. It also indirectly supports safety risk management through issue identification, information and tools for analysis of hazards. (OI: 601103)

Enhanced Safety Information Analysis and Sharing

Aviation Safety Information Analysis and Sharing (ASIAS) will improve system-wide risk identification, integrated risk analysis and modeling and implementation of emergent risk management. (OI: 601102)

Integrated Safety Analysis and Modeling

This OI mitigates safety risk associated with the design, evolution and implementation of NextGen by providing enhanced integrated safety methods. It will provide advanced capabilities for integrated, predictive safety baseline risk assessment; advanced capabilities for integrated risk analysis; improved validation and verification processes supporting certification; simulation protocols that provide enhanced evaluation frameworks for safe operational procedures; and enhanced training requirements analysis for safe system operation. (OI: 601202)

Capital Investments That Support System Safety Management

The System Safety Management Portfolio is implemented through these programs which are described in Appendix B, BLI 3A10.

- Aviation Safety Information Analysis and Sharing (ASIAS), G07A.02-01
- Systems Safety Management Transformation (SSMT), G07M.02-01

4 Enterprise Architecture Infrastructure Roadmaps

The detailed infrastructure roadmaps appearing in the following subsections are an integral part of the NAS Enterprise Architecture and show the existing systems in the NAS, and the planned capital programs for legacy and NextGen systems. The roadmaps show planned modernization beyond the 5-year horizon covered in the CIP, because planning to meet future needs of the NAS extends beyond that timeframe. Upgrading the sophisticated systems used for air traffic control requires significant engineering development efforts to ensure the continued safety and efficiency of the NAS while inserting advanced technology into working systems. The roadmaps present an executive view of the programs and systems that make up the NAS and do not include every aspect of the detailed planning behind them. Timelines are included to show the length of time existing systems or their replacements will remain in service. They help FAA program managers anticipate future engineering and financial challenges and integrate the modernization efforts by showing how updates to other systems will impact their program.

Many improvements shown in the roadmaps will also require aviation users to add equipment to their aircraft and adopt new procedures, so the roadmaps serve to inform them what they should expect regarding changes to their equipment and crew training. These roadmaps are updated annually to reflect results of studies, demonstration projects, and economic analysis related to programs; however, the roadmaps are, and should be, reasonably stable from year-to-year. For more detailed information on the roadmaps, view the Enterprise Architecture and Infrastructure Roadmaps at: https://nasea.faa.gov

The infrastructure roadmaps in this section organize the architecture based on functional areas. The systems on the left side in each of the diagrams are currently in service. Funding to maintain and operate the in-service systems is provided by the Operations account. Capital investments to upgrade or replace systems are shown by the program boxes within the roadmap timeline; the box reflects the timeframe for funding the programs. Legacy programs are portrayed as gray bars and NextGen programs are shown as orange bars. To associate programs in the FAA Enterprise Architecture with the funding provided in Appendix C, BLI number references are included at the end of each of the descriptions contained within this section.

Figure 4-1 shows and defines the symbols used in the infrastructure roadmaps. The solid red lines indicate the time the systems, or their replacements will remain in operation and the dashed lines indicate that a system is scheduled to be replaced or taken out of service; final date of operation is indicated with an X. The boxes with names identify programs, functions or systems, which are either described in the text or, when they are not described, their acronyms are spelled out in Appendix E.

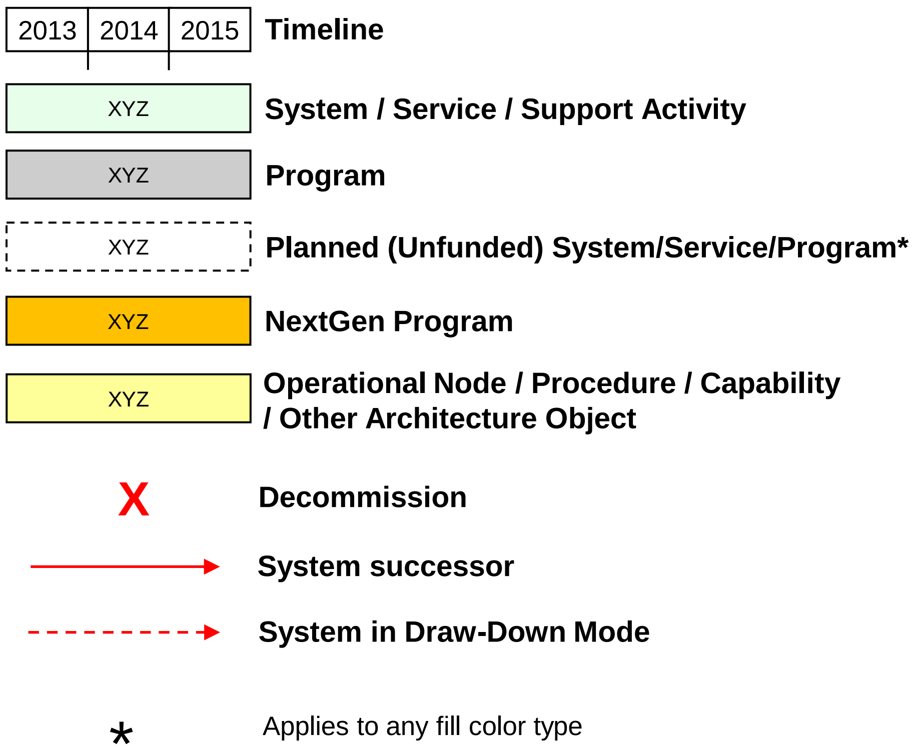

Figure 4-1 Infrastructure Roadmap Legend

4.1 Automation Roadmaps

Automation is a core element of the air traffic control system. Controllers require a real-time display of aircraft location as well as information about the operating characteristics of aircraft they are tracking—such as speed and altitude—to keep the approximately 60,000 daily flights safely separated. Automation gives controllers continuously updated displays of aircraft position, identification, speed, and altitude as well as whether the aircraft is level, climbing, or descending. Automation systems can also continue to show an aircraft's track when there is a temporary loss of surveillance information. It does this by calculating an aircraft's ground speed and then uses that data to project an aircraft's future position.

The Traffic Flow Management (TFM) System at the Air Traffic Control System Command Center (ATCSCC) and the Traffic Management Units (TMUs) at en route centers and TRACONs enable traffic managers to work together in strategic planning and management of air traffic. These systems use inputs from aircraft tracking systems, weather observations and airline operation centers to balance the flow of air traffic with airport capacity. TFM hosts software decision support tools that show projected arrivals and runway capacity and develop traffic management initiatives to meter air traffic to reduce delays and make maximum use of system capacity.

Automation systems will host the software improvements that support many of the NextGen OIs. NextGen programs develop the enhancements which are then installed on existing or upgraded automation systems. Program descriptions in Appendix B provide details on those enhancements.

Automation implementation, including the plans to sustain, upgrade, replace or decommission current systems displayed from 2014 through 2028 in the following NAS EA roadmaps:

1. Roadmap 1 (figure 4-2) - Air Traffic Management and Air Traffic Control
2. Roadmap 2 (figure 4-3) - Air Traffic Support and Oceanic Air Traffic Control
3. Roadmap 2 (figure 4-4) - Flight Services, Aeronautical and Information Support

Automation Roadmap (1 of 3)

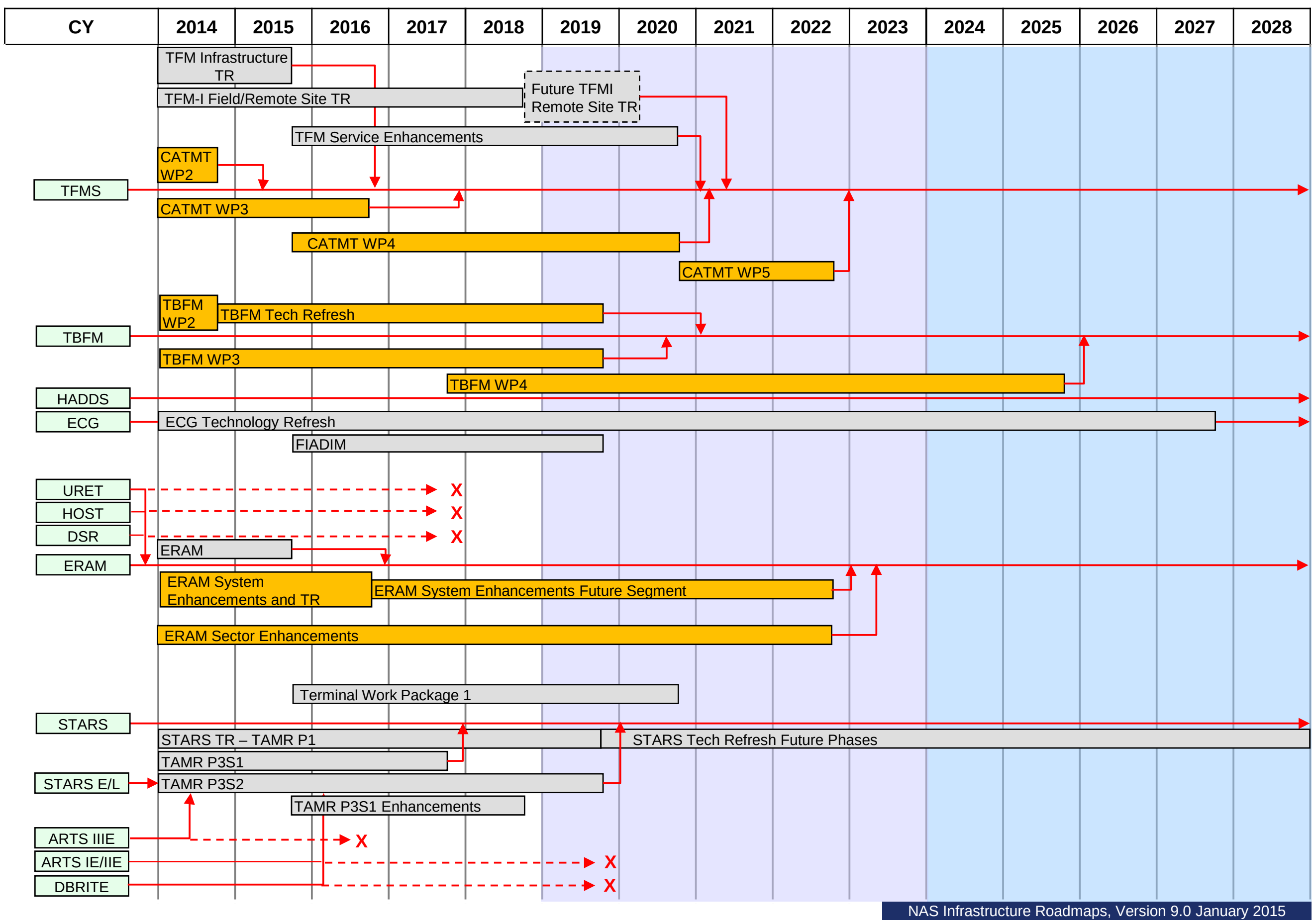

Figure 4-2 Air Traffic Management and Air Traffic Control Roadmap

The first system on the left side of the roadmap is the Traffic Flow Management System (TFMS) installed at air traffic control facilities including the Air Traffic Control System Command Center (ATCSCC), en route centers, and major terminal control facilities. The FAA will continue to implement the TFM Infrastructure and Remote Site Technology Refresh program to upgrade the hardware for existing TFMS components. The TFM Service Enhancements program will upgrade decision support tools to give traffic managers more precise forecasts that will allow them to implement more efficient Traffic Management Initiatives (TMIs). TFMS infrastructure and software enhancements are funded through BLIs 2A05.

The Collaborative Air Traffic Management Technologies (CATMT) work packages are enhancements to the TFMS and expand collaboration to individual pilots and improve information exchange between the FAA and airline dispatch offices. Collaboration improves the efficiency of operations by allowing operators to help determine the most efficient way to allocate NAS capacity. CATMT work packages are funded by 2A14.

The Time Based Flow Management (TBFM) system determines specific times of arrival for points in an aircraft’s route. This results in a systemic and efficient flow of aircraft to the terminal airspace, starting hundreds of miles away. Aircraft using this technique can arrive properly sequenced and spaced to maximize capacity at the nation’s busiest airports. TBFM Work Package 3 will implement additional NextGen concepts, such as optimized descent during time-based metering (Path Stretch); terminal sequencing and spacing to provide efficient sequencing and runway assignment; expansion of the Integrated Departure/Arrival Capability (IDAC) to additional locations; and making TBFM more flexible to accommodate reroute operations during adverse weather conditions during FY2015-FY2020. The TBFM technology refresh program will replace the system hardware to avoid obsolescence, system performance degradation and impact on other programs. TBFM is funded by 2A15.

The next six blocks on the left side are components of the en route control system. The Host ATM Data Distribution System (HADDS) supplies data to the TFMS discussed above and will remain in operation throughout the roadmap timeframe. The En Route Communication Gateway (ECG), which formats data for the en route automation system, remains a separate program and will continue to receive a technology refresh. The Flight and Interfacility Data Interface Management (FIADIM) program modernizes the flight data exchange between en route, oceanic and terminal automation systems. In conjunction with the Surveillance Interface Modernization (SIM), FIADIM can eliminate the need for the ECG. These programs use internet protocols to replace the serial interfaces used by ECG. ECG is funded by BLI 2A02. FIADIM is funded by BLI 2B20.

The En Route Automation Modernization (ERAM) program incorporates three of the en route system component pieces: User request Evaluation Tool (URET); Host Computer; and Display System Replacement (DSR). ERAM is now fully operational, and it supports the agency's transition to NextGen.

Improvements to ERAM will include ERAM System Enhancements and Technology Refresh and ERAM Sector Enhancements. The System Enhancements segment will include:

- Test and Training System improvements;
- Flight data processing enhancements, enabled by the increased adoption of ICAO flight plan standards;
- Controller usability enhancements;
- Tracking and correlation processing enhancements; and
- Improvement of overall system management, analysis and monitor and control functions.

ERAM Technology Refresh consists of upgrades and modernization of existing system components. ERAM system enhancements and technology refresh are funded through BLI 2A01. ERAM System Enhancements Future Segment will continue the enhancement and technology refresh activities starting in FY 2017.

ERAM Sector Enhancements provides software and hardware enhancements for the En Route sector controller team. It facilitates increased efficiency and effectiveness between the tactical and strategic controllers and establishes a common processing platform, with similar tool sets, that may be tailored for either controller. ERAM Sector Enhancements is funded through BLI 2A01.

Terminal Work Package 1 funds system engineering to develop concepts which address issues relating to system performance in the terminal domain. Proposed technical changes to automation and updated air traffic procedures will be delivered to the appropriate program offices for further development and implementation. It is funded by BLI 2B05B.

The next five systems provide ATC automation for terminal airspace:

- Standard Terminal Automation Replacement System (STARS);
- STARS Enhanced Local Integrated Tower Equipment / Local Integrated Tower Equipment (STARS E/L);
- Automated Radar Terminal System model IIIE (ARTS IIIE);
- ARTS 1E/IIE; and
- Digital Bright Radar Indicator Tower Equipment (DBRITE).

DBRITE is a tower display that allows tower cab controllers to determine the location of approaching traffic before it becomes visible to them. STARS and ARTS systems allow Terminal Radar Control (TRACON) controllers to track aircraft as they transition from en route control to terminal airspace, normally within 60 miles of the destination airport.

There are several phases to the STARS Terminal Automation Modernization and Replacement (TAMR) program for upgrading and modernizing these systems:

- The first phase replaced 47 existing ARTS with STARS. These STARS systems were installed at medium activity level airports;
- The STARS Technology Refresh (TAMR Phase 1) is modernizing the 47 sites installed under the STARS program as well as sites installed under TAMR Phase 2;
- TAMR Phase 2 involved the installation of STARS at five TRACONs and the modernization of four operational ARTS at large TRACONs. Phase 2 is completed and not shown on the roadmap;
- STARS TAMR Phase 3 Segment 1 (P3S1) is replacing 11 ARTS IIIE systems, which are the most sophisticated terminal automation systems located at high activity TRACONs;
- STARS TAMR Phase 3 Segment 2 (P3S2) will replace 91 ARTS IIE systems at medium and small airports with STARS Enhanced Local Integrated Tower Equipment (ELITE) and 6 ARTS IE systems at the smallest airports with STARS Local Integrated Tower Equipment (LITE). The upgraded STARS systems will be able to process position information from the ADS-B system along with information from terminal radars; and

- STARS Technology Refresh Future Phases will continue to address the technology refresh updates needed to modernize the STARS at all sites.

STARS is funded through BLIs 2B03 and 2B04.

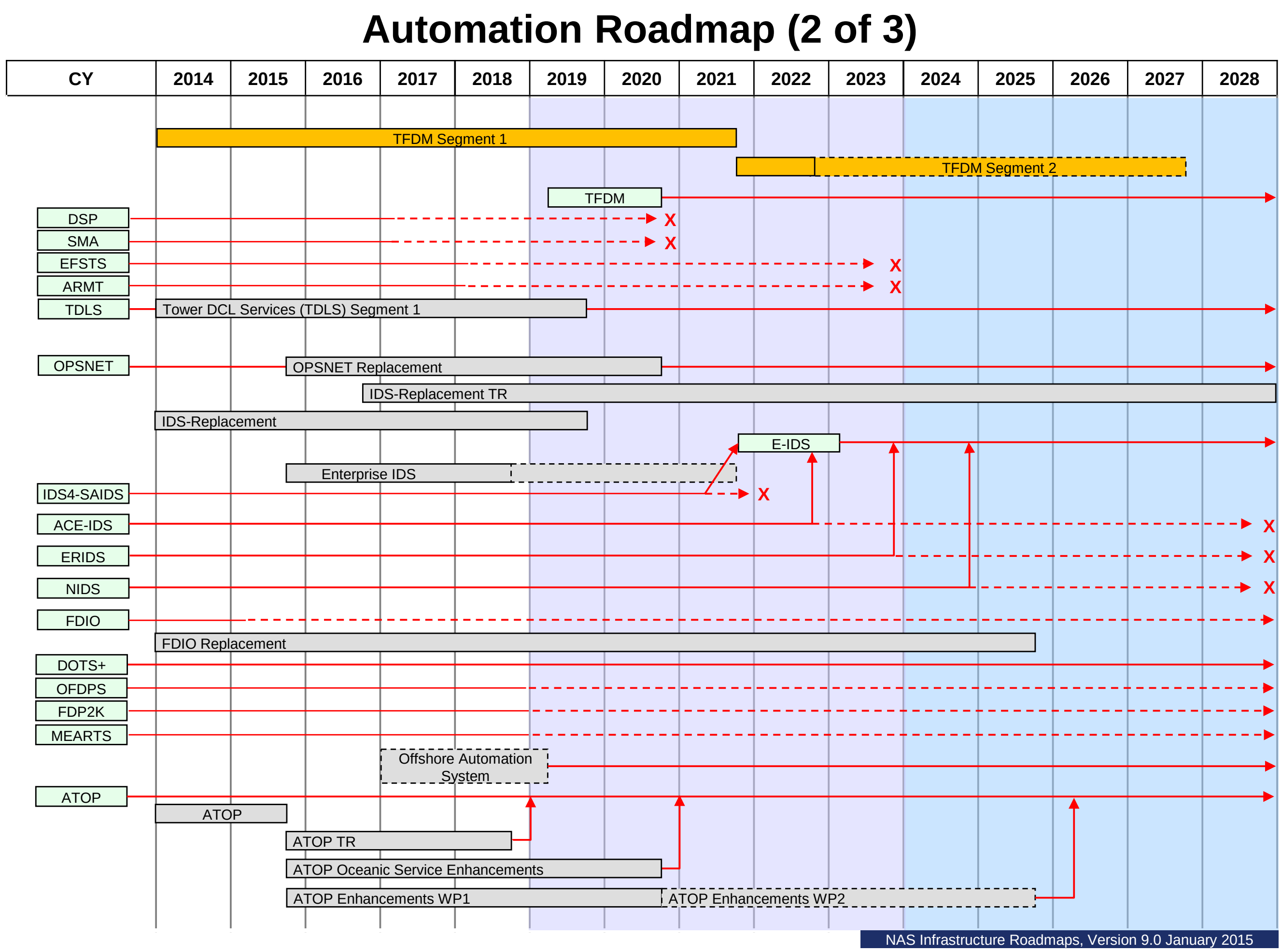

Figure 4-3 Air Traffic Support and Oceanic Air Traffic Control Roadmap

The Terminal Flight Data Manager (TFDM) – Segment 1 program supports a phased implementation of a new terminal local area network (LAN) based infrastructure to reduce redundant displays and integrate flight data functions. TFDM will provide System Wide Information Management (SWIM) enabled flight data exchanges with other NAS subsystems. TFDM initially will integrate data from existing systems, and it will be enhanced in TFDM Segment 2. TFDM is funded through BLI 1A06A.

The Departure Spacing Program (DSP) is used by tower controllers to optimize taxi and takeoff clearances in order to efficiently use available runway and airspace capacity.

The Surface Movement Advisor (SMA) provides the status of aircraft moving from the gates to the runways; and it improves taxiing efficiency. The Electronic Flight Strip Transfer System (EFSTS) is a system to transfer flight information to towers and TRACONs electronically rather than by paper. The Airport Resource Management Tool (ARMT) provides an assessment of available airport capacity.

The Tower Data Link Services (TDLS) provides datalink route clearances to pilots preparing to depart an airport. Data Communications Segment 1 Phase 1will be providing upgrades to the TDLS system.

The Operations Network (OPSNET) Replacement program will upgrade the existing system that collects data on flight operations and the number and reason for delays. It will automate data collection and expand the categories of delay reasons. OPSNET Replacement is funded through BLI 1A01I.

The Integrated Display Systems model 4 (IDS-4), the System Atlanta Information Display System (SAIDS) and NAS IDS (NIDS) provide weather and other information to tower controllers. These systems will be modernized by the IDS Replacement program. IDS Replacement Technology Refresh will provide system sustainment and upgrades starting in FY 2017. The Enterprise IDS (E-IDS) program, if approved, will take over the upgrade/replacement of systems included in the IDS replacement program. IDS is funded through BLI 2B14.

The Automated Surface Observing System (ASOS) Controller Equipment-Information Display System (ACE-IDS) displays weather information collected by ASOS to tower controllers. These services will begin a transition to the proposed E-IDS in 2022.

The En Route Information Display System (ERIDS) will be transitioned to the proposed E-IDS system in 2023. ERIDS is an information display system that provides access to aeronautical data including weather, airspace charts, ATC procedures, Notice to Airmen (NOTAMS), and pilot reports (PIREPS).

Flight Data Input/Output (FDIO) provides pre-filed flight plan and other data to operational facilities shortly before the aircraft is scheduled to begin its flight. It will be replaced incrementally throughout the roadmap timeframe. FDIO is funded through BLI 2B05.

The next group of five systems on the left side support oceanic ATC. The Dynamic Ocean Tracking System plus (DOTS+) system uses weather information to determine the most fuel-efficient routes based on wind velocity and direction. It will continue in operation through the timeframe of the roadmap. The other oceanic automation systems process data regarding the position of aircraft on oceanic and offshore flights to aid controllers in separating flights in FAA controlled oceanic airspace. The FAA plans to decide in 2017 whether to continue operating the Offshore Flight Data Processing System (OFDPS), Flight Data Processing 2000 (FDP2K), and the Microprocessor En route Automated Radar Tracking System (MEARTS) or transition their functions to a new Offshore Automation System.

Three centers (New York, Oakland and Anchorage) house the oceanic control system, Advanced Technologies and Oceanic Procedures (ATOP). Upgraded versions of ATOP will remain in operation throughout the roadmap timeframe. ATOP Technology Refresh, ATOP Oceanic Service Enhancements and ATOP Enhancements Work Packages 1 and 2 will sustain and upgrade the system. The enhanced ATOP systems will allow controllers to apply NextGen concepts such as assigning optimal routes and allowing reduced separation between aircraft to oceanic air traffic control. Enhancements include:

- Improved Accommodation of Flight Operator Trajectory Preferences;
- Increased System Efficiency in Support of Separation Management; and
- Increased Situational Awareness.

The three ATOP programs are funded through BLI 2A09.

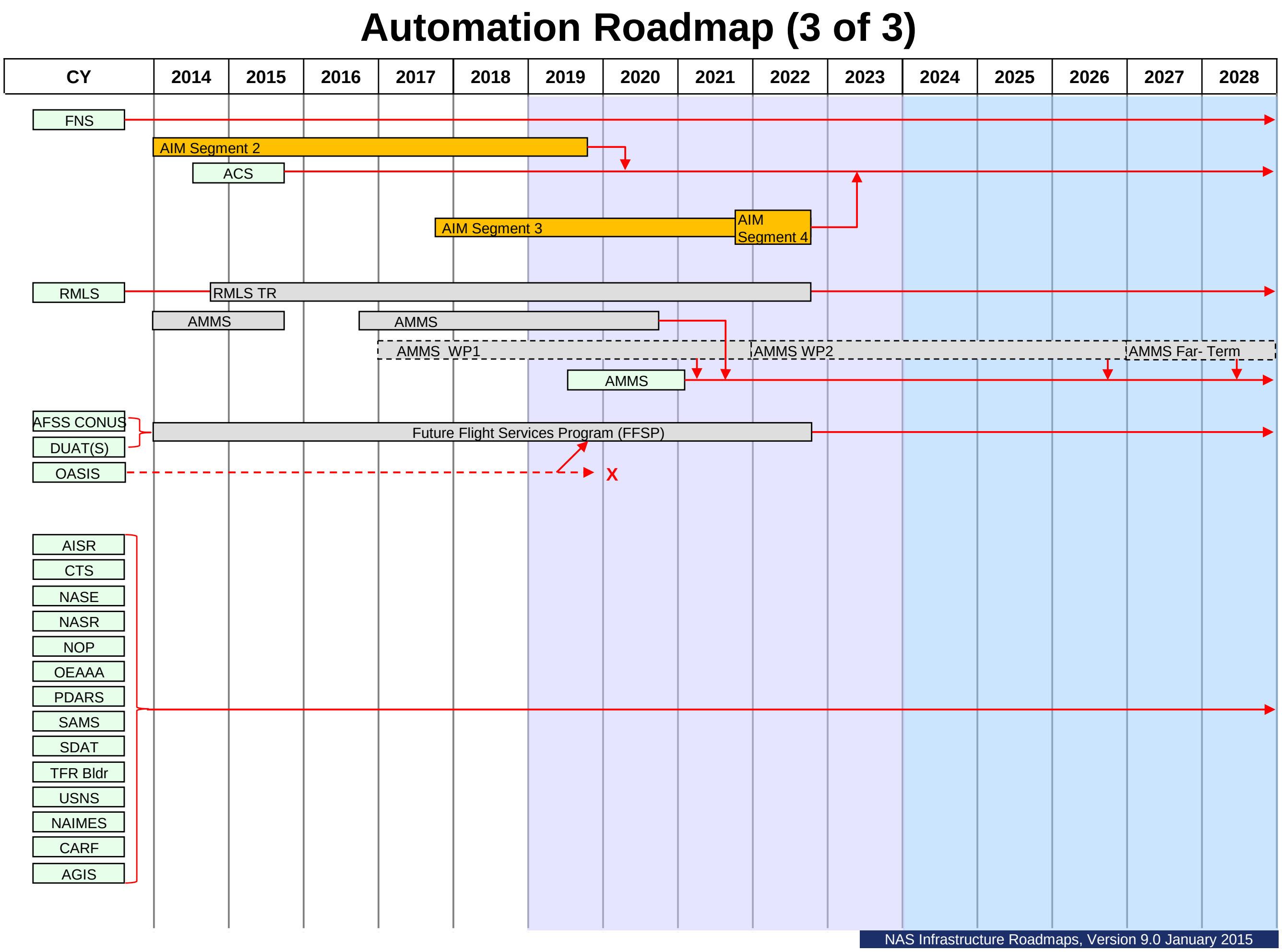

Figure 4-4 Flight Services, Aeronautical and Information Support Roadmap

Figure 4-4 shows the Federal NOTAM System (FNS) will remain in operation throughout the roadmap timeframe. It is a centralized system that collects and distributes Notices to Airmen

(NOTAMs) so pilots are aware of Navaid outages, closed runways, and other factors affecting their planned flight.

The Aeronautical Information Management (AIM) Segments 2, 3 and 4 consolidate and automate the storage and dissemination of aeronautical data used by pilots and aviation planners. They will upgrade the Aeronautical Common Services (ACS) which publishes information about airports, navigational aids and other aeronautical data. AIM is funded through BLI 4A09.

The Remote Maintenance Logging System (RMLS) serves two functions. It allows the maintenance staff to monitor equipment performance electronically from a central location, and it provides software for management of workforce hours and maintenance actions. The existing system is undergoing a technology refresh and will be supplemented by the Automated Maintenance Management System (AMMS). RMLS technology refresh and AMMS are funded through BLI 2B15.

The Automated Flight Service Station Continental United States (AFSS CONUS), Direct User Access Terminal System (DUATS) and Operational And Supportability Implementation System (OASIS) are automation systems that provide aeronautical and weather data to support flight services. Flight services include flight planning and pilot weather briefings, which are primarily used by general aviation pilots. Flight services in the lower 48 States and Puerto Rico are provided by contractor flight service personnel using the AFSS CONUS. The DUATS is a web-based service that allows pilots to access weather and aeronautical data for self-briefings and to file flight plans. The OASIS automation system is used at the Flight Service Stations in Alaska by FAA flight service specialists to provide flight services to general aviation pilots.

The Future Flight Service Program (FFSP) is examining the need for continued availability of flight service information currently provided by DUATS, AFSS and OASIS. The acquisition strategy is being developed. FFSP is funded through BLI 2C02.

Figure 4-4 shows fourteen systems that continue in operation, with technology refreshes, through the roadmap timeframe. A brief description of each system's capability and impact of providing service for airports, airspace, and navigation facilities is provided below:

- Aeronautical Information System Replacement (AISR) – distributes information on weather, flight plans, NOTAMS, Pilot Reports and other NAS status items to FAA facilities, Department of Defense, and pilots;
- Coded Time Source (CTS) – provides the official source of time that synchronizes the information flows in the air traffic control equipment;
- NAS Adaptation Services Environment (NASE) – contains detailed information about the airspace, geography, equipment, and procedures required to make each ATC system work properly;
- National Airspace System Resources (NASR) – contains information pertaining to Instrument Approach Procedures (IAPs), Departure Procedures (DPs), Standard Terminal Arrival Routes (STARs), and Military Training Routes (MTRs);
- National Offload Program (NOP) – allows FAA to download radar information from en route automation systems for analysis and review;

- Obstruction Evaluation/Airport Airspace Analysis (OEAAA) – contains data about obstructions around airports that present a hazard for aircraft taking off and landing;
- Performance Data Analysis and Reporting System (PDARS) – is a fully integrated performance measurement tool designed to help the FAA improve the NAS by tracking the daily operations of the ATC system and its environmental impact. PDARS is funded through BLI 1A01B;
- Special Airspace Management System (SAMS) – informs controllers when airspace ordinarily reserved for military use is available for civilian use;
- Sector Design and Analysis Tool (SDAT) – this is a visualization and analysis tool used to evaluate the impact on controller workload when sector and route changes are being considered during major airspace redesign efforts;
- Temporary Flight Restriction Builder (TFR Bldr) – an automated system for establishing temporary flight restrictions that prohibit aircraft from flying over areas where special events such as the Super Bowl are being held;
- United States NOTAM (Notice to Airmen) System (USNS) – an automated system used to process, store and distribute NOTAM information;
- NAS Aeronautical Information Management Enterprise System (NAIMES) – consists of a suite of NAS safety/mission critical systems and services that directly support the collection, validation, management, and dissemination of aeronautical information in the NAS;
- Central Altitude Reservation Function (CARF) – a system used by military and civilian pilots to reserve altitudes for their planned flights; and
- Airport Geographic Information System (AGIS) – stores data on airport configuration and physical location and size of all elements of the airport. It is used to develop airport modernization plans, and it is necessary for developing new approach and departure procedures.

4.2 Communications Roadmaps

Communication between pilots and controllers is an essential element of air traffic control. Currently the primary method for communication is voice radio. To ensure controllers can stay in contact with pilots remotely located radio sites are used to provide coverage. The controller has electronic links to activate radios at remote sites and ground telecommunication lines from these sites carry the verbal exchange to and from air traffic control facilities. If ground links are not available, satellite communication links can be used, and in the future, data link may be used for most routine communications. Backup systems are essential to ensure the continued ability to maintain communications when the primary systems fail.

NextGen improvements will require improved voice switching and A/G data communications as shown on the diagrams. Details on those investments can be found in the program descriptions in Appendix B.

Communication system implementation is broken down into five different NAS EA roadmaps:

1. Roadmap 1 (figure 4-5) - Telecom and Other Communications
2. Roadmap 2 (figure 4-6) - Voice Switches and Recorders
3. Roadmap 3 (figure 4-7) - Air-to-Ground Voice and Oceanic Communications
4. Roadmap 4 (figure 4-8) - Air-to-Ground Data Communications
5. Roadmap 5 (figure 4-9) - Messaging Infrastructure

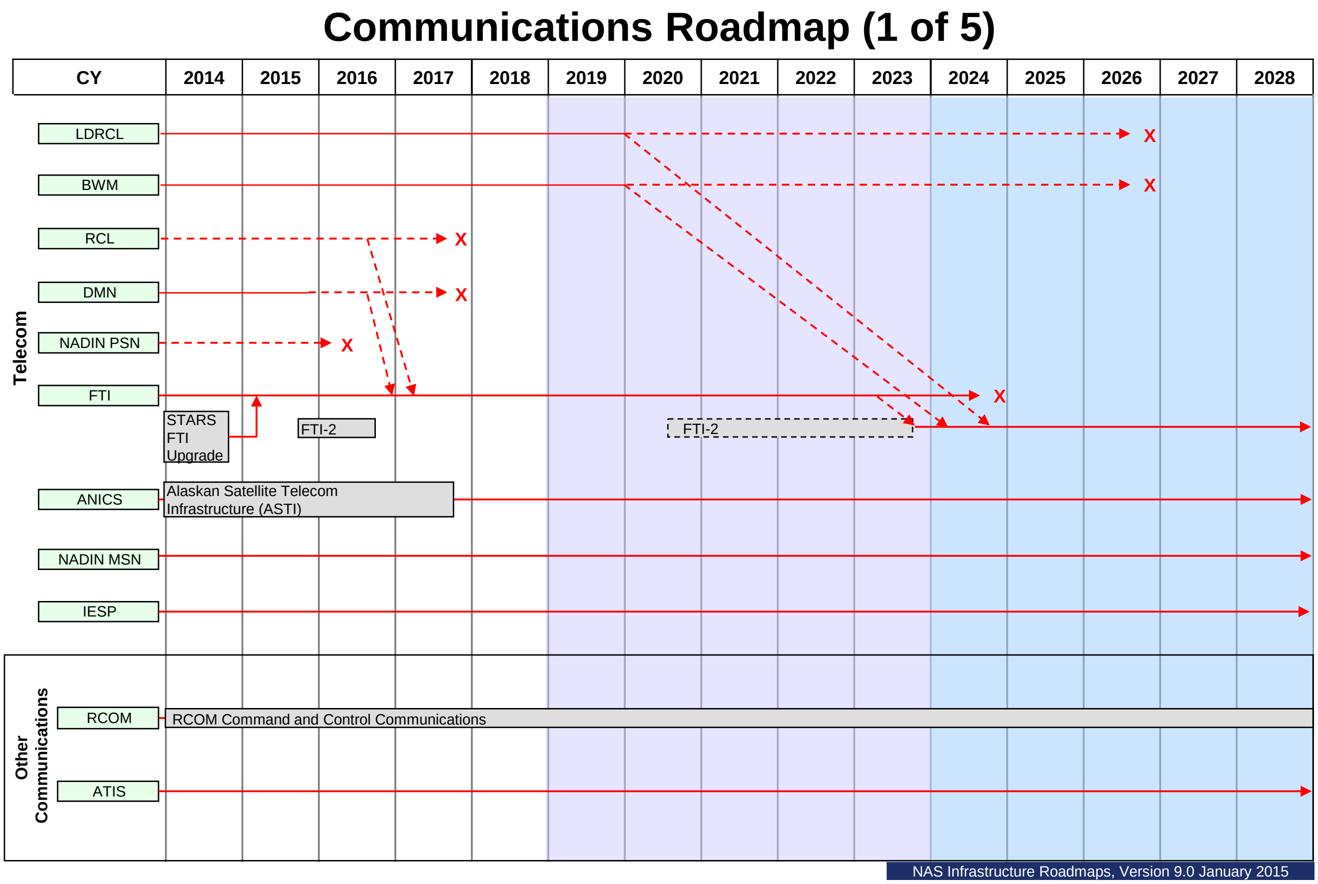

Figure 4-5 Telecom and Other Communications Roadmap

The Low Density Radio Communication Link (LDRCL) and the Radio Communication Link (RCL) are microwave systems that were created to transmit radar data from remote radar sites to FAA air traffic control facilities. These systems were linked in a national network to transmit operational and administrative information to and from air traffic control facilities. Many RCL communication links have already transitioned their functions to the FAA Telecommunications Infrastructure (FTI). The LDRCL will remain in service for areas with limited commercial services, but their functions will be transitioned to the new FTI contract. The Band Width Manager (BWM) improves efficiency of information flow on the microwave network. It will not be needed when microwave links are no longer used. The Data Multiplexing Network (DMN) and National Airspace Data Interchange Network – Package Switching Network (NADIN PSN) transmit flight plans and other important aeronautical information to air traffic facilities. The FAA is transitioning functions of DMN and NADIN PSN to the FTI network. NADIN Message

Switching Network (MSN) will be improved by the NMR (NADIN MSN Rehost) to comply with international standards for transmitting flight plans and remain available for that purpose.

The FTI contract provides communications services between FAA facilities. In 2016, work will begin on preparing for a transition to a new FTI contract under the FTI-2 program. The STARS FTI Upgrade has established a diverse and redundant core Internet Protocol infrastructure across the FTI telecommunications backbone that significantly reduces the impact of any unforeseen events on service. FTI-2 is funded under BLI 2E11.

The Alaska National Airspace System Interfacility Communications System (ANICS) consists of ground stations that send and receive data from communications satellites to connect the operational facilities in Alaska. The Alaska Satellite Telecommunications Infrastructure (ASTI) program modernizes the ANICS infrastructure. Because there are far fewer ground telecommunications connections in Alaska, a satellite system is used to ensure that important air traffic information is reliably transmitted between small and large facilities. ASTI is funded through BLI 2E05.

The Integrated Enterprise Service Platform (IESP) is a shared computing infrastructure that provides a common set of server and network hardware for the hosting of multiple NAS services. It leverages virtualization technology to maximize the return on investment for hardware procurements, and provides value added configuration management and high availability services. IESP uses an enterprise level Simple Network Management Protocol (SNMP) system which is capable of providing monitoring services for external NAS systems.

Recovery Communications (RCOM) is an emergency network to be used for command and control of the ATC system when other communications systems fail. RCOM is funded through BLI 3A04.

The Automated Terminal Information System (ATIS) broadcasts weather and other pertinent information to pilots as they approach an airport. ATIS functions will be maintained during the entire timeframe of the roadmap.

Communications Roadmap (2 of 5)

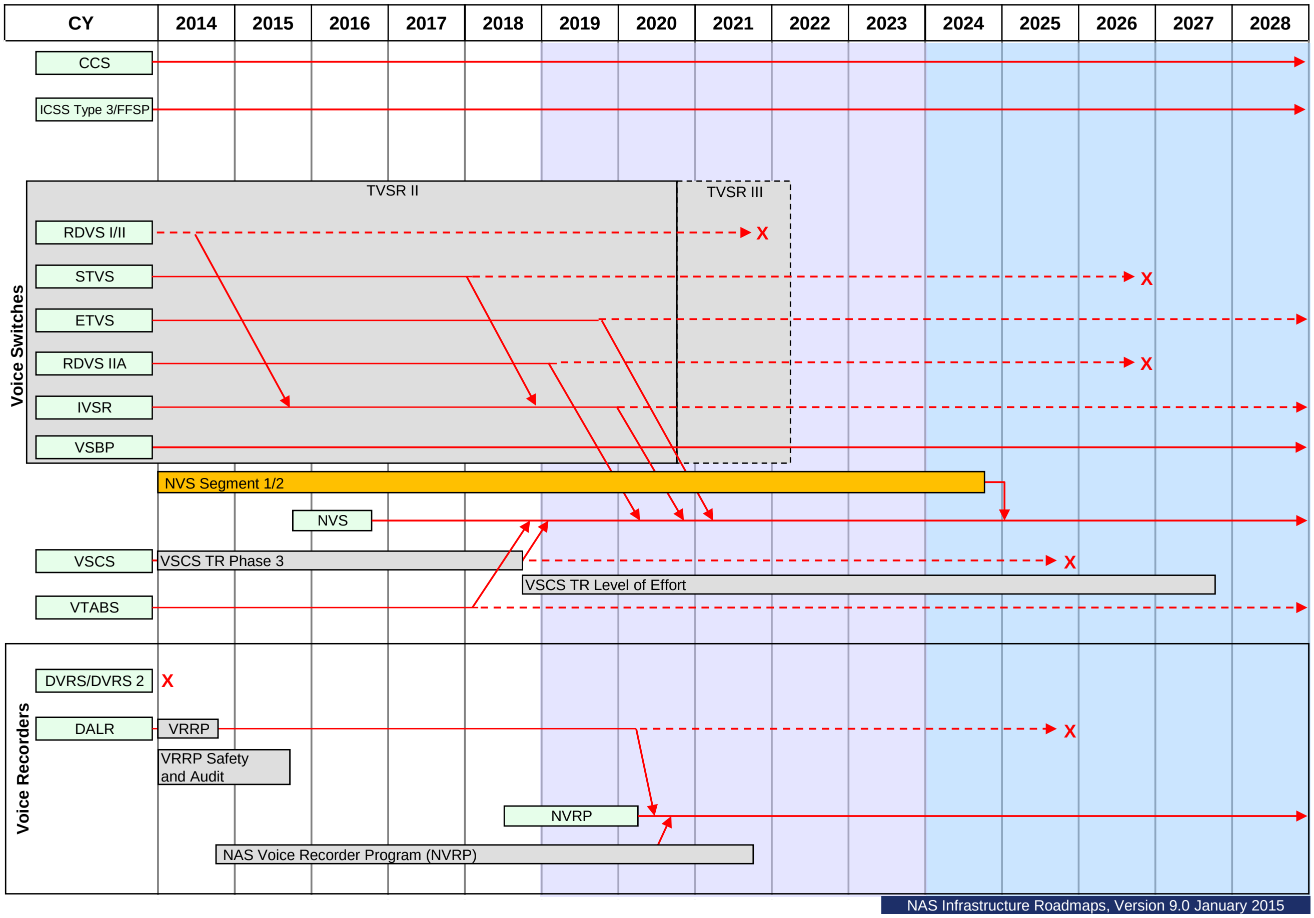

Figure 4-6 Voice Switches and Recorders Roadmap

Figure 4-6 shows the Conference Control Switch (CCS) installed at the Air Traffic Control System Command Center (ATCSCC) facility. It allows the FAA specialists to stay in contact with air traffic control facilities and external users of the NAS. They can coordinate with centers, TRACONs, and users to decide how best to implement traffic management initiatives and when to use severe weather avoidance programs.

The Integrated Communication Switching System Type 3 (ICSS Type 3/FFSP) is installed at flight service stations. Decisions made for the Future Flight Services Program (FFSP) will determine the future status of this switch.

Voice switches used in terminal and flight service facilities enable air traffic controllers to select lines to communicate with pilots as well as other air traffic control facilities. The Terminal Voice Switch Replacement (TVSR) II program, funded through BLI 2B08, is an umbrella program to replace terminal voice switches at the rate of about 5 per year, refurbish approximately 2 voice switches per year and install voice switches in newly constructed air traffic control towers. The switches are:

- Rapid Deployment Voice Switch (RDVS) I, II and IIA;
- Small Tower Voice Switch (STVS);
- Enhanced Terminal Voice Switch (ETVS);
- Interim Voice Switch Replacement (IVSR); and
- The Voice Switch By Pass (VSBP) is a backup voice switch that terminal controllers can use to stay in communication with pilots if there is a failure in the primary voice switch.

In 2021 the TVSR III program will be established to refurbish and replace terminal voice switches that are not replaced under the NAS Voice System (NVS) program.

The FAA has awarded the contract for a two segment procurement of the NVS. The first segment is the NAS Qualification phase which consists of the development and testing of production-ready systems capable of being deployed in the NAS operational environment, including three key site systems. The second segment is the Deployment phase which consists of NVS deployments at operational facilities beyond key sites. The NVS deployment schedule will be finalized to support the Final Investment Decision. The NVS program will also include remote radio control equipment. NVS will provide flexible networking for voice switch-to-voice switch connectivity as well as for voice switch to Air-to-Ground (A/G) radio connectivity. This architecture will facilitate meeting NextGen requirements for ATC workload sharing, unmanned aircraft system (UAS) operations, virtual tower operations, and business continuity. NVS will replace ARTCC, ATCT and TRACON voice switches and is funded through BLI 2B13.

The Voice Switching and Communications System (VSCS) is the voice switch currently used in ARTCCs. The FAA is upgrading VSCS with a technology refresh to replace components that have a high failure rate until the NVS program can replace the switches. Technology Refresh may continue past 2020 depending on the rate at which NVS switches replace VSCS. The VSCS Training and Backup Switch (VTABS) can maintain critical A/G and ground-to-ground communications if the main communications system becomes inoperable as a result of a power outage, a catastrophic system failure, or during system maintenance or upgrade activities. VSCS is funded through BLI 2A08.

The Digital Audio Legal Recorder (DALR) is the voice recorder that is replacing Digital Voice Recorder Systems (DVRS). These voice recorders provide a legally accepted recording capability for conversations between air traffic controllers, pilots, and ground-based air traffic facilities in all ATC domains and are used in the investigation of accidents and incidents and routine evaluation of ATC operations. DALR is also installed in newly constructed air traffic control towers. The NAS Voice Recorder Program (NVRP) is evaluating alternatives for the next generation of recorders. NVRP is funded through BLI 2B18.

Communications Roadmap (3 of 5)

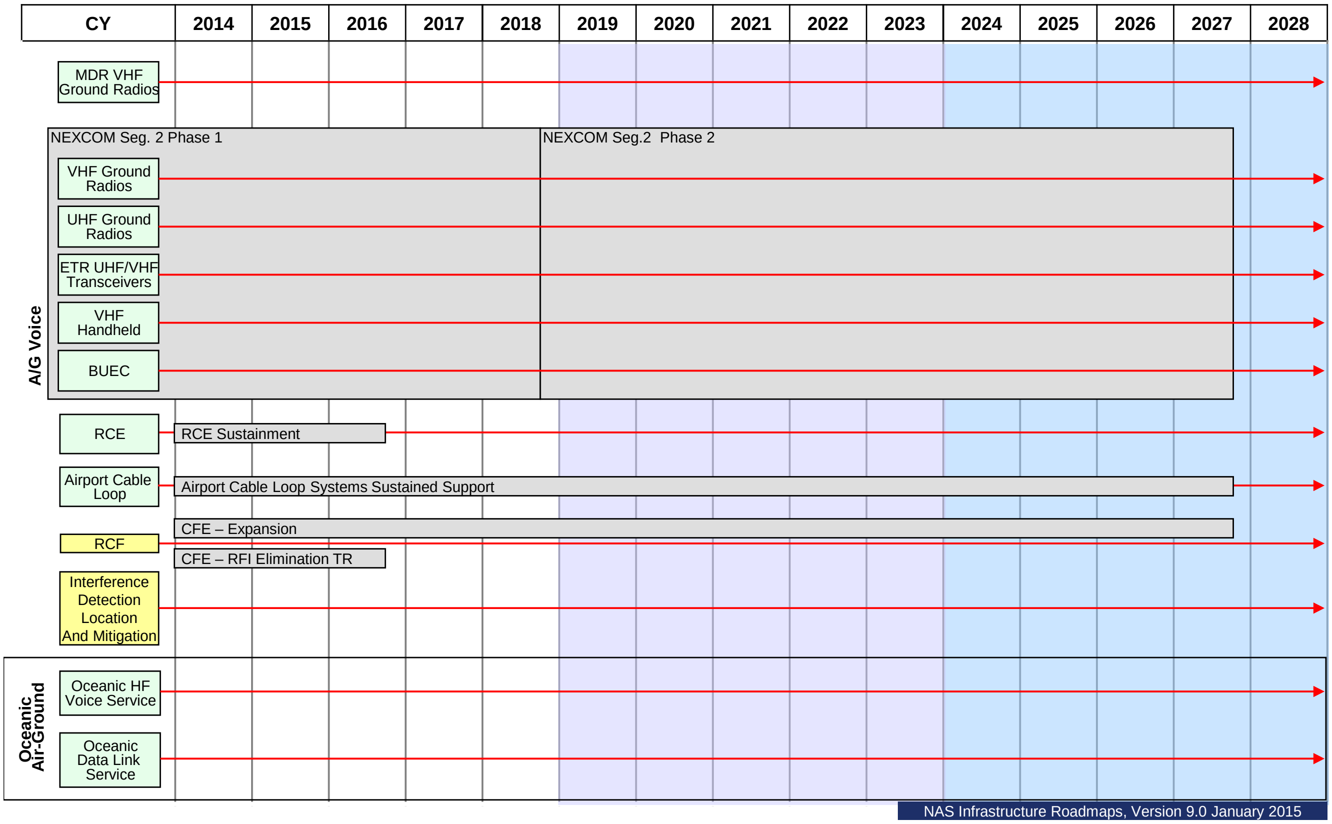

Figure 4-7 Air-to-Ground Voice and Oceanic Communications Roadmap

Figure 4-7 shows the Next Generation Air/Ground Communications (NEXCOM) program is upgrading Very High Frequency (VHF) radios used to communicate with civil aviation and Ultra High Frequency (UHF) radios used by FAA to communicate with military aircraft. The Multimode Digital Radios (MDR) VHF Ground Radios used for high and ultrahigh en route sectors have been replaced and will continue in operation during the timeline of the roadmap. NEXCOM Segment 2 will use a combined contract for both VHF and UHF radios to replace the radios that terminal facilities use. It will also replace emergency backup radios (emergency transmitter replacement (ETR)) that provide service when primary radios are not working. The Back Up Emergency Communication (BUEC) consists of radios installed at remote sites that back-up the primary radios that controllers use. NEXCOM is funded through BLI 2A10.

The Radio Control Equipment (RCE) – Sustainment program modernizes the electronic equipment that allows controllers to control the radios they use at remote sites. RCE is funded through BLI 2A06.

The Airport Cable Loop program replaces the communications cables that control and report the condition of equipment necessary for airport operations such as the Airport Surveillance Radar. FAA is replacing copper wires with fiber optics and adding dual path operations so that a break in the cable does not stop the flow of information. The Airport Cable Loop program is funded through BLI 2E04.

The Communications Facility Expansion (CFE) program enhances operational efficiency and effectiveness by establishing, replacing and upgrading radio equipment at Remote Communication Facilities (RCF) that provide connections to air traffic facilities. The CFE Radio Frequency Interference (RFI) Elimination program installs equipment to eliminate RFI that would affect pilot to controller communication. The programs are funded through BLI 2A06.

The Interference Detection, Location and Mitigation (IDLM) program investigates occurrences of non-FAA transmitters interfering with FAA radios and navigation systems, locates the source, and ensures that they no longer interfere with FAA controlled frequencies. The FAA has specially equipped vehicles that detect and locate the sources of interference.

The last two items on the roadmap are communications systems used for oceanic air traffic control. The first one is the high frequency (HF) radio. HF radio allows the FAA to stay in touch with aircraft that are out of range of VHF radios. Oceanic Satellite Data Link Services is used by equipped aircraft and relies on communications satellites to transfer messages to and from aircraft flying over the oceans.

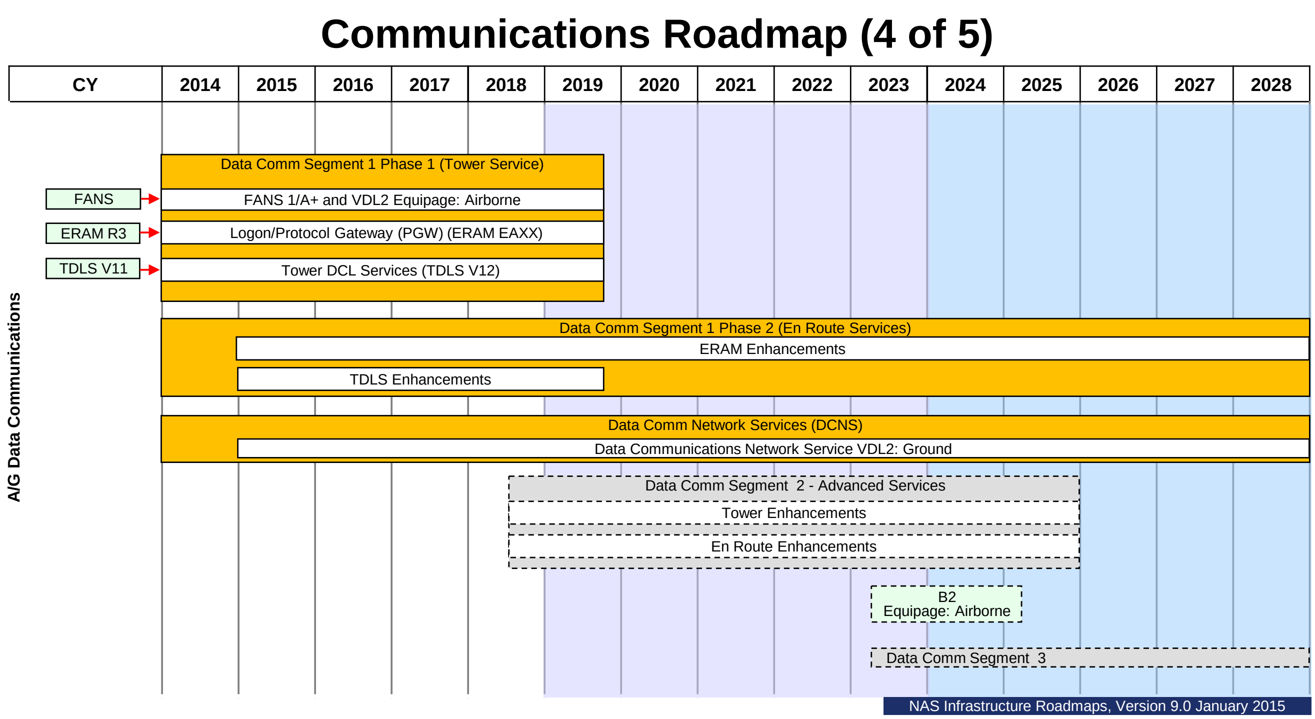

Figure 4-8 Air-to-Ground Data Communications Roadmap

The fourth communications roadmap (figure 4-8) shows the planned addition of data communications services for routine communications between controllers and pilots. Improvements to the NAS will be delivered by Data Comm in two segments.

Data Comm Segment 1 Phase 1 (S1P1) will deliver the initial set of data communications services integrated with automation support tools by deploying an upgraded Terminal Data Link System (TDLS) to deliver the Departure Clearance (DCL) in the Tower domain. Future Air Navigation System (FANS) defines the capabilities used for automated position reporting and satellite data link communications during oceanic operations. Aircraft that are FANS equipped will be able to receive data link messages from ATC facilities. The Logon/Protocol Gateway (PGW) upgrade began development in 2012 to assure security of transmissions to pilots.

Segment 1 Phase 2 (S1P2) will deliver services to the En Route domain in two stages, initial services and full services. 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. Full services will extend the service offerings in En Route domain to include more complex services including tailored arrivals, holding instructions, advisory messages, speeds and headings, beacon codes, stuck microphone, full controller initiated reroutes, full direct-to-fix messages, and full crossing restrictions.

Data Comm Network Services (DCNS) will establish the ground infrastructure necessary to support communication between aircraft and FAA facilities. Data Comm programs are funded through BLI 2A19.

Data Comm Segments 2 and 3 will further enhance services related to the terminal and en route capabilities developed in Segment 1. More advanced services will transmit revised route clearances from en route and terminal ATC automation system to the aircraft's Flight Management System.

B2 Equipage Airborne is the Aeronautical Telecommunications Network Baseline 2 which specifies the aircraft equipage to enable enhanced data communications in en route services leading to full trajectory based operations.

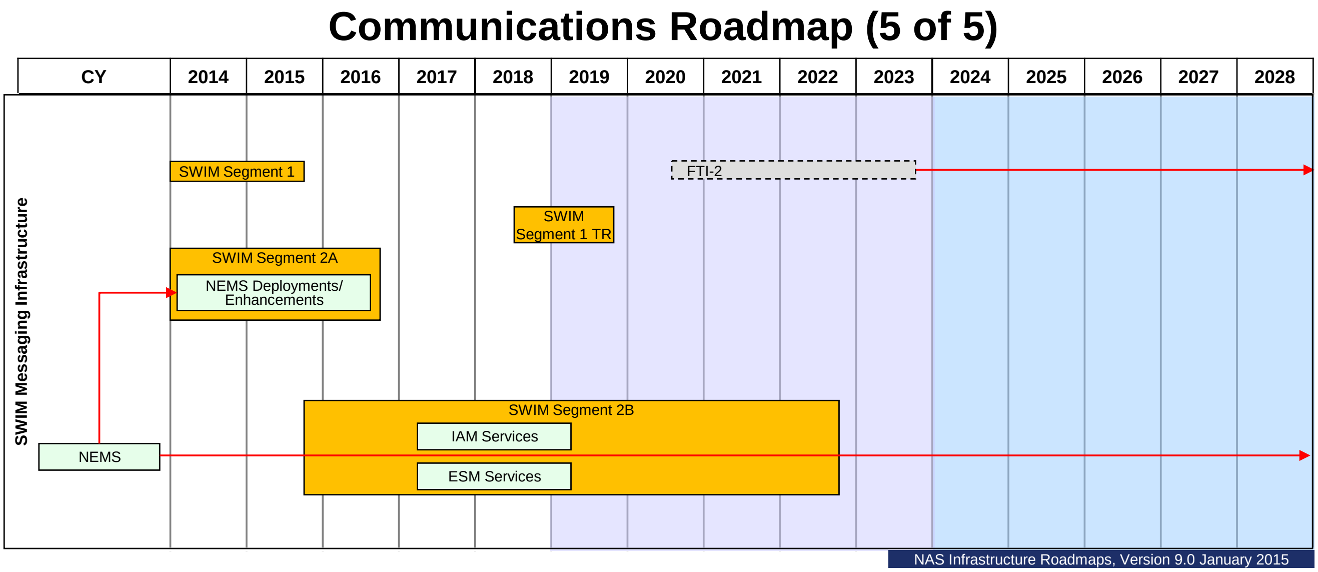

Figure 4-9 Messaging Infrastructure Roadmap

The fifth communications roadmap (figure 4-9) shows the System Wide Information Network (SWIM) components. SWIM is an information system that provides ready connection to many data sources so pilots and traffic managers can take advantage of updated information for more efficient operations.

SWIM segment 1 deployed services to all the ARTCCs, 39 TRACONs and the Command Center. The capabilities include:

- Special Use Airspace automated exchange;
- Integrated Terminal Weather System and Corridor Integrated Weather System data publication;
- Pilot report data publication;
- Reroute data exchange; and
- Terminal traffic, flight data and weather information.

SWIM segment 2A involves the use of the National Enterprise Messaging System (NEMS) to carry the data flows between users and providers. SWIM segment 2B will develop user connection with Identity and Access Management (IAM) and Enterprise Service Monitoring (ESM) services. SWIM programs are funded by BLI 2A11.

4.3 Surveillance Roadmaps

To provide separation services to aircraft, air traffic controllers must have an accurate display of all aircraft under their control. Controller displays use a variety of inputs, including radar and transponder information, to show the location of aircraft. Surveillance data is provided by the following technologies:

- Primary radar – the radar beam is bounced off the aircraft and reflected back to the radar receiver;
- Secondary radar – a reply is generated by the aircraft transponder and sent back to the radar in response to a secondary radar signal. The transponder reply contains the aircraft call sign, altitude, speed and can be processed to determine its position;
- Multilateration – multiple ground sensors receive aircraft electronic signals and triangulate this information to determine aircraft position; and
- ADS-B – the aircraft determines its location using a GPS receiver or other navigation equipment and broadcasts that information to an ADS-B ground station. The ground station relays the position information to automation systems which process the data and send it to controller displays.

En route and terminal facilities normally use Secondary radars (either the Air Traffic Control Beacon Interrogators (ATCBI) or the Mode Select (Mode S)) for traffic separation. Using ATCBI or Mode S enhances the controller's ability to separate traffic because speed and altitude information supplement the position display for each aircraft.

NextGen operational improvements will rely on advanced surveillance capabilities provided by ADS-B and Wide Area Multilateration which will provide more accurate information to controllers and better situational awareness for pilots. See Appendix B for more details on program activities.

Surveillance systems are shown in three different roadmaps:

1. Roadmap 1 (figure 4-10) - En Route Surveillance
2. Roadmap 2 (figure 4-11) - Terminal Surveillance
3. Roadmap 3 (figure 4-12) - Surface, Approach and Cross Domain Surveillance

Surveillance Roadmap (1 of 3)

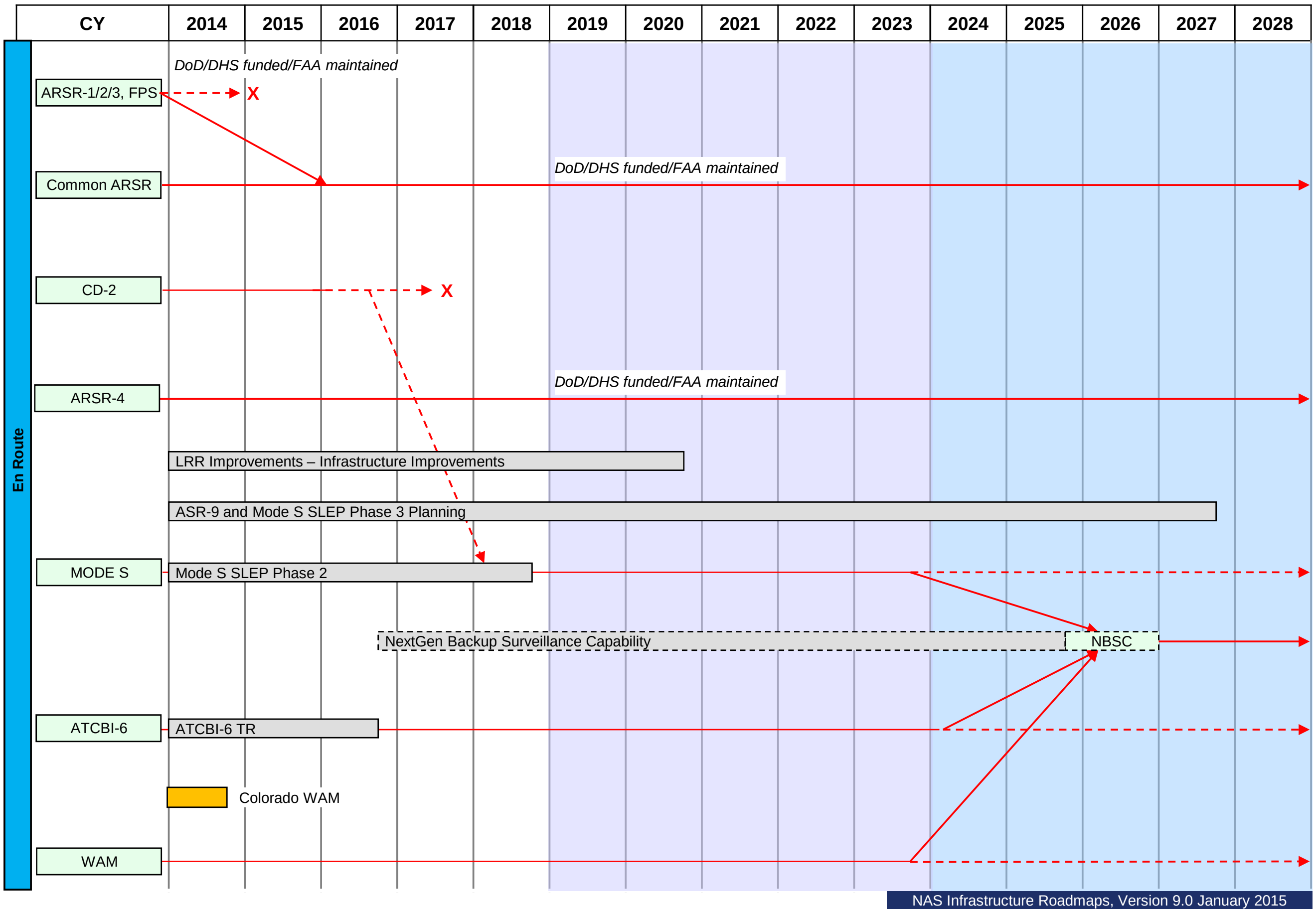

Figure 4-10 En Route Surveillance Roadmap

En route facilities use the Air Route Surveillance Radar (ARSR) model 1, 2, 3 and 4 and the Fixed Position Surveillance (FPS) system as primary radars. The ARSR and FPS radars do not require a cooperative transmission from an aircraft to detect and track its location. The ARSR and FPS have a range exceeding 200 miles. They are "skin-paint" radars (do not require cooperation from the detected aircraft) and transmit high frequency pulses and process the reflected energy to determine aircraft range based on the total time for the signal to reach and return from the target. The direction from the radar is based on the antenna position when the pulse is sent.

Existing early model ASRS 1, 2, 3 and FPS are being converted to the Common ARSR (CARSR) configuration. The existing Common Digitizers (CD-2), which convert analog radar information to a digital format, will not be needed after programs to convert radar information to internet protocols are completed. The Department of Defense will fund system upgrades of the ARSR through 2025 due to national security concerns. ARSR infrastructure upgrades (buildings, power, towers, roads) that support and protect secondary radars used by FAA are funded by the LRR Improvements program through BLI 2A07.

The Mode S SLEP Phase 2 program will implement modifications to the Mode S system to sustain secondary surveillance service through 2028. Mode S SLEP Phase 2 is funded through 2B16A. As part of a continuing effort to maintain the performance of the Mode S systems the ASR-9 and Mode S SLEP Phase 3 Planning program will address additional Mode S obsolescence issues. The SLEP Phase 3 Planning program is funded through BLI 2B16B.

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. ATCBI Model 6 technology refresh is funded through BLI 2A16.

The Next Generation Backup Surveillance Capability (NBSC) is a planned activity to identify and implement a backup surveillance capability for ADS-B which will allow for potential decommissioning of secondary radar systems. An initial investment decision is planned for 2017.

The Colorado Wide Area Multilateration (WAM) system uses electronic transmissions from an aircraft and multilateration technology to detect aircraft position in areas where the radar signal may be unavailable or blocked by mountainous terrain. There are 4 locations in Colorado that are operating the WAM system.

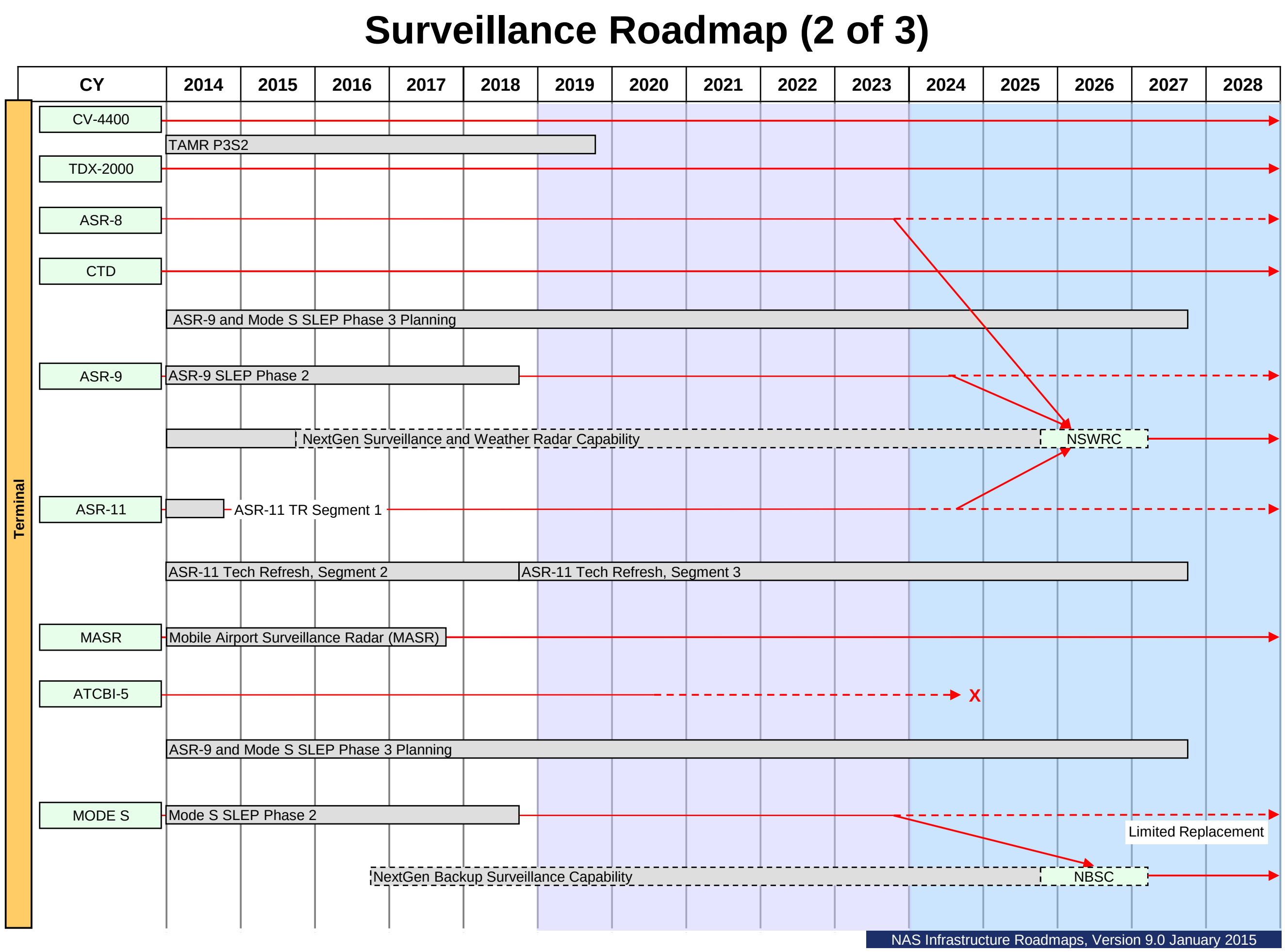

Figure 4-11 Terminal Surveillance Roadmap

The CV-4400 at the top of Figure 4-11 is a legacy system that allows use of terminal radar information in en route automation systems, e.g., using terminal radar to fill gaps in en route radar coverage at selected en route centers. The TDX-2000 is also a legacy system that digitizes the output of analog radars (for example, ASR-8) for use by more modern digital automation systems, such as STARS.

There are three models of terminal radars currently in use. The Airport Surveillance Radar Model 11 (ASR-11) is the newest and has replaced several of the radars that were not replaced by an earlier ASR-9 program. The ASR-9, which serves larger airports, will have a Service Life Extension Programs (SLEP) to update and modernize its components. ASR-9 SLEP and ASR-11 technology refresh programs are funded through BLI 2B10 and 2B11 respectively.

As part of a continuing effort to maintain the performance of the ASR-9 and Mode S systems the ASR-9 and Mode S SLEP Phase 3 Planning program will address additional obsolescence issues. The SLEP Phase 3 Planning program is funded through BLI 2B16B.

The existing ASR-8 is a primary radar system that requires a Common Terminal Digitizer (CTD) be installed to convert analog outputs to digital inputs needed by STARS. As more of the remaining ARTS automation systems are replaced by STARS additional CTDs will need to be installed.

A initial investment decision is planned for 2017 to determine whether to replace existing primary radar (ASR 8, 9, & 11) systems with the NextGen Surveillance and Weather Radar Capability (NSWRC).

The Mobile Airport Surveillance Radar (MASR) is a terminal surveillance radar that can be moved from site to site to support radar relocations, temporary planned outages of an existing radar for installation of upgrades, and emergency operations when existing systems are damaged. MASR is funded through BLI 2B11.

The Next Generation Backup Surveillance Capability (NBSC) is a planned activity to identify and implement a backup surveillance capability for ADS-B which will allow for potential partial decommissioning of secondary radar systems. An initial investment decision is planned for 2017.

Surveillance Roadmap (3 of 3)

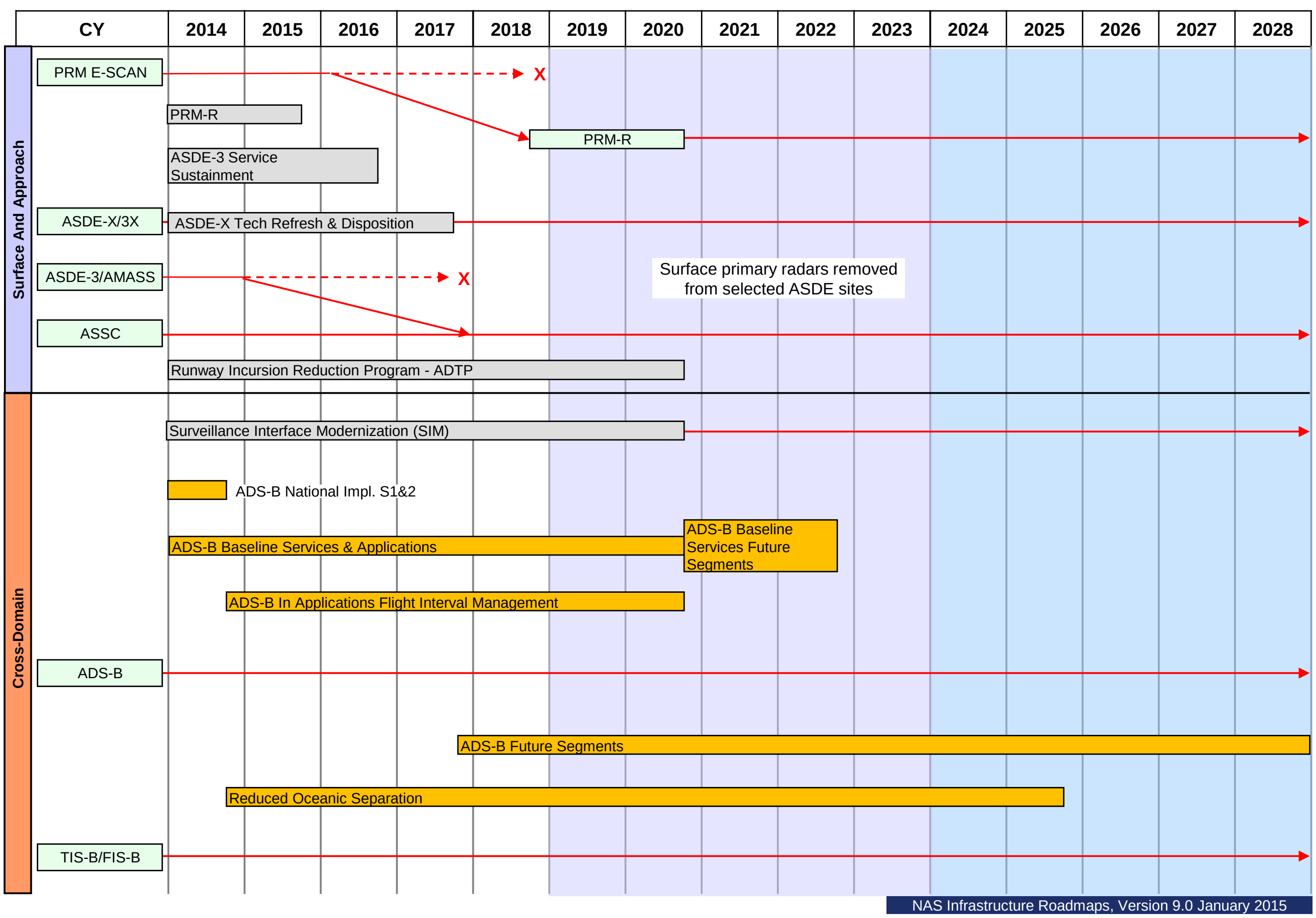

Figure 4-12 Surface, Approach and Cross Domain Surveillance Roadmap

The Precision Runway Monitor (PRM) (figure 4-12) is used to monitor the safety of side-by-side simultaneous approaches to closely spaced parallel runways during IFR conditions. It is a secondary rapid update radar that provides the precision that controllers need to ensure that two aircraft maintain safe clearance between them while approaching closely spaced runways. The electronic scan (E-SCAN) version achieves the rapid update by moving the beam electronically rather than relying on turning the antenna. The FAA Flight Standards organization has determined that required runway separation requirements can be reduced which eliminated the need for PRM at Atlanta (ATL). The PRM at San Francisco (SFO) will be sustained utilizing ATL PRM system assets and will not be replaced.

The FAA uses several systems for tracking aircraft on or near the airport surface. The Airport Surface Detection Equipment Model 3 (ASDE-3) is a primary radar system that provides a display of aircraft and ground vehicles in the airport operating areas (runways and taxiways). The ASDE-X merges primary and secondary radar, multilateration and ADS-B information to improve detection of aircraft and vehicles on or near taxiways and runways. This helps controllers manage aircraft on the ground and warn them of potential runway collisions. ASDE-X has converted 18 of the 35 ASDE-3 sites to ASDE-X which incorporate the existing ASDE-3 radar. Seven ASDE 3 sites have been replaced by ASDE-X. A third system which uses only multilateration is the Airport Surface Surveillance Capability (ASSC), and it will replace nine of the ASDE-3 radars. The ASSC will use multilateration and ADS-B aircraft information to display aircraft location for the airport tower controllers. Controllers use these systems to prevent runway incursions on the airport surface.

ASDE-3 and ASDE-X will have a technology refresh to update some of their components. The technology refresh programs are funded through BLI 2B01. The ASSC program is funded through BLI 2A12.

The Runway Incursion Reduction Program (RIRP) is evaluating other technologies that could be used to track aircraft surface and approach movements. RIRP is funded through BLI 1A01A.

The FAA will begin fielding Surveillance Interface Modernization (SIM) equipment after the Final Investment Decision is approved to replace legacy serial point to point interfaces and implement flexible Internet Protocol (IP) addressable interfaces between FAA radars and automation systems. The SIM IP transmission formats will simplify circuit management, support data security policies, provide higher reporting precision and target information which will reduce life cycle costs, enable efficient distribution of radar data in the NAS and support future FAA operational improvements. SIM is funded through BLI 2B17.

ADS-B implementation supports the NextGen operational improvements that use GPS aircraft position information as the basis for surveillance data provided to controllers. Nationwide implementation of ADS-B enables a more frequent transmission of location and other flight information from the aircraft to air traffic control facilities. ADS-B has a faster update rate (1 second versus 5 seconds for a radar), and unlike radar technology, the accuracy remains constant regardless of the distance from the aircraft to the receiving site. The Traffic Information Service

(TIS-B) broadcasts information on the location of nearby aircraft, and the Flight Information Service (FIS-B) broadcasts weather and airspace information to aircraft that are equipped with the capability to receive it. The Baseline Services and Applications program provides the ADS-B services as provided in the program baseline. Additional applications using ADS-B information will also be developed by the Flight Interval Management program and funded in the ADS-B Future Segments program. Implementation of ADS-B, TIS-B and FIS-B are funded through BLI 2A12. The ADS-B Flight Interval Management program is funded through BLI 1A05A.

The Reduced Oceanic Separation program will address methods to enhance surveillance and communication capabilities to increase the use of 30/30nm separation and potentially reduce separation to 15/15nm in Oceanic Flight Information Regions (FIRs). These improvements to air navigation services would reduce separation minima to allow optimum routing and the capability to create new air routes for increased airspace capacity.

The three Reduced Oceanic Separation alternatives being evaluated:

- promote continued voluntary equipage of Future Air Navigation System (FANS-1/A);
- acquire a space-based Automatic Dependent Surveillance Broadcast (ADS-B Out) service; and
- develop and approve the use of the ADS-B In Pairwise Trajectory Management (PTM) application.

4.4 Navigation Roadmaps

Navigation aids (also called Navaids) can be electronic or visual. En route and terminal electronic aids have traditionally been ground-based radio transmitters that emit signals that pilots, whose aircraft are equipped with related avionics, can use to determine the direction and/or distance from the Navaid. The ground-based system commonly used for en route navigation is the Very High Frequency Omnidirectional Range with Distance Measuring Equipment (VOR with DME). There are more than 1,000 VORs spread across the United States. They define the Victor and Jet airways, which are published routes based on straight lines from VOR to VOR. Aircraft equipped with GPS navigation systems are now able to navigate departure to destination routes without the ground based aids. Visual Navaids are ground based lighting systems that show pilots the path they need to follow during approach and landing.

Navaids have an important role in guiding pilots to a safe landing in low visibility conditions. They support two types of approaches — precision and non-precision. Instrument Landing Systems (ILS) are used for precision approaches and allow pilots to descend to lower minimum altitudes than are possible with non-precision approaches. The minimum altitude also called the decision height is the lowest an aircraft can descend before committing to land, and the pilot must be able to see the runway at that altitude before descending further. Non-precision approaches use Navaids other than ILS and usually only provide lateral guidance, not vertical guidance. The decision height for these approaches is significantly higher than for a precision approach. In addition to the electronic aids used for approach guidance, there are several visual systems that help a pilot see the runway when the aircraft reaches decision height.

Many NextGen OIs rely on improved position information provided by the GPS satellite navigation system. See descriptions in Appendix B which provide more information on program activities.

Navigational aid programs are portrayed in two different roadmaps:

1. Roadmap 1 (figure 4-13) - Precision Approach/Surface Navigation and Safety and Enhancements
2. Roadmap 2 (figure 4-14) - Infrastructure and En Route/ Terminal/Non-Precision Approach

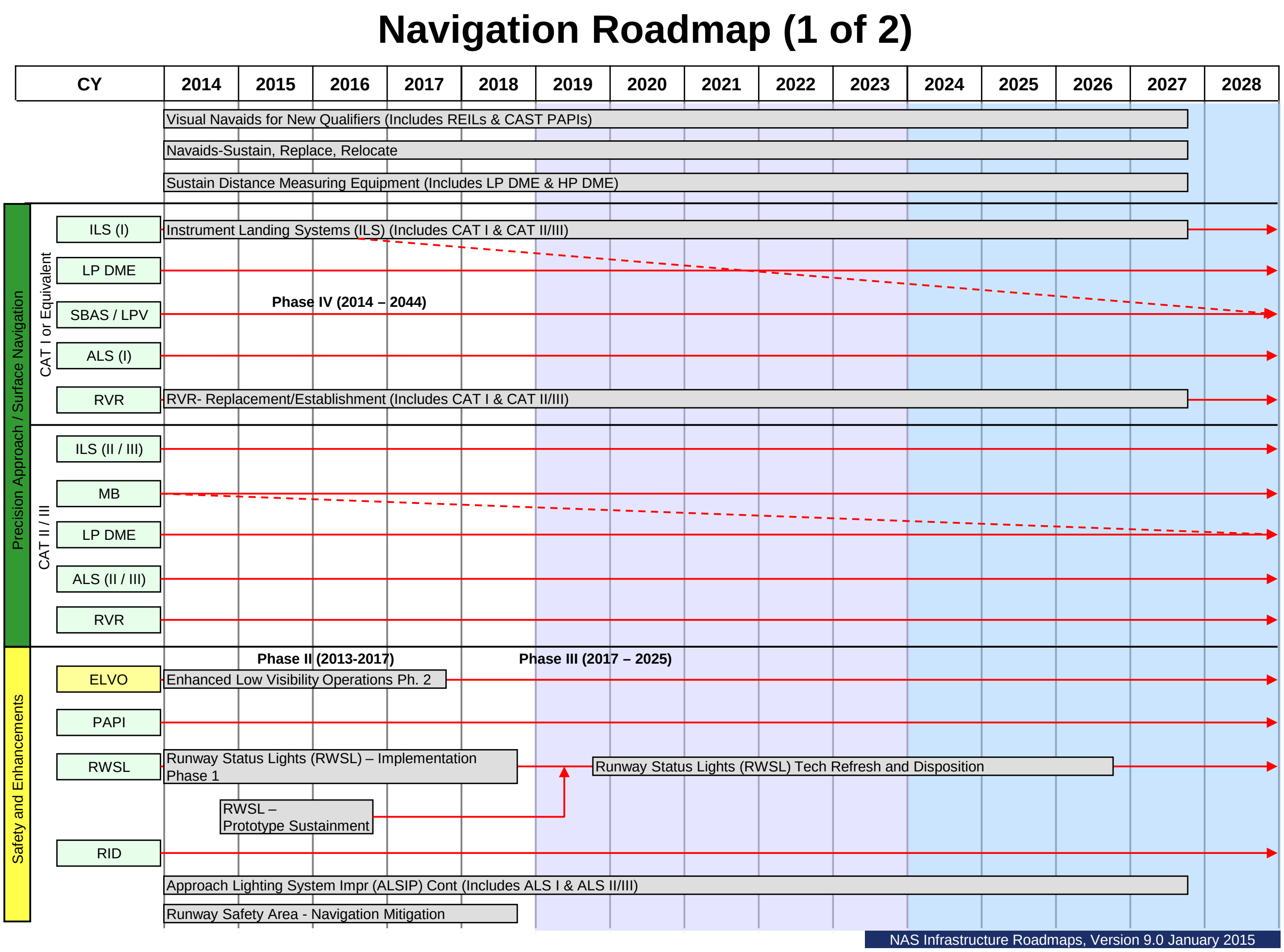

Figure 4-13 Precision Approach, Surface Navigation and Safety & Enhancements Roadmap

At the top of the roadmap, figure 4-13, are 3 programs that support the continued operation of existing systems. Visual Navaids assist pilots in staying on the proper glide path to a runway. The Visual Navaids for New Qualifiers and the Navaids-Sustain, Replace, Relocate programs update, replace and augment the existing inventory of navigational aids. The Sustain Distance Measuring Equipment (DME) program both renovates and increases the number of low power

(LP) and high power (HP) DMEs. Visual Navaids, navigation aids and DMEs are funded through BLIs 2D06, 2D07 and 2D09.

The current most widely used precision landing aids are ILS that guide pilots to runway ends using a pair of radio beams—one for lateral guidance and the other for vertical guidance—to define the approach glidepath, so that pilots can follow it to the runway using cockpit instrumentation. The ILS program also funds the purchase of Approach Lighting Systems with Sequenced Flashing lights (ALSF) and Medium-intensity Approach Light Systems with Runway alignment indicator lights (MALSR). These approach lighting systems must be installed at the end of a runway for an aircraft to descend to the designated minimums for Category I, II, or III ILS landings. Category I is the most commonly available precision approach. It guides the pilot to the runway end, but it typically requires that the pilot be able to see the runway when the aircraft is no less than 200 feet above the field elevation, and the horizontal visibility is one-half mile or more. The Category II and III approaches allow aircraft to descend to lower minimums (i.e., less vertical and horizontal visibility is required). Category II and III ILS have higher redundancy and reliability levels that reduce the risk of equipment failures. There are more than 1,200 ILSs installed in the United States. The ILS program provides for the replacement of aging ILS systems and new installations when new runways are commissioned. ILSs are funded through BLI 2D02.

The LP DME is being installed to replace marker beacons and support advanced procedures requiring performance based navigation equipage. Specially trained pilots can use these procedures to minimize the length of approach. LP DMEs installations are funded through BLI 2D06.

The Space Based Augmentation System (SBAS) is implemented by the Wide Area Augmentation System (WAAS) that uses a network of 38 ground monitors to calculate corrections to the GPS signals and broadcast those corrections from geostationary (GEO) satellites. WAAS-equipped aircraft can use the information to fly a precision approach to a runway in low-visibility conditions. There are more than 4,100 WAAS Localizer Performance with Vertical Guidance (LPV) and Localizer Performance (LP) based precision approaches in place as of January 2015. As SBAS comes into broader use, the FAA can consider decommissioning ILS, and plans to make an initial decision in 2016 on the drawdown of Category I ILS. WAAS is funded through BLI 2D03.

In both Category I and II/III sections of the roadmap, the Approach Light System (ALS) and the Runway Visual Range (RVR) systems are shown. The ALS helps the pilot see the end of the runway and transition from instrument to visual flight for landing before reaching runway minimums. The RVR informs the tower of the measured visibility so that controllers can inform the pilot whether the runway visibility is above or below minimums. In the Category II section the existing MB (Marker Beacon) installations are being evaluated to determine how many can be replaced by LP DMEs. The FAA is also testing use of light-emitting diodes (LED) to replace the incandescent lamps currently in use in ALS to reduce both maintenance and operating costs. The approach lights and visibility sensors will need to be sustained and remain in operation for precision approach guidance regardless of any decision on decommissioning ILSs. ALSs, RVRs and other approaching lighting systems are funded through BLI 2D04 and 2D05.

The Safety and Enhancements section of the roadmap shows several systems designed to assist pilots to operate safely in low visibility conditions. They are:

- Enhanced Low Visibility Operations (ELVO) – allows pilots to land with more limited visibility conditions than standard procedures. Additional RVRs to support this capability are funded through BLI 2D04;
- Precision Approach Path Indicator (PAPI) – allows pilots to determine visually that they are on the proper glideslope for landing. They are funded through BLI 2D10;
- Runway Status Lights (RWSL) – are designed to give pilots a stop signal if it is dangerous to enter or cross a runway, funded through BLI 2B12;
- Runway Incursion Device (RID) – is a system in the tower that alerts controllers when a runway is occupied;
- Airport Lighting System Improvement Program (ALSIP) – a response to the National Transportation Safety Board recommendation to replace steel airport light supports with frangible structures to minimize damage to aircraft that descend below the glidepath, funded through BLI 2D05; and
- Runway Safety Area (RSA) – a program to replace structures in the safety area surrounding a runway with low-impact supports to minimize damage to aircraft that veer off the runway, funded through BLI 2D12.

Navigation Roadmap (2 of 2)

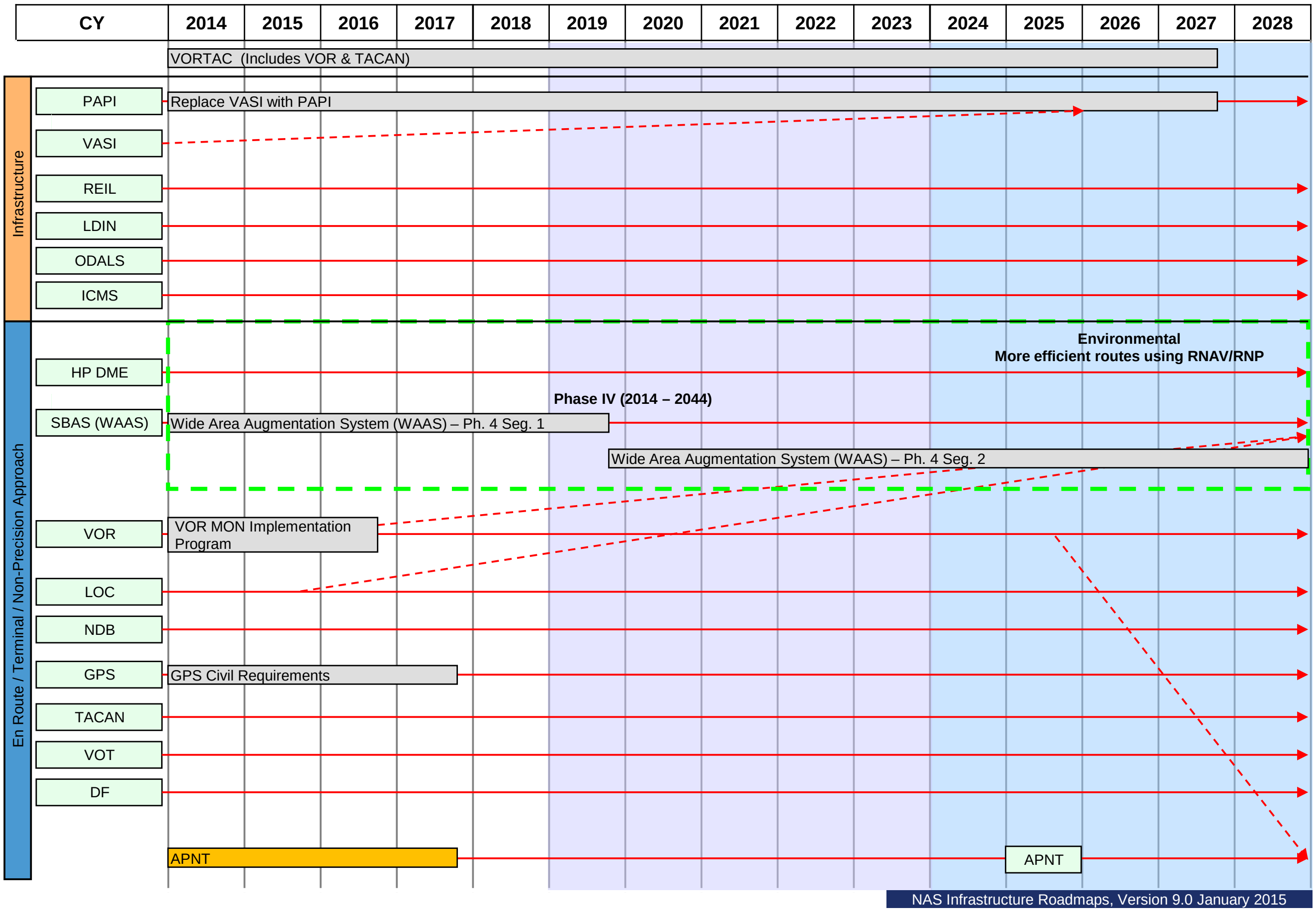

Figure 4-14 Infrastructure and En Route, Terminal and Non-Precision Approach Roadmap

The VORTAC program at the top of the roadmap (Figure 4-14) shows that combined Very High Frequency Omnidirectional Range (VOR) and Tactical Navigation System (TACAN) sites will be supported indefinitely based on the need to retain them. TACAN is the military equivalent of combined VOR and DME systems. VORTAC is a site with a VOR and TACAN co-located, and the VOR uses the TACAN for DME information. The VORTAC program is funded through BLI 2D01A.

There are also two visual systems which are used to confirm that the aircraft is on the proper glide path for a safe landing. Vertical Approach Slope Indicator (VASI) systems are being replaced by Precision Approach Path Indicator (PAPI) systems to meet international standards. The replacement program will be continued until the PAPI replaces all of the current VASI systems, at a time well into the future. The Replace VASI with PAPI program is funded through 2D10.

The Runway End Identification Lights (REIL) help pilots to visually align with the runway for both precision and non-precision approaches. The REIL will continue operating throughout the roadmap timeframe. The LDIN (Lead In Light System) and the ODALS (Omnidirectional Airport Lighting System) are installed at the end of runways to help pilots determine the active runway for landing. The Interlock Control and Monitoring System (ICMS) lets controllers rapidly activate and deactivate the navigational aids at an airport.

HP DME supports navigation for both en route and terminal operations. HP DME installations are funded through BLI 2D06. Analysis is being performed by the NextGen Navigation Engineering program to determine the DME expansion needed to support RNAV and NAS-wide Performance Based Navigation (PBN). NextGen Navigation Engineering is funded through BLI 1A10D.

The Space Based Augmentation System (SBAS) also called the Wide Area Augmentation System (WAAS) uses a network of 38 ground monitors to calculate corrections to the GPS signals and broadcast those corrections from GEO satellites. The FAA has more than 5,900 Lateral Navigation (LNAV) GPS-WAAS non-precision approach procedures in place. WAAS is funded through BLI 2D03.

As GPS replaces the VOR as a navigation aid, FAA will decrease the number of VORs to a Minimum Operational Network (MON). The MON will serve as a backup for GPS and will be available for those aircraft that have not equipped with GPS navigation systems. The VOR MON program is funded through BLI 2D01B.

The Localizer (LOC) is an ILS component that provides horizontal guidance to a runway end. When used as a stand-alone system without a Glideslope component, the LOC supports non-precision approach operations; SBAS (WAAS) will begin to replace that functionality at airports where only localizers are installed.

The FAA will continue operating Non-Directional Beacons (NDB), because NDBs are still used at some remote areas, where it is not economically justified to install modern navigational equipment.

The Department of Defense operates GPS. There are typically 24 to 30 active satellites in orbit, and a navigation receiver can determine an aircraft's position by interpreting the data transmitted by the satellites in view of the aircraft's antenna. Two GPS upgrades are expected in future years. The next generation of satellites will have a second frequency (L5) for civilian safety-of-life use. An aircraft receiver that receives both the existing L1 signal and the new L5 signal can internally calculate corrections that enhance the accuracy of the position calculation and eliminate the errors caused by ionospheric distortion. The GPS III family of satellites will be upgraded with an additional civil signal (L1C) and increased transmitting power. The GPS Civil Requirements BLI 2D11 will fund the ground monitoring stations to measure the accuracy and reliability of the new civil frequencies.

The VOT (VOR Test Range) is used to check and calibrate VOR receivers in aircraft. The Direction Finder (DF) was used to help locate lost pilots, but it is being decommissioned because better technology is now available.

The Alternate Positioning Navigation and Timing System (APNT) is a program to determine the appropriate back up navigation system in case GPS service is disrupted. It is a NextGen initiative to ensure continuity of service if GPS is disrupted. If it is successful as a backup, the VORs not identified as necessary for the MON may be decommissioned. The APNT program is funded through BLI 1A05.

4.5 Weather Roadmaps

Timely and accurate weather observations and forecasts are essential to aviation safety and for making the best use of aviation capacity. Weather information will be even more important when NextGen direct or user chosen trajectory routing becomes routine. Pilots need to know the direction and speed of winds aloft so that they can take advantage of tailwinds and minimize the effect of headwinds. They also need to know if there will be obstructions to visibility that restrict landings at their destination airport, and whether the runway is wet or dry and how that will affect braking action. Traffic flow managers and pilots use weather observations and forecasts to determine when they need to plan alternative routes to avoid severe weather. Pilots must avoid thunderstorms with hail and heavy rain, turbulence, and icing to avoid damage to the aircraft and the potential for injuring passengers. The FAA has a lead role in collecting and distributing aviation weather data – particularly hazardous weather. The FAA distributes weather hazard information from its own systems and uses both the FAA and National Weather Service (NWS) computer forecast models based on data available from FAA and NWS sensors to develop forecasts for use by air traffic control facilities, pilots, airline operations centers, and other aviation-related facilities.

NextGen operational improvements will rely on improved access to weather information provided by Common Support Services – Weather (CSS - Wx) and better weather processing and forecasting provided by NextGen Weather Processor (NWP).

Weather sensors include weather radars and surface observation systems that measure atmospheric parameters, such as surface temperature, prevailing wind speed and direction, relative humidity, and cloud bases and tops, as well as wind shear and microbursts. These weather sensors provide real-time information to air traffic facilities and to centralized weather-forecasting models.

Weather processing/dissemination/ display systems organize and process the sensor’s observed data. Data from multiple sensors feed forecast models whose output can be disseminated and integrated in national and local processing and display systems that interpret broad weather trends affecting aviation operations. This information can then be sent to air traffic controllers, traffic flow managers, dispatchers, and pilots.

Weather system implementation is broken down into two different roadmaps:

1. Roadmap 1 (figure 4-15) - Weather Sensors
2. Roadmap 2 (figure 4-16) - Weather Dissemination, Processing, and Display

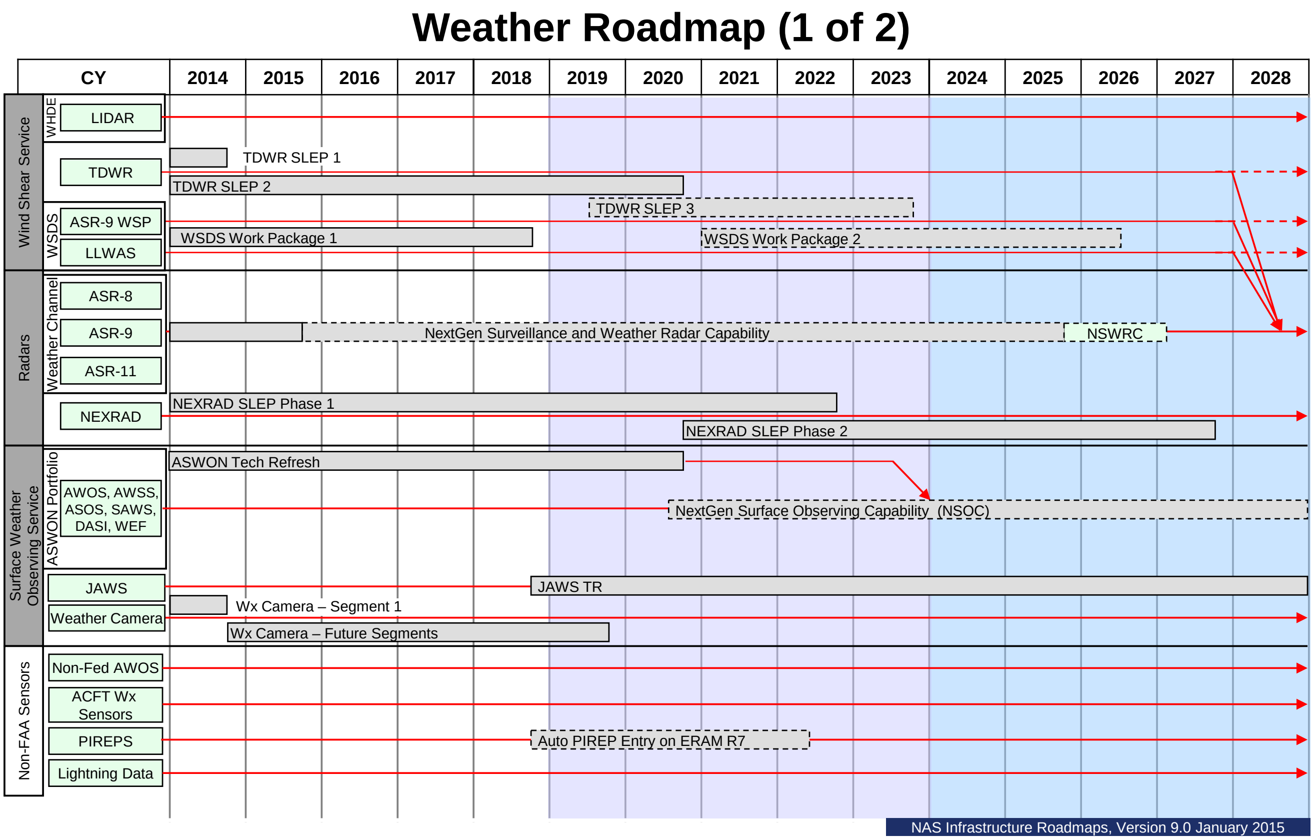

Figure 4-15 Weather Sensors Roadmap

Figure 4-15 shows the Wind Shear Services (WSS) portfolio which includes:

- Light Detection and Ranging (LIDAR) system;
- Terminal Doppler Weather Radar (TDWR);
- Airport Surveillance Radar-9 (ASR-9) Wind Shear Processor (WSP); and
- Low Level Wind Shear Alerting System (LLWAS).

The LIDAR system uses lasers to detect dry microbursts and gust fronts that radar systems may not detect. Evaluation of LIDAR is underway at airports located in dry high plains or mountain environments, where wind shear is not always accompanied by sufficient precipitation for the TDWR to detect it with 90 percent reliability.

TDWR, ASR-9 radars, wind sensors and lasers are used to detect wind shear conditions near the runways and approach areas of airports. TDWR is installed at 46 airports and detects wind shear and microbursts, so controllers can warn pilots of these hazards as they approach the runways and begin landing procedures. TDWR is the most sophisticated wind shear detection system. Using Doppler technology, the radars can detect the rapid changes in wind speed and direction that indicate existence of wind shear hazards for an aircraft approaching or departing a runway. Airports with significant wind shear risk that have a lower volume of air traffic are served by the ASR-9 WSP, a lower cost alternative to TDWR. The ASR-9 WSP processes weather from the two dimensional Doppler search radar signals, which are its standard format to detect wind shear which approximates the output of the TDWR.

LLWAS consists of wind sensors located at 6 to 29 points around the runway thresholds to measure surface wind direction and velocity. The LLWAS computer systems compare the wind velocity and direction detected by these sensors at different locations to determine whether wind shear events are occurring at or near the runways. The sensors measure surface winds and do not detect wind shear above the surface in the approach or departure paths. LLWAS serves airports that may also have a TDWR or ASR-9 because the system supplements the weather radars with point-specific wind measurements to verify the presence and location of wind shear.

The Wind Shear Detection Services (WSDS) Work Package 1 program will provide for modernization of the ASR-9 WSP and LLWAS. The Wind Shear Detection Portfolio is funded through BLI 2A13. The TDWR service life extension program is funded through BLI 2B02.

The ASR-8/9/11 Weather Channel and the Next Generation Weather Radar (NEXRAD) detect precipitation, wind, and thunderstorms that affect aircraft in flight. Replacing the weather information that the ASR-8/9 radars generate will be necessary if these radars are decommissioned. The FAA is evaluating the potential to combine these functions into a NextGen Surveillance and Weather Radar Capability (NSWRC) if the business case shows that solution to be viable.

Development of NEXRAD occurred under a joint program run by the Department of Commerce's National Weather Service, Department of Defense, and FAA. NEXRAD systems are Doppler weather radars that detect and produce over 100 different long-range and high-altitude weather observations and products, including areas of precipitation, winds, thunderstorms, turbulence, and icing. The NEXRAD radars are essential for forecasting future weather. A cooperative program with the partner agencies will upgrade the NEXRAD radars with a Service Life Extension Program (SLEP) to modernize and renovate the existing system of radars. The NEXRAD SLEP Phase 1 program is funded through 2A03.

The Automated Surface Weather Observation Network (ASWON) Portfolio includes several surface sensors (AWOS/ASOS/AWSS/SAWS/DASI/WEF) that measure weather parameters on the surface and report conditions to air traffic facilities and pilots. The data collected is important to pilots and dispatchers as they prepare and file flight plans, and it is vital for weather forecasting. The Automated Surface Observing Systems (ASOS) and other variants (such as the Automated Weather Observing System (AWOS); the Automated Weather Sensor Systems (AWSS); and the Stand Alone Weather Sensing (SAWS) system) have up to 14 sensors that measure weather data, including temperature, barometric pressure, humidity, type and amount of precipitation, and cloud bases and amount of sky cover. The Digital Altimeter Setting Indicator (DASI) shows tower controllers the current barometric pressure, so they can inform pilots of the proper aircraft altimeter setting so it will display the correct ground elevation of the runway at touchdown. The Wind Equipment F-400 Series (WEF) determine and display the wind direction and velocity on the runways. These systems feed data directly to air traffic control facilities and support automated broadcast of weather information to pilots. They also provide regular updates for the forecast models that predict future weather conditions including adverse weather. These systems will remain in operation until a decision is made to implement the NextGen Surface Observing Capability. The ASWON Technology Refresh program will provide upgrades and replacements needed to address obsolescence, supportability, and maintainability issues. The ASWON Portfolio is funded through BLI 2C01.

The Juneau Airport Weather System (JAWS) is unique to Juneau, Alaska. It uses mountain-peak wind sensors located around Juneau to provide wind hazard information to the Flight Service Station and Alaska Airlines to improve the safety of aircraft arriving at and departing the airport. The Technology Refresh program will provide upgrades and replacements needed to address obsolescence, supportability and maintainability issues. The JAWS program is funded through BLI 2A13.

The Weather Camera program installed cameras along flight routes in Alaska and at airports, so pilots have a visual picture of the weather they might encounter as they file their flight plans for a specific route. Flights can be cancelled if the cameras show poor weather along the planned route or at the destination. The Weather Camera program will replace cameras as they fail or reach end of life. The program is funded through 2C04.

The non-FAA sensors shown at the bottom of the roadmap are sources of weather information that improve FAA's overall knowledge of weather conditions. Some states and smaller airports operate AWOS for weather observations. Inputs from these systems provide supplemental data to FAA sensors. Aircraft weather sensors can provide humidity, wind speed and atmospheric pressure readings that are helpful in forecasting weather conditions. Pilot Reports (PIREPS) provide real time reports on the weather along major flight routes. A planned activity would enhance ERAM to allow automatic entry of pilot reports. Lightning Data systems provide air traffic facilities important information about the location and intensity of thunderstorms.

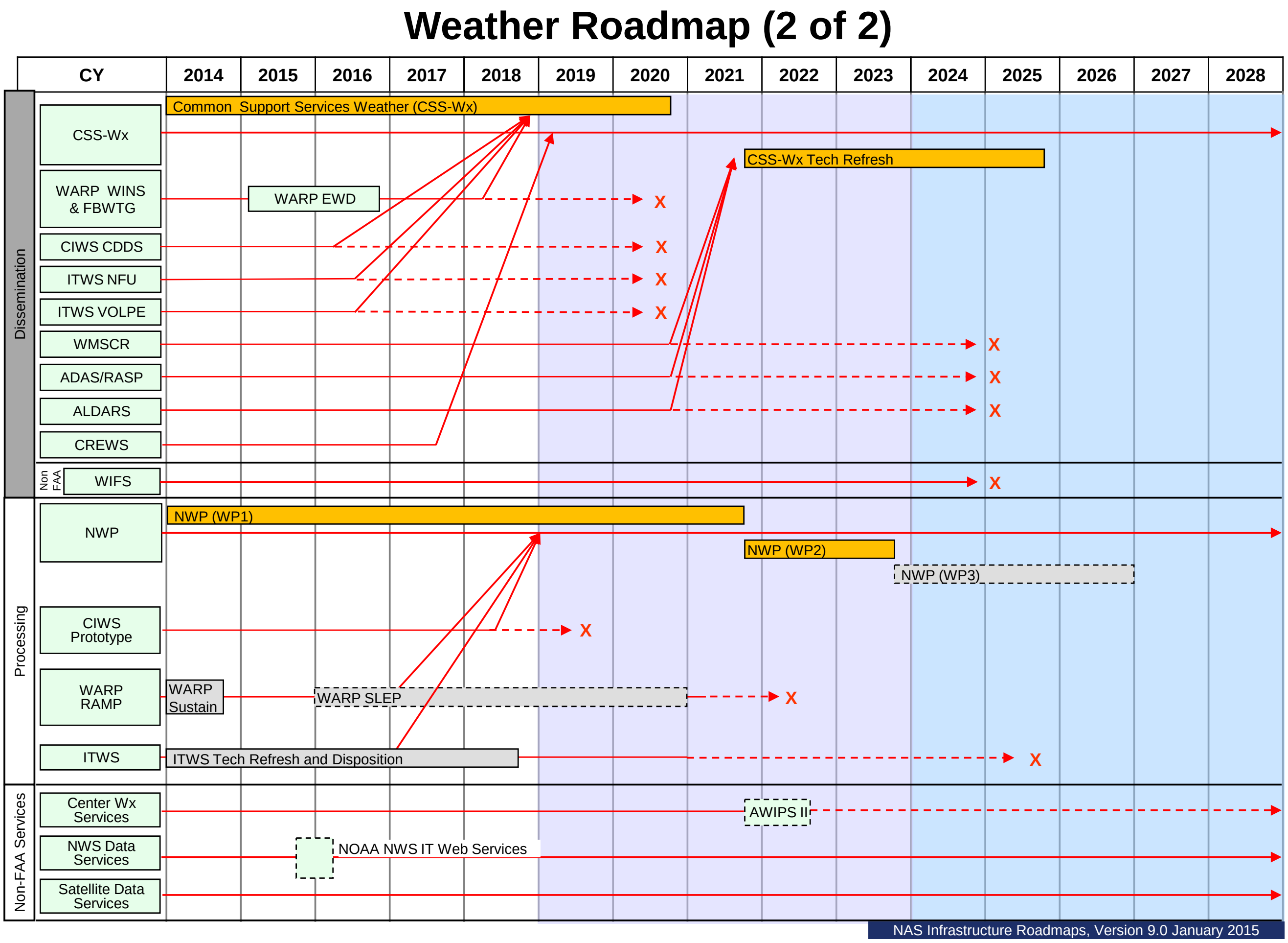

Figure 4-16 Weather Dissemination, Processing and Display Roadmap

Figure 4-16 shows the Common Support Services – Weather (CSS - Wx) which will be the source for weather information and it will provide access to all users throughout the NAS. Supported by the SWIM program, this capability is planned to be operational in 2019. The CCS-Wx program is funded through BLI 2A11B.

The Weather and Radar Processor Weather Information Network Server (WARP WINS) processes and stores data from multiple NEXRAD radars for use by en route control facilities. The information is used by the Center Weather Service Unit to develop forecasts. WARP also provides NEXRAD precipitation intensity data to controllers' displays. The WARP FAA Bulk Weather Communications Gateway (FBWTG) provides NWS data to the center weather service units to aid in their forecast of weather conditions in the center's airspace. The roadmap shows that WARP will be upgraded with an Enhanced WINS distribution (WARP EWD) before the WARP functions are incorporated in CSS – Wx.

The Corridor Integrated Weather System (CIWS) gathers weather information along the busiest air traffic corridors to help air traffic specialists select the most efficient routes when they must divert traffic to avoid severe weather conditions. The CIWS Data Distribution System (CDDS) program enabled the existing CIWS system to distribute data to external NAS users so traffic management participants have the same information for daily route planning.

The Integrated Terminal Weather System (ITWS) consolidates weather information from automated sensors and surrounding radars (TDWR and NEXRAD) to provide real-time weather information for terminal control facilities. The system also projects movement of thunderstorms and gust fronts up to 20 minutes into the future. ITWS has been installed at 23 airports. Tower and Terminal Radar Approach Control (TRACON) controllers use the information to make more precise estimates of when runways should be closed and subsequently reopened. They also use the information to plan for a switch in terminal arrival patterns to avoid inefficient maneuvering to accommodate runway changes. The ITWS will have two enhancements. The National Weather Service Filter Unit (ITWS NFU) will send data collected by FAA to the National Weather Service to use for weather forecasting. The ITWS Volpe will establish an internet connection to the ITWS weather data for external users. After 2018, ITWS NFU and ITWS Volpe data collection functions will be incorporated into the CSS-Wx.

The ITWS systems installed at towers and TRACONs will receive a technical refresh and may be merged with NextGen Weather Processor (NWP). ITWS is funded through BLI 2B19.

The FAA-operated Weather Message Switching Center Replacement (WMSCR) is a network with distribution nodes in Salt Lake City and Atlanta that collects and distributes nationwide weather information. The FAA will integrate WMSCR functionality into the CSS-Wx for weather information distribution.

The Automated Weather Observation System (AWOS) Data Acquisition System/Regional ADAS Service Processor (ADAS/RASP) is a communications link that transmits AWOS/ASOS/AWSS data to air traffic facilities. ADAS also correlates cloud-to-ground lightning strike information to AWOS/ASOS/AWSS data to better determine the location of nearby thunderstorm activity.

The Automated Lightning Detection and Reporting System (ALDARS) will become part of the CSS-Wx in 2021 and its information will be consolidated with other weather inputs.

The Center/TRACON automation system (CTAS) Remote Weather System (CREWS) collects data to help en route and terminal facility controllers coordinate the flows of air traffic into busy terminal facilities. Decisions on its future will be made in 2017.

The World Area Forecast System (WAFS) Internet File Service (WIFS) is a commercial service that provides weather information to support global flight operations.

The NextGen Weather Processor (NWP) will process the weather information collected on CSS-Wx and take over the processing functions of the existing Weather and Radar Processing (WARP), CIWS and ITWS systems. The NWP program will enhance the display of weather information by using new algorithms to portray icing conditions, turbulence, and other hazards. Further upgrades of weather-predicting algorithms will also be added to include Wind Shear/Microburst and Wake Vortex Detection and prediction advisories. The WARP Radar and

Mosaic Processor (RAMP) processes weather data and will remain in service until their functions can be incorporated in NextGen systems. The NWP program is funded through BLI 2A17.

The non-FAA services provide data from the NWS ground and satellite sensors to FAA for use by the NWS meteorologist who interpret and forecast weather at the FAA en route centers.

Center Weather, NWS Data and Satellite Data Services comprise a distributed “virtual” database that will receive weather data directly from sensors, NWS, National Oceanic and Atmospheric Administration (NOAA) and other sources and, either automatically or by request, send data to FAA facilities and users so that observations and forecasts can be more widely and consistently distributed via network-enabled communications. Decision support tools will use this weather information to assist users in understanding weather constraints and taking actions to reduce risk for aviation operations. Integration of these services into the NAS is funded through the CSS-Wx program as part of the SWIM BLI 2A11.

4.6 Facilities

The Air Traffic Organization maintains and operates thousands of staffed and unstaffed operational facilities that must regularly be upgraded and modernized. The largest facilities are the 21 en route centers, that house hundreds of employees and the equipment they use to control aircraft flying in the en route airspace. The other operational facilities with significant staffing are the more than 500 towers and 167 TRACON facilities that control arrival and departure traffic to and from airports.

There are more than 16,000 unstaffed facilities—many in very remote locations—sheltering communications, navigation, surveillance equipment and weather sensors. Much of this equipment is housed in buildings that need renovation. Many have deteriorating steel towers and foundations. Some newer unstaffed buildings and structures frequently need renovation because they are in remote and/or hazardous locations near the ocean or on mountaintops. Replacing roofing, electric power generators, heating/cooling, and structural and security components of these structures is essential to successful operation of the NAS. Modernization of unstaffed facilities is funded through BLI 2E02.

The William J. Hughes Technical Center (WJHTC) in Atlantic City, NJ, and the Mike Monroney Aeronautical Center (MMAC) in Oklahoma City, OK, each have many buildings. Each year, these complexes receive funds to both upgrade and replace infrastructure, and to improve and modernize buildings to support training, logistics, research, and management functions. The MMAC operates under a lease from the Oklahoma City Airport Trust, and funds are requested to pay the annual lease costs. The MMAC also receives funding for building renovation and updated infrastructure. The WJHTC supports research programs to determine the feasibility of NextGen concepts, and it also supports the testing of new equipment that will be installed in the NAS. The FAA has requested funding for 2016 and beyond to upgrade buildings and supporting infrastructure, such as roads. Annual funding is provided to reconfigure the research laboratories to accommodate acceptance testing for new equipment and to test modifications to existing equipment. The WJHTC is funded through BLI 1A02, 1A03 and 1A04. The MMAC is funded through BLI 3B01 and 4A04.

The Terminal Air Traffic Control Facilities – Replace program includes funding for replacement of existing air traffic control towers (ATCT) and TRACON facilities. Projects are funded in five segments and are scheduled based on FAA priorities. 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. Funding is allocated to the segments based on FAA priorities while maintaining the overall 5 year funding estimates for the program. The program also includes the project to replace the New York TRACON on Long Island. The existing N90 facility is old, does not meet operational requirements and needs to be replaced. FAA is currently acquiring real estate and conducting site preparation for the new facility. This program is funded through BLI 2B06.

The Terminal Air Traffic Control Facilities – Modernize program renovates or replaces specific exterior or interior components of existing towers, such as elevators, heating ventilation and cooling equipment, roofs, or other infrastructure that the FAA must upgrade to keep towers functioning. ATCT/TRACON modernization program is funded through BLI 2B07.

The FAA upgrades and improves Air Route Traffic Control Center (ARTCC) facilities by replacing heating and cooling systems, upgrading electrical power distribution systems, and providing other facility needs to meet mission requirements. ARTCC modernization program is funded through BLI 2A04.

5 Conclusion

The capital investment plan contains an annual summary of the ongoing planning to modernize and expand the air traffic control and supporting systems over the next five years. It balances planned improvements between modernizing and upgrading legacy facilities and equipment and investing in the future capabilities of NextGen. That balance is necessary to ensure reliable and safe operation of the NAS while the NextGen operational improvements are implemented. Investment in legacy equipment, facilities and information technology systems cannot be suspended, because these systems must continue to provide services during and, in many cases, after the transition. Computer systems and other technology that FAA currently uses for air traffic control continue to face obsolescence issues. As legacy systems age, reliability becomes an issue and they face the additional problem of not being repairable because manufacturers no longer produce replacement parts.

The capital investment plan draws on several layers of planning integral to building the system of the future. System engineers develop a concept of operations and projected operational improvements to air traffic control consistent with the FAA's Strategic Priorities. As part of that process, functional requirements are developed to design a system architecture that supports operational improvements and NextGen concepts. The next step is determining how fast modernization can proceed by evaluating the financial resources available to build the systems shown in the NAS Enterprise Architecture. The complex equipment necessary to support operational improvements takes time to develop, build, install, and test to ensure it will operate error free. In addition, allowing adequate time to train controllers in the use of the new equipment and procedures is critical to successful implementation.

FAA has completed a significant level of development work that supports progress in implementing NextGen operational improvements. These improved methods of operation have reached the point where aviation users can take advantage of them. FAA has collaborated with industry through the NextGen Advisory Committee to develop a plan to implement high-priority NextGen capabilities that are projected to produce significant near-term benefits. These programs are:

- Increased use of wake categorization and other improvements for dual and independent parallel runway operations at 28 locations nationwide;
- Improving air traffic flow in major metropolitan areas by deploying Performance Based Navigation procedures that allow shorter and more direct flight routes. Work is continuing at Northern California, Charlotte and Atlanta metroplexes, with more to follow when these are complete;
- Improving information sharing and taxi procedures for surface operations at airports. Automation improvements and collaboration with air carriers will reduce delays aircraft experience in reaching active runways and increase the hourly rate of takeoffs and landings by reducing inefficiencies in moving from the gate to the active runway; and
- Replacing some voice communications with data communications will be accelerated to reduce the time needed to relay non-critical air traffic information and reduce the potential for errors in sending and read back of flight plan clearances.

These four initiatives have been identified because industry sees them as having significant benefits and they have been tested at trial sites. The CIP shows the level of resources needed to pursue these commitments, which support the transition to more efficient and safer airspace operations.

6 Appendices

The CIP contains five appendices.

Appendix A

- Lists FAA strategic priorities and metrics.
- Associates CIP programs with performance metrics.

Appendix B

- Provides CIP program descriptions and the alignment of programs to strategic priorities.
- Describes the programs contribution to meeting the performance metric.
- Lists performance output goals for FY 2016–2020.
- Shows system implementation schedules.

Appendix C

- Provides funding amounts from FY 2016 through FY 2020 by BLI. Funding amounts are in Millions of Dollars.

Appendix D

- Response to GAO Report 08-42 - Identifies major programs with cost and schedule changes from the original baseline and explains the causes of those changes.

Appendix E

- Defines acronyms and abbreviations.

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Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix A

Fiscal Years 2016 – 2020

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APPENDIX A

ALIGNMENT OF PROGRAMS TO STRATEGIC PRIORITIES

The Federal Aviation Administration (FAA) Administrator, in February 2014, established a new strategic framework to define where the agency will focus its efforts. This framework includes high-level Strategic Priorities and related Performance Metrics that will help achieve the priorities. The Strategic Priorities and Performance Metrics support the Department of Transportation's (DOT) strategic plan. The four Strategic Priorities are:

- Make aviation safer and smarter
- Deliver benefits through technology and infrastructure
- Enhance global leadership
- Empower and innovate with the FAA's people

Performance Metrics are a tool the agency uses to track progress towards accomplishment of the Strategic Priorities. The Capital Investment Plan (CIP) programs have been aligned to the performance metrics. In the CIP Appendix B, a section entitled "Relationship of Program to FAA Performance Metric" gives more specific information about how each program helps meet a Performance Metric.

Many FAA programs will support more than one performance metric; however the program linkages in the CIP (Appendix A and B) are aligned to a single metric to which a program's contribution is most significant. Only CIP programs with currently planned funding in any or all of Fiscal Years (FY) 2016-2020 are included in Appendix A, B, and C.

To provide a complete picture of FAA performance, additional performance metrics are identified and tracked by the FAA to assess progress in meeting internal organizational performance objectives. These additional metrics are identified in the FAA Business Plan and many are included in this Appendix.

Each program, listed under its performance metric, includes the following information: FY 2016 Budget Line Item (BLI); CIP number; and CIP Program Name. BLI numbers with an X (i.e., 1A10X) are used to designate programs that are not funded in the FY 2016 President's Budget, but future funding is planned within the FY 2017-2020 timeframe. These programs are new starts or future extensions of existing programs. Appendix B will report the future year planned activities for these programs based on the planned funding.

For clarification, the following definitions generally describe the terms used in the CIP.

FAA STRATEGIC PRIORITY

The agency will use four strategic priorities as its organizing principle to focus efforts in the coming years.

PERFORMANCE METRIC

A quantifiable target for the desired improvement in performance, which will be accomplished in a specific timeframe. These metrics normally affect FAA customers, such as: "Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over a 9-year period (2010-2018). No more than 6.2 in 2018."

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1. FAA Strategic Priority: Make Aviation Safer and Smarter

There is an imperative to be smarter about how we ensure aviation safety because the aviation industry is growing more complex. At the same time, we have more safety data than we have ever had before. This provides us with the opportunity to be more proactive about safety and constantly raise the bar.

- **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.

FY 2016 BLI	CIP #	CIP Name
1A07B	G05A.02-01	Common Status & Structure Data
2A13	W05.03-01	Wind Shear Detection Services – Work Package 1
2A18	M54.01-01	Airborne Collision Avoidance System X (ACAS X) – Segment 1
2B18	C23.02-01	NAS Voice Recorder Program (NVRP)
2D05	N04.03-00	Approach Lighting System Improvement Program (ALSIP) Continuation
2D07	N04.01-00	Visual Navaids for New Qualifiers
2D12	N17.01-01	Runway Safety Area – Navigation Mitigation
2E03X	M12.01-04	NextGen Flight Simulation Testing and Research Technologies (Flight START) – Technology Refresh Program – Additional Projects
2E12X	M25.00-00	Independent Operational Assessment (IOA)
3A02	A17.01-02	Regulation and Certification Infrastructure for System Safety (RCISS) – Segment 2
3A02X	A17.01-03	Regulation and Certification Infrastructure for System Safety (RCISS) – Segment 3
3A07	A25.02-01	System Approach for Safety Oversight (SASO) – Phase 2a
3A07	A25.02-02	System Approach for Safety Oversight (SASO) – Phase 2b
3A08	A26.01-01	Aviation Safety Knowledge Management Environment (ASKME) – Segment 2
3A09	M53.01-02	Aerospace Medical Equipment Needs (AMEN) – Phase 2
3A09X	M53.01-03	Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3
3A10A	G07A.02-01	Aviation Safety Information Analysis and Sharing (ASIAS)
3A10B	G07M.02-01	Systems Safety Management Transformation (SSMT)
3A13	A35.01-01	Aerospace Medicine Safety Information System (AMSIS) – Segment 1
4A09	G05A.02-05	Aeronautical Information Management (AIM) Modernization Segment 2
4A09X	G05A.02-06	Aeronautical Information Management (AIM) Modernization Segment 3

- **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.

FY 2016 BLI	CIP #	CIP Name
2C02	A34.01-01	Future Flight Services Program
2C04	M08.31-02	Weather Camera Program – Future Segments
2D03	N12.01-07	Wide Area Augmentation System (WAAS) – Phase IV Segment 1
2D03X	N12.01-08	Wide Area Augmentation System (WAAS) – Phase IV Segment 2
6A01B	N12.01-09	Wide Area Augmentation System (WAAS) – Sustain Leased Services

– **Performance Metric 3:** No fatalities, serious injuries, or significant property damage to the uninvolved public during licensed or permitted space launch and reentry activities.

FY 2016 BLI	CIP #	CIP Name
2A05C	M55.01-01	Commercial Space Integration Into The NAS

– **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.

FY 2016 BLI	CIP #	CIP Name
1A01A	S09.02-00	Runway Incursion Reduction Program (RIRP) – ATDP
2B01A	S09.01-01	Airport Surface Detection Equipment Model-X (ASDE-X) –Technology Refresh & Disposition
2B01B	S01.05-01	Airport Surface Detection Equipment Model-3 (ASDE-3) Service Sustainment
2B12A	S11.01-02	Runway Status Lights (RWSL) – Implementation – Phase 1
2B12B	S11.01-03	Runway Status Lights (RWSL) – Prototype Sustainment
2B12X	S11.01-04	Runway Status Lights (RWSL) – Technology Refresh & Disposition

– **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.

FY 2016 BLI	CIP #	CIP Name
1A01H	M08.32-03	Operational Analysis and Reporting System (OARS)
1A05H	G02S.04-01	Reduced Oceanic Separation

– **Performance Metric 6:** Address 80% of high value risks within 30 days. Establish oversight by the Cybersecurity Steering Committee to assure consistent risk acceptance decisions. Visualize vulnerabilities on all IP based systems.

FY 2016 BLI	CIP #	CIP Name
3A06	M31.00-00	Information Systems Security

– **Performance Metric 7:** Exceed Continuity Communications activation levels, as identified in the Federal Communications Directive (FCD) Annex H, by 5 percent. (FAA Business Planning Metric)

FY 2016 BLI	CIP #	CIP Name
3A04	C18.00-00	NAS Recovery Communications (RCOM)

2. FAA Strategic Priority: Deliver Benefits through Technology and Infrastructure

NextGen gives us the opportunity to redefine the National Airspace System for the future and prove that we can deliver benefits to the users of the system. We also need to safely integrate new types of user technologies into the airspace, as well as rebalance existing services and modernize our infrastructure, which will enable us to reduce our costs and become more efficient in the long run.

– **Performance Metric 1:** Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.

FY 2016 BLI	CIP #	CIP Name
1A05C	G06A.01-06	Alternative Positioning, Navigation, and Timing (APNT)
2A02	A01.12-02	En Route Communication Gateway (ECG) – Technology Refresh
2A03	W02.02-02	Next Generation Weather Radar (NEXRAD) – Service Life Extension Program (SLEP) Phase 1
2A04	F06.01-00	Air Route Traffic Control Center (ARTCC) & Center Radar Approach Control (CERAP) Modernization
2A06	C04.01-01	Radio Control Equipment (RCE) – Sustainment
2A06	C06.01-00	Communications Facilities Enhancement (CFE) – Expansion
2A06	C06.03-01	Communications Facilities Enhancement (CFE) – Air/Ground Communications RFI Elimination – Technology Refresh
2A07	S04.02-03	Long Range Radar (LRR) Improvements – Infrastructure Upgrades/Sustain
2A08	C01.02-04	Voice Switching and Control System (VSCS) – Technology Refresh – Phase 3
2A08X	C01.02-05	Voice Switching and Control System (VSCS) – Technology Refresh – Level of Effort
2A09A	A10.03-01	Advanced Technologies and Oceanic Procedures (ATOP) – Technology Refresh
2A10	C21.02-01	Next-Generation VHF and UHF A/G Communication System (NEXCOM) – Segment 2 – Phase 1 of 2
2A10X	C21.02-02	Next-Generation VHF and UHF A/G Communication System (NEXCOM) – Segment 2 – Phase 2 of 2
2A13X	W10.01-02	Juneau Airport Wind System (JAWS) – Technology Refresh
2A16	S02.03-03	ATC Beacon Interrogator Model-6 (ATCBI-6) – Technology Refresh
2B02	W03.03-02	Terminal Doppler Weather Radar (TDWR) – Service Life Extension Program (SLEP) – Phase 2
2B03	A04.01-01	Standard Terminal Automation Replacement System (STARS) – Technology Refresh (TAMR Phase 1)
2B03X	A04.01-03	Standard Terminal Automation Replacement System (STARS) – Technology Refresh Future Phases
2B05A	A01.11-01	Flight Data Input/Output (FDIO) Replacement
2B06	F01.02-00	Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Replacement
2B07A	F01.01-00	Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Modernization
2B07B	F02.10-01	Facility Realignment
2B08	C05.02-00	Terminal Voice Switch Replacement (TVSR) II

2B10	S03.01-09	Airport Surveillance Radar Model-9 (ASR-9) Service Life Extension Program (SLEP), Phase 2
2B11A	S03.02-05	Airport Surveillance Radar Model-11 (ASR-11) – Technology Refresh, Segment 2
2B11B	S03.02-06	Airport Surveillance Radar Model-11 (ASR-11) – Mobile Airport Surveillance Radar (MASR)
2B11X	S03.02-07	Airport Surveillance Radar Model-11 (ASR-11) – Technology Refresh, Segment 3
2B14A	A03.05-01	Integrated Display Systems (IDS) – Replacement
2B14X	A03.05-02	Integrated Display Systems (IDS) – Replacement – Technology Refresh
2B15A	M07.04-02	Remote Monitoring and Logging System (RMLS) – Technology Refresh
2B15X	M07.05-01	Automated Maintenance Management System (AMMS)
2B16A	S03.01-08	Mode Select (Mode S) Service Life Extension Program (SLEP) – Phase 2
2B16B	S03.01-11	Airport Surveillance Radar Model-9 (ASR-9) and Mode Select (Mode S) Service Life Extension Program (SLEP) – Phase 3 Planning
2B17	S13.01-01	Surveillance Interface Modernization (SIM)
2B19	W07.01-02	Integrated Terminal Weather System (ITWS) – Technology Refresh & Disposition
2B20	G08A.01-01	Flight and Interfacility ATC Data Interface Modernization
2C01	W01.03-01	Aviation Surface Weather Observation Network (ASWON) – Technology Refresh
2C03	F05.04-02	Alaska Flight Service Facility Modernization (AFSFM)
2D01A	N06.00-00	Very High Frequency Omni-Directional Range (VOR) Collocated with Tactical Air Navigation (VORTAC)
2D04A	N08.02-00	Runway Visual Range (RVR) – Replacement/Establishment
2D09	N04.04-00	Navaids – Sustain, Replace, Relocate
2E01	F13.01-00	Fuel Storage Tank Replacement Management
2E02	F12.00-00	Unstaffed Infrastructure Sustainment (UIS)
2E03A	M12.00-00	Aircraft Related Equipment (ARE) Program
2E04	F10.00-00	Airport Cable Loop Systems Sustained Support
2E05	C17.02-01	Alaskan Satellite Telecommunication Infrastructure (ASTI)
2E07	F11.01-01	Power Systems Sustained Support (PS3)
2E07X	F11.01-02	Power Systems Sustained Support (PS3) – Future Segments
3A03	M21.04-01	Logistics Center Support System (LCSS) – Segment 2
3A05	F24.01-02	Facility Security Risk Management (FSRM) – Two
3A11	M17.01-01	National Test Equipment Program
3A12	F31.01-01	Mobile Assets Management Program

– **Performance Metric 2:** Maintain an average daily capacity for Core airports of 59,122, or higher, arrivals and departures.

FY 2016 BLI	CIP #	CIP Name
1A01B	M08.28-00	System Capacity, Planning, and Improvements – ATDP
1A01C	M08.29-00	Operations Concept Validation and Infrastructure Evolution – ATDP
1A01D	M08.28-04	Major Airspace Redesign – ATDP
1A01E	M46.01-01	Strategy and Evaluation – ATDP
1A01I	A37.01-01	Operations Network (OPSNET) Replacement – ATDP

FY 2016 BLI	CIP #	CIP Name
1A01X	M52.01-01	Operational Modeling Analysis and Data
1A05A	G01S.02-01	Automatic Dependent Surveillance-Broadcast (ADS-B) In Applications – Flight Interval Management
1A05B	G01A.01-01	Modern Procedures
1A05D	G06M.02-02	Wake Turbulence Re-Categorization
1A05E	G01A.02-02	Oceanic Tactical Trajectory Management
1A05G	G01M.02-04	Separation Management Concepts & Analysis
1A05X	G01A.01-06	Separation Automation System Engineering
1A05X	G01A.01-07	NextGen Oceanic Capabilities
1A05X	G01A.02-03	Conflict Advisories
1A06A	G06A.03-01	Terminal Flight Data Manager (TFDM) – Segment 1
1A06B	G02A.01-01	Surface Tactical Flow
1A06X	G02A.01-02	Surface Conformance Monitoring
1A07A	G05A.02-03	Flight Object
1A07C	G05A.02-08	Flight Object Exchange Services (FOXS)
1A07D	G05A.04-01	Dynamic Airspace
1A07X	G05A.02-02	Advanced Methods
1A07X	G05M.02-01	Collaborative Information Management (CIM)
1A09A	G06A.01-02	Wake Turbulence Mitigation for Arrivals (WTMA)
1A09B	G06N.01-02	Closely Spaced Parallel Runway Operations
1A09C	G06N.01-01	Ground Based Augmentation System (GBAS)
1A10A	G04W.02-01	Weather Observation Improvements
1A10B	G04W.03-01	Weather Forecast Improvements
1A10C	G06N.01-03	NextGen Navigation Engineering
1A10D	G01M.02-02	New Air Traffic Management (ATM) Requirements
1A10X	G06A.02-01	Surface/Tower/Terminal Systems Engineering
1A12B	G05A.02-04	Concept Development for Integrated NAS Design & Procedure Planning
2A01A	G01A.01-05	En Route Automation Modernization (ERAM) System Enhancements and Technology Refresh
2A01B	G01A.01-04	En Route Automation Modernization (ERAM) Sector Enhancements
2A01X	G01A.01-08	En Route Automation Modernization (ERAM) System Enhancements Future Segment
2A05B	A05.01-14	Traffic Flow Management (TFM) Infrastructure – TFM Service Enhancements
2A11B	G05C.01-06	System Wide Information Management (SWIM) – Common Support Services Weather (CSS-Wx)
2A12X	G02S.01-02	Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Future Segments
2A14C	G05A.01-01	Strategic Flow Management Application
2A14X	G05A.01-02	Strategic Flow Management Engineering Enhancement (SFMEE)
2A15	G02A.01-06	Time Based Flow Management (TBFM) Work Package 3
2A15	G02A.01-07	Time Based Flow Management (TBFM) Technology Refresh
2A15X	G02A.01-08	Time Based Flow Management (TBFM) Work Package 4
2A19	G01C.01-05	Data Communications – Segment 1 Phase 1
2A19	G01C.01-06	Data Communications – Segment 1 Phase 2 Initial En Route Services

FY 2016 BLI	CIP #	CIP Name
2A19X	G01C.01-07	Data Communications – Segment 1 Phase 1 & 2 Data Comm Integrated Services (DCIS) Network Services
2A19X	G01C.01-08	Data Communications – Aeronautical Telecommunications Network (ATN) Gateway
2A19X	G01C.01-09	Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application
2A19X	G01C.01-10	Data Communications – Segment 1 Phase 2 Full En Route Services
2B04A	A04.07-01	Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1
2B04B	A04.07-02	Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 2
2B04	A04.07-04	Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements
2B05B	A04.08-01	Terminal Work Package 1
2B13	G03C.01-01	NAS Voice System (NVS) – Demonstration & Qualification
2B13	G03C.01-03	NAS Voice System (NVS) – Contingency Work for NVS
2B13X	G03C.01-02	NAS Voice System (NVS) – Deployment
2B14B	A03.05-03	Enterprise Information Display System (E-IDS)
2D02	N03.01-00	Instrument Landing Systems (ILS)
2D04B	N08.03-01	Enhanced Low Visibility Operations (ELVO) – Phase II
2D06	N09.00-00	Sustain Distance Measuring Equipment (DME)

– **Performance Metric 3:** Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.

FY 2016 BLI	CIP #	CIP Name
1A07X	G05A.02-09	Airspace Resource Management System (ARMS)
2A05A	A05.01-13	Traffic Flow Management (TFM) Infrastructure – Field/Remote Site Technology Refresh
2A09C	A10.03-03	Advanced Technologies and Oceanic Procedures (ATOP) – Oceanic Service Enhancements
2A12A	G02S.03-01	Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Baseline Services & Applications (Service Volume)
2A12X	G02S.01-02	Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Future Segments
2A14A	G05A.05-02	Collaborative Air Traffic Management Technologies (CATMT) – Work Package 3
2A14B	G05A.05-03	Collaborative Air Traffic Management Technologies (CATMT) – Work Package 4
2A18	G04W.03-02	NextGen Weather Processor (NWP), Work Package 1
2D10	N04.02-00	Replace Visual Approach Slope Indicator (VASI) with Precision Approach Path Indicator (PAPI)
4A08	M03.02-00	CIP Systems Engineering & Technical Assistance – MITRE
6A01A	G02S.03-05	Automatic Dependent Surveillance Broadcast (ADS-B) – Sustain Leased Services

– **Performance Metric 4:** The U.S. population exposed to significant aircraft noise around airports has been reduced to less than 342,000 persons by 2015.

FY 2016 BLI	CIP #	CIP Name
1A08	G06M.02-01	Environmental Management System & Noise/Emission Reduction

– **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)

FY 2016 BLI	CIP #	CIP Name
2A09B	A10.03-02	Advanced Technologies and Oceanic Procedures (ATOP) – ATOP Enhancements (Work Package 1)

– **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)

FY 2016 BLI	CIP #	CIP Name
1A12A	G05N.01-01	NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP)
2D01B	N06.01-01	Very High Frequency Omni-Directional Range (VOR) – Minimum Operating Network (MON) Implementation Program

– **Performance Metric 7:** Achieve documented cost savings and cost avoidance of $30 million in FY 2015. (FAA Business Planning Metric)

FY 2016 BLI	CIP #	CIP Name
1A01G	M08.46-01	Unified Contracting System (UCS)
1A02 / 1A03	F14.00-00	System Support Laboratory Sustained Support
1A04	F16.00-00	William J. Hughes Technical Center Building and Plan Support
1A09X	G03M.04-02	Enhanced Service Small Communities (ESSC)
1A11	G03M.02-01	NextGen Laboratories
2A11A	G05C.01-04	System-Wide Information Management (SWIM) – Segment 2A
2A11	G05C.01-08	System Wide Information Management (SWIM) – Segment 2B
2A11X	G05C.01-05	System-Wide Information Management (SWIM) – Segment 1 Technology Refresh
2D08	A14.02-02	Instrument Flight Procedures Automation (IFPA) – Technology Refresh, Segment 1
2D08X	A14.02-03	Instrument Flight Procedures Automation (IFPA) – Technology Refresh, Segment 2
2E06	F26.01-01	Decommissioning – Real Property Disposition
2E08	F20.01-01	FAA Employee Housing and Life Safety Shelter System Services
2E09	F13.04-02	Energy Management and Compliance (EMC)
2E11	C26.01-02	FAA Telecommunications Infrastructure – 2
3A01	F13.02-00	Environmental Cleanup / Hazardous Materials (HAZMAT)
3A14	M20.01-04	National Airspace System (NAS) Training - Equipment Modernization – Training Simulators – Tower Simulation System
3B01	F18.00-00	Aeronautical Center Infrastructure Modernization
3B02	M10.00-00	Distance Learning

FY 2016 BLI	CIP #	CIP Name
4A01A	M03.03-01	CIP Systems Engineering & Development Support – SE2020
4A01B	M08.01-00	Provide Air Navigation Facilities (ANF)/Air Traffic Control (ATC) Support (Quick Response)
4A02	M08.06-00	Program Support Leases
4A04	F19.00-00	Aeronautical Center Lease
4A05A	M22.00-00	NAS Integration Support Contract (NISC)
4A05B	M03.01-02	Configuration Management Automation (CMA)
4A06	M02.00-00	Technical Support Services Contract (TSSC)
4A10	G08M.04-01	Cross Agency NextGen Management

– **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)

FY 2016 BLI	CIP #	CIP Name
1A01F	M47.01-01	Dynamic Capital Planning
4A07	M08.14-00	Resource Tracking Program (RTP)

– **Performance Metric 9:** Safely and efficiently integrate new types of operations, such as Unmanned Aircraft Systems into the NAS and enable the benefits these operations will provide. (FAA Business Planning Metric)

FY 2016 BLI	CIP #	CIP Name
1A05E	G01A.01-09	Unmanned Aircraft Systems (UAS) Concept Validation and Requirements Development

3. FAA Strategic Priority: Enhance Global Leadership

Aviation is a global industry. We have to continue our heritage as world leaders in aviation and set the safety standard for others to measure against. We need to be at the table to shape international standards to improve aviation safety and efficiency around the world.

4. FAA Strategic Priority: Empower and Innovate with the FAA's People

The FAA's employees are the ultimate driver behind our success, and we need to have the best and the brightest talent with the appropriate leadership and technical skills to transform the FAA and the aviation system.

– **Performance Metric 1:** Achieve a total workplace injury case rate of no more than 1.82 per 100 employees for the FAA. (FAA Business Planning Metric)

FY 2016 BLI	CIP #	CIP Name
2B09	F13.03-00	NAS Facilities Occupational Safety and Health Administration (OSHA) & Environmental Standards Compliance

– **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 the 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)

FY 2016 BLI	CIP #	CIP Name
2D11	N12.03-01	Global Positioning System (GPS) Civil Requirements
2E10	F22.01-01	Child Care Centers – Infrastructure Improvements
4A03	M05.00-00	NAS Regional/Center Logistics Support Services

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Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix B

Fiscal Years 2016 – 2020

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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 2016 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 2016, 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 new 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 2016 Request $21.3M

- A, Runway Incursion Reduction Program (RIRP) – ATDP, S09.02-00
- B, System Capacity, Planning and Improvements – ATDP, M08.28-00
- C, Operations Concept Validation and Infrastructure Evolution – ATDP, M08.29-00
- D, Major Airspace Redesign – ATDP, M08.28-04
- E, Strategy and Evaluation – ATDP, M46.01-01
- F, Dynamic Capital Planning, M47.01-01
- G, Unified Contracting System (UCS), M08.46-01
- H, Operational Analysis and Reporting System (OARS), M08.32-03
- I, Operations Network (OPSNET) Replacement – ATDP, A37.01-01
- X, 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 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 2016 – 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 RI indications.
- Complete annual report on Runway Incursion (RI) prevention shortfall analysis.
- Complete annual report on testing of safety logic enhancements to Runway Incursion (RI) detection and prevention products.
- Publish the Project Plan and Resource Management Plan (RMP) for the utilization of a Small Airport Surveillance Sensor (SASS) as a sensor to drive the activation of direct to pilot alerting safety logic.

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 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 Runway Incursion (RI) detection and prevention products.
- Complete report documenting candidate site selection for a system to test the utilization of a Small Airport Surveillance Sensor (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 Small Airport Surveillance Sensor (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 human-in-the-loop (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 Runway Incursion (RI) detection and prevention products.
- Complete report on results of initial shadow operations testing for the utilization of a Small Airport Surveillance Sensor (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 human-in-the-loop (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 Runway Incursion (RI) detection and prevention products.
- Complete annual report documenting results of using a Small Airport Surveillance Sensor (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 human-in-the-loop (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 Runway Incursion (RI) detection and prevention products.
- Complete annual report documenting results of using a Small Airport Surveillance Sensor (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).

B, 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), 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 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;
- 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 space-based ADS-B over the North Atlantic.

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 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 59,122, 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 2016 – Performance Output Goals

- Complete design of PDARS into a net centric system.
- Provide airport capacity modeling and annual service volume analysis reports.
- Produce Joint Performance Benchmark Report with EUROCONTROL/the European Commission.
- Prepare white paper on methodologies to standardize international measurement of system capacity, throughput, predictability and efficiency.
- Develop upgrade of PDARS visualization products.
- Develop upgrade of PDARS processing system.
- Complete enhancement of FAA Metrics webpage.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space-based ADS-B (Out) over the North Atlantic.

Program Plans FY 2017 – Performance Output Goals

- Implement PDARS web-based access capabilities.
- Integrate available SWIM data products into the PDARS system.
- Implement upgraded PDARS visualization products.
- Implement upgraded PDARS processing system.
- Produce Annual Joint Performance Benchmark Report with EUROCONTROL/European Commission.
- Conduct a workshop to examine development and coordination of international standardized measurement of system capacity, throughput, predictability and efficiency.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space-based ADS-B (Out) over the North Atlantic.

Program Plans FY 2018 – Performance Output Goals

- Complete implementation of PDARS into a net centric system.
- Implement available SWIM data products into the PDARS system.
- 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 modernization.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space-based ADS-B (Out) over the North Atlantic.

Program Plans FY 2019 – Performance Output Goals

- Produce Joint Performance Benchmark Report with EUROCONTROL/the European Commission.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space-based ADS-B (Out) over the North Atlantic.
- Identify PDARS system enhancements to meet user needs.

Program Plans FY 2020 – Performance Output Goals

- Produce Joint Performance Benchmark Report with EUROCONTROL/the European Commission.
- Implement identified PDARS system enhancements.
- Initiate PDARS system review for identification of system modernization enhancement.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space-based ADS-B (Out) over the North Atlantic.

C, 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.
- 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 59,122, 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 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 (CNS) 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 2016 – Performance Output Goals
- Develop and provide annual updates to the NAS Enterprise Level Operational Requirements to reflect the results of research and development conducted in 2015.
- Develop and provide annual updates to the NAS Enterprise Architecture for NAS level Operational Improvements and operational sustainment activities based on completed research and acquisition decisions made in 2015.

Program Plans FY 2017 – Performance Output Goals
- Develop and provide annual updates to the NAS Enterprise Level Operational Requirements to reflect the results of research and development conducted in 2016.
- Develop and provide annual updates to the NAS Enterprise Architecture for NAS level Operational Improvements and operational sustainment activities based on completed research and acquisition decisions made in 2016.

Program Plans FY 2018 – Performance Output Goals
- Develop and provide annual updates to the NAS Enterprise Level Operational Requirements to reflect the results of research and development conducted in 2017.
- Develop and provide annual updates to the NAS Enterprise Architecture for NAS level Operational Improvements and operational sustainment activities based on completed research and acquisition decisions made in 2017.

Program Plans FY 2019 – Performance Output Goals
- Develop and provide annual updates to the NAS Enterprise Level Operational Requirements to reflect the results of research and development conducted in 2018.
- Develop and provide annual updates to the NAS Enterprise Architecture for NAS level Operational Improvements and operational sustainment activities based on completed research and acquisition decisions made in 2018.

Program Plans FY 2020 – Performance Output Goals
- Develop and provide annual updates to the NAS Enterprise Level Operational Requirements to reflect the results of research and development conducted in 2019.
- Develop and provide annual updates to the NAS Enterprise Architecture for NAS level Operational Improvements and operational sustainment activities based on completed research and acquisition decisions made in 2019.

D, 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 (RNAV)/ Required Navigation Performance (RNP) 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 to evaluate the New York Metropolitan area redesign and its integration into the NAS. 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 59,122, 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 2016-2020 – Performance Output Goals

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

E, 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 59,122, 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. Previously, the FAA relied on a suite of outdated models for analyzing the impact of proposed changes to ATM procedures, equipment, and airport infrastructure, as well as anticipated changes in the quantity, composition, and distribution of air traffic. These legacy models were not capable of analyzing the new technologies, capabilities, and procedures of NextGen. 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 2016 – Performance Output Goals

- Delivery of new SWAC executable software with improvements to the fidelity of the oceanic model.
- Delivery of new SWAC executable software capable of modeling pre-departure and surface data sharing.
- Delivery of new Airfield Delay Simulation Model (ADSIM+) executable software capable of automatically generating taxi-paths (based upon historical data).
- Delivery of new ADSIM+ executable software improving the fidelity of the terminal airspace model.

Program Plans FY 2017 – Performance Output Goals

- Delivery of new SWAC executable software incorporating the FAA's Office of Policy and Planning's Terminal Area Forecast modernization.
- 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).

F, 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 2016-2020 – Performance Output Goals
- Complete monthly Capitalization report.
- Complete monthly program baseline status report.

G, Unified Contracting System (UCS), M08.46-01

Program Description

The UCS program will streamline the management of FAA procurement processes to improve efficiency, reduces costs, standardizes work products, and eliminates redundant and paper-based processes. UCS will automate contract formulation and execution (planning, pre-award, award, administration/post-award, and close-out). UCS will allow future acquisitions process changes to be implemented by the FAA, with minimal external support. This program will provide accurate and timely acquisition data, electronic storage and retrieval of contractual documents and data, and management information reports – such as workload distribution and the list and content of each contracting action through the lifecycle of the acquisition. UCS will be utilized at all FAA offices and organizations involved in procurement contracts for CIP Projects and other acquisitions.

UCS will be implemented in an iterative and modular approach. The modules will accomplish the actions below to incorporate some or all aspects of the planned functionality:

- Automate manual procurement processes;
- Interface with Delphi, the FAA's Oracle 12i financial system and;
- Replace the functionality used in FAA's current procurement funds obligation and commitment system (PRISM), to include sending required procurement data to the Federal Procurement Data System Next Generation (FPDS-NG), which is a Congressionally required database established to collect historical and statistical information about the government's procurements to report how and where tax dollars are spent.

Specific functionality incorporated into the UCS program will include:

- Purchase Card Purchasing System (PCPS) – an automated process for tracking purchase card usage Agency-wide;
- Transition from paper procurement documents and content management to electronic management (Electronic Document Management System);
- Automated procurement processes (e.g., routing / approvals) for all contract types and all procurement phases (e.g., planning, pre-award, post-award /administration, and close-out);
- Initiate requisitions and manage contract funds through Requisition to Obligation and interface with the FAA's financial system;
- Statement of Work (SOW) creator / generator;
- Contract writing / contract clause generator; and
- Contractor labor rates engine / repository – a database for all contractor labor rates, allowing for improved accuracy in developing Independent Government Cost Estimate (IGCE) and contract rates negotiation.

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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

UCS will provide a cost effective, automated solution for improving FAA's procurement process by consolidating supporting documentation and decision information. This will reduce the time for issuing, maintaining and closing out contract actions and eliminate paper-based processes. UCS will normalize and streamline the procurement process by providing an integrated system that uses automated workflow processes, functions and standards, and electronic document management. UCS will provide users and management access to status reporting, allocation of effort, task durations, and other user and management measurements. The Agency has over 300 procurement officers/specialists who process over 44,500 actions per year (based on FY 2013 calculations). By implementing UCS, the cycle time from receipt of Procurement Request (PR) to award will be improved, thus contributing to a 10% reduction in time to award major system contracts. Other program performance goals include: Increased productivity through standardized and automated processes; improved quality and accessibility to data by eliminating paper based processes; and improved cycle time through automation and standardization. UCS will eventually replace the existing and costly FAA procurement funds obligation and commitment system (PRISM).

Program Plans FY 2016 – Performance Output Goals
- Achieve IOC for Requisition to Obligation (R2O) module (PRISM Replacement).
- Achieve IOC for Automating Procurement Processes (APP) version 2.0.

Program Plans FY 2017 – Performance Output Goals
- Achieve IOC for Statement of Rates Engine module.
- Achieve IOC for Automated Procurement Process (APP) version 3.0.

Program Plans FY 2018 – Performance Output Goals
- Achieve IOC for Statement of Work Generator (SOWGen) module.
- Achieve IOC for Automated Procurement Process (APP) version 4.0.
- Complete Legacy Document Conversion (UCS becomes the official contract/file system). (APB milestone)

Program Plans FY 2019 – Performance Output Goals
- Achieve IOC for Automated Procurement Process (APP) version 5.0. (Prior year funds)
- Achieve IOC for Federal Procurement Data System – Next Generation (FPDS-NG) Interface. (APB milestone) (Prior year funds)
- Complete Full UCS Functionality Deployment. (APB milestone) (Prior year funds)

Program Plans FY 2020 – Performance Output Goals
- None.

System Implementation Schedule

H, 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 prognostic 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; it then uses the results of these analyses to make decisions on how to best mitigate any potentially unacceptable 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 from multiple locations, and 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) items when possible. OARS will leverage the technology of 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 also for an integrated system safety approach.

An Investment Analysis Readiness Decision (IARD) for this program was achieved in October FY 2015. Initial Investment Decision (IID) is planned for Q2 FY 2016. The Final Investment Decision (FID) is planned for Q1 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 enough; the FAA needs to 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 high risk events in the NAS. This will allow the strategic management of financial, equipment, and personnel resources and the prioritization of efforts to obtain the maximum safety improvement in the most cost effective manner.

Program Plans FY 2016 – Performance Output Goals

- Complete development of 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.
- Begin 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).

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 FID.
- Other output goals will be determined at FID.

Program Plans FY 2018-2020 – Performance Output Goals

- Output goals will be determined at FID.

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

Program Description

Accurate metrics of the FAA's management of the NAS are needed to evaluate and improve FAA performance. The Operations Network (OPSNET) is a component of Aviation System Performance Metrics (ASPM) system and is the official FAA system for collecting and reporting flight operations count and delay data. The OPSNET measures the number of delays attributable by cause and includes weather, volume, equipment status, and runway conditions, etc. Although it is important to measure all delays, their inclusion in the metrics for FAA performance and management of the NAS doesn't provide an accurate picture of delays caused by FAA actions and equipment. The measured data also differs from the airline delay data reported to the DOT. Separating delays attributable to the FAA, such as runway and NAS equipment issues, from those beyond FAA's control, such as weather and volume, is necessary to identify causes, develop solutions, and reduce delays.

The current system has been in service since 1988. New capabilities for entering data were added in 1999, and in 2004 an internet input capability was added. In 2006, a four-phased plan was initiated to automate OPSNET, but after two years the plan was abandoned due to limitations of the outdated system. Few modifications have been made to OPSNET over the past 25 years and the system remains cumbersome with significant deficiencies. The current design lacks the flexibility to make system changes driven by revised agency regulatory actions. Because the system cannot easily adapt to regulatory changes, facilities are often unable to comply with changes in policy which leads to inaccurate data collection and reporting. Due to limited storage capability, data must often be aggregated for input rather than entered with all available details that could provide additional options for analysis and developing reports. Due to the higher risk of errors that may be introduced by manual data entry, an experienced analyst who understands the intricacies of the OPSNET system is required for the daily time-consuming review and manipulation of the data to produce an usable reports. The current subjective process by which delay and delay causes are reported sharply contrasts with the automated reporting and information processing that the OPSNET Replacement system will provide.

The OPSNET Replacement program will expand the collection and recording of delay "causes" 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 airlines to improve air traffic operational services and procedures. By improving definitions for measuring NAS performance, and in coordination with the international community, the definition of the reported metrics can be standardized. Having more accurate metrics for reporting will enable improved benchmarking and more accurate forecasting to facilitate analysis of NAS performance.

Categories of Delay shortfalls include:

- Delays less than 15 minutes are not reported
- Delays incurred at gates or on an airport ramp are not reported
- Delays after an aircraft lands are not reported
- Delays for more than one reason (sequentially additive) are not reported
- Delays from en route speed reductions and vectoring are not reported
- Delays from taxi back are not reported

Information Availability Limitations:

- Limiting delay cause to one of five conditions (weather, equipment, runway/taxiway, volume, other) distorts performance analysis and forecasting
- Real-time delay data is not provided to the user community, which inhibits corrective action

Data Input/System Limitations:

- Manual data input may be incomplete or reported incorrectly
- Group delay reporting prevents detailed delay analysis
- Manual system manipulation requires time and is not responsive to agency direction
- Reported information is not tailored to user needs
- Manual input is required for special activity airspace operations

Harmonization Limitations:

- Delay calculation differences exist between FAA, DOT, and the Airlines
- Benefits associated with implementation of NextGen technology cannot be measured
- Lack of harmonized definitions detracts from FAA's strategic initiative to enhance global leadership

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 59,122, 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 2016 – Performance Output Goals

- Complete the following documentation in support of the Concept & Requirements Definition Readiness Decision (CRDRD):
  - Preliminary Shortfall Analysis Document
  - Concepts and Requirements Definition (CRD) Plan
  - Acquisition Category (ACAT) Determination
  - Enterprise Infrastructure Assessment by Architecture Review board (ARB) (Cloud, FTI, SWIM)
  - Technical Review Board (TRB) Endorsement
  - Architecture Change Notice approved by NAS Enterprise Architecture (EA) Division

Program Plans FY 2017 – Performance Output Goals

- Complete the following products in support of the Investment Analysis Readiness Decision (IARD):
  - Final Shortfall Analysis Document
  - Solution ConOps
  - Functional Analysis document
  - Preliminary Program Requirements
  - Range of Alternatives Document
  - ROM Cost Estimate and Monetize Shortfalls
  - Initial Investment Analysis Plan
- Achieve IARD.

Program Plans FY 2018 – Performance Output Goals

- Complete the following products in support of the Initial Investment Decision (IID):
  - Initial Program Requirements (update pPR)
  - Initial Screening Information Request (SIR)
  - Market Survey and Analysis
  - Initial Implementation Strategy and Planning Document (ISPD)
  - Safety Assessment
  - Initial Performance Requirements Document
  - Initial Business Case Analysis Report (BCAR)
  - Architecture Impact Assessment
  - Human Engineering/Operability Assessment
  - Information and System Security Assessment
  - Initial Affordability Analysis (Alts 1-n)
- Achieve IID.

Program Plans FY 2019 – Performance Output Goals

- Complete the following products in support of the Final Investment Decision (FID):
    - Final Program Requirements (update fPR)
    - Add/Revise Final Shortfall Analysis Document
    - Final Investment Analysis Plan
    - Strategy for Implementation and Life Cycle Support
    - Final Screening Information Request (SIR)
    - Solicit Offers
    - Evaluate Offers from Prime Contractors
    - Independent Government Cost Estimate (IGCE)
    - Final Draft Business Case
    - Detailed Program Plan (WBS)
    - Acquisition Program Baseline (APB)
    - Final Implementation Strategy and Planning Document (FISPD)
- Achieve FID.

Program Plans FY 2020 – Performance Output Goals

- Refine the lower level performance requirements definition.
- Produce the System Specification Document (SSD).
- Produce and publish the RFD package.
- Award Contract.

X, 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 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 likely 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. 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;
- Tools that provide reliable and comprehensive extraction of data from repositories of operational data; and
- Improved NAS and airport operational models.

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 59,122, 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 2016 – Performance Output Goals
- None.

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).

1A02/1A03, NAS IMPROVEMENT OF SYSTEM SUPPORT LABORATORY

FY 2016 Request $1.0M
FY 2016 Request $19.1M

System Support Laboratory Sustained Support, F14.00-00

Program Description

The William J. Hughes Technical Center (WJHTC) System Support Laboratory program provides sustainment and modernization of the FAA's centralized NAS laboratories located in Atlantic City, NJ. The laboratory facilities and supporting infrastructure are necessary to support FAA's programs providing research, development, test, and evaluation of NAS and NextGen systems. The FAA's centralized set of laboratories are used to develop prototype systems and NextGen solutions that are tested and integrated into the NAS. Once systems become operational, the prototypes become part of the FAA's test bed and are used to support development of upgrades and test necessary changes to the operational field sites over their lifecycle. It is necessary to sustain these laboratories systems in configurations and capabilities that match field sites that currently exist or are planned in the future. 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.

Maintaining a centralized core of test beds reduces the overall cost to the FAA and increases efficiency in testing and preparing new systems for operational use in the NAS.

Improvements to the System Support Laboratory include upgrading and enhancing electrical and electronic equipment to allow testing of new or modified systems and reconfiguration of laboratory space to allow the removal of decommissioned systems and installation of new systems. It also procures unique equipment and systems that can interface and switch the various systems into multiple test and field support configurations. A centralized laboratory has the flexibility to test both individual systems and the interfaces between systems and avoids the cost of operating multiple test facilities.

These laboratories provide around the clock operational support to En Route, Terminal, and other ATC facilities fielded throughout the nation, and are sustained in configurations and capabilities that match the field sites that currently exist or are planned for the future. This program provides for the ongoing sustainment of the WJHTC NAS and NextGen laboratories.

This program also provides for the modernization of laboratory infrastructure and equipment. The Laboratory Master Plan, developed in 2010, identified over 150 improvement areas. The Laboratory Services Division reevaluates the priority list of projects annually to validate needs and review emerging and/or urgent projects which may take priority over planned improvements. Additionally, we are preparing a lab consolidation plan to collocate systems that share a common need for special infrastructure support, such as generator power, uninterrupted power supply etc.

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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

This centralized testing facility serves as the FAA's research, development, testing and evaluation, and field support location. With centralization of these functions, each acquisition program need not establish and maintain separate laboratory facilities to support research, development, test, evaluation, and field support for their program. It also enables the FAA to evaluate concepts and programs that span more than one domain of the NAS and integrate NextGen solutions into the NAS. This reduces the overall cost to the FAA and helps critical acquisition programs maintain cost and schedule targets. This results in overall operational efficiency to the FAA.

Program Plans FY 2016 – Performance Output Goals

- Complete independent external surveillance audits of the Laboratory Services Division Quality Management procedures and processes.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Prepare plans and estimates for the Laboratory Priority 1 Systems consolidation project.
- Provide LabNet and National Operations Center equipment upgrades.
- Install equipment upgrades to flight simulators.
- Remove HOST Power Distribution Units.
- Complete design of Traffic Flow Production Control Emergency Power-Off & Fire Suppression systems.
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2016.
- 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.

Program Plans FY 2017 – Performance Output Goals

- Complete independent external surveillance audits of the Laboratory Services Division Quality Management procedures and processes.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete phase 1 of the Laboratory Priority 1 Systems consolidation project.
- 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.
- 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.

Program Plans FY 2018 – Performance Output Goals

- Complete independent external surveillance audits of the Laboratory Services Division Quality Management procedures and processes.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete phase 2 of the Laboratory Priority 1 Systems consolidation project.
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2018.
- 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.

Program Plans FY 2019 – Performance Output Goals

- Complete independent external surveillance audits of the Laboratory Services Division Quality Management procedures and processes.
- Achieve a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete phase 3 of the Laboratory Priority 1 Systems consolidation project.
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2019.
- 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.

Program Plans FY 2020 – Performance Output Goals

- Complete independent external surveillance audits of the Laboratory Services Division Quality Management procedures and processes.
- Maintain a Quality Management Customer Feedback response rating of 3.5 or higher (meets or exceeds customer requirements).
- Complete phase 4 of the Laboratory Priority 1 Systems consolidation project.
- Complete 70% of the NAS Modernization projects scheduled for completion in FY 2020.
- 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.

1A04, WILLIAM J. HUGHES TECHNICAL CENTER INFRASTRUCTURE SUSTAINMENT

FY 2016 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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

Infrastructure Modernization at the WJHTC will control costs while delivering quality customer service by replacing aged 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 2016 – Performance Output Goals
Execute the following Center Facility System Improvements:
- Complete Replacement of Aerial Distribution Switches 1 and 2.
- Award Contract for Building 316 Electrical Substation Replacements (Phase 1 of 2).
- Complete Buildings 300 & 301 Fire Detection/Annunciation System Upgrades (Phase 2).
- Complete Building 316 Chiller Replacements (Two Chillers).
- Award Contract for Buildings 211 and 303 Roof Replacements.
- Award Contract for Design for Building 300 Mechanical Equipment Replacements (Phase 3 of 4).
- Complete Design for Life Safety Improvements to five Facilities.
- Award Contract for Main Electrical Substation Upgrades (Switchgear Enclosure).

Program Plans FY 2017 – Performance Output Goals
Execute the following Center Facility System Improvements:
- Complete Building 316 Electrical Substation Replacements (Phase 1 of 2).
- Award Contract for Building 316 Electrical Substation Replacements (Phase 2 of 2).
- Complete Buildings 211 and 303 Roof Replacements.
- Complete Design for Building 300 Mechanical Equipment Replacements (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 the Replacement of the Central Utilities Plant Electrical Switchgear.
- Complete Life Safety Improvements to five Facilities (Phase 1 of 2).
- Complete Technical Support Space Utilization Strategy.

Program Plans FY 2018 – Performance Output Goals
Execute the following Center Facility System Improvements:
- Complete Building 316 Electrical Substation Replacements (Phase 2 of 2).
- Complete Building 300 Mechanical Equipment Replacements (Phase 3 of 4).
- Complete Central Utilities Plant Chiller (No. 2 of 3) Replacement.
- Award Contract for Replacement of the Central Utilities Plant Electrical Switchgear.
- Complete Life Safety Improvements to five Facilities (Phase 2 of 2).
- Complete Refurbishment of Elevators in Five Buildings (Phase 1 of 2).
- Complete Design for Buildings 303 and 316 Chilled Water Systems Interconnection.

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 Buildings 303 & 316 Chilled Water System Interconnection.
- Complete Replacement of the Central Utilities Plant Electrical Switchgear.
- Complete Refurbishment of Elevators in Five Buildings (Phase 2 of 2).
- 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 Mechanical and Electrical Improvements to Various Research and Development Buildings.

Program Plans FY 2020 – Performance Output Goals
Execute the following Center Facility System Improvements:

- Award Contract for Center Wide Building Automation System Upgrade/Expansion.
- Complete Primary Electrical Feeder Replacement to Building 316.
- Complete Building 316 Fire Detection/Annunciation System Upgrades.
- Complete Design for Building 300 Mechanical Equipment Replacements (Phase 4 of 4).
- Complete Design for Roof Replacements at Buildings 275 and 305.
- Award Contract for Design of Overhead Electrical Distribution System Replacement.
- Award Contract for Design of Water Distribution System Improvements.
- Award Contract for Repairs to Wastewater Scavenger System.

1A05, NEXTGEN – SEPARATION MANAGEMENT PORTFOLIO
FY 2016 Request $26.5M

- 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
- H, Reduced Oceanic Separation, G02S.04-01
- X, Separation Automation System Engineering, G01A.01-06
- X, Separation Management Concept & Analysis, G01M.02-04
- 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

The program will develop ADS-B applications for Flight Interval Management. This application 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.

The FAA chartered the ADS-B In Aviation Rulemaking Committee (ARC) in June of 2010 to provide a forum for the U.S. aviation community to recommend a strategy for incorporating ADS-B In technologies into the NAS. The ARC was tasked to provide recommendations that clearly define how FAA, users and manufacturers should proceed with ADS-B In while ensuring compatibility with defined ADS-B Out avionics. In September 2011, the ARC published a report that included a priority listing of ADS-B-In applications from a user perspective. Subsequently, in accordance with the FAA Reauthorization Act, Section 211(b), the ARC evaluated a variety of equipage implementation strategies to frame a targeted ADS-B In mandate.

In response to the September 2011 ARC recommendations, the FAA Surveillance and Broadcast Services (SBS) program has been evaluating the business case, affordability, and maturity of the various applications. The SBS program is maturing the requirements definition of a suite of ADS-B In Interval Management (IM) applications and will pursue a series of final investment decisions as each application or a set of applications are deemed suitably defined for implementation.

Interval Management (IM) consists of a set of ground (Ground-based Interval Management (GIM)) and flight deck (Flight-deck-based Interval Management (FIM)) capabilities and procedures for the flight crew and ATC that are used in combination to more efficiently and precisely manage inter-aircraft spacing (e.g., achieve a precise interval on arrival) based on an ATC clearance. An air traffic controller can issue an IM clearance that allows flight crews to manage spacing through speed adjustments generated by onboard FIM equipment until reaching a planned termination point. Depending on local constraints and traffic characteristics the capabilities can be used in several types of operation such as:

- Closely Spaced Parallel Operations (CSPO);
- Arrivals & Approach;
- Cruise (both domestic surveillance airspace and oceanic non-surveillance airspace); and
- Departures.

Expected benefits include consistent, low variance spacing between paired aircraft that improves arrival capacity and reduces the need for downstream path-lengthening.

This program will develop Minimum Operational Performance Standards (MOPS) and functional requirements for Interval Management – Spacing Arrivals & Approach, and Cruise (IM-S AA&C). This activity will include requirements development, avionics standards development, prototype avionics, a flight demonstration to test prototype ground and flight deck systems, and all deliverables necessary to prepare for FAA AMS milestones up through Final Investment Decision. These capabilities will be implemented / deployed as a future segment of the ADS-B budget line item.

Pre-Implementation activities for ADS-B In are funded in FY 2015 – FY 2018 under this CIP, G01S.02-01. The ADS-B NAS Wide Implementation – Future Segments CIP, G02S.01-02, supports the implementation activities for FY 2017 and beyond. An Investment Analysis Readiness Decision (IARD) is planned for the first set of ADS-B In applications (IM-S AA&C) in Q3 FY 2015, with a Final Investment Decision (FID) in Q1 FY 2017. Follow on investment decisions include an IARD for Advanced ADS-B In Interval Management applications (involving new air-to-air separation standards) in FY 2022 and an FID in 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 2 – Maintain an average daily capacity for Core airports of 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

Improved 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 Final Investment Decision.

Program Plans FY 2016 – Performance Output Goals

- Complete Final Program Requirements (FPR) Document.
- Complete Computer-Human Interface (CHI) Requirement / Visual Specification for ERAM, STARS, and TBFM Systems.
- Complete System Specification Documents (SSDs) for ERAM, STARS, and TBFM.
- Complete Joint Resources Council (JRC) checklist items necessary for IM-S AA&C FID including, but not limited to:
  - Requirements document,
  - Implementation Strategy and
  - Planning Document.

Program Plans FY 2017 – Performance Output Goals

- Complete IM-S AA&C Business Case Analysis Report and Acquisition Program Baseline for FID.
- Complete all remaining JRC checklist items necessary for IM-S AA&C FID.
- Build prototype ERAM software to be used in the FY 2018 Joint FAA-NASA Flight Test.

Program Plans FY 2018 – Performance Output Goals
- Complete integrated test of prototype automation software.
- Complete Advanced ADS-B In Interval Management Shortfall Analysis Report.
- Complete RTCA SC-186 Operational Services and Environment Definitions document for Advanced ADS-B In Interval Management.

Program Plans FY 2019 – Performance Output Goals
- Complete RTCA SC-186 Safety and Performance Requirements (SPR) document for Advanced ADS-B In Interval Management.
- Complete Advanced ADS-B In Interval Management Concept of Operations.

Program Plans FY 2020 – Performance Output Goals
- Complete Advanced ADS-B In Interval Management preliminary Program Requirements (pPR) Document.

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.

This program is currently planning activities in the following areas:
- Developing en route NextGen enhancements associated with identifying and resolving conflicts and displaying that information on the radar console such as R-side conflict probe.
- Improving Flight Data display to:
  - notify controllers when an aircraft is not following the flight plan specification;
  - determine feasibility for selective altitude restriction removal; and
  - alert controllers when an aircraft is predicted to enter active dynamic Special Activity Airspace.
- Conducting operational evaluations for:
  - integration of trial planning for flight plan adjustments on the radar console;
  - automating entry of clearances and amendments; and
  - automating approval of lateral offsets clearances for flight management computer equipped aircraft.

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 59,122, 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 2016 – Performance Output Goals
- Complete report on evaluating Kinetic Vertical Modeling (KVM) Phase-3 prototyping.
- Complete report on evaluating complex Turn Modeling.
- Complete study of runway assignment data and availability into ERAM.
- Complete report on ERAM's trajectory prediction performance on Unmanned Aircraft Systems flights.
- Develop mature route offset concepts.
- Conduct an initial operational evaluation for Automaton-Assisted Controller-to-Controller Coordination.
- Develop overtake/in-trail fine filter algorithm to reduce false alerts when aircraft are flying similar trajectory routes during predicted conflicts.
- Complete operational acceptability determination of problem detection based on the aircraft's CNS capability.

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.
- Develop Service Analysis related artifacts for future ERAM enhancements Concept and Requirements Definition Readiness Decision.

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.
- Develop Concept and Requirements Definition required artifacts for future ERAM enhancements IARD.

Program Plans FY 2019-2020 – Performance Output Goals
- None.

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

Program Description

The Alternative Positioning, Navigation, and Timing (APNT) program is investigating alternatives for providing a back-up for Global Positioning System (GPS) based position, navigation, and timing (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 improvements. Presidential Policy Directive 21 (PPD-21) and National Security Presidential Directive 39 (NSPD-39) require that the FAA establish a resilient backup in the event of a GPS outage or interference event to maintain safety and security and prevent a significant economic impact. 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 and RNP 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 back-up 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 equivalent, or 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 develop the Investment Analysis Readiness Decision (IARD) in Q1 FY 2017. An Initial Investment (IID) is planned in Q4 FY 2017, followed by a procurement package and a contract award in three to five years.

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 to support operational transition from PBN to VOR based navigation. 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 2016 – 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.

Program Plans FY 2017 – Performance Output Goals

- Achieve IARD.
- Develop the following products in support of the Initial Investment Decision (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 2018-2020 – 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, 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 provide safe separation of aircraft from each other's wake vortices, but no longer provide 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 program, in collaboration with EUROCONTROL, has developed new airport runway wake separation standards; and, based on that work, will develop tailored leader and follower aircraft static pair-wise wake mitigation separation standards for all aircraft. This will result in increased airport runway arrival and departure capacity, especially when the airport is experiencing weather or other conditions requiring it to operate with instrument landing procedures. The final phase of the program will develop the aircraft and ground based capabilities required to achieve the NextGen goal of safe, most capacity efficient, pair-wise dynamic wake mitigation separations of aircraft. These dynamic separations and associated wake mitigation air traffic control processes will adjust the required minimum aircraft wake mitigation separations based on the weather the aircraft are experiencing.

This program is part of a joint EUROCONTROL and FAA program that has reviewed the current required wake mitigation aircraft separations used in both the USA's and Europe's air traffic control processes and has determined the current standards can 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 present standards to reflect the change in fleet mix that occurred during the last 25 years. In 2010, the program provided a set of recommendations for international review that focused on changes to the present static standards. To accomplish this, the program 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 new standards in the United States began at the Memphis International Airport in November 2012 and was introduced at the Louisville International Airport in September 2013, Cincinnati / Northern Kentucky (CVG) International Airport and Atlanta Hartsfield International Airport (ATL) in 2014. Implementations will continue in 2015 at other US airports that will realize the most capacity throughput benefit from these initial changes in wake separation standards. In 2014, the second phase of this program developed a wake separation minimum matrix of approximately 100 aircraft type pairs covering over 99% of all aircraft types 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. These standards and supporting benefit and safety cases were provided to ICAO. It is projected that the Leader/Follower Pair-Wise Static wake separation standards developed in this second phase will begin implementation by the FAA in FY 2017.

The final phase of this program will encompass modeling and simulation to validate potential improved wake mitigation processes and standards and conduct high level analyses to link wake transport and decay characteristics to aircraft flight and surrounding weather parameters. Based on these studies, the program will develop aircraft and ground based capabilities required to achieve the NextGen far-term concept of dynamic pair-wise wake mitigation separations of aircraft. Unlike the static separations which are constant at all times, the dynamic pair-wise separation capability will allow for the refinement of wake separation minima based on real-time weather factors such as winds or atmospheric turbulence, to achieve greater airspace capacity while maintaining the high level of safety observed today.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

The Wake Turbulence Re-Categorization program 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, it is rebalancing the wake turbulence separation standards to address today's mix of aircraft utilizing the nation's core airports. The program is expected to yield additional arrival and departure slots for each of these airports from increased runway throughput capacity. The end goal of the program is to increase the NextGen core airports' runway throughput capacity by as much as 7% to 10%. The 6 Category wake separation standards already developed by the program and projected to be fully available in the NAS by FY 2016, are expected to yield a 4 to 7% increase. The first operational use of the 6 Category standards occurred in November 2012 at the Memphis International Airport (MEM), September 2013 at the Louisville International Airport (SDF), March 2014 at CVG and ATL in June 2014. FedEx, the major air carrier at MEM, is reporting a double digit MEM departure runway throughput capacity increase since the introduction of the 6 Category standards as well as significant fuel savings in their MEM arrival operations. United Parcel Service is seeing similar benefits at SDF. Delta, the major air carrier at 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 Leader/Follower Pair-Wise Static wake separations is projected to provide an additional 4-7% increase in a Core airport's runway throughput capacity.

Program Plans FY 2016 – Performance Output Goals
- Complete changes to FAA Orders for implementing Leader/Follower Pair-Wise Static wake separation standards.
- Complete a NAS Change Proposal (NCP) and associated Safety Risk Management Document for operational use of the Leader/Follower Pair-Wise Static wake separations.
- Develop prototype software and adaptation changes for FAA automation platforms to evaluate requirements are met for use with the Leader/Follower Pair-Wise Static wake separation standards.

Program Plans FY 2017 – Performance Output Goals
- Complete development of Leader/Follower Pair-Wise Static wake separation standards software adaptation and key site (TRACON/ATCT) training for implementation.
- Complete the feasibility description of dynamic wake separation standards and the concept of how they would be applied by Air Navigation Service Providers (ANSPs).
- Deliver briefings to and conduct data gathering with the aviation community concerning the dynamic wake separation concept.

Program Plans FY 2018 – Performance Output Goals
- Complete high level analyses supporting the development of dynamic wake separation standards.

Program Plans FY 2019 – Performance Output Goals
- Complete design of dynamic wake separation standards.
- Develop process and procedures for the dynamic wake separation standards.

Program Plans FY 2020 – 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 59,122, 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 2016 – Performance Output Goals

- Complete modeling and simulation and report results for 4-D Stochastic Trajectory Model.
- Develop Capability and Functional Analysis for:
    - Traffic Congestion Depiction;
    - Flight Specific Likelihood Feedback;
    - Pre-Oceanic Coordination Planner; and
    - Re-Profile Alert.
- Integrate Pre-Oceanic Capabilities into Mini Global synthetic environment.

Program Plans FY 2017 – Performance Output Goals

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

Program Plans FY 2018-2020 – 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 and new UAS enabling technologies. It executes concept development, engineering analysis, and evaluation in support of mission analysis and investment analysis activities. 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.

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. The program will identify and mature UAS enabling technologies within the NAS Infrastructure to support the evolution of UAS in the NAS. Advanced planning is essential to develop the technology for full implementation of UAS National Goals. 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 and new technologies. These new technologies may include communications, surveillance, and automation changes to support continued evolution of UAS in the NAS. Issues involved in UAS integration in the NAS, 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.

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 Unmanned Aircraft Systems 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 2016 – Performance Output Goals

- Develop operational scenarios.
- Update Concept of Operations (CONOPS).
- Update shortfall analysis document.
- Conduct Human in the Loop (HITL) trials and simulations focused on what could be viewed as nearer-term UAS operations such as, search and rescue operations, agriculture monitoring and/or news crews.
- Perform preliminary functional analyses.
- Develop a plan for a NAS Threshold Analysis to determine the impact of increasing numbers of UAS in the NAS. Plan will be phased, with additional types of UAS operations and numbers of UAS increasing over time.
- Develop Preliminary Operational Requirements Document.
- Update Safety Analyses.
- Develop HITL and simulation plans for future Concept Validation.

Program Plans FY 2017 – Performance Output Goals
- Update CONOPS.
- Develop additional operational scenarios, as needed.
- Develop Preliminary Computer Human Interface requirements documents.
- Update preliminary functional analyses.
- Update Safety Analyses.
- Update Operational Requirements document
- Develop HITL Plans for next round of concept validation.

Program Plans FY 2018 – Performance Output Goals
- Conduct second round of NAS Threshold Analysis focused on increasing numbers of UAS in select airspace. Results from FY 2016 HITLs will inform this analysis.
- Conduct HITL trials and simulations looking at UAS operations on the airport surface, use of UAS in high altitude surveillance, and transiting to high altitude airspace. The trials will identify new operational requirements and potential research areas.
- Update CONOPS.
- Update shortfall analysis.
- Update Safety Analyses.
- Develop rough order or magnitude (ROM) cost estimates.
- Develop preliminary benefits analysis documents.
- Develop initial Concept of Use documents.
- Update Operational Requirements document.
- Develop preliminary program requirements.

Program Plans FY 2019 – Performance Output Goals
- Conduct NAS Threshold Analysis focused on increasing numbers of UAS in select airspace. Results from FY 2018 HITL trials will inform this analysis.
- Conduct HITL trials and simulations looking at long endurance high altitude flights, oceanic airspace and delegated separation to identify new operational requirements and potential research areas.
- Update Safety Analyses.
- Update ROM cost estimates
- Develop preliminary benefits analysis documents.
- Prepare artifacts and complete coordination to support Concept Requirements Development Readiness Decision (CRDRD).

Program Plans FY 2020 – Performance Output Goals
- Achieve CRDRD.
- Conduct NAS Threshold Analysis focused on increasing numbers of UAS in select airspace. Results from FY 2019 HITL trials will inform this analysis.
- Conduct HITL trials on requirements areas needing further clarification.
- Update CONOPS.
- Update Initial Concept of Use document.
- Develop quantified shortfall analysis.
- Develop initial program requirements.
- Update Operational Requirements document.
- Develop Enterprise Architecture Artifacts.
- Update Safety Analyses.
- Update ROM cost estimates.
- Update initial program requirements.
- Identify technical alternatives as necessary.
- Prepare artifacts and complete coordination to support Investment Analysis Readiness Decision (IARD).

H, Reduced Oceanic Separation, G02S.04-01

Program Description

The Reduced Oceanic Separation program will address gaps in performance by increasing 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 to allow for optimum routing or creating new air routes for increased airspace capacity. Performance levels for the various communications, navigation, and surveillance components must be suitable to provide the required accuracy necessary for reducing separation standards. Appropriate tradeoffs are possible if some systems have more sophisticated capabilities that can supplement performance shortfalls in other systems. For example, better navigation can reduce the need for more frequent surveillance updates and better surveillance may offset communications latencies.

Although technical advances have improved the controller capability to control aircraft in the oceanic sectors, there are still limitations associated with Oceanic airspace. A lack of ground based surveillance such as radar and inefficiencies associated with data link and high frequency communications requires larger separation between aircraft than would otherwise be necessary. In most oceanic sectors, separation is dependent on equipage, and the inconsistent levels of equipage by aircraft flying oceanic routes requires separation minima to be greater than that required for well-equipped aircraft.

To address the limitations in the oceanic ATC system, the 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 time estimates and positions. Currently, this information is generated by Future Air Navigation System (FANS); in the future, this information could be generated/enhanced by one of the Reduced Oceanic Separation alternatives.

This initiative to re-examine the oceanic limitations supports a number of planned NextGen Operational Improvements (OIs) as well as addressing the opportunity for space-based surveillance. Related NextGen OIs include:

- OI 102108 – Oceanic In-Trail Climb and Descent
- OI 104102 – Flexible Entry Times for Oceanic Tracks

The three Reduced Oceanic Separation alternatives being evaluated:

1. promote continued voluntary equipage of FANS-1/A;
2. acquire a space-based Automatic Dependent Surveillance Broadcast (ADS-B Out) service; and
3. develop and approve the use of the ADS-B In Pairwise Trajectory Management (PTM) application.

An Investment Analysis Readiness Decision was completed in January 2014. A JRC Strategy Decision took place on October 15, 2014. This strategy decision defines the approach to mature all three alternatives, and provide operators with the service that best suits their business needs. Alternative 3 (ADS-B In PTM) will be incorporated into the ADS-B NAS Wide Implementation – Future Segments (CIP G02S.01-02) program and will cease to be part of the Reduced Oceanic Separation program. Future JRC decisions are planned in 2018.

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 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 2016 – Performance Output Goals
- Establish Service Delivery Point for test purposes.
- Conduct ICAO & FAA Safety Assessments – FANS-1/A and Space Based ADS-B.
- Validate the delivery and conduct assessment of pre-operational space-based data to WJHTC.
- Conduct separation assurance and safety assessments for alternatives.
- Develop Final Requirements document.

Program Plans FY 2017 – Performance Output Goals
- Complete Target Level of Safety Analysis.
- Service Acceptance Test at the WJHTC for Oceanic service volumes.
- Conduct ICAO & FAA Safety Assessments – FANS-1/A and Space Based ADS-B.

Program Plans FY 2018 – Performance Output Goals
- Conduct ICAO & FAA Safety Assessments – FANS-1/A and Space Based ADS-B.
- Achieve JRC decisions for alternatives being evaluated.

Program Plans FY 2019 – Performance Output Goals
- Complete ICAO & FAA Safety Assessments.

Program Plans FY 2020 – Performance Output Goals
- Complete End to End testing – ADS-B Out.
- Complete Operational Test and Evaluation – ADS-B Out.
- Achieve IOC – ADS-B Out.

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

Program Description

Separation Automation System Engineering will refine and validate NextGen capabilities that will improve separation management automation tools for air traffic controllers (ATC) in the Oceanic, En route and Terminal domains. This pre-implementation effort 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, part task analysis and human-in-the-loop (HITL) 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.

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 59,122, 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 2016 – Performance Output Goals

- None.

Program Plans FY 2017 – Performance Output Goals

- Conduct an operational integration analysis to identify potential separation management issues due to introduction of multiple changes to the primary separation management platforms.
- Conduct operational assessment of extended en route trajectory prediction and automated conflict detection capabilities.
- Complete feasibility study white paper on ERAM's ability to issue 4D Trajectory for direct routes.
- Conduct concept engineering activities to identify shortfalls associated with terminal conflict alert (CA) and minimum safe altitude warning (MSAW) functions and enhancements to those functions.

Program Plans FY 2018 – Performance Output Goals

- Conduct an operational evaluation for extending the en route trajectory prediction and automated conflict detection and routing capabilities to utilize data communications.
- 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 functions.
- Develop the following products in support of the Concept and Requirements Definition Readiness Decision (CRDRD):
    - Preliminary shortfall analysis
    - As Is and To Be functional analyses
    - Preliminary concept of operations document
    - CRD plan

Program Plans FY 2019 – Performance Output Goals

- Develop and operationally evaluate mitigations in response to the introduction of multiple capabilities that impact separation management platforms.
- Develop the following products in support of Initial Analysis Readiness Decision (IARD):
    - Final shortfall analysis document
    - Solution concept of operations
    - Functional analysis document
    - NAS enterprise architecture products
    - Environmental impact statement assessment
    - Operational safety assessment
    - Preliminary program requirements
    - Range of alternatives document
    - Rough order of magnitude cost estimate and monetize shortfalls
    - Acquisition category determination
    - Initial investment analysis plan

Program Plans FY 2020 – Performance Output Goals

- Develop the following products in support of Initial Investment Decision:
  - Initial program requirements
  - Business case analysis report
  - Enterprise architecture artifacts
  - Implementation strategy and planning document
  - Chief Financial Officer package
- 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
  - Based upon gaps, complete As Is and To Be functional analyses, and conduct concept validation activities to mature new enhancements

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

Program Description

As NextGen evolves, precise 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. This program will also assess human performance issues for controllers and technical operations personnel to ensure safe operations at increased capacity levels. Additionally, it will assess how these roles will be best 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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

This program aims at developing concepts for improving the use of airport capacity. It will evaluate whether the proposed benefits for new operational concepts can be achieved, and assess the human factors implication of these new and other related NextGen concepts and technologies. Incorporation of such concepts as well as human factors guidance and products into NAS systems will result in improvements in air traffic controller efficiency such as handling a greater number of aircraft to meet forecast demand and increase throughput while maintaining the safety of the NAS.

Program Plans FY 2016 – Performance Output Goals

- None.

Program Plans FY 2017 – Performance Output Goals

- Document findings from concept validation studies in a report 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 implementation in 2020-2022 and beyond.
- Document 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 operational methods document to address future growth in demand and reduce gate-to-gate transit time.
- Document initial research on assessing human and system performance of reduced horizontal separation standards, 3 nautical miles (nm), in the en route environment.
- Document initial research for assessing "no closer than" spacing operations in the terminal area where Time Based Flow Management (TBFM) is not being used. Understand the roles and interactions of the controller, ground automation, and the required avionics on the flight deck for successful operations.

Program Plans FY 2018 – 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.
- Develop operational methods and procedures documents that will address future growth in demand, reduce gate-to-gate transit time and increase efficiency through a decrease in workload and increased reliance on automation.
- Develop criteria for assessing human and system performance impacts from the use of 3-nm separation in the en route environment. Criteria should address the potential impact to wake mitigation procedures and various 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. New enhancements will not only alert controllers of pending conflicts but decision support tools (DSTs) will provide rank-ordered conflict resolutions actions to controllers based on environmental factors such as efficiency, weather, and take into account the action resulting in creating additional conflicts. Include the analysis of the impact of adverse events and overall system resiliency in maintaining safe separation standard when using the added level of automation.

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 operational methods and procedures documents that will address future growth in demand, reduce gate-to-gate transit time and increase efficiency through a decrease in workload/increased reliance on automation.
- Validate the information and design requirements evaluation criteria to assess human performance impacts when implementing 3-nm separation operations en route. Begin 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. Start evaluation with a subset of relevant use cases.
- Develop evaluation criteria to assess the rank-ordered conflict resolutions recommendations that the DST provide. 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 operational methods and procedures documents that will address future growth in demand, reduce gate-to-gate transit time and increase efficiency through a decrease in workload/increased reliance on automation.
- Consolidate identified impacts and issues from assessment on 3-nm separation operations en route. Integrate the results in a report that provide guidance for enhancing human and system performance to accommodate and comply with 3-nm separation in en route airspace.
- Consolidate the 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 the criteria used for the evaluation of human performance impacts related to using automated rank-ordered conflict resolutions from DST, and provide additional recommendations to the design of these tools based on Human Factors Standards and best practices. 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.

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 59,122, 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 2016-2018 – 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.
- Publish system analysis recording via SWIM.
- Subscribe to Weather Data – Weather and Radar Processor and Weather Message Switching Center Replacement 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, 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 directly link 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 59,122, 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 2016-2019 – 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.

1A06, NEXTGEN – IMPROVED SURFACE/TERMINAL FLIGHT DATA MANAGER (TFDM) PORTFOLIO

FY 2016 Request $17.0M

- A, Terminal Flight Data Manager (TFDM) – Segment 1, G06A.03-01
- B, Surface Tactical Flow, G02A.01-01
- X, Surface Conformance Monitoring, G02A.01-02

A, 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 air traffic control (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. The decision support capabilities will also promote more efficient and safe 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 and, En Route, and Approach Control, Traffic Flow Management (TFM), and Flight/Airline Operations facilities.

Early implementation of TFDM will be comprised of the following:

- Traffic Flow Management System (TFMS) enabled data exchange for additional data elements from the flight operators;
- Deployment of a Surface Situational Awareness capability at Southern California TRACON (SCT) via System Wide Information Management (SWIM);
- Sustainment of the Phoenix (PHX) Advanced Electronic Flight Strip System (AEFS) prototype and deployment of additional AEFS prototypes at approximately 4 sites (Cleveland (CLE), San Francisco (SFO), Las Vegas (LAS), Charlotte (CLT); 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.

Initial deployment of TFDM will be comprised of the following functions:

- Migration to electronic flight data exchange, including enhanced tower/TRACON data exchange;
- Increased sharing and Collaborative Decision Making (CDM) based on shared surface situational awareness and automated surface surveillance data;
- TFDM scheduler/sequencer, including integration of Traffic Flow Management System (TFMS)/Time Based Flow Management (TBFM) and CDM on the surface implementation;
- Enhanced data exchange with flight operators and other airport stakeholders.

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, and those in other Air Traffic Control facilities and overseeing Traffic Flow Management systems. This will also facilitate data exchange with aviation partners such as the airlines' flight operations centers and airport operators to support collaborative decision making. Providing flight data in electronic format eliminates the necessity of physical exchange of flight data, reduces telephone exchange of data between facilities, and reduces manual re-entry of data among multiple ATC systems.

Another key component of 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.

Initial Investment Decision was achieved in March 2014. Final Investment Decision (FID) date is planned for March 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 spanning from FY 2020 to FY 2027.

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 59,122, 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 lead to more efficient performance and airport capacity utilization during severe weather and other off-nominal conditions.

Program Plans FY 2016 – Performance Output Goals

- Complete enhanced CDM for Surface data element exchange into TFMS.
- Complete AEFS operational in SFO.
- Complete Technology Refresh deployment of EFSTS at 8 of 39 sites (21% complete).
- Complete Investment Analysis (IA) – Establish a Program Baseline at FID.
- Complete the evaluation of the prime contractor proposals received in response to the TFDM Screening Information Request (SIR).
- Award Prime Contract.
- Conduct System Requirements Review (SRR) for Build 1 Development and Integration.
- Conduct Preliminary Design Review (PDR) for Build 1 Development and Integration.

Program Plans FY 2017 – Performance Output Goals

- Conduct Critical Design Review (CDR) for Build 1 Development and Integration.
- Begin incremental software and hardware development of TFDM system.
- Complete Technology Refresh deployment of EFSTS at 24 of 39 sites (82% complete).

Program Plans FY 2018 – Performance Output Goals

- Complete hardware unit testing and incremental software development testing of TFDM Build 1 Development and Integration.
- Complete Factory Acceptance Test for Build 1 Development and Integration.
- Complete System Integration of TFDM Build 1.
- Conduct System Requirements Review (SRR) for Build 2 Development and Integration.
- Complete Technology Refresh deployment of EFSTS at 7 of 39 sites (100% complete).

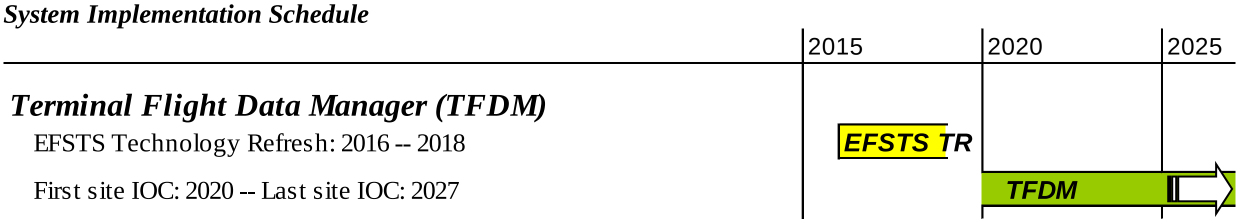
Program Plans FY 2019 – Performance Output Goals

- Complete Government Acceptance Testing of TFDM Build 1.
- Conduct Preliminary Design Review (PDR) for Build 2 Development and Integration.
- Conduct Critical Design Review (CDR) for Build 2 Development and Integration.
- Complete Factory Acceptance Test for Build 2 Development and Integration.
- Conduct Operational Test program of TFDM Build 1.

Program Plans FY 2020 – Performance Output Goals

- Complete TFDM Key Site installation and checkout.
- Complete Initial Operating Capability (IOC) at key site for Build 1 Development and Integration.
- Complete System Integration of TFDM Build 2.
- Conduct System Requirements Review (SRR) for Build 3 Development and Integration.

System Implementation Schedule



B, 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 improve the use of airport capacity by coordinating surface and airborne trajectory based operations.

This program will demonstrate and document requirements for a series of capabilities that build to the NextGen vision for Surface Trajectory-Based Operations (STBO). Examples of capabilities include local data exchange which leads to the sharing of flight readiness information to enable collaboration of pre-planned runway schedules integrated with airborne trajectory-based operations. Surface flow management will reduce engine operating times during surface operations, resulting in fuel-savings and reduced environmental impacts and avoidance of 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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

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

Program Plans FY 2016 – Performance Output Goals

- Deliver a report summarizing support to NASA’s Air Traffic Demonstration 2 (ATD-2) as a means of risk reduction of 3T (Time-Based Flow Management (TBFM) - Traffic Flow Management System (TFMS) - Terminal Flight Data Manager (TFDM)) Integration and as an option for the NextGen Integration Working Group (NIWG) commitment to Congress to conduct a departure management demonstration.
- Deliver a Safety Risk Management Document for departure management field demonstration at a selected airport.
- Deliver a departure management collaborative HITL Plan.
- Deliver an Airport Collaborative Decision Making Implementation Plan in collaboration with industry stakeholders for a selected airport.
- Conduct a simulation of Integrated Scheduling capabilities in preparation for a departure management field evaluation.
- Adapt Integrated Departure Arrival Capability (IDAC) to selected ATC environment (Tower, TRACON, and ARTCC).

Program Plans FY 2017 – Performance Output Goals

- Deliver a report summarizing the continued support and any research products from the technology transition of risk reduction research and provide lessons learned of 3T integration.
- Leverage NASA research efforts to accomplish field evaluations of Integrated Scheduling with coordination of TBFM, TFMS and TFDM.
- Conduct a field evaluation of a collaborative departure management capability, to include surface CDM and collaboration with flight operators, airport operators, and ATC.
- Deliver field evaluation report of collaborative departure management capability, to include surface CDM and collaboration with flight operators, airport operators, and ATC.
- Complete technology transfer of lessons learned in departure management with integrated scheduling in the NAS.

Program Plans FY 2018 – Performance Output Goals

- Deliver a report summarizing the leveraging of NASA research efforts for NAS integrated scheduling.
- Develop a collaborative HITL simulation plan for integrated scheduling.
- Conduct a collaborative HITL simulation for integrated scheduling.
- Deliver a report on a collaborative HITL simulation for integrated scheduling.

Program Plans FY 2019 – Performance Output Goals

- Deliver a report summarizing the leveraging of NASA research efforts for NAS integrated scheduling, with concentration on the TRACON area with metroplex airports.
- Develop a collaborative simulation plan for an additional integrated scheduling simulation, with concentration on TRACON area with metroplex airports.
- Develop collaborative plan for NASA's field demonstration in an operational environment.
- Develop a simulation plan for specific FAA focus areas in integrated scheduling which require additional maturity.
- Conduct simulation of specific FAA focus areas in integrated scheduling which require additional maturity.
- Deliver report on simulation of specific FAA focus areas in integrated scheduling which require additional maturity.

Program Plans FY 2020 – Performance Output Goals

- Deliver a report summarizing the continued leveraging of NASA research efforts for NAS integrated scheduling, with concentration on the TRACON area with metroplex airports.
- Develop collaborative plan for NASA's second field demonstration in an operational environment, with concentration on the TRACON area with metroplex airports.
- Complete technology transfer of lessons learned.
- Develop Time-Based Taxi Route Generation Tool simulation plan.
- Conduct a simulation of a Time-Based Taxi Route Generation Tool.

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. SCM will provide safety and workload benefits through conformance 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; and
- Demonstrate Trajectory Based Operations (TBO) concept feasibility on airport surface.

This program will 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 59,122, 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, thereby freeing up controllers to manage more aircraft on the surface environment resulting in improved capacity and efficiency. It can also reduce taxi times resulting in reduced surface delays at congested airports.

Program Plans FY 2016-2017 – Performance Output Goals

- None.

Program Plans FY 2018 – Performance Output Goals

- Complete assessment of NASA Integrated Surface Management with Flight Deck Research Transition Product.
- Update Concept of Use document for Surface Conformance Monitoring to include flight deck and ground based conformance integration.

Program Plans FY 2019 – Performance Output Goals

- 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.
- Conduct HITL simulations of Time-Based Surface Trajectory Based Operation (STBO) Surface Conformance Monitoring evaluating the performance of Departure-Taxi clearance delivery.

Program Plans FY 2020 – Performance Output Goals

- Complete initial use case and operational procedures for Conformance Monitoring with integrated Flight Deck.
- Complete HITL evaluation of Time Based Surface Conformance Monitoring integrating NASA Integrated Surface Management with Flight Deck.
- Complete HITL evaluation report for Time Based Surface Conformance Monitoring integrating NASA Integrated Surface Management with Flight Deck.
- Deliver the tech transfer package.

1A07, NEXTGEN – ON DEMAND NAS PORTFOLIO

FY 2016 Request $11.0M

- 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
- X, Advanced Methods, G05A.02-02
- X, Collaborative Information Management (CIM), G05M.02-01
- 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, Airport, Terminal, Enroute, and Oceanic). Similarly, International Air Navigation Service Providers (ANSPs) also operate as separate entities servicing their own airspace. Even though flight data may be found in multiple NAS systems, a unified, complete, accurate, up-to-date, and easily-accessible picture of any and 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 both 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 much richer than today's flight data construct. FIXM is part of a family of information exchange models (including AIXM - Aeronautical Information Exchange Model and WXXM - Weather information Exchange Model) designed to cover the information needs of Air Traffic Management (ATM). FIXM is an International data exchange standard, and it will receive annual incremental updates 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. The FAA will deploy Flight Data Publication Service (FDPS) under the SWIM Segment 1 program (G05C.01-01) which will publish by FY 2015 SWIM-compliant flight data from En Route Automation Modernization (ERAM) in the FIXM standard. FDPS is currently planning for deployment using FIXM v1 and will be upgraded to incorporate future FIXM releases. International data exchange will soon start to be available. 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, the FIXM embraces the "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 the version 5.0 and 6.0, the FIXM Core will include the additional set of data elements to support the four-dimensional trajectory (4DT) concept. Series of 4DT operational scenarios are being developed and coordinated between SESAR and NextGen. These scenarios, along with FIXM data elements necessary to support the illustrated 4DT concept, will serve as input for the development of FIXM Core data standard. In addition, the FIXM US Extension will supplement FIXM content in the following data areas to support various FAA NextGen initiatives through the future releases:

- Surface CDM;
- US Trajectory;
- UAS;
- Commercial Space; and
- Flight Capability.

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

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

<u>Development of FIXM Standard:</u>
The FIXM Core Standard will be updated on an 18 months basis (FIXM V3.0 was released in August 2014), while the FIXM US extension will follow an annual development cycle. The following artifacts will be created for each version: FIXM data dictionary, data models and XML schema. The updates will be created with collaboration with FAA stakeholders, International partners, industry, International Civil Aviation Organization (ICAO) and International Air Transport Association (IATA).

<u>Flight Object Operational Analysis:</u>
The operational analysis will assess various ATM capabilities and identify their 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 59,122, 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. This 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, thereby improving planning, decision making, and NAS capacity.

Program Plans FY 2016 – Performance Output Goals
<u>Development of FIXM Standard:</u>

- Develop and complete final FIXM Core v4.0 artifacts.
- Develop and complete final FIXM US extension v4.0 artifacts.

<u>Flight Object Operational Analysis:</u>

- Develop and complete final global Flight Object Operational Analysis Document for FIXM Core v5.0.
- Develop and complete final US Flight Object Operational Analysis Document for US extension v5.0.
- Develop and complete final operational scenarios to define the operational context for FIXM US Core v4.0.
- Develop and complete final operational scenarios to define the operational context for FIXM US extension v4.0.

Program Plans FY 2017 – Performance Output Goals

Development of FIXM Standard:

- Develop and complete final FIXM Core v5.0 artifacts.
- Develop and complete final FIXM US extension v5.0 artifacts.

Flight Object Operational Analysis:

- Develop and complete draft global Flight Object Operational Analysis Document for FIXM Core v6.0.
- Develop and complete final US Flight Object Operational Analysis Document for US extension v5.1.
- Develop and complete final operational scenarios to define the operational context for FIXM US Core v5.0.
- Develop and complete final operational scenarios to define the operational context for FIXM US extension v5.0.

Program Plans FY 2018 – Performance Output Goals

Development of FIXM Standard:

- Develop and complete draft FIXM Core v6.0 artifacts.
- Develop and complete final FIXM US extension v5.1 artifacts.

Flight Object Operational Analysis:

- Develop and complete final global Flight Object Operational Analysis Document for FIXM Core v6.0.
- Develop and complete final US Flight Object Operational Analysis Document for US Extension v6.0.
- Develop and complete draft operational scenarios to define the operational context for FIXM US Core v6.0.
- Develop and complete final operational scenarios to define the operational context for FIXM US extension v5.1.

Program Plans FY 2019 – 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.

Flight Object Operational Analysis:

- Develop and complete final global Flight Object Operational Analysis Document for FIXM Core v7.0.
- Develop and complete final US Flight Object Operational Analysis Document for US Extension v7.0.
- Develop and complete final operational scenarios to define the operational context for FIXM US Core v6.0.
- Develop and complete final operational scenarios to define the operational context for FIXM US extension v6.0.

Program Plans FY 2020 – Performance Output Goals

Development of FIXM Standard:

- Develop and complete final FIXM Core v7.0 artifacts.
- Develop and complete final FIXM US extension v7.0 artifacts.

Flight Object Operational Analysis:

- Develop and complete draft global Flight Object Operational Analysis Document for FIXM Core v8.0.
- Develop and complete final global Flight Object Operational Analysis Document for US extension v7.1.
- Develop and complete final operational scenarios to define the operational context for FIXM US Core v7.0.
- Develop 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 improved access to aeronautical information and a common language so that external users (DoD, Airline Operations Centers, Flight Operation Centers, pilots) and Air Navigation Service Providers (ANSP) can make more informed decisions and plans based on the most current information available with regard to planned airspace constraints (e.g. SAA etc.), airport configuration, static airspace constraints, and NOTAMs affecting the NAS.

Key elements of the CSSD program include:

- The Aeronautical Common Services (ACS) platform, implemented as part of Aeronautical Information Management Modernization (AIMM) Segment 2, will be used to ingest data from the authoritative databases, process and combine data from these multiple sources, and distribute the data via the System-Wide Information Management (SWIM) infrastructure. The combination of the ACS, SWIM network, and authoritative NAS databases will provide an enterprise level platform for accessing and delivering both (1) the authoritative data and/or (2) products created 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 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 are: aeronautical information visualization/mapping, relational filtering (e.g. airspace affected by a given NOTAM, Standard Operating Procedures/Letter of Agreement (SOP/LOA) constraints affecting a given geographic location, and airspace affected by SAA Schedule and Status); 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 (2010-1018). 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, management, and maintenance of aeronautical information in a digital format for machine to machine exchange. When fully realized the FAA will have the ability to model how new procedures, new regulations, new airspace changes, and dynamic SAA information affect current and future NAS safety.

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 by supporting preflight, during flight and post-operational aeronautical information for exchange and use by NAS automation systems. The resulting gains will enable the FAA to maximize safety, to reduce the number of incidents.

Program Plans FY 2016 – Performance Output Goals

- Develop cross-domain requirements document identifying operational and design requirements for users of automation systems and decision support tools to connect to and access aeronautical information including airspace definitions, airport configurations, SAA schedules/Status/legal descriptions, SOP/LOA, and other constraints such as miles-in-trail restrictions, boundary crossing data, via ACS and SWIM.
- Develop the following products in support of the Concept and Requirements Definition Readiness Decision (CRDRD) for AIM Modernization Segment 3 (AIMM S3):
  - Preliminary Shortfall Analysis
  - Assess NAS ConOps impact and endorse Enterprise Architecture changes
  - Concept and Requirements Definition (CRD) Plan
- Achieve CRDRD for AIMM S3.

Program Plans FY 2017 – Performance Output Goals

- Begin developing level of integration of the aeronautical information in NAS automation and interface requirements documents to support design of interfaces and data flow with decision support tools and other automation using AIM information, for example, ERAM or TFDM.
- Develop the following products in support of the Investment Analysis Readiness Decision (IARD) for AIMM S3:
    - Functional Analysis
    - Concept of Operations
    - Investment Analysis Plan
    - Enterprise Architecture Artifacts
    - Preliminary Program Requirements
- Achieve IARD for AIMM S3.

Program Plans FY 2018 – Performance Output Goals

- Finish developing level of integration of the aeronautical information in NAS automation and interface requirements documents to support design of interfaces and data flow with decision support tools and other automation using AIM information, for example, ERAM or TFDM.
- Develop the following products in support of the Initial Investment Decision (IID) for AIMM S3:
    - Initial Program Requirements
    - Business Case Analysis Report (BCAR)
    - Enterprise Architecture Artifacts
    - Implementation Strategy and Planning Document (ISPD)
    - Chief Financial Officer (CFO) Package
- Achieve IID for AIMM S3.
- Develop requirements for ingesting, fusing, and distributing static and planned constraint information including SAA and airport configuration data (i.e., airspace definitions and schedules, airport configuration definitions and business rules).
- Develop requirements for SOP/LOA constraints and relevant aeronautical data and information such as airspace activation, active runway, and additional status information from NAS systems including ERAM and TFDM respectively to deliver common status and structure data and integrated information products through web services.

Program Plans FY 2019 – Performance Output Goals

- Develop the following products in support of the CRDRD for AIM Modernization Segment 4 (AIMM S4):
    - CRD Plan
    - Concept of Operations
    - Shortfall Analysis
- Achieve CRDRD for AIMM S4.
- Develop the following products in support of the Final Investment Decision (FID) for AIMM S3:
    - Final Program Requirements
    - BCAR
    - ISPD
    - Enterprise Architecture Artifacts
    - Communications Plan
- Achieve FID for AIMM S3.

Program Plans FY 2020 – Performance Output Goals

- Develop the following products in support of the IARD for AIMM S4:
    - Preliminary Program Requirements
    - Functional Analysis
    - Investment Analysis Plan
    - Enterprise Architecture Artifacts
- 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, 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 (including Aeronautical Information Exchange Model (AIXM) and 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 these updates will require updating FOXS 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. The information contained in the Flight Object will evolve to support new capabilities and become much more detailed than today's flight data.

The Program is currently in the Concept and Requirements Definition (CRD) Phase. It is scheduled for an Investment Analysis Readiness Decision (IARD) in FY 2016 and Final Investment Decision (FID) is planned by 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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

The FOXS will provide a unified, complete, accurate, up-to-date, and easily-accessible picture of any and 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, thereby improving planning, decision making, and use of NAS capacity.

Program Plans FY 2016 – Performance Output Goals

- Complete engineering and Investment Analysis planning for incorporating FOXS into ATM Systems.
- Complete Investment Analysis for implementation of consolidated national exchange of standardized flight data.

Program Plans FY 2017 – Performance Output Goals

- Complete engineering and Investment Analysis planning to incorporate FIXM changes into FOXS.
- Complete Investment Analysis for incorporating FIXM changes into SWIM services.
- Complete the following products to support the FOXS Initial Investment Decision (IID):
  - Initial Program Requirements
  - Business Case Analysis Report (BCAR)
  - Enterprise Architecture Artifacts
  - Implementation Strategy and Planning Document (ISPD)
  - Chief Financial Officer (CFO) Package

Program Plans FY 2018 – Performance Output Goals

- Complete the following products to support the FOXS FID:
  - Final Program Requirements
  - BCAR
  - ISPD
  - Enterprise Architecture Artifacts
  - Communication Plan
- Achieve FID for FOXS.

Program Plans FY 2019 – Performance Output Goals

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

Program Plans FY 2020 – Performance Output Goals

- Complete initial FOXS implementation, including:
  - FOXS hardware infrastructure
  - 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;
  - In-Service Review (ISR) Checklist completed or action plans for those remaining open;
  - Safety Risk Management Document;
  - Information security certification and authorization or certification and authorization;
  - Stakeholder concurrence on readiness for the ISD; and
  - ISD briefing and action plans.

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 efficiency of operations. When faced with constraints such as weather, dynamic airspace supports robust aviation business continuity capabilities for a consistent NAS flow strategy.

Concept and Requirements Definition Readiness Decision (CRDRD) for this program is planned for FY 2018. An Investment Analysis Readiness Decision (IARD) for this program is planned for FY 2019. Initial Investment Decision (IID) is planned for FY 2020. The 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 2 – Maintain an average daily capacity for Core airports of 59,122, 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 Special Use Airspace (SUA).

Program Plans FY 2016 – Performance Output Goals

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

Program Plans FY 2017 – Performance Output Goals

- Conduct concept validation activities, such as a human-in-the-loop simulation.
- Develop an initial Concept of Operations (ConOps).

Program Plans FY 2018 – Performance Output Goals

- Complete documentation in preparation for CRDRD.
- 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 2019 – 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 2020 – Performance Output Goals

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

X, 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 work will support improvements to increase airport capacity and sector throughput, and reduce sector delays by providing the NAS users and Air Traffic Management (ATM) with a common understanding of the 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 in FY 2016 through FY 2018, together with those developed through the Strategic Flow Management Application (SFMA) program, will serve as the basis for Collaborative Air Traffic Management Technologies (CATMT) Work Package 5 (WP5). Along with baselined Traffic Flow Management System (TFMS) enhancements, the CATMT Work Package 5 investment will provide new TFM functions to improve NAS traffic flow prediction and efficiency as well as overall system capacity. Advanced Methods will identify automation and procedural enhancements to address strategic TFM shortfalls in the following areas:

- Constraint Prediction, Monitoring and Alerting:
    - Translate the effects of weather and traffic complexity on 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" analysis 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.

- Post-Operational Analysis and Training:
    - 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.

The capabilities defined by this program will be implemented in future TFMS updates. Other potential system interdependencies include En Route Automation Modernization, Time-Based Flow Management, and System Wide Information Management.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

Advanced Methods for TFM will analyze different technologies, infrastructure enhancements, and procedural changes that will lead to improvements that will allow more efficient use of airport capacity, increase sector throughput and reduce sector delays.

Program Plans FY 2016 – Performance Output Goals
- None.

Program Plans FY 2017 – Performance Output Goals
- Conduct concept engineering activities to develop the following products:
  - Updated capability functional analysis and requirements for individual capabilities under constraint prediction, monitoring and alerting; operational response development; and post-operational analysis and training; and
  - Rough order of magnitude cost estimate for individual capabilities under constraint prediction, monitoring and alerting; operational response development; and post-operational analysis and training.

Program Plans FY 2018 – Performance Output Goals
- Update products as necessary for individual capabilities under constraint prediction, monitoring and alerting; operational response development; and post-operational analysis and training.
- Begin exploring new capabilities and developing associated products:
  - 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, HITLs, and reports; and
  - Updated capability CONOPS.

Program Plans FY 2020 – Performance Output Goals
- Conduct concept engineering activities to develop the following products:
  - Updated capability functional analysis;
  - Updated capability requirements;
  - Quantitative capability benefits; and
  - Rough order of magnitude cost estimate.

X, Collaborative Information Management (CIM), G05M.02-01

Program Description

Collaborative Information Management is an information sharing capability that promotes inter-agency communication and collaboration through the use of modern network enabled tools, technologies, and operational procedures. Stakeholders will be provided with the connectivity and interoperability necessary to rapidly and dynamically share information. The connectivity and interoperability will be enhanced by validation and development of processes and procedures to share relevant information with other government agencies that have their own Service Oriented Architecture (SOA), such as the Department of Homeland Security (DHS) and the Department of Defense (DoD). The CIM program will also look at the use of mobile applications in a System-Wide

Information Management (SWIM) structure; specifically focusing on the non-safety critical ATM function. The long term goal is to establish the requirements for robust inter-agency SOA environment that provides the equivalent of the FAA's SWIM functionality.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

With collaborative situational awareness tools available to the FAA, DoD and DHS, decision making for flights will be done efficiently and with more precise timing. This will greatly enhance the communication needed to handle future Unmanned Aircraft flights and the projected increase in air travel.

Program Plans FY 2016 – Performance Output Goals
- None.

Program Plans FY 2017 – Performance Output Goals
- Complete an engineering report outlining a method of enhanced security and encryption for flight information to secure individual data fields.
- Evaluate cyber threat scenarios related to air domain system vulnerabilities and report findings.

Program Plans FY 2018 – Performance Output Goals
- Complete a report evaluating the sharing of enhanced operational data products between FAA and other agencies.

Program Plans FY 2019 – Performance Output Goals
- Provide recommendations and findings on international information sharing requirements for government to government.

Program Plans FY 2020 – Performance Output Goals
- Complete a report outlining the potential security concerns and constraints for international operational data exchange.

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.

A Final Investment Decision 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 2016-2019 – Performance Output Goals

- None.

Program Plans FY 2020 – Performance Output Goals

- Complete Chief Financial Officer Package.
- Release Screening Information Request.

1A08, NEXTGEN – ENVIRONMENT PORTFOLIO
FY 2016 Request $1.0M

Environmental Management System & Noise/Emission Reduction, G06M.02-01

Program Description

Despite the technological advancements achieved during the last 40 years, aircraft noise still affects people living near airports, and aircraft emissions continue to be an issue at local, regional, and global scales. While energy efficiency and local environmental issues have traditionally been important drivers of aeronautics innovation, the current and projected effects of aviation emissions on our global climate are a serious long-term environmental issue facing the aviation industry. Aside from their associated health and welfare impacts, aircraft noise and aviation emissions are a considerable challenge in terms of community acceptance of aviation activities and this challenge is anticipated to grow. Environmental impacts are often the number one cause of opposition to airport capacity expansion and airspace redesign.

The Environmental Management System and Noise/Emissions Reduction program is providing the tools and analyses and maturing solutions to mitigate the impacts of aviation on the environment. This program is part of the overall FAA effort to reduce system wide aviation environmental impacts via a five pillar approach consisting of improved tools for environmental analysis based on the advanced scientific understanding; aircraft and engine technologies; alternative fuels; air traffic management modernization and operational procedure improvements; and environmental policies and standards. Without these efforts, environmental impacts imposed by noise, air pollution and greenhouse gas emissions, and fuel consumption could limit the growth in NAS capacity and prevent the full realization of NextGen benefits.

There are two environmental projects under this program.

<u>Environmental Management:</u>
The FAA has designed the NextGen Environmental Management System (EMS) framework to evaluate progress towards aviation environmental and energy goals within the NAS and to aid the development of new options to further mitigate the impact of aviation on the environment. The NextGen EMS framework relies on environmental assessment capabilities and their use to examine the current and future state of the NAS. This effort has led to enhancements of local to NAS-wide environmental assessment capabilities within the Aviation Environment Design Tool (AEDT), improved environmental impacts and economics capabilities in the Aviation Environment Portfolio Management Tool (APMT), and the integration of these environmental assessment capabilities with NAS design tools and simulation models and performance monitoring systems. These environmental modeling capabilities are being used with a combination of the FAA Terminal Area Forecast (TAF), improvements in operational procedures

including those from NextGen incorporation, fleet technology advancement, and estimates of future alternative jet fuel penetration to estimate the current and future environmental performance of the NAS. Through these efforts, the NextGen EMS framework is providing a systematic examination of options for noise, fuel burn, and emissions reduction to support sustainable mobility growth.

Noise and Emission Reduction:
Implementation of advanced aircraft designs in both engine and airframe technologies and improved environmental and energy efficient operational procedures are the keys to significantly reducing environmental impact while improving system energy efficiency. Policy options, environmental standards and market-based measures also provide mitigation that will help to meet environmental and energy efficiency goals. This program will focus on assessing the impacts of surface, departure, en route, and arrival operational procedures and ATM-related technologies that could reduce noise, emissions, and fuel burn. ATM-related aircraft technologies matured under this program complements airframe and engine technology maturation efforts that are being pursued under the Continuous Lower Energy, Emissions and Noise (CLEEN) Program within the NextGen Environmental Research RE&D program.

Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 4 – The U.S. population exposed to significant aircraft noise around airports has been reduced to less than 342,000 persons by 2015.*

Relationship to Performance Metric

This program supports the development of mitigation solutions for improvement of NextGen environmental performance. It supports the development and use of tools to evaluate the system-wide environmental performance. It also supports accelerated development and implementation of operational procedures, air traffic management improvements and adoption of aircraft technologies that could reduce aircraft noise and improve energy efficiency. These two efforts, which are a part of the overall Environment and Energy portfolio, will lead to reduction in the aircraft noise footprint and the number of people exposed along with improvement in the aviation environmental performance while ensuring that environmental issues are not a constraint on aviation growth.

Program Plans FY 2016 – Performance Output Goals
- Submit a report on enhancements to Aviation Environmental Design Tool (AEDT) terminal area capabilities to enable the evaluation of environmental impacts from NextGen.
- Submit a final report on integration of NextGen simulation models and data with AEDT software version 2b.

Program Plans FY 2017 – Performance Output Goals
- Report on further enhancements to AEDT to enhance fuel burn and emissions modeling, that account for high fidelity weather to enable improved evaluation of the environmental impacts from NextGen.
- Integrate NextGen simulation models and data with enhanced version of AEDT.

Program Plans FY 2018-2020 – Performance Output Goals
- None.

1A09, NextGen – Improved Multiple Runway Operations Portfolio

FY 2016 Request $8.0M

- A, Wake Turbulence Mitigation for Arrivals (WTMA), G06A.01-02
- B, Closely Spaced Parallel Runway Operations, G06N.01-02
- C, Ground Based Augmentation System (GBAS), G06N.01-01
- X, Enhanced Service Small Communities (ESSC), G03M.04-02

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

Program Description

The WTMA program is evaluating R&D developed air traffic control wake mitigation separation arrival procedures and supporting decision support technology to determine if they can safely meet predicted NextGen throughput demands requiring increased NAS capacity. If the program's developed procedures and supporting technology demonstrate a benefit in NAS throughput, they will be incorporated into the 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 the required wake mitigation separation minima between landing aircraft. High level analyses have indicated that the 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 air traffic control (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 FY2015 WTMA-P will begin an operational evaluation at Philadelphia International Airport (PHL). Additional Core CSPR airports may qualify to run WTMA-P, based on the operational analyses that will continue into FY 2016.

The second part of the project, WTMA System (WTMA-S) 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. The WTMA-S procedure and supporting technology allows controllers to position aircraft ahead of wake turbulence from the leading aircraft on the adjacent CSPR approach to the airport. WTMA-S will allow the FAA Order 7110.308's 1.5 NM minimum diagonal separation between the paired aircraft and 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 59,122, 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 FAA 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 will be the first airport to use the WTMA-P CSPR arrival procedure and is already eligible to run the similar 7110.308 CSPR procedure. If PHL could run the WTMA-P procedure, the benefit to PHL and its air carriers, is another 10% increase to PHL's CSPR instrument arrival operational capacity. WTMA-S extends the WTMA 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 2016 – Performance Output Goals
- Develop WTMA-S requirements.
- Complete TAMR Automated Terminal Proximity Alert – Phase 2 (ATPA-Phase 2) adapted for WTMA-P software modification.
- Begin PHL operational use of ATPA-Phase 2 decision support software as part of their WTMA-P operating procedures.
- Complete TAMR simulation platform (ATPA Phase 3 simulated) for WTMA-S evaluation.

Program Plans FY 2017 – Performance Output Goals
- 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 evaluation of the WTMA-S information displays on TAMR (ATPA-Phase 3 simulated) and at the Command Center.
- Complete review by Stakeholders of WTMA-S Functional Description Narratives.

Program Plans FY 2018-2020 – 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 pairs to airports with parallel and multiple parallel runways that are closely spaced (runways that are less than 4300 feet apart). CSPOs have been implemented at several Metroplex airports to meet the increased demand. Instrument Meteorological Conditions (IMC) can reduce the airport arrival rate by half since aircraft are scheduled on the assumption of good weather and cleared or released based upon current and forecasted weather. Simultaneous Independent Instrument Approach (SIIA) operations provide the maximum capacity increase when weather conditions do not allow visual approaches. 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, 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 the parallel final approach, 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 independent approach operations.

The CSPO program will accelerate activities to provide increased arrival and departure operations to airports with closely spaced parallel runways in IMC. CSPO will develop the performance requirements that enable the implementation of innovative procedures, tools and/or controller/pilot aids that increase capacity at airports utilizing multiple independent and dependent operations. This program 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, reevaluating blunder model assumptions used for risk assessments, and the development of new standards to facilitate NextGen applications.

This program is directed towards 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.

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 59,122, 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 IMC operations to closely spaced parallel runways. The goal of CSPO analysis is to maintain the same arrival and departure rates regardless of weather conditions are IMC or VMC. 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 2016 – Performance Output Goals

- Complete enhancements to the CSPO blunder model.
- Complete enhancement and upgrades to the Modeling and Simulation Tool Suite.
- Evaluate Paired Approach (PA) Algorithm Feasibility Initial Operating Capability (IOC) and provide report.
- Perform additional fast time simulation for PA to CAT I Minima.
- Complete mission needs assessment for Paired Approaches to CAT II/III minima using the Simplified Aircraft-Based Paired Approach algorithm.
- Complete safety risk data collection for Simultaneous Approaches using ADS-B with multi-sensor fusion via through the use of fast time simulations of blunders on closely spaced parallel approaches.
- Complete concept of operations for CSPO departures using flight deck interval management capabilities.
- Provide subject matter expertise for the development of safety risk documentation and controller training materials to enable the implementation and use of new standards in FAA Order 7110.65 for triple simultaneous approaches and simultaneous approaches with offsets.

Program Plans FY 2017 – Performance Output Goals

- Finalize analysis of PA to CAT I minima and provide technical report.
- Conduct analysis of the operational feasibility for PA to CAT II/III approach minima.
- Complete Simultaneous Approaches using ADS-B with multi-sensor fusion technical report and supply a status memo.
- Perform functional analysis and requirements development data collection through the use of human in the loop simulations assessing CSPO departure concept feasibility and human factors.

Program Plans FY 2018 – Performance Output Goals

- Provide subject matter expertise for the development of safety risk documentation and controller training materials to enable the implementation and use of new standards in FAA Order 7110.65 for Simultaneous Approaches using ADS-B with multi-sensor fusion at applicable airports.
- Provide subject matter expertise for the development of safety risk documentation and controller/pilot training materials to enable the implementation and use of new standards for PA to CAT I approach minima at applicable airports
- Perform analysis of CSPO departures algorithm feasibility IOC.
- Conduct HITL simulations of the PA to CAT II/III concept.

Program Plans FY 2019 – Performance Output Goals

- Finalize analysis of the CSPO departures using flight deck interval management capability and provide technical report.
- Perform analysis of PA to CAT II/III algorithm feasibility IOC and complete report.

Program Plans FY 2020 – Performance Output Goals

- Provide subject matter expertise for the development of safety risk documentation and controller/pilot training materials to enable the implementation and use of new standards for CSPO departures at applicable airports.
- Finalize analysis of PA to CAT II/III minima and provide technical report.

C, Ground Based Augmentation System (GBAS), G06N.01-01

Program Description

The Ground Based Augmentation System (GBAS) augments the current Global Positioning System (GPS) signals mainly to support terminal, non-precision and precision approaches in the NAS. GBAS will eliminate the need to install runway specific Instrument Landing System (ILS) localizer and glideslope antennas that provide horizontal and vertical guidance to the runway centerline; however, approach lighting systems would still be required. The GBAS determines a correction to the GPS signal and that correction is transmitted for use by aircraft instrumentation to ensure the accuracy necessary for guidance to a runway end during limited visibility conditions.

GBAS provides one of the capabilities that would allow the transition from the current navigation and landing system to a satellite-based navigation system. The Local Area Augmentation System (LAAS) is the United States version of a system that meets internationally accepted standards for GBAS Category I service (GBAS Approach Service Type C). GBAS is a ground-based augmentation to GPS that mainly serves airport traffic (approximately a 20-30 mile radius) for precision approach, departure procedures, and terminal area operations. GBAS is intended as an alternative to ILS, and it has technical, operational, and maintenance advantages over ILS. A single device can service an entire airport versus an ILS is required for each runway end. GBAS will eliminate the capacity constraint placed on air traffic operations due to the ILS critical areas and can be installed at airports that do not have precision approaches due to ILS siting constraints. GBAS provides the capability for variable glide path and displaced threshold operations supporting wake turbulence avoidance and environmental noise abatement procedures. GBAS is dependent on GPS signals and a plan for a minimum back up system may be required.

A GBAS Category I design, the Honeywell SLS-4000, has been approved for use, and design upgrades to this system for radio frequency interference (RFI) mitigation were successfully implemented at Newark. GBAS CAT I systems are operational at Houston and Newark and United Airlines flies GBAS landing system (GLS) approaches on a regular basis.

International Civil Aviation Organization (ICAO) standards for Category III GBAS have been published and systems are being tested to validate those standards. The FAA work on the Category I design and experience from that program will be used to validate the ICAO GBAS Category III requirements. The goal of this program is to support commercial development of a prototype Category III GBAS capability (GBAS Approach Service Type D (GAST-D)) for validation testing. The vendor developing the prototype will have an option to seek a Category III non-federal approval using the FAA's system design approval (SDA) process. The Department of Defense (DoD) also plans to implement GBAS technology in their Joint Precision Approach and Landing System program. Civil interoperability is a "Key Performance Parameter" to this DoD system. The FAA will support DoD developments, facilitating technology transfer as applicable.

An FAA-owned GBAS (SLS-4000) installed in Atlantic City International Airport will continue to be used as an interim platform to validate Category III requirements under this program. This program will support activities necessary to complete the required integrity reviews and produce documentation describing the results. Also, the program will conduct specialized research and development activities to address GPS degradation due to RFI issues that were identified in the implementation of a non-Fed LAAS, a GBAS Cat III systems predecessor. In addition, the program will identify and address GBAS development risks, refine system and ground station requirements, and investigate potential alternatives to the system being tested. The program will also work with the international community on GBAS lessons learned, and CAT III implementation and approval.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

GBAS will allow for increased flexibility in the Terminal Area by eliminating the capacity constraint due to ILS limitations and help reduce arrival and taxi delays. Future enhancements to GBAS when combined with surveillance, may allow for reduced aircraft separation in all weather conditions. Similarly, once the capability has been validated, GBAS will eventually be able to provide navigation guidance for continuous descent approaches and curved-segmented approaches in extremely low visibility conditions. In addition, GBAS will allow for increased access by allowing airports to operate in low visibility conditions where there is not sufficient demand for ILS or sites where an ILS installation is not possible due to location specific restrictions such as terrain.

Program Plans FY 2016 – Performance Output Goals

- Complete analysis of GBAS VHF data broadcast (VDB) authentication and VDB coverage at runway threshold and during roll out.
- Complete initial documentation for the FAA GBAS GAST-D SDA (High level hardware requirements, High level software requirements, Draft Human Machine Interface analysis, Design Analysis, Human Factors design, Security design).

Program Plans FY 2017 – Performance Output Goals

- Complete SDA system safety management documentation.
- Approve applicant GBAS CAT III architecture for operations in the NAS.

Program Plans FY 2018-2020 – Performance Output Goals

- None.

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

Program Description

Current Air Traffic Control (ATC) services at small airports 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 characteristics. ESSC will recommend and evaluate a group of airports based on their required level of service and potential benefits to be achieved. Improving ATC services at these locations will enable increased capacity, improved safety and incentives for the communities served by these airports to provide increased 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 the recommended changes to controller equipment, standards, procedures and policies to provide the required surveillance, communications and other capabilities to support improved air traffic services and improved 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 would 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 $30 million in FY 2015. (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 2016 – Performance Output Goals
- None.

Program Plans FY 2017 – Performance Output Goals
- Complete analysis of current airport operational capabilities and characteristics.
- Complete draft ESSC alternatives analysis document.
- Complete draft ESSC feasibility study document.
- Complete draft concept of operations (ConOps) document for ESSC.

Program Plans FY 2018 – Performance Output Goals
- Initiate simulation activity for ESSC.
- Complete initial safety case analysis.
- Develop draft operational procedures.

Program Plans FY 2019 – 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 2020 – 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.

1A10, NextGen – NAS Infrastructure Portfolio
FY 2016 Request $11.0M

- A, Weather Observation Improvements, G04W.02-01
- B, Weather Forecast Improvements, G04W.03-01
- C, NextGen Navigation Engineering, G06N.01-03
- D, New Air Traffic Management (ATM) Requirements, G01M.02-02
- X, Surface/Tower/Terminal Systems Engineering, G06A.02-01

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 observing shortfalls is continuously refined and prioritized based on feedback from key stakeholders and user groups. With this information, the program explores potential NextGen-enabled concepts 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 (e.g., the ability to discern the type and intensity of frozen precipitation types, which impacts the efficiency of winter weather and deicing operations) and conduct technical and operational risk assessment of potential 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 59,122, 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 allowing fuller use of weather information for operational decision-making. This would include supporting the optimal selection of aircraft routes and precise spacing for arriving and departing aircraft. The increased accuracy of forecasts and improved observations will also enable the capability to provide individual trajectory-based profiles and optimize the use of available airspace.

Program Plans FY 2016 – Performance Output Goals
- Complete and deliver second winter season Concept Maturity Technology Demonstration (CMTD) report.
- Deliver technical requirements specification for automated winter weather capability.
- Deliver final automated winter weather algorithm and code package.
- Refine shortfall analysis for terminal area adverse winds.

Program Plans FY 2017 – Performance Output Goals
- Update weather observations shortfall analysis and stakeholder prioritization.
- Initiate assessment of market technologies and maturing research and development programs for potential adverse wind mitigating applications.
- Initiate system engineering activities for terminal-area adverse winds useful segment.

Program Plans FY 2018 – Performance Output Goals

- Deliver Weather Observation Improvements Risk Mitigation Plan for terminal-area adverse winds useful segment.
- Deliver NextGen Surface Observing Capability (NSOC) CMTD plan for terminal-area adverse winds useful segment.
- Initiate CMTD for terminal-area adverse winds useful segment.

Program Plans FY 2019 – Performance Output Goals

- Complete system engineering, risk reduction and technical analysis activities.
- Deliver initial CMTD results and analysis to key stakeholders and users.
- Produce initial algorithms and design documents.

Program Plans FY 2020 – Performance Output Goals

- Deliver final CMTD results and analysis to key stakeholders and users.
- Produce government furnished information code and technical requirements for next useful segment.
- Update weather observations shortfall analysis and stakeholder prioritization for terminal-area adverse winds useful segment.

B, Weather Forecast Improvements, G04W.03-01

Program Description

The Weather Forecast Improvements (WFI) program addresses both the need to improve weather predictions and how to make best 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 decision makers are challenged by the numerous elements that go into the decision making process during a weather-constraining event. There is currently very little automation to assist decision makers with identifying, analyzing, and developing mitigation strategies for weather-constrained airports and airspace.

Sophisticated National Weather Service (NWS) forecast models will be portrayed 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 this 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 by implementing advanced aviation weather forecasting models to determine 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). It will design a process for quality control and standardization of aviation weather products and construct and implement an ICAO-compliant Quality Management System (QMS). Specific work elements under Weather Forecast Improvements include the following:

- ATM Weather Integration – A needs and dependency assessment that will yield a coordinated strategy for the development of weather translation techniques in support of future Collaborative Air Traffic Management Technologies (CATM-T), Time Based Flow Management (TBFM), and Surface Trajectory-Based Operations (STBO) work packages. Additionally, work includes weather integration activities necessary to help support exchange standards.
- Weather Post-Analysis Capability (Wx-PAC) – This tool provides TMs with a rapid, objective assessment of prior-day Traffic Management Initiatives (TMIs) imposed due to weather and isolates similar events from historical data archives to compare them to the targeted event. This allows ATMs to evaluate "What-if" simulation scenarios.

- Quality Management System – QMS provides a methodology to ensure aviation weather products and services undergo continuous improvement using defined processes based on ISO 9001:2008 series of standards. This systematic approach includes comparing product performance to performance baselines, incorporating end-user feedback, and monitoring the processes themselves. Ultimately this results in making the necessary changes to maintain or improve the quality of the product and service.
- International – This effort develops and coordinates requirements and standards 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.
- National Airspace System Enterprise Architecture (NAS EA) – This work element ensures NextGen weather activities are correctly captured in the weather roadmap. The updated NAS EA Weather Infrastructure Roadmap documents the current plans for NextGen Weather programs and aligns these weather programs with all NAS EA programs with weather interdependencies.

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 59,122, 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 2016 – Performance Output Goals

ATM-Weather Integration:

- Complete Draft Preliminary Weather Integration Roadmap.
- Organize and support an ATM-Weather Integration community of interest (COI).
- Complete Final Weather Integration Roadmap.
- Complete draft post 2020 direct and indirect weather needs analysis.
- Complete initial report documenting draft weather integration needs necessary to help support exchange standards.

Weather Post-Analysis Capability:

- Complete documentation of evaluation of system functions into requirements.
- Complete enterprise architecture artifacts.
- Complete CRD plan elements.
- Complete final shortfall analysis.
- Complete draft Solution ConOps.

Quality Management System:

- Finalize transition package.

International:

- Complete US position on draft of Amendment 77 to Annex 3.
- In coordination with the European Organization for the Safety of Air Navigation (EURO CONTROL), deliver draft procedures and weather information requirements to support trajectory-based operations.
- Complete annual report on US differences with ICAO SARPs.
- Deliver annual assessment promoting harmonization of ICAO SARPs and US practices and procedures.
- Complete documentation to implement exchange standards.

NAS EA:

- Update and coordinate FY 2017 NAS EA Weather Infrastructure Roadmap.
- Update and coordinate weather-related sections of the Enterprise-level Mid-term and Far-term artifacts to ensure they have right interfaces, data, and decision-makers.
- Complete quality control assessment of 28 system-level NAS EA artifacts for weather systems.

Program Plans FY 2017 – Performance Output Goals

ATM Weather Integration:

- Complete final post 2020 direct and indirect weather needs analysis.
- Complete post 2020 Gap Analysis & Shortfall Mitigation Plan.
- Complete final report documenting updated weather integration needs necessary to help support exchange standards.

Weather Post-Analysis Capability:

- Complete Preliminary Program requirements.
- Complete the following products in support of the Investment Analysis Readiness Decision (IARD):
  - Preliminary Program Requirements (pPR) documentation
  - Initial Benefits and Cost documentation
  - Safety Documentation
  - Enterprise Architecture documentation
- Complete final Solution ConOps.

International:

- In coordination with EURO CONTROL, complete development of reports and presentations on requirements and standards for the provision and dissemination of meteorological information for international air navigation to ICAO panels and operations groups.
- Complete US position on draft Amendment 78 to ICAO Annex 3.
- Complete annual report on US differences with ICAO SARPs.
- Deliver annual assessment promoting harmonization of ICAO SARPs and US practices and procedures.

NAS EA:

- Update and coordinate FY 2018 NAS EA Weather Infrastructure Roadmap.
- Update and coordinate weather-related sections of the enterprise-level mid-term and far-term artifacts to ensure they have right interfaces, data, and decision-makers.
- Complete quality-control assessment of 28 system-level NAS EA artifacts for weather systems.

Program Plans FY 2018 – Performance Output Goals

ATM Weather Integration:

- Complete initial evaluation document of weather translation techniques for all airspace weather constraints (e.g., convection, turbulence and icing) and airport weather relevant to threshold events (e.g., ceiling, visibility, wind speed, wind direction) for future Collaborative Air Traffic Management Technologies (CATM-T), Time Based Flow Management (TBFM), and Surface Trajectory-Based Operations (STBO) work packages.
- Identify and record prototype translation technologies that could be used as common sources of cross-user/cross-program post 2020 weather translation needs.

Weather Post-Analysis Capability:

- Complete draft requirements documentation for Wx-PAC.

International:

- In coordination with EURO CONTROL, complete development of reports and presentations on requirements and standards for the provision and dissemination of meteorological information for international air navigation to ICAO panels and operations groups.
- Complete US position on final version of Amendment 78 to ICAO Annex 3.
- Complete annual report on US differences with ICAO SARPs.
- Deliver annual assessment promoting harmonization of ICAO SARPs and US practices and procedures.

NAS EA:

- Update and coordinate FY 2019 NAS EA Weather Infrastructure Roadmap.
- Update and coordinate weather-related sections of the Enterprise-level Mid-term and Far-term Artifacts to ensure they have right interfaces, data, and decision-makers.
- Complete quality-control assessment of 28 system-level NAS EA artifacts for weather systems.

Program Plans FY 2019 – Performance Output Goals

ATM Weather Integration:

- Complete final evaluation document of weather translation techniques for all airspace weather constraints (e.g., convection, turbulence and icing) and airport weather relevant to threshold events (e.g., ceiling, visibility, wind speed, wind direction) for future Collaborative Air Traffic Management Technologies (CATM-T), Time Based Flow Management (TBFM), and Surface Trajectory-Based Operations (STBO) work packages.
- Select and build one prototype translation technology that could be used as a common source of cross-user/cross-program post 2020 weather translation needs.

Weather Post-Analysis Capability:

- Complete finalized requirements documentation for Wx-PAC capability.

International:

- In coordination with EURO CONTROL, complete development of reports and on requirements and standards for the provision and dissemination of meteorological information for international air navigation to ICAO panels and operations groups.
- Complete US position on draft Amendment 79 to ICAO Annex 3.
- Complete annual report on US differences with ICAO SARPs.
- Deliver annual assessment promoting harmonization of ICAO SARPs and US practices and procedures.

NAS EA:

- Update and coordinate FY20 NAS EA Weather Infrastructure Roadmap.
- Update and coordinate weather-related sections of the Enterprise-level Mid-term and Far-term Artifacts to ensure they have right interfaces, data, and decision-makers.
- Complete quality-control assessment of 28 system-level NAS EA artifacts for weather systems.

Program Plans FY 2020 – Performance Output Goals

ATM-Weather Integration:

- Assess weather needs for post 2020 NextGen initiatives.
- Review post 2020 artifacts and complete initial analysis report depicting weather needs.
- Validate weather needs with stakeholders.
- Complete final report for post 2020 NextGen weather needs.

International:

- In coordination with EURO CONTROL complete development of reports and presentations on requirements and standards for the provision and dissemination of meteorological information for international air navigation to ICAO panels and operations groups.
- Complete US position on final version of Amendment 79 to ICAO Annex 3.
- Complete annual report on US differences with ICAO SARPs.
- Deliver annual assessment promoting harmonization of ICAO SARPs and US practices and procedures.

NAS EA:

- Update and coordinate FY 2021 NAS EA Weather Infrastructure Roadmap.
- Update and coordinate weather-related sections of the Enterprise-level Mid-term and Far-term Artifacts to ensure they have right interfaces, data, and decision-makers.
- Complete quality-control assessment of 28 system-level NAS EA artifacts for weather systems.

C, NextGen Navigation Engineering, G06N.01-03

Program Description

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

Terminal RNAV DME-DME:

This activity supports terminal 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 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 high end 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. 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 current United States (U.S.) standard for DMEs, currently not in alignment with the International Civil Aviation Organization (ICAO) standard, could be moved to be the same. Further, as work progresses with definition of the Very High Frequency Omnidirectional Range (VOR) system Minimum Operational Network (MON), this works supports cases where the VOR is removed yet the DME is still required for operations. This activity will assess the needed changes to the existing DME infrastructure to support the NextGen goal of implementing NAS-wide Performance-Based Navigation.

<u>NextGen Navigation Support – ELVO Phase 3:</u>
This activity supports requirements analysis for low visibility operations for landing or departing aircraft when the horizontal visibility along the runway is less than 1200 feet. These low visibility operations cover approach, landing, roll out, taxi movements and takeoff. Low visibility operations (LVO) below 1200 feet visibility will require the use of additional advanced avionics such as the Enhance Vision Systems/Enhanced Flight Vision System (EVS/EFVS), Heads Up Display, and Combined Vision System that incorporate other emerging technologies such as Synthetic Vision Guidance System or Head Down Display. When operations are allowed below 1200 feet visibility, the operation can be compliant with Low Visibility Operations /Surface Movement Guidance Control Systems (LVO/SMGCS) requirements. The activity will determine the changes needed to ground-based navigational aids and lighting systems to support ELVO Phase 3. ELVO Phase 3 also supports the planning activities for the FY 2016 Operational Demonstration of Capability (ODC) for Seattle International Airport (SEA) and other activities to provide protected low visibility taxi routes (PLOVTR). PLOVTR will allow safe operations while taxing to and from the gate during even extreme low visibility. The goal of the Seattle ODC is to show that EFVS can also provide safe taxi capability in low visibility operations and establish operational credit for NAS Operators to do so upon a successful ODC.

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 59,122, 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 2016 – Performance Output Goals
<u>Terminal RNAV DME-DME:</u>
- Complete final DME capacity study to address critical DME issues associated with PBN implementation.
- Complete DME coverage analysis for Central Service Area in support of PBN implementation.

<u>NextGen Navigation Support – ELVO Phase 3:</u>
- Complete draft report on requirements for lower minima and EFVS operation.
- Complete LVO/SMGCS demonstration at one NAS airport.
- Complete shortfall analysis to support ELVO Phase 3.
- Complete draft report on NextGen planned implementation for LVO/SMGCS, including identifying required testing and current navigation capabilities.

Program Plans FY 2017 – Performance Output Goals
<u>Terminal RNAV DME-DME:</u>
- Develop an initial shortfall analysis.
- Develop plan for integration of non-collocated DME-only facilities into NAS Operations.

NextGen Navigation Support – ELVO Phase 3:
- Complete LVO/SMGCS pretest at a Part 139 airport with Geographic Information System airport survey data.
- Complete initial report on NextGen planned implementation for LVO/SMGCS, including identifying current navigation capabilities.
- Develop the required products in support of the Investment Analysis Readiness Decision (IARD).

Program Plans FY 2018 – Performance Output Goals
Terminal RNAV DME-DME:
- Complete impact assessment and recommendations for non-collocated DME.

NextGen Navigation Support – ELVO Phase 3:
- Complete initial plan for LVO/SMGCS compliance in the NAS.
- Complete initial development of guidance and training.

Program Plans FY 2019 – Performance Output Goals
Terminal RNAV DME-DME:
- Develop Terminal DME strategy based on previous year's impact assessment.

NextGen Navigation Support – ELVO Phase 3:
- Complete final LVO/SMGCS compliance plan.
- Complete update to report on NextGen planned implementation for LVO/SMGCS, including identifying current navigation capabilities.
- Develop the required products in support of the Initial Investment Decision (IID).
- Develop the required products in support of the Final Investment Decision (FID).

Program Plans FY 2020 – Performance Output Goals
Terminal RNAV DME-DME:
- Complete final Terminal DME strategy based on previous year's impact assessment.

NextGen Navigation Support – ELVO Phase 3:
- Complete report update on NextGen planned implementation for LVO/SMGCS, including identifying current navigation capabilities.
- Develop schedule for remaining testing for LVO/SMGCS.

D, New Air Traffic Management (ATM) Requirements, G01M.02-02

Program Description

The New 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 enterprise information use 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 & 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 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 operational needs to develop initial operational concepts to satisfy those needs and determine which concepts should continue to be developed; and (c) creation, testing and evaluation of prototypes and operational demonstrations for the purpose of defining and refining operational use concepts.

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 portion 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 to meet the more stringent NextGen performance requirements.

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 59,122, 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 2016 – Performance Output Goals
New Radar Requirements (Surveillance & Weather):
- Define high level requirements document for Multi-function Phased Array Radar (MPAR).
- Deliver assessment report on phased array radar interface to NAS automation systems.
- Complete update to MPAR cost model based on advanced technology demonstrator.

Enterprise Information Protocol and Exchange:
- Establish, standardize, and document the baseline versions of exchange models.
- Develop enterprise solution documentation to mediate across NAS system.
- Complete common information protocols and exchange standards documentation.

Future Collision Avoidance System (Future CAS):
- Develop interoperability requirement of UAS collision avoidance systems.
- Develop ACAS Xu system requirements specifications.
- Complete ACAS Xu operational capability flight demonstration flight test.

Weather Transition:
- Conduct assessment of mature research for transition to the National Weather Service (NWS) for their implementation and product dissemination into the NAS.
- Develop and validate weather requirements for NWS to improve forecasts in support of FAA operational decision making.

Synchronization of Air/Ground Procedures:
- Develop initial document for two-way communications procedures between FMS and ground systems.

Advanced Air/Ground Communications:
- Support and document the development of the L-Band communications standards and prototypes with international community.
- Support and document the development of the Next Generation Aeronautical Mobile-Satellite Route Service satellite-based communications standards, along with the international community, which will support the NextGen and SESAR requirements.

Program Plans FY 2017 – Performance Output Goals

New Radar Requirements (Surveillance & Weather):
- Finalize MPAR performance requirements.
- Develop detailed MPAR advanced technology demonstrator test and evaluation plan.

Enterprise Information Protocol and Exchange Standards:
- Maintain and update information protocols and exchange standards.

Future CAS:
- Formalize ACAS Xu system requirements specifications for non-cooperative collision avoidance capability.
- Prepare Phase II report that validates collision avoidance interoperability criteria for RTCA SC-228.

Weather Transition:
- Perform engineering studies and analysis translating 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 prototype testing of L-band Communications systems and develop a test report to document their performance.
- Develop test plan for satellite-based NextGen and SESAR requirements including Push-to-Talk communications with international community.
- Conduct tests of satellite-based Push-to-Talk communications standards with the international community and develop a test report to document the performance.

Program Plans FY 2018 – Performance Output Goals

New Radar Requirements (Surveillance & Weather):
- Deliver MPAR advanced technology demonstrator operational capability report.
- Deliver technical transfer package in support of NSWRC Investment Analysis.

Enterprise Information Protocol and Exchange Standards:
- Maintain and update the information protocols and exchange standards documentation.

Future CAS:
- Develop ACAS Xu System Requirements Specification (SRS) v2 and inform RTCA Special Committee’s 147 & 228.

Weather Transition:

- Perform engineering studies and analysis translating 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:

- Prepare a safety analysis report for satellite-based Push-to-Talk communications standards.
- Conduct standards validations tests of new L-band communications system with the international community and develop a validation test report.
- Conduct safety analysis of new L-band communications standards and develop a safety analysis report.
- Develop requirements and standards for a software defined radio to support future communication waveforms.

Program Plans FY 2019 – Performance Output Goals

Enterprise Information Protocol and Exchange Standards:

- Maintain and update information protocols and exchange standards documentation.

Future CAS:

- Formalize ACAS Xp system concept and requirements to inform ongoing RTCA SC-147 standards development activities.
- Develop ACAS Xu Algorithm Data Description Document (ADD) v4 (Julia Software Code) and inform RTCA Special Committee's 147 & 228.

Weather Transition:

- Develop and validate weather requirements for NWS to improve forecasts in support of FAA operational decision making.
- Analyze current FAA weather-related services and operational needs.
- Perform engineering studies and analysis translating 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 validation tests of the new communications standards with international community and develop a final validation report.
- Conduct security analysis of new communications standards and develop a security assessment report.
- Develop a prototype software defined radio to validate the system supports all future communication waveforms.

Program Plans FY 2020 – Performance Output Goals

Enterprise Information Protocol and Exchange Standards:

- Maintain and update information protocols and exchange standards documentation.

Future CAS:

- Formalize ACAS Xp SRS v1 for RTCA SC-147.
- Develop final ACAS Xu SRS and ADD.

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.
- Analyze current FAA weather-related services and operational needs.
- Perform engineering studies and analysis translating weather information into operational impacts.

Advanced Air/Ground Communications:

- Conduct standards validation tests of software defined radios and develop a validation report.

X, 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 thoroughly evaluate any potential impacts resulting from the integration of the techniques and equipment necessary to achieve these 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
    - FDIO 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.

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 59,122, 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 2016 – Performance Output Goals

- None.

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 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.
- 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.
- Updated algorithmic development and documentation.

Program Plans FY 2019-2020 – Performance Output Goals

- None.

1A11, NEXTGEN – SUPPORT PORTFOLIO AT WJHTC

FY 2016 Request $10.0M

NextGen Laboratories, G03M.02-01

Program Description

Prior to the implementation of full-scale operational NextGen capabilities, the FAA requires environments for the design, development, integration, evaluation and demonstration of future NextGen concepts and technologies. This program provides platforms at the NextGen Integration and Evaluation Capability (NIEC) and Florida NextGen Test Bed (FTB) for 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 new technologies before making further investments and decisions on potential implementation in operations. It will be necessary to test the integration, development, and operations functions in a real-time and flexible environment to validate the broad framework of concepts, technologies, and systems introduced by NextGen.

Operational Assessment supports the transition to NextGen by providing comprehensive evaluation of demonstrations to determine systems performance. It also supports NextGen benefits modeling and cost-benefit data collection efforts. Beginning in FY 2016 the NextGen Operational Assessment Performance activity will be included within this program to better align post demonstration evaluation activities.

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 activities. 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, which will 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 by performing analyses in two areas: Systems Analysis and NextGen Performance Snapshots (NPS).

- Systems Analysis will continue to track quantitative estimates of the anticipated operational benefits of the NextGen portfolio, through the "mid-term" and for the entire investment life-cycle; cost estimates for the overall NextGen portfolio, to include aircraft equipage costs; an integrated business case for NextGen, combining the costs and benefits to determine the return on investment (for society at large as well as individual stakeholder groups); and quantitative assessments of the operational impacts of fielded NextGen components as they become available.
- The NextGen Performance Snapshots (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.

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 $30 million in FY 2015. (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 be used 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 it has built up in support of previous simulations, to support future sponsors thereby reducing cost across 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 operational performance assessments and benefits analyses of the activities included in the NAS Segment Implementation Plan (NSIP). In order to justify the expenditure of substantial taxpayer funds, help formulate detailed plans, and build the business case for operator equipage with NextGen-related avionics, various NextGen cost-benefit analyses must be performed. The analysis uses the FAA's system-wide model to estimate the benefits of planned operational improvements for various stakeholder groups. Operational analysis is performed once projects have been completed and new capabilities fielded to determine whether or not these capabilities are performing as desired.

Program Plans FY 2016 – Performance Output Goals

NIEC:

- Modernize the NIEC infrastructure and capabilities to support NextGen research, human-in-the-loop simulations, and proof of concept demonstrations for sponsors.
- Identify and install NIEC upgrades and enhancements that support customer project activities projected in the annual NIEC Multiyear Program Plan.
- Enhance inter-system communications capabilities by implementing and integrating Enterprise Messaging Services (EMS) and SWIM capabilities.

FTB:

- Modernize the operations and sustainment of the facility and systems at the FTB.
- Identify and install upgrades and enhancements to FTB to support NextGen and industry-initiated concept demonstration activities.
- Perform technology refresh of FTB ATC systems and network equipment to support upcoming NextGen concepts and maintain reliability, improve performance, and ensure compatibility with current-day commercial of the shelf systems.

NextGen Operational Assessment – Performance:

- Evaluate the benefits and costs of targeted NextGen capabilities.
- Evaluate the operational performance impacts of NextGen technologies and procedures, and publish an annual report.
- Develop document collecting new NPS data information and NPS data sources for any new metrics based on information assessment.
- Update the NSIP to aid the planning and deployment of NextGen portfolio in the mid-term timeframe.

Program Plans FY 2017 – Performance Output Goals

NIEC:

- Modernize the NIEC infrastructure and capabilities to support NextGen research, human-in-the-loop simulations, and proof of concept demonstrations for sponsors.
- Identify and install NIEC upgrades and enhancements to support customer project activities projected in the annual NIEC Multiyear Program Plan.
- Complete enhancements of the data communications capabilities between the air traffic controller workstations and the NIEC cockpit simulator.

FTB:

- Modernize the operations and sustainment of the facility and systems at the FTB.
- Identify and install upgrades and enhancements to FTB to support NextGen and industry-initiated concept demonstration activities.
- Provide additional demonstration scenario development, validation, and analysis tools to facilitate NextGen Test Bed demonstrations.

NextGen Operational Assessment – Performance:

- Evaluate the benefits and costs of targeted NextGen capabilities.
- Evaluate the operational performance impacts of NextGen technologies and procedures, and publish an annual report.
- Develop documentation that collects new NPS data information and NPS data sources for any new metrics based on information assessment.
- Update the NSIP to aid the planning and deployment of NextGen portfolio in the mid-term timeframe.

Program Plans FY 2018-2020 – Performance Output Goals

NIEC:

- Modernize the NIEC infrastructure and capabilities to support NextGen research, human-in-the-loop simulations, and proof of concept demonstrations for sponsors.
- Identify and install NIEC upgrades and enhancements to support customer project activities projected in the annual NIEC Multiyear Program Plan.

FTB:

- Modernize the operations and sustainment of the facility and systems at the FTB.
- Identify and install upgrades and enhancements to FTB to support NextGen and industry-initiated concept demonstration activities.
- Add new scenario development and analysis tools.
- Initiate planning for FY 2020 FTB technology refresh.
- Increase capacity of FTB systems to provide the ability to conduct simulations with US and global systems under increased future traffic loads.
- Expand infrastructure to support additional data streams into the FTB.

NextGen Operational Assessment – Performance:

- Enhance the safety model to support NextGen Operational Assessments.
- Evaluate the benefits and costs of targeted NextGen capabilities.
- Evaluate the operational performance impacts of NextGen technologies and procedures, and publish an annual report.
- Develop documentation that collects new NPS data information and data sources for any new metrics based on information assessment.
- Update the NSIP to aid the planning and deployment of NextGen portfolio in the mid-term timeframe.

1A12, NextGen – Performance Based Navigation & Metroplex Portfolio

FY 2016 Request $13.0M

- 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

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 continues to integrate airspace design and associated activities, including traffic flow analysis, arrival and departure route design and procedures optimization. This will lay the framework for developing PBN initiatives. Optimizing airspace use and associated procedures development in Metroplexes will:

- Facilitate the use of additional transition access/egress points to/from terminal airspace not tied to ground-based navigation aids;
- Develop and implement optimized arrival and departure procedures;
- Decouple conflicting operations to and from primary and secondary/satellite airports serviced by the same complex terminal airspace; and
- When necessary, develop 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.

The Metroplex program executes this work via sites; a geographical volume of airspace which may vary in size and can encompass one or more of the Core airports as well as surrounding regional airports within the site. For example, the North Texas Metroplex site includes Dallas/Fort-Worth (DFW) as well as Dallas Love Field (DAL), and other regional airports, while the Florida Metroplex site includes Orlando (MCO), Miami (MIA), Tampa (TPA), Palm Beach (PBI), Fort Lauderdale (FLL) and other regional airports.

In 2010, the NextGen Advisory Committee and the NextGen Management Board prioritized a list of 21 candidate Metroplex sites; 11 of which have been approved for implementation. Evaluation of candidate Metroplex sites for future airspace and procedures optimization will be considered for implementation beginning in FY 2019.

Each Metroplex site follows a standard five phase process. The first phase is the Study phase, followed by the Design phase, the Evaluation phase, the Implementation phase, and concluding with the Post-Implementation phase. All phases include industry participation. The details of the work accomplished during these phases are as follows:

- Study and Scoping: The Study Phase is conducted by study teams that identify issues and propose potential solutions through facility and industry interface meetings. 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. 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. If analyses are conducted during the Design Phase, they may carry over into the Evaluation Phase.

- Implementation: The Implementation Phase is the last part of the Metroplex process conducted by the D&I team. This phase includes all steps required for implementation of the Metroplex site including flight inspections, publishing procedures, planning and executing training, and documentation of activities and processes.

- Post Implementation Review and Modifications: Post-Implementation work consists of Metroplex documentation reviews, lessons learned and potential redesign based on benefits analysis, and process improvement activities at Metroplex sites.

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 improved arrival and departure flows. Metroplex solutions are focused on optimizing procedures and traffic flows and may include changes to airspace structure to support optimal routings. Specific operational changes include converting conventional procedures to PBN, removing level-offs on arrivals, segregating arrival routes to deconflict flows, adding departure points, expediting departures, adding new high-altitude PBN routes, and realigning airspace to support those changes.

Program Plans FY 2016 – Performance Output Goals

- Complete Metroplex design work at two Metroplex sites (e.g., South/Central Florida and Denver).
- Complete Metroplex evaluation activities at three Metroplex sites (e.g., Southern California, Phoenix, and Cleveland/Detroit).
- Begin Implementation activities at two Metroplex sites (e.g., Cleveland/Detroit and Southern California).
- Complete Post-Implementation activities at two Metroplex sites (e.g., Washington DC and Northern California).

Program Plans FY 2017 – Performance Output Goals
- Complete the Evaluation Phase at two Metroplex sites (e.g., Denver and Florida).
- Complete the Implementation Phase at five Metroplex sites (e.g., Atlanta, Charlotte, Southern California, Cleveland/Detroit, and Phoenix).
- Complete Post-Implementation Review and Modifications activities at three Metroplex sites (e.g., Charlotte, Atlanta, and Southern California).

Program Plans FY 2018 – Performance Output Goals
- Complete the Implementation Phase at two Metroplex sites (e.g., Denver and South/Central Florida).
- Complete Post-Implementation Review and Modifications activities for four Metroplex sites (e.g., Cleveland/Detroit, Phoenix, Denver, and South/Central Florida).

Program Plans FY 2019 – Performance Output Goals
- Complete Post-Implementation Review and Modifications activities for one Metroplex site.
- Pending the results of current planning activities:
    - Begin Metroplex Study work at two Metroplex sites.

Program Plans FY 2020 – Performance Output Goals
- Pending the results of current planning activities:
    - Complete Metroplex Study work at two Metroplex sites.
    - Begin Metroplex Design work at two Metroplex sites.

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 Performance Based Navigation (PBN) 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 predicable operations. Human factors activities will focus on the interaction between the air and ground domains to evaluate and validate PBN procedure designs, as well as, document “lessons learned” to provide guidance for future PBN procedure implementations.

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, concept development activities will validate concepts that increase capacity and improve efficiency and throughput, while leveraging PBN technologies.

Shifting the EoR concept of operation from a key developmental site to a NAS-wide Document Change Proposal (DCP) is a major undertaking. It involves designing comprehensive scenarios of various simultaneous parallel runways operations and configurations, which will then be analyzed from a safety and benefits perspective to support the Safety Risk Management (SRM) process. It may require specific waivers that will allow operational concept validation to be conducted. After the initial implementation of EoR at developmental sites, additional data will be collected to support final safety and benefits validation. These final analyses will be utilized in support of actual DCPs that would alter separation standards in FAA orders allowing NAS-wide use of the EoR operational capability. Some of these scenarios will happen in parallel, however, the majority will occur in a consecutive progression as the analysis models for the more complex configurations are typically constructed from the framework of the less complex configurations.

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 59,122, 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 2016 – Performance Output Goals

- Complete the safety analysis for the Track-to-Fix (TF) of Fly-by Approach scenarios for EoR Duals Operation.
- Initiate modeling and safety analysis of EoR Triples Operation scenarios. Develop modeling and safety analysis and data collection plan.
- Conduct initial implementation of EoR scenarios at developmental site(s) to validate EoR operational concept.
- Conduct concept validation studies and document findings in a concept validation report for end-to-end and lower level operational concepts for implementation in 2022 and beyond.
- Consolidate data from subject matter expert sessions evaluating and validating the control structure showing PBN operations, develop draft report.
- Begin interviews with specialists responsible for designing RNAV/RNP procedures and associated airspace design decisions from both the air traffic and flight crew perspectives. Focus on the interaction between the air and ground domains, as well as FAA and stakeholders to identify and categorize issues of implementing PBN procedures.
- Provide initial analysis supporting PBN Route Coordination and Deconfliction to enable ANSP and flight operators to negotiate trajectories that meet NAS constraints and operator objectives.
- Develop preliminary assessment of optimal arrival/departure routing options and implementation strategies that support PBN Route Optimization.

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.
- 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.

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 and document findings to reduce risk/uncertainties of NextGen Mid Term Operational Concepts.
- Provide guidance on PBN implementation issues and "lessons learned".
- 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 to assess optimal arrival/departure routing options and implementation strategies for PBN Route Optimization.

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.

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.
- 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.
- 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.

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 2016 Request $79.4M

- A, En Route Automation Modernization (ERAM) System Enhancements & Technology Refresh, G01A.01-05 / X, En Route Automation Modernization (ERAM) System Enhancements Future Segment, G01A.01-08
- B, En Route Automation Modernization (ERAM) Sector Enhancements, G01A.01-04

A, En Route Automation Modernization (ERAM) System Enhancements & Technology Refresh, G01A.01-05 / X, En Route Automation Modernization (ERAM) System Enhancements Future Segment, G01A.01-08

Program Description

The FAA has divided the upgrading of the ERAM system into three separate programs. The System Enhancements and Technology Refresh program, G01A.01-05, will update ERAM capabilities to improve the overall functionality and usability of the controller workstation. The technology refresh segment will replace equipment that is becoming obsolete and is in critical need of replacement. The Sector Enhancements program, which is addressed in a separate CIP write up G01A.01-04, will introduce NextGen enhancements to allow for improved coordination between the tactical (R-side) and strategic (D-side) controllers and more efficient airspace management. The ERAM System Enhancements Future Segment program, G01A.01-08, will follow after the current ERAM System Enhancements and Technology Refresh program is finished.

<u>ERAM System Enhancement and Technology Refresh (G01A.01-05):</u>
All the ERAM systems are scheduled to be operational in 2015 with the planned baseline functionality. The ERAM System Enhancements will provide capabilities above and beyond the core ERAM functionality. The Final Investment Decision for ERAM System Enhancements and Technology Refresh was made in September 2013, with baseline funding requirements established for FY 2013 – FY 2016 and a baseline schedule with activities completing in FY 2017.

The FY 2013 through FY 2017 System Enhancements consists of the following:

- Test and Training System improvements;
- Controller usability enhancements;
- Tracking and correlation processing enhancements; and
- Improvement of overall system management, analysis and monitor and control functions.

The Technology Refresh segment of the ERAM System Enhancements & Technology Refresh program will replace many of the ERAM components, which were procured as early as calendar year 2006, and are approaching and/or at their projected end-of-life. The Technology Refresh consists of the following:

- Advanced Interactive eXecutive Operating System Version Update;
- En Route Communications Gateway (ECG) Firewall replacement;
- En Route Information Display (ERIDS) Hardware replacement; and
- Support Environment Operating System replacement.

ERAM System Enhancement Future Segment (G01A.01-08):
The FAA anticipates additional investment decision(s) to baseline ERAM System Enhancements & Technology Refresh follow on efforts for FY 2017 and subsequent years. It is anticipated that the first Final Investment Decision will occur in FY 2017 to baseline a combination of additional technology refresh activities and functional system enhancements that will incorporate concept engineering work performed under CIP G01A.01-01, Modern Procedures.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

The ERAM System Enhancement Refresh and Technology Refresh effort will provide ERAM updates after the last site passes its Operational Readiness Date by deploying user identified ERAM enhancements and innovations designed to increase efficiency, usability and safety. These updates will increase the efficiency of air traffic control and maintain average daily airport capacity.

Program Plans FY 2016 – Performance Output Goals
System Enhancements and Technology Refresh (G01A.01-05):
- Complete development of second block of enhancements.
- Complete test and deployment of second block of enhancements.
- Begin development of third block of enhancements.
- Complete installation of ECG Router Firewall Equipment at Last Site. (APB milestone)

ERAM System Enhancement Future Segment (G01A.01-08):
- None.

Program Plans FY 2017 – Performance Output Goals
System Enhancements and Technology Refresh (G01A.01-05):
- Complete development of third block of enhancements. (Prior year funds)
- Complete test and deployment of third block of enhancements. (Prior year funds)
- Deploy last ERAM Release containing system enhancements. (APB milestone) (Prior year funds)

ERAM System Enhancement Future Segment (G01A.01-08):
- Develop supporting documents for a Final Investment Decision to baseline program.

Program Plans FY 2018 – Performance Output Goals
System Enhancements and Technology Refresh (G01A.01-05):
- None.

ERAM System Enhancement Future Segment (G01A.01-08):
- Complete development and deployment of first block of technology refresh and enhancements.

Program Plans FY 2019 – Performance Output Goals
System Enhancements and Technology Refresh (G01A.01-05):
- None.

ERAM System Enhancement Future Segment (G01A.01-08):
- Complete development and deployment of second block of enhancements.

Program Plans FY 2020 – Performance Output Goals
System Enhancements and Technology Refresh (G01A.01-05):
- None.

ERAM System Enhancement Future Segment (G01A.01-08):
- Complete development and deployment of third block of enhancements.

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

Program Description

ERAM Sector Enhancements provides software and hardware 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 FY 2015. Prime contractor system engineering, software development, and implementation activities are planned to begin in 2016 and complete in 2020.

The specific enhancements under analysis as a part of FID activities are listed below:

- Trajectory Modeling Enhancements – Aircraft trajectory modeling will be improved to reduce the occurrence of false and missed alerts and flight plan trajectory modeling will be improved to ensure more accurate handoffs and complete distribution of flight data to downstream sectors.
- Conflict Probe Enhancements – Provide problem detection in airspace with 3-nautical mile (NM) separation standards and in airspace with mixed 5-NM and 3-NM separation standards, and performance improvements through parameters and special notification logics changes.
- Flight Plan Processing – Use an improved International Civil Aviation Organization (ICAO) template for displaying Performance-Based Navigation information.
- Data management Tools – Problem detection will be introduced on the R-side display and the display of important situational views will be enhanced on the D-Side.
- Test and Training Lab Enhancements – Utilize voice recognition and speech synthesis technologies & capabilities.
- International Common Coordination – Automated transfer of aircraft control from US domestic sectors to Canada, Cuba, Dominican Republic, and Bahamas will be implemented.
- ERAM Adaptation Refinement and Certification Tools – Improve the ability for Second Level Engineering personnel to change preset adaptation data.
- Initial ERAM enhancements to support UAS operations in the NAS – Actions will be taken to initiate the integration of UAS information into ERAM.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

The ERAM Sector Enhancements program will improve trajectory modeling, enhance conflict probe processing and detection, provide additional data management capabilities, 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 2016 – Performance Output Goals
- Award ERAM contract modification for Sector Enhancements.
- Begin development of the engineering and complete requirements document for the first phase of ERAM Sector Enhancement.

Program Plans FY 2017 – Performance Output Goals
- Complete software development, test and deployment of the first phase of ERAM Sector Enhancement.
- Begin development of the engineering and complete requirements document of the second phase of ERAM Sector Enhancements.

Program Plans FY 2018 – Performance Output Goals
- Complete software development, test and deployment of second phase of ERAM Sector Enhancements.
- Begin development of the engineering and complete requirements document of the third phase of ERAM Sector Enhancements.

Program Plans FY 2019 – Performance Output Goals
- Complete software development, test and deployment of the third phase of ERAM Sector Enhancements.
- Begin development of the engineering and complete requirements document of the fourth phase of ERAM Sector Enhancements.

Program Plans FY 2020 – Performance Output Goals
- Complete software development, test and deployment of the fourth phase of ERAM Sector Enhancements.

2A02, EN ROUTE COMMUNICATIONS GATEWAY (ECG)
FY 2016 Request $2.7M

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

Program Description

The En Route Communications Gateway (ECG) system is a computer system that formats and conveys critical air traffic data to the En Route Automation Modernization (ERAM), Host Computer System (HCS) and the Enhanced Backup Surveillance (EBUS) System at the Air Route Traffic Control Centers (ARTCCs). The ECG is fully operational at the ARTCCs.

The ECG increases efficiency in the use of NAS capacity and allows air traffic facilities to expand the airspace they use for air traffic control by enabling the current automation systems to use new surveillance technology, such as Automatic Dependence Surveillance Broadcast (ADS-B) and Wide Area Multilateration (WAM). ECG introduced new interface standards and data formats which are required for compatibility with International Civil Aviation Organization (ICAO) 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. ECG was a prerequisite to deploying ERAM software and hardware.

This program is structured in 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.

<u>Technology Refresh:</u>
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 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 formal test program for these components will be conducted in FY 2016. Updated hardware for the Random Access Planned Position Indicator (RAPPI) will be delivered starting 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

The ECG Technology refresh project will replace some of the hardware and update critical software in this key air traffic control automation system. It is important to keep this system up-to-date to avoid failures and system outages. This investment will reduce supportability limitations and increase the ECG systems availability and reliability. Quarterly ECG Operational Analysis Reports indicate an operational availability of 100% from first site Operational Readiness Demonstration (ORD) in 2004 through November 18, 2014.

Program Plans FY 2016 – Performance Output Goals
<u>Performance Monitoring:</u>
- Deliver monthly STEP EOL Reports.
- Deliver quarterly OA Reports.

<u>Technology Refresh:</u>
- Complete formal test phase of Interface Processor, Magma Chassis and Intelligent Communication Adapter Card hardware upgrade.
- Deliver RAPPI hardware to sites.

Program Plans FY 2017 – Performance Output Goals
<u>Performance Monitoring:</u>
- Deliver monthly STEP EOL Reports.
- Deliver quarterly OA Reports.

<u>Technology Refresh:</u>
- Deliver Interface Processor, Magna Chassis and Intelligent Communication Adapter Card hardware upgrade to key site and begin national deployment.

Program Plans FY 2018-2020 – Performance Output Goals
<u>Performance Monitoring:</u>
- Deliver monthly STEP EOL Reports.
- Deliver quarterly OA Reports.

<u>Technology Refresh:</u>
- Complete technology refresh activities recommended in the prior year ECG STEP.

2A03, NEXT GENERATION WEATHER RADAR (NEXRAD)

FY 2016 Request $6.5M

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

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 radars they operate and some of the 12 FAA radars and creates 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; NWS, FAA, and DOD. The FAA-owns and operates 12 of the NEXRAD systems with seven located in Alaska, four in Hawaii and one in Puerto Rico.

NEXRAD radars were initially deployed from 1992-1997 and the FAA-owned NEXRAD systems will be reaching their 20-year end-of-life state beginning in 2015. The Tri-Agency partners plan to keep NEXRAD in full operation through 2030. A favorable Final Investment Decision for NEXRAD was received on 19 September 2012, and a new cost and schedule baseline was 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 (RPG) and Radar Data Acquisition (RDA) 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.

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. To date, the NEXRAD systems are achieving 98% operational availability.

Program Plans FY 2016 – Performance Output Goals

- Complete first replacement/refurbishment at first site. (APB milestone)
- Deliver upgraded Icing algorithm to Radar Operations Center (ROC).

Program Plans FY 2017 – Performance Output Goals

- Deliver upgraded Icing algorithm to ROC.
- Complete 1st Signal Processor replacement (1 of 12, 8%).

Program Plans FY 2018 – Performance Output Goals

- Complete 4th Signal Processor replacement (4 of 12, 33%).
- Complete 1st Transmitter refurbishment (1 of 12, 8%).
- Deliver upgraded Icing algorithm to ROC.

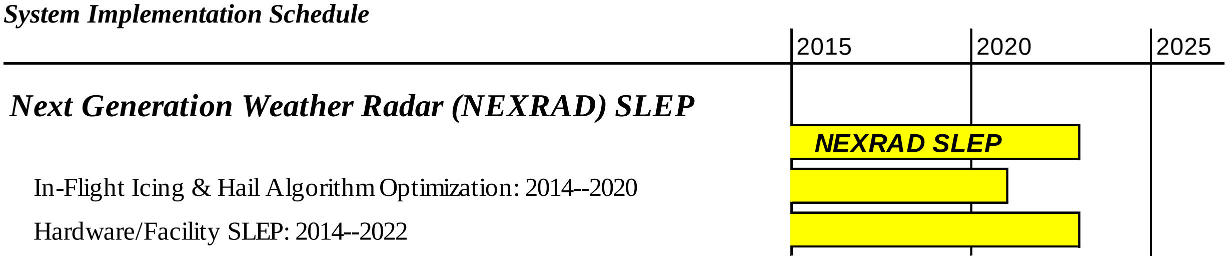
Program Plans FY 2019 – Performance Output Goals

- Complete 8th Signal Processor replacement (8 of 12, 67%).
- Complete 4th Transmitter refurbishment (4 of 12, 33%).
- Complete 1st pedestal refurbishment (1 of 12, 8%).
- Deliver upgraded Icing algorithm to ROC.

Program Plans FY 2020 – Performance Output Goals

- Complete Signal Processor replacement (12 of 12, 100%).
- Complete 8th Transmitter refurbishment (8 of 12, 67%).
- Complete 6th pedestal refurbishment (4 of 12, 33%).
- Deliver upgraded Icing algorithm to ROC.

System Implementation Schedule



2A04, ARTCC BUILDING IMPROVEMENTS/PLANT IMPROVEMENTS

FY 2016 Request $74.2M

Air Route Traffic Control Center (ARTCC) & Center Radar Approach Control (CERAP) Modernization, F06.01-00

Program Description

The ARTCC & CERAPs Modernization 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 two CERAPs facilities.

Major modernization projects include:

- Control Wing Basement is the space used to house NAS systems 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 project replaces the aging Direct Digital Control Systems (DDCS) that monitors and controls the facility environmental systems, such as heating, ventilation, air conditioning equipment, chillers, cooling towers, pumps, air handlers, and computer room air conditioners, as well as monitoring water leak detection systems. The new Building Automation Controls Network "BACnet" replacement system will be an open communication standard protocol that was developed by 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.

The following projects will be executed starting in FY 2019 to extend the service life of the ARTCCs and CERAPs. It is anticipated that these projects will typically include:

- Mechanical System Upgrades: replacement of chillers, pumps, piping and valves, air handler units throughout various locations of the ARTCC buildings and CERAPs associated Building Automation Controls for this equipment.
- Fire Protection System Upgrades: replacement of fire detection and alarm, annunciation equipment and fire suppression systems in various locations of the ARTCC buildings and CERAPs.
- Renovation of Power Service Building: upgrades to building structure to meet seismic response requirements, other architectural element including wall, floor, and ceiling; and mechanical and electrical systems such as air handlers, lighting systems, and electrical panels.

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 CERAPs.

These structures were built in the 1960's and expanded several times since then. As of FY 2014 there was a $93.1 million facility backlog which includes all building systems such as heating, ventilating, and air conditioning (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 FAA's ATC Facilities Strategic Sustainment 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. The improvements to ARTCC facility infrastructure will extend the service life of facilities and minimize outages that would delay air traffic. Associated risks to operations include potential equipment damage, mold and operations interruptions from incidents such as roof leaks and pipe ruptures. The chiller plants for air conditioning are currently approaching or are past their life expectancy. Replacement of these plants is underway but will not be complete 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 2016 – Performance Output Goals

- Award construction contracts for Control Wing Basement/Major Mechanical Systems projects at Oakland, Indianapolis, Cleveland, and Washington ARTCCs.
- Award contract for M1 Room Reconfiguration at Los Angeles ARTCC.
- Award contracts for Building Automation Controls System Replacement projects at Albuquerque and Kansas City ARTCCs.
- Award design contracts for Control Wing Basement/Major Mechanical Systems at Salt Lake, Seattle, and Denver ARTCCs.
- Award design contracts for Building Automation Controls Systems Replacement for Los Angeles and Washington ARTCCs.
- Provide funding to all ARTCCs and CERAPs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database all ARTCCs and CERAPs.

Program Plans FY 2017 – Performance Output Goals

- Award construction contracts for Control Wing Basement/Major Mechanical projects at Los Angeles, Salt Lake City, Seattle and Atlanta ARTCCs.
- Award contracts for Building Automation Controls System Replacement projects at Boston and Anchorage ARTCCs.
- Award design contracts for Building Automation Controls Systems Replacement for Denver, Atlanta, Minneapolis, Seattle, and Salt Lake ARTCCs and Guam CERAP.
- Provide funding to all ARTCCs and CERAPs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all ARTCCs and CERAPs.

Program Plans FY 2018 – Performance Output Goals

- Award construction contracts for Control Wing Basement/Major Mechanical projects at Denver and Kansas City ARTCCs.
- Award contracts for Building Automation Controls System Replacement projects at Los Angeles, Atlanta, Indianapolis, Oakland, Cleveland, Washington ARTCCs and Guam CERAP.
- Provide funding to all ARTCCs and CERAPs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all ARTCCs and CERAPs.

Program Plans FY 2019 – Performance Output Goals

- Award contracts for Building Automation Controls System Replacement project at Minneapolis, Salt Lake City, Seattle, and Denver ARTCCs.
- Renovate and upgrade ARTCC and CERAP Mechanical Systems, Fire Protection Systems, and Power Service Building infrastructure based on facility condition survey.
- Provide funding to all ARTCCs and CERAPs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all other ARTCCs and CERAPs.

Program Plans FY 2020 – Performance Output Goals

- Renovate and upgrade ARTCCs and CERAPs Mechanical Systems, Fire Protection Systems, and Power Service Building infrastructure based on facility condition survey.
- Provide funding to all ARTCCs and CERAPs for mission critical infrastructure and miscellaneous sustainment needs.
- Update the national Facility Condition Assessment database for all ARTCCs and CERAPs.

2A05, Air Traffic Management (ATM) – Traffic Flow Management (TFM)
FY 2016 Request $13.7M

- 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. Purchased in 2008-2009, the field equipment will no longer be produced in 2014 and will require another replace-in kind hardware technology refresh. Hardware will be replaced at over 89 TFM-equipped Air Traffic Control facilities around the country including TMUs at En Route Centers, Terminal Radar Facilities, Air Traffic Control Towers, and Airline Operation Centers. 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 2 & 3 effort, as they both reside and operate on TFMS.

Program Plans FY 2016 – Performance Output Goals
- Begin site surveys for all 88 remote sites.
- Complete engineering analysis for replacement hardware.
- Begin the hardware procurement for all remote site hardware replacements.

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)

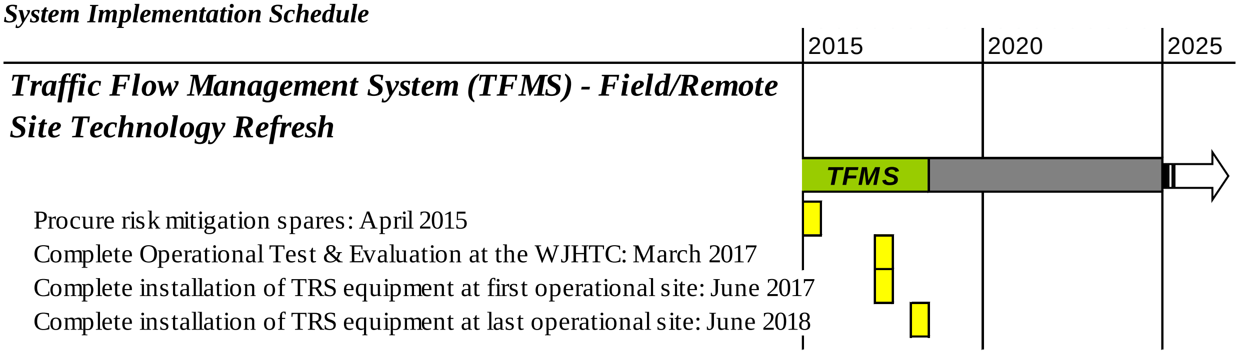
Program Plans FY 2018 – Performance Output Goals

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

Program Plans FY 2019-2020 – Performance Output Goals

- None.

System Implementation Schedule



B, Traffic Flow Management (TFM) Infrastructure – TFM Service Enhancements, A05.01-14

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.

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.

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 59,122, 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 Traffic Management Initiatives (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 2016 – 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 2017 – 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 2018 – 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 2019 – 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 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.

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

Program Description

The mission of the FAA's Office of Commercial Space Transportation (AST) is to ensure protection of the public, property, and the national security and foreign policy interests of the United States during commercial launches and reentries, and to encourage, facilitate, and promote 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 the ATO to facilitate the development of required agreements with commercial space operators and to support the planning and real time monitoring processes necessary to integrate these missions in the NAS. AST personnel are stationed at the Air Traffic Control System Command Center and they interface regularly with traffic managers and procedures specialists at Air Route Traffic Control Centers (ARTCCs) and other air traffic facilities.

The Commercial Space Transportation Integration into the NAS program focuses specifically on Commercial Space NAS Automation. The number of licensed and permitted commercial space operations 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. The work is currently manual in nature, time consuming, and unable to respond to dynamic conditions as it relies on existing toolsets that were not designed for commercial space purposes. Interfaces to ingest telemetry and planning data into these tools do not exist, so a small team of AST and

ATO personnel manually transfer data across tools and networks verbally and on paper, enter the data by hand, and complete multiple checks to minimize the potential for human error. As it is so resource intensive, the team can address only one mission at a time, stressing the FAA's ability to keep pace with the increasing commercial space operations tempo. A technical capability for automating these processes and procedures 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, procedures, and automated systems that will be significantly enhanced, allowing the FAA to identify multiple, complex constraints much earlier in the process and work them in parallel, maximizing the opportunity to address them in a way that best benefits the NAS.

The FAA requires an automation 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. An operational demonstration of this capability is scheduled in FY 2015 and AST is developing this demonstration in close collaboration with NextGen, ATO System Operations Support, and ATO Mission Support. This prototype will be applied to a specific mission to demonstrate the benefits that automation can provide. During the operation, real-time (or near real-time) telemetry data from the vehicle will be ingested into a Traffic Flow Management System (TFMS) test environment, allowing display of the vehicle's position along its trajectory relative to pre-determined aircraft hazard areas. Once it becomes operational, this capability will allow the FAA to dynamically modify aircraft hazard areas so as to release airspace no longer at risk as the mission progresses. Post-mission statistics will be gathered and examined that will validate and quantify the reduction in effort required in planning and the gains in efficiency realized during the operation. These metrics will be applied to the mission analysis that will facilitate an investment decision, leading to eventual deployment and broad application of the automation solution. While the FY 2015 demonstration focuses on TFMS, additional efforts will extend this capability to an En Route Automation Modernization (ERAM) environment.

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

Currently during commercial space operations, less than optimal procedures are followed based on the inability of the NAS to support the automated ingest of real-time telemetry and planning data. This produces large, static hazard areas that close airspace for long periods of time. These hazard areas ensure safety of all NAS users 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 no fatalities, serious injuries, or significant property damage to the public during licensed or permitted space launch and reentry activities. This program will develop and utilize an automation system that uses real-time data, allowing for a more dynamic use of the NAS. Using precise and upgraded information will allow for better initial planning, as it applies to hazard areas and closures, which will in turn allow for less airspace needing to be closed for long periods of time while still maintaining the required level of safety for all NAS users. This program, via automation, will also allow the transition from larger, static hazard areas which are used currently, to smaller, dynamic hazard areas which will be used in the future. In addition to the beneficial effects of the automation system, consistent processes will allow for more timely and accurate information being shared amongst NAS users. This makes aviation safer and smarter while integrating an increasing number of commercial space operations into the NAS.

Program Plans FY 2016 – Performance Output Goals

- Develop the following products in support of the Initial Investment Decision (IID):
  - Prepare Initial Program Requirements Document;
  - Prepare Acquisition Program Baseline;
  - Prepare Initial Implementation and Planning Document; and
  - Prepare Business Case Analysis Report (BCAR) required for an Investment Analysis Readiness Decision (IARD).
- Complete update to Long-Term NextGen Concept of Operations.

Program Plans FY 2017 – Performance Output Goals
- Develop the following products in support of the IID:
  - Enterprise Architecture Artifacts;
  - Implementation Strategy and Planning Document (ISPD); and
  - Chief Financial Officer (CFO) Package.
- Achieve JRC IID.

Program Plans FY 2018 – Performance Output Goals
- Deploy NAS Automation Capability to select ATC facilities.
- Develop the following products in support of the Final Investment Decision (FID):
  - Final Program Requirements documentation;
  - Enterprise Architecture Artifacts;
  - Business Case documentation;
  - Implementation Strategy and Planning Document (ISPD); and
  - Acquisition Program Baseline (Execution Plan).
- Achieve a FID.

Program Plans FY 2019 – Performance Output Goals
- Initiate transition to Long-Term NextGen Concept of Operations.
- Deploy NAS Automation Capability to additional ATC facilities, locations determined at FID.

Program Plans FY 2020 – Performance Output Goals
- Output goals will be determined at FID.

2A06, AIR/GROUND COMMUNICATIONS INFRASTRUCTURE
FY 2016 Request $9.8M

Radio Control Equipment (RCE) – Sustainment, C04.01-01 / Communications Facilities Enhancement – Expansion, C06.01-00 / Communications Facilities Enhancement – Air/Ground Communications RFI Elimination – Technology Refresh, C06.03-01

Program Description

The Air-to-Ground (A/G) Communications Infrastructure Sustainment programs enhance operational efficiency and effectiveness by replacing old radio equipment, provide new, relocated or upgraded remote communications facilities, and provide 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 allows a controller to select and use a remote radio channel. The RCE program improves reliability and maintainability by replacing older non-supported tone control equipment. New equipment provides more functionality than older type tone control equipment which improves operational performance. Additional functionality such as split voice/data is provided, which splits the control data from the voice circuit so the voice circuit can be compressed; offering the ability to use less telephone line bandwidth. Reduced bandwidth saves operating costs for satellite communications because fees are based on the bandwidth used. Also, the new equipment will provide dual control functionality which gives the option of toggling control of a remote communications facility between two towers allowing transfer of frequency control to another facility when a tower is closed for the night. RCE is required at service delivery sites such as ARTCCs, TRACON facilities, ATCTs, CERAPs, Radar Approach Controls, and AFSSs. 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.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):
The Radio Frequency Interference (RFI) Elimination and Technology Refresh program is designed to expedite the detection and facilitate the resolution of radio frequency interference events to minimize delays and congestion thereby improving air traffic capacity, while maximizing the overall throughput of the NAS. This program is needed to provide the Service Areas with the tools and support services necessary to quickly restore NAS radio services.

RFI mitigation can be addressed by adding Receiver (RX) Multicouplers at RCF's. The RX Multicoupler allows connection of multiple radio receivers to one antenna. Doing so reduces RFI by utilizing the internal filters of the RX Multicoupler and additionally provides greater capacity by installing more frequencies on the limited number of antennas located at an RCF. Presently, there are approximately 1300 RX Multicouplers used in the NAS; however, many of these units were purchased locally, are not supportable by the FAA Depot, and have failing power supplies that cannot be replaced. In June, 2007, a contract was awarded for 4 & 8-port RX Multicouplers. A technology refresh is planned to replace all of the current RX Multicouplers in the NAS that were locally purchased. The new RX Multicouplers are FAA logistically supported units and are available from the new 10-year contract.

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. In addition, the programs improve and provide upgrades needed at A/G Communication sites and facilities to sustain reliable operation.

Program Plans FY 2016 – Performance Output Goals
Radio Control Equipment – Sustainment (C04.01-01):
- Implement recommendations from updated obsolescence report.
- Install 15 channels of RCE.

Communications Facilities Enhancement – Expansion (C06.01-00):
- Establish/Replace/Upgrade nine CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):
- Procure and deliver 50 Rx Multicoupler units to FAA Depot.
- Procure and deliver RFI equipment to ten sites.

Program Plans FY 2017 – Performance Output Goals
Radio Control Equipment – Sustainment (C04.01-01):
- None.

Communications Facilities Enhancement – Expansion (C06.01-00):
- Establish/Replace/Upgrade nine CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):
- None.

Program Plans FY 2018 – Performance Output Goals

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

- None.

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

- Establish/Replace/Upgrade nine CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- None.

Program Plans FY 2019 – Performance Output Goals

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

- None.

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

- Establish/Replace/Upgrade nine CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- None.

Program Plans FY 2020 – Performance Output Goals

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

- None.

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

- Establish/Replace/Upgrade four CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- None.

2A07, AIR TRAFFIC CONTROL EN ROUTE RADAR FACILITIES IMPROVEMENTS

FY 2016 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 serviceability. 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 FAA's ATC Facilities Strategic Sustainment 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. Infrastructure failure resulted in almost 11 percent of Air Route Surveillance Radar (ARSR) outages experienced from August 2010 to August 2011.

Program Plans FY 2016 – Performance Output Goals

- Complete upgrades of critical infrastructure systems at 19 facilities including Critical/Essential/Commercial Power Distribution and HVAC systems (actuals may vary based upon validation and priority for the year).
- Complete sustainment projects at 21 facilities. 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).

Program Plans FY 2017-2020 – Performance Output Goals

- Complete upgrades of critical infrastructure systems at 20 facilities including Critical/Essential/Commercial Power Distribution and HVAC systems (actuals may vary based upon validation and priority for the year).
- Complete sustainment projects at 20 facilities. 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 2016 Request $9.9M

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 operational at 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 obtained 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. This 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 2016 – Performance Output Goals

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

- Complete 50% of FOTT power supply retrofits.
- Complete Ground-to-Ground Node Reduction. (APB milestone)

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

- None.

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.

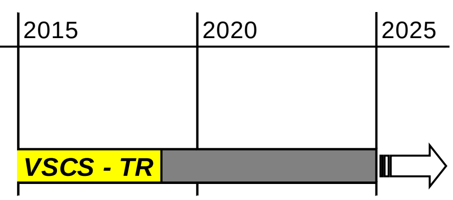
VSCS – Technology Refresh – Level of Effort (C01.02-05):

- 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.

System Implementation Schedule

Voice Switching and Control System (VSCS) - Technology Refresh

First site IOC: 2002 -- Last site ORD: 2018



2A09, OCEANIC AUTOMATION SYSTEM (OAS)

FY 2016 Request $20.0M

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

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 achieved in February 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 unsupportable equipment/operating system to reduce future system failures and increase ATOP system performance to meet future requirements/capabilities.

Program Plans FY 2016 – Performance Output Goals

- Achieve FID.
- Develop engineering requirements document for refreshing the hardware and the operating system.
- Award contract task for the planning, development, and implementation of the Technology Refresh 2 (TR2) which will be completed by late calendar year 2018. This contract task is an option to the existing ATOP contract which will expire in FY 2021.

Program Plans FY 2017 – Performance Output Goals

- Complete the final procurement of the hardware for TR2 for the implementation of the TR2 at the three ATOP sites (Anchorage, New York, and Oakland) and the WJHTC.
- Complete implementation of the technology refresh configuration at the WJHTC.

Program Plans FY 2018 – Performance Output Goals

- Complete the implementation of the technical refresh configuration at the three oceanic sites.

Program Plans FY 2019-2020 – Performance Output Goals
- None.

B, 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 Oakland, New York, and Anchorage Air Route Traffic Control Centers (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. 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.

The ATOP Enhancements program is addressing the operational shortfalls with the current oceanic system as the FAA moves forward with NextGen and other NAS upgrades. The program will address the continued evolution of the capabilities and services sourced through requirements within the Concepts, Validation and Requirements Directorate. The program has nine planned enhancements and these nine enhancements are being categorized under nine shortfall categories, which are:

- User interface and data processing limitations impacting controller coordination;
- Inability to access required external weather data and publish flight and System Analysis Reporting (SAR) data;
- Lack of automation support for coordination with international air navigation service providers (ANSPs);
- 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 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 2016. Final Investment Decision (FID) is planned for second quarter 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 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 is providing enhancements to the controller to more effectively interface with the airspace user to provide more direct routings, reduce fuel burn, and reduced CO2 emissions through improved communication, coordination and surveillance.

Program Plans FY 2016 – 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.
- Achieve IARD.

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.
- Additional output goals will be developed at FID

Program Plans FY 2018-2020 – Performance Output Goals

- Output goals will be developed at FID.

C, 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 or involve significant systems complexity and interdependencies, and 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 2016-2020 – Performance Output Goals

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

2A10, Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)

FY 2016 Request $43.6M

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 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 baseline. The NEXCOM program is currently reviewing and finalizing the requirements and SIR package for the upcoming procurement. The program expects contract award in FY2016 or FY2017, and should start deploying the Emergency Transceivers in FY 2017.

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.

<u>NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):</u>
The NEXCOM procurement for Segment 2, Phase 1 has a combined contract to deliver Very High Frequency (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.

<u>NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):</u>
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 2027).

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 2016 – Performance Output Goals
NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):
- Deploy 2,700 new Terminal Air Traffic Control Radios.
- Purchase 3,000 Radios.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):
- None.

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.
- Complete transition from Phase One to Phase Two.

NEXCOM – Segment 2 – Phase 2 of 2 (C21.02-02):
- None.

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.

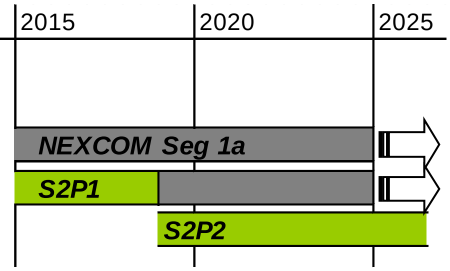
System Implementation Schedule

Next-Generation VHF A/G Communications System (NEXCOM) – Segment 2 - Phase 1/2

First site: July 2003 -- Last site: September 2013

First site: 2009 -- Last site: September 2018

First site: 2019 -- Last site: August 2027



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

FY 2016 Request $37.4M

- A, System Wide Information Management (SWIM) – Segment 2A, G05C.01-04 / System Wide Information Management (SWIM) – Segment 2B, G05C.01-08
- B, System Wide Information Management (SWIM) – Common Support Services Weather (CSS-Wx), G05C.01-06
- X, System Wide Information Management (SWIM) – Segment 1 Technology Refresh, G05C.01-05

A, System Wide Information Management (SWIM) – Segment 2A, G05C.01-04 / 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 sharing of information between diverse systems enabling the NextGen delivery of the right information to the right places at the right time. The program achieves this 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.

SWIM – Segment 2A (G05C.01-04):
Segment 2A includes the following key elements:

- Development, deployment, and maintenance of SOA Core Services. These SOA Core Services, which are comprised of NAS Enterprise Messaging Service (NEMS), Enterprise Service Management, Interface Management, and Security services, are provided for use by multiple FAA domains and programs. NEMS is being provided via FAA Telecommunications Infrastructure (FTI), building on Data Exchange (DEX), the operational prototype currently used to provide Airport Surface Detection Equipment – Model X (ASDE-X) data; and
- Responsibility for all acquisition, management and maintenance activities for the hardware and software associated with developing and deploying those capabilities that results in a consolidated SOA infrastructure (e.g., supporting SOA Core Services).

SWIM – Segment 2B (G05C.01-08):
Plans for Segment 2B include the following:

- Continued on ramping of programs onto the NAS Enterprise Messaging Service (NEMS) – provides a reliable messaging infrastructure to be leveraged by SWIM producers and consumers
- Providing additional NAS enterprise services:
    - Enterprise Service Monitoring (ESM) – provides Operations and Maintenance (O&M) status of NAS infrastructure and the SOA services;
    - Identity and Access Management (IAM) – provides a scalable security solution supporting other NAS programs and systems establishing an Enterprise Service and allows NAS programs with unique functional requirements to leverage the solution resulting in overall lower costs;
    - NAS Common Reference (NCR) – provides a unified, application-level interface to obtain filtered subsets of information, in specified format, via request or subscription;
    - Enhancement of the SWIM Flight Data Publication Service – makes flight and airspace data independent of HOST/Air Traffic Management Data Distribution System (HADDS) and makes it available to consumers; and
    - Enhancement of the SWIM Terminal Data Distribution Service (STDDS) – adds additional terminal data collection and services to present that data to consumers.

The Segment 2B Final Investment Decision is scheduled for Q4 FY 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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

SWIM reduces the number and types of unique interfaces, reduces redundancy of information, better 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 2016 – Performance Output Goals
SWIM Segment 2A (G05C.01-04):

- Complete FY 2016 NEMS demand assessment and associated deployment of new NEMS Nodes. (APB milestone)
- Complete NEMS producer/consumer management enhancements.
- Connect producers and consumers to NEMS (Aeronautical Information Management (AIM) Segment 2, Common Support Services – Weather (CSS-Wx), etc.).
- Complete NEMS consumer self-service management deployment.
- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis process in 2016.

SWIM Segment 2B (G05C.01-08):

- Complete transition from Segment 2A to Segment 2B.
- Additional output goals will be established at FID.

Program Plans FY 2017-2020 – Performance Output Goals

SWIM Segment 2A (G05C.01-04):

- None.

SWIM Segment 2B (G05C.01-08):

- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis processes.
- Additional output goals will be established at FID.

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

Program Description

Common Support Services-Weather (CSS-Wx), formerly known as NextGen Network Enabled Weather (NNEW), will be the FAA's first common support services capability. CSS-Wx 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), 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. It will be scalable to accommodate the addition of new users and new systems. CSS-Wx will be the FAA's single provider of aviation weather data, consolidating several legacy weather dissemination systems and will provide weather information 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 ultimately:

- Provide weather information via gridded data [Web Coverage Service (WCS)], non-gridded data [Web Feature Service (WFS)], and images [Web Map Service (WMS)];
- Filter weather information by location and time with the ability to provide the user with Wx data for a specific geographic area;
- Provide weather information in common, standardized formats identified by the Open Geospatial Consortium; 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), the National Oceanic and Atmospheric Administration's (NOAA) NextGen Web Services, and other weather sources available to FAA and NAS users.

The program achieved Final Investment Decision (FID) in March 2015. FID for CSS-Wx occurred with FID for NWP. The milestones and schedule will be updated in the next publication.

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 59,122, 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 all applicable 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 enabling en route and terminal controllers to provide 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 2016 – Performance Output Goals

- Complete Preliminary Design Review (PDR) for CSS-Wx.

Program Plans FY 2017 – Performance Output Goals

- Complete Critical Design Review (CDR) for CSS-Wx.
- Complete First Site Delivery.

Program Plans FY 2018 – Performance Output Goals

- Complete Factory Acceptance Testing (FAT).
- Complete Operational Testing (OT).

Program Plans FY 2019 – Performance Output Goals

- Achieve Key Site Initial Operational Capability (IOC) for CSS-Wx.
- Achieve In-Service Decision.
- Achieve First Site Operational Readiness Date (ORD).

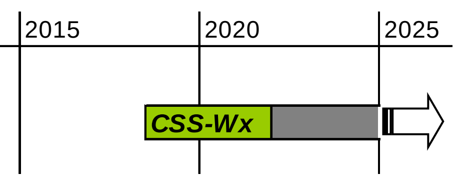
Program Plans FY 2020 – Performance Output Goals

- Achieve CSS-Wx ORD at deployed sites (number of sites determined at FID).

System Implementation Schedule

Common Support Services - Weather (CSS-Wx)

First site IOC: November 2018 -- Last site IOC: July 2021



X, System Wide Information Management (SWIM) – Segment 1 Technology Refresh, G05C.01-05

Program Description

In 2007, the FAA established the System Wide Information Management (SWIM) program to implement a set of information technology (IT) capabilities in the NAS to provide users with direct access to 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 sharing of information between diverse systems enabling the NextGen delivery of the right information to the right places at the right time. The program achieves this by providing the IT enterprise infrastructure necessary for NAS systems to share and reuse information and increase interoperability.

SWIM's enterprise infrastructure will enable 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 will reduce the cost and risk for NextGen programs to develop and deploy services.

SWIM Segment 1 will be completed in FY 2015. Due to the rapid pace of technological innovation, SWIM is required to perform technology refresh in FY 2019 and perform the periodic replacement of both SWIM compliant capabilities and Commercial-Off-The-Shelf (COTS) system components to assure continued supportability.

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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

SWIM will reduce the number and types of unique interfaces, reduce redundancy of information, improve information-sharing, predictability and operational decision-making, and reduce the cost of service. The improved coordination that SWIM provides will allow for the transition from tactical conflict management of air traffic control to strategic trajectory-based operations. In addition, SWIM will provide the foundation for enhanced information sharing and exchange external to the FAA.

Program Plans FY 2016-2018 – Performance Output Goals

- None.

Program Plans FY 2019 – Performance Output Goals

- Complete Technology Refresh for NAS Service Registry/Repository.

Program Plans FY 2020 – Performance Output Goals

- None.

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

FY 2016 Request $45.2M

- 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 – Future Segments, G02S.01-02

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

Program Description

Automatic Dependent Surveillance – Broadcast (ADS-B) is an advanced surveillance technology that provides highly accurate and more comprehensive surveillance information. ADS-B is the cornerstone 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 or other navigation inputs, instead of position information from traditional radar.

Aircraft position (longitude, latitude, altitude, and time) is determined using the Global Navigation Satellite System (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, (such as identification, indication of climb or descent angle, velocity, next waypoint, and other data that is limited only by the equipment's capability) 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 (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 and equipped with ADS-B In avionics may receive and process the surveillance information of nearby aircraft for display to the pilot using the aircraft's multifunction display. Finally, ADS-B equipment may be placed on ground vehicles to allow controllers and pilots to locate and identify them on runways or taxiways.

The main ADS-B acquisition has been structured as a multiple year, performance-based service contract under which the vendor will install, own, and maintain the ground-based ADS-B equipment that provides the surveillance information to FAA automation systems. The program has three activities: Baseline Services and Applications, Gulf Expansion and In Trail Procedures.

Baseline Services and Applications:
This activity continues implementation of baseline applications including Ground-based Interval Management (GIM), Traffic Situation Awareness, Airport Traffic Situation Awareness Enhanced Visual Approach, Cockpit Display of Traffic Information (CDTI) Assisted Visual Separation (CAVS), Traffic Situation Awareness with Alerts, 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 multilateration sensors, ADS-B, and Airport Surveillance Radar/Mode Select (ASR/Mode S) terminal radars. ASSC consists of a multilateration subsystem, multi-processor subsystem, data distribution subsystem, tower display subsystem and a maintenance subsystem. ASSC will enhance the situational awareness for controllers located in the ATCT by providing a fused target position of all transponder-equipped aircraft and ADS-B equipped ground vehicles on the airport surface movement area, as well as aircraft flying within five miles of the airport, for display in the ATCT.

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

Gulf of Mexico Expansion:
Three additional ADS-B radio stations will be located in Mexico which, combined with existing stations, will provide coverage for all of the Gulf of Mexico (GOMEX). A Memorandum of Agreement (MOA) was signed between the United States and Mexico on May 22, 2012. The MOA defines the roles of each entity, describes how the added surveillance will improve situational awareness and enable more efficient air traffic handoffs between the countries, and contains a requirement to build a detailed plan that includes cost share, schedule, and ATC procedures development.

The additional ADS-B radio stations in Mexico will provide coverage over all air traffic routes extending from Houston ARTCC into Mexico. Airlines will use the routes in both directions, transitioning from North to South, or South to North, because of the expanded coverage in the far south of the US Flight Information Region (FIR). This expanded coverage will result in more efficient use of the airspace over the Gulf of Mexico.

In Trail Procedures:
In Trail Procedures (ITP) allows air traffic control to approve ADS-B equipped aircraft to perform flight level changes when there is less than standard separation. ITP enables flight level change maneuvers that are otherwise not possible using non-ADS-B based oceanic procedural separation standards. ITP allows ATC to approve these flight level change requests between properly equipped aircraft using reduced separation during the 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.

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 and will result in fewer delays and more optimal routing for aircraft. The other efficiency benefits include reductions in weather deviations, and reduced cancellations resulting from increased access to some Alaskan villages during reduced weather conditions. The 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.

Adding three ADS-B radio stations in Mexico will provide coverage over all of the Gulf of Mexico air traffic routes extending from U.S. airspace into Mexico, which allows reduced separation on both sides of the border and enables more efficient handoffs between U.S. and Mexican airspace. Reduced separation will allow for improved on-time arrivals by allowing more volume of traffic to be managed.

Program Plans FY 2016 – Performance Output Goals

- Baseline Services and Applications:
  - Achieve Initial Operating Capability (IOC) of Terminal ATC Separation Services at 13 sites (80 of 159 complete).
  - Achieve Initial Operating Capability (IOC) of Surface Advisory Services at one Airport Surface Surveillance Capability (ASSC) site.
- Gulf of Mexico Expansion:
  - Complete remaining radio station construction (three cumulative).
  - Achieve operation of expanded GOMEX services at Houston Center. (APB milestone).
- In Trail Procedures:
  - Achieve ATOP Oceanic ITP operational readiness at one Key Site.

Program Plans FY 2017 – Performance Output Goals

- Baseline Services and Applications:
  - Achieve Initial Operating Capability (IOC) of Terminal ATC Separation Services at 39 sites (119 of 159 complete).
  - Achieve Initial Operating Capability (IOC) of Surface Advisory Services at three Airport Surface Surveillance Capability (ASSC) sites.
- In Trail Procedures:
  - Achieve ATOP Oceanic ITP operational at Oakland, New York and Anchorage Centers. (APB milestone)

Program Plans FY 2018 – Performance Output Goals

- Baseline Services and Applications:
  - Achieve Initial Operating Capability (IOC) of Terminal ATC Separation Services at 28 sites (147 of 159 complete).
  - Achieve Initial Operating Capability (IOC) of Surface Advisory Services at four Airport Surface Surveillance Capability (ASSC) sites.

Program Plans FY 2019 – Performance Output Goals

- Baseline Services and Applications:
  - Achieve Initial Operating Capability (IOC) of Terminal ATC Separation Services at 12 sites (159 of 159 complete).

Program Plans FY 2020 – Performance Output Goals

- Baseline Services and Applications:
    - Achieve Final Investment Decision (FID) for next ADS-B investment period.

X, Automatic Dependent Surveillance-Broadcast (ADS-B) NAS Wide Implementation – Future Segments, G02S.01-02

Program Description

The program will develop and implement ADS-B In applications for Interval Management. Interval Management 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.

The FAA chartered the ADS-B In Aviation Rulemaking Committee (ARC) in June of 2010 to provide a forum for the U.S. aviation community to recommend a strategy for incorporating ADS-B In technologies into the NAS. The ARC was tasked to provide recommendations that clearly define how FAA, users and manufacturers should proceed with ADS-B In while ensuring compatibility with defined ADS-B Out avionics. In September 2011, the ARC published a report that included a priority listing of ADS-B-In applications from a user perspective. Subsequently, in accordance with the FAA Reauthorization Act, Section 211(b), the ARC evaluated a variety of equipage implementation strategies to frame a targeted ADS-B In mandate.

In response to the September 2011 ARC recommendations, the FAA Surveillance and Broadcast Services (SBS) program has been evaluating the business case, affordability, and maturity of the various applications. The SBS program is maturing the requirements definition of a suite of ADS-B In Interval Management (IM) applications and will pursue a series of final investment decisions as each application or a set of applications are deemed suitably defined for implementation.

IM consists of a set of ground (Ground-based Interval Management (GIM)) and flight deck (Flight-deck-based Interval Management (FIM)) capabilities and procedures for the ATC and flight crews that are used in combination to more efficiently and precisely manage inter-aircraft spacing (i.e., achieve a precise interval on arrival) based on an ATC clearance. An air traffic controller can issue an IM clearance that allows flight crews to manage spacing through speed adjustments generated by onboard FIM equipment until reaching a planned termination point. Depending on local constraints and traffic characteristics the capabilities can be used in several types of operation such as:

- Closely Spaced Parallel Operations (CSPO);
- Arrivals & Approach;
- Cruise (both domestic surveillance airspace and oceanic non-surveillance airspace); and
- Departures.

Pre-Implementation activities for ADS-B In are funded in FY 2015 – FY 2018 under CIP G01S.02-01 ADS-B In Applications – Flight Interval Management. This CIP G02S.01-02, supports the implementation activities from FY 2017 and beyond. An Investment Analysis Readiness Decision (IARD) is planned for the first set of ADS-B In IM applications, Spacing Arrivals, Approach and Cruise, in Q3 FY 2015, with a Final Investment Decision (FID) in Q1 FY 2017. Follow on investment decisions include an IARD for Advanced ADS-B In applications in FY 2022 and a FID in 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 2 – Maintain an average daily capacity for Core airports of 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

Improved 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.

Program Plans FY 2016 – Performance Output Goals
- None.

Program Plans FY 2017 – Performance Output Goals
- Complete Preliminary Design and Preliminary Design Review for ERAM, STARS and TBFM.
- Complete Critical Design Review with automation vendors for ERAM, STARS, and TBFM.
- Equip aircraft with FIM MOPS v1 functionality (in preparation for FY 2018 FAA-NASA Joint Flight Test).

Program Plans FY 2018 – Performance Output Goals
- Begin software development with TBFM automation vendor.
- Complete FAA-NASA Joint Flight Test.

Program Plans FY 2019 – Performance Output Goals
- Begin planning vendor testing of TBFM software.
- Begin software development with ERAM automation vendor.

Program Plans FY 2020 – Performance Output Goals
- Complete Interval Management MOPS v2 (Advanced ADS-B In Interval Management).
- Award Contract for MOPS v2-compliant avionics used in FY 2026 Operational Benefits Validation.
- Begin planning vendor testing of ERAM software.

2A13, WINDSHEAR DETECTION SERVICE (WDS)
FY 2016 Request $5.2M

- A, Wind Shear Detection Services – Work Package 1, W05.03-01
- X, Juneau Airport Wind System (JAWS) – Technology Refresh, W10.01-02

A, 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 Wind Shear 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 will contribute 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 2016 – Performance Output Goals

- First WSP site upgrade complete (1 of 34, 3%). (APB milestone)

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 2019-2020 – 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 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 unsupportable equipment which could fail.

Program Plans FY 2016-2018 – 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 Operation;
    - Functional Analysis;
    - Enterprise Architecture Products;
    - Program requirements; and
    - Safety Assessment.
- Achieve Investment Analysis Readiness Decision (IARD).

Program Plans FY 2020 – Performance Output Goals
- Develop the following products in support of the Final Investment Decision (FID):
    - Final Program Requirements documentation;
    - Enterprise Architecture Artifacts;
    - Business Case documentation;
    - Implementation Strategy and Planning Document (ISPD); and
    - Acquisition Program Baseline (Execution Plan).
- Achieve Final Investment Decision (FID).

2A14, NEXTGEN – COLLABORATIVE AIR TRAFFIC MANAGEMENT PORTFOLIO
FY 2016 Request $9.8M

- A, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 3, G05A.05-02 / B, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 4, G05A.05-03
- C, Strategic Flow Management Application, G05A.01-01
- X, Strategic Flow Management Engineering Enhancement (SFMEE), G05A.01-02

A, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 3, G05A.05-02 / B, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 4, G05A.05-03

Program Description

The Collaborative Air Traffic Management Technologies program provides enhancements to the Traffic Flow Management (TFM) system. The TFM system 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 TFM system 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. TFM 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 3 (G05A.05-02):
CATMT Work Package 3 (WP3) adds enhancements to the TFM during the years FY 2011 to 2015. The FAA baseline for WP 3 includes:

- TFM Remote Site Re-engineering (TRS-R) – Modernizes the software infrastructure, the backbone of the TFM decision support tool suite used by Traffic Managers in the field:
    - Phase 1 – Consolidates three software based codes into one. Allows the airlines to see the same information as the FAA for better situational awareness, collaboration and decision support.
    - Phase 2 – Consolidates software communications, control and data management into one modernized suite. This is the first and fundamental step for future mid-term CATMT capabilities, the TFM integrated tool suite and integrated displays planned for future CATMT work packages.
- Collaborative Information Exchange (CIX) – Manages information exchange between the TFM system and external systems through software interfaces:
    - CIX uses System Wide Information Management (SWIM) as the medium for information exchanges between the TFM system and external systems to receive Special Use Airspace (SUA) status through this software interface.
    - Integrates SUA status information made available through SWIM Segment 1 for use in decision support tools and on the Traffic Situation Display.

CATMT Work Package 4 (G05A.05-03):
CATMT Work Package 4 (WP4), 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. Concept exploration analyses are on-going as one part of the NextGen Collaborative Air Traffic Management (CATM) portfolio and will eventually lead to the identification of the possible CATMT Work Package 4 capabilities. Capabilities being considered for CATMT WP4 include:

- Improving Demand Predictions – a set of several enhancements aimed at improving the Traffic Flow Management System (TFMS) predictions of demand for NAS resources.
- Integrated Traffic Management Initiative (TMI) Modeling – a "what-if" modeling tool that allows traffic managers to model multiple, commonly used TMIs together to view the net effect of all TMIs on the system prior to TMI execution.
- Airport Acceptance Rate (AAR) Decision Support – a capability that provides an objective, strategic forecast of AAR for specified airports considering local adaptation and weather integration of 3-D wind and ceiling and visibility forecasts.
- Arrival Route Status and Impact – a tool that provides strategic/tactical forecast of arrival route status due to convective weather for specified airports. Provides ability to generate and act on flight lists with impacted flights.
- Integrated Departure Route Planner – 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 Final Investment Decision (FID) is planned for 4th quarter FY 2015. Business case analysis to support FID is being performed under G05A.01-02 Strategic Flow Management Engineering Enhancement.

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 2016 – Performance Output Goals

CATMT WP3 (G05A.05-02):

- Complete TRS-R Phase 2 deployment. (APB milestone)
- Complete CATMT WP3 transition and close-out activities.

CATMT WP4 (G05A.05-03):

- Pending JRC FID, award contract for the TFMS/CATMT WP4 and begin transition activities to the new contractor.

Program Plans FY 2017-2020 – Performance Output Goals

CATMT WP3 (G05A.05-02):

- None.

CATMT WP4 (G05A.05-03):

- Pending JRC FID and contract award, complete contract transition activities and begin the design, development and deployment of CATMT Work Package 4.

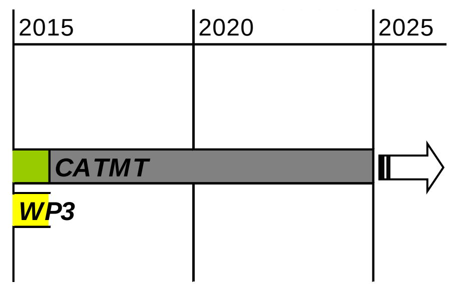
System Implementation Schedule

Collaborative Air Traffic Management Technologies (CATMT) – Work Package 3 and 4

First Operational Capability (OC): June 2008 -- Last OC: TBD

WP3 First Software Enhancement: 2012 -- Last: December 2015

WP4 - Pending final investment decision



C, Strategic Flow Management Application, G05A.01-01

Program Description

Strategic Flow Management Application (SFMA) will identify operational shortfalls and gaps for rerouting of airborne and pre-departure flights, which remain after the implementation of Airborne Reroute Automation (ABRR), Collaborative Trajectory Options Program (CTOP), and Data Communications (Data Comm). 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 will help resolve air traffic flow problems, reduce delay, reduce 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 under SFMA will be incorporated into Collaborative Air Traffic Management Technologies (CATMT) Work Package 5 (WP5).

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 59,122, 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 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 2016 – Performance Output Goals

- Conduct concept engineering activities to develop the following products:
  - Updated SFMA shortfall analysis report for the management of En Route resources for airborne and pre-departure flights under constraints
  - Additional prototyping, human in the loop (HITL) evaluation, and report
  - Updated SFMA capability concepts of operations (ConOps)
  - Updated SFMA preliminary requirements
  - Updated rough order of magnitude (ROM) cost estimate
  - Updated benefit analysis and estimate

Program Plans FY 2017 – Performance Output Goals

- Conduct concept engineering activities to develop the following products:
  - Updated SFMA capability concepts of operations (ConOps) to support WP5 artifact generation
  - Updated SFMA preliminary requirements to support WP5 artifact generation
  - Updated rough order of magnitude (ROM) cost estimate to support WP5 artifact generation
  - Updated benefit analysis and estimate to support WP5 artifact generation

Program Plans FY 2018 – Performance Output Goals

- Conduct engineering activities to identify shortfalls and new capabilities and develop products for the next segment of improved strategic flow services and capabilities:
  - Preliminary Shortfall Analysis for traffic flow services and capabilities
  - Preliminary capability Concept of Operations (ConOps)

Program Plans FY 2019 – Performance Output Goals

- Conduct concept engineering activities to develop the following products:
  - Initial prototyping, human in the loop (HITL) evaluation, and report
  - Quantitative Shortfall Analysis
  - Operations Requirements
  - Capability Concept of Operations (ConOps)
  - Preliminary capability Functional Analysis

Program Plans FY 2020 – Performance Output Goals

- Conduct concept engineering activities to develop the following products:
  - Preliminary capability requirements
  - Additional prototyping, human in the loop (HITL) evaluation, and report
  - Updated capability Concept of Operations (ConOps)

X, Strategic Flow Management Engineering Enhancement (SFMEE), G05A.01-02

Program Description

The Strategic Flow Management Engineering Enhancement program (SFMEE) will support future work packages for Traffic Flow Management (TFM) enhancements. The concept engineering work for the individual capabilities that comprise these future work packages will be conducted primarily through the Strategic Flow Management Application (SFMA) and Advanced Methods (AM) programs. Implementation of TFM capabilities will be accomplished by the Traffic Flow Management System program.

The fundamental goal of TFM is to manage the flow of air traffic to minimize delays and congestion due to system stressors such as weather or equipment outages. Today’s operations could be more efficient by establishing strategic plans for mitigating delay and capacity issues. Strategic plans 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, complete view of the operation or to 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 is not known until the initiative is implemented. Traffic Managers do their best to estimate impact by gathering data and applying personal experience on how an initiative has performed in the past. This process is cognitively demanding, workload-intensive and outcome highly dependent on the individuals' skills and experience.

A comprehensive view of NAS status and the initiatives that are already in place will provide Traffic Managers with the information they need to identify problems sooner and make better decisions. Better modeling capabilities will allow them to assess the effectiveness and potential impact of decision alternatives before they are 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 59,122, 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 traffic management initiatives (TMIs). More efficient TMIs translate to the improved usage of available NAS capacity.

Program Plans FY 2016 – Performance Output Goals
- None.

Program Plans FY 2017 – Performance Output Goals
- Develop the following products in support of the Concept & Requirements Definition Readiness Decision (CRDRD) for targeted AMS investment:
    - Preliminary Shortfalls Analysis; and
    - 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; and
    - Solution Concept of Operation.
- Achieve CRDRD for targeted AMS investment.

Program Plans FY 2018 – Performance Output Goals
- Develop the following products in support of IARD for targeted AMS investment:
    - Functional Analysis;
    - Enterprise Architecture Products;
    - Program requirements;
    - Safety Assessment; and
    - Alternatives & ROM Costs.
- 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 targeted AMS investment:
  - Initial Program Requirements;
  - Business Case Analysis Report (BCAR);
  - Enterprise Architecture Artifacts;
  - Implementation Strategy and Planning Document (ISPD); and
  - Chief Financial Officer (CFO) Package.
- Develop the following products in support of the Final Investment Decision (FID) for targeted AMS investment:
  - Final Program Requirements documentation;
  - Enterprise Architecture Artifacts;
  - Business Case documentation;
  - Implementation Strategy and Planning Document (ISPD); and
  - Acquisition Program Baseline (Execution Plan).
- Achieve IID/FID for targeted AMS investment.

Program Plans FY2020 – Performance Output Goals

- None.

2A15, NEXTGEN – TIME BASED FLOW MANAGEMENT (TBFM) PORTFOLIO

FY 2016 Request $42.6M

Time Based Flow Management (TBFM) Work Package 3, G02A.01-06 / Time Based Flow Management (TBFM) Technology Refresh, G02A.01-07 / X, Time Based Flow Management (TBFM) Work Package 4, G02A.01-08

Program Description

Time Based Flow Management (TBFM) is an automation system currently available that enables the use of time-based metering to optimize the capacity in the NAS by improving traffic flow management of aircraft approaching and departing congested airspace and airports. TBFM has been field-tested over the past 10 years and is operational at the 20 ARTCCs and adapted for most of the major airports served by those centers. The TBFM system 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 address 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; terminal sequencing and spacing to provide efficient sequencing and runway assignment; and expansion of the Integrated Departure/Arrival Capability (IDAC) to additional locations. The design, development and deployment of these concepts will occur during the 2015-2019 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 is planned in FY 2015.

TBFM Technology Refresh (G02A.01-07):
TBFM Technology Refresh will replace the equipment that was deployed in 2012 and 2013 with new equipment in the FY 2018-2019 time frame. The current equipment will begin to reach its end of service/maintenance by 2017. The TBFM program office, starting in the FY 2015 time frame, will begin the acquisition management process to reach a FID to replace this hardware. FID is planned in FY 2017.

TBFM Work Package 4 (G02A.01-08):
TBFM Work Package 4 will improve the management of traffic flow in all phases of flight by using dynamic metering; providing NAS user preferences including preferred runway, arrival sequence or slot swapping; and integrating strategic and tactical scheduling to reduce delays for departures.

4D Trajectory Demonstration:
4D Trajectory demonstration will validate the capability of air/ground (ATN Baseline 2 data communication), and ground/ground (flight object used in the air traffic flow management and Flight Operation Center (FOC) automation) to support advanced trajectory exchange with curved path and time of arrival control including operational sufficiency of the data sets.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Target

TBFM will expand time-based metering solutions to additional phases of flight. This will increase daily airport capacity and improve flight efficiency by reducing last minute maneuvering of aircraft as they approach their destination airport. This will also improve controller efficiency in organizing the arrival stream for maximum use of that airport capacity. Time-based metering through TBFM has provided an average 3-5% increase in throughput at the airports where it is installed.

Program Plans FY 2016 – Performance Output Goals
TBFM Work Package 3 (G02A.01-06):
- Complete preliminary software review for Terminal Sequencing and Spacing.
- Other outputs to be defined at FID.

TBFM Technology Refresh (G02A.01-07):
- Complete the following products in support of the Investment Analysis Readiness Decision:
  - Initial Investment Analysis Plan (IAP)
- Develop initial versions of the following products in support of the FID:
  - Requirements document
  - Business Case
  - Implementation Strategy and Planning Document (ISPD)
  - Acquisition Program Baseline (APB)

TBFM Work Package 4 (G02A.01-08):
- None.

4D Trajectory Demonstration:
- Demonstrate the benefits of a limited DataComm ATN Baseline 2 to support future DataComm investment for ground and flight deck.
- Complete a report on the feasibility, safety considerations based on current standards, and recommendations for future standards.
- Conduct demonstration evaluation.
- Complete analysis report.

Program Plans FY 2017 – Performance Output Goals
TBFM Work Package 3 (G02A.01-06):
- Outputs to be developed at FID.

TBFM Technology Refresh (G02A.01-07):

- Complete the documentation required for FID.
- Achieve FID.
- Award contract.
- Prepare Engineering Analysis for replacement Hardware.

TBFM Work Package 4 (G02A.01-08):

- None.

Program Plans FY 2018 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- Outputs to be developed at FID.

TBFM Technology Refresh (G02A.01-07):

- Procure Hardware for Technology Refresh.

TBFM Work Package 4 (G02A.01-08):

- Begin development of products in support of Concept & Requirements Definition Readiness Decision (CRDRD):
    - Preliminary Program Requirements (pPR) documentation
    - Quantified shortfall analysis

Program Plans FY 2019 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- Outputs to be developed at FID.

TBFM Technology Refresh (G02A.01-07):

- Outputs to be developed at FID.

TBFM Work Package 4 (G02A.01-08):

- Complete the following products in support of the Investment Analysis Readiness Decision (IARD):
    - Preliminary Program Requirements (pPR) documentation
    - Initial Benefits and Cost documentation
    - Safety Documentation
    - Enterprise Architecture documentation
- Achieve IARD.
- Begin development on Final Investment Documentation.

Program Plans FY 2020 – Performance Output Goals

TBFM Work Package 3 (G02A.01-06):

- None.

TBFM Technology Refresh (G02A.01-07):

- None.

TBFM Work Package 4 (G02A.01-08):

- Complete the following products in support of the FID:
    - Final Requirements document
    - Business Case
    - Implementation Strategy and Planning Document (ISPD)
    - Acquisition Program Baseline (APB)
- Achieve FID.
- Award contract.

2A16, ATC BEACON INTERROGATOR (ATCBI) - TECHNOLOGY REFRESH

FY 2016 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 and 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 currently planned for June 2017 and the Final Investment Decision (FID) is currently planned for June 2020. This activity will determine the retrofit requirement for the 132 operational ATCBI-6 systems in the FAA inventory with the identified modification kits.

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 2016 – Performance Output Goals

- Complete the ATCBI-6 Parts Obsolescence and supply support study.
- 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 2017-2020 – Performance Output Goals

- None.

2A17, NEXTGEN – NEXT GENERATION WEATHER PROCESSOR (NWP)
FY 2016 Request $7.0M

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. As input, NWP WP1 will use information from the FAA and National Oceanic and Atmospheric Administration (NOAA) radars and other weather sensors and NOAA forecast models. NWP will use sophisticated algorithms to create high-quality aviation-specific current and predicted weather information. NWP WP1 will create value-added weather information that will be available via the Common Support Services-Weather (CSS-Wx) system. It will perform weather translation necessary to enable the use of weather information by automated decision-support tools (DSTs). NWP WP1 will also provide improved aviation safety related windshear products. Collectively these features will help reduce rising operations and maintenance costs by consolidating the following systems over its lifecycle:

- Corridor Integrated Weather System (CIWS): Provides 0-to-2 hour aviation weather information to the Traffic Flow Management System (TFMS) and associated users for heavily used 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; and
- Integrated Terminal Weather System (ITWS): Provides weather information to terminal air traffic supervisors and controllers.

The NWP WP1 program will accomplish the following:
- Replace and enhance the current 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.

The initial investment decision for NWP WP1 was approved by the JRC in September 2013. A Final Investment Decision (FID) for NWP was approved in March 2015. FID for NWP occurred with FID for CSS-Wx. The milestones and schedule will be updated in the next publication.

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 fuller use of weather information for operational decision-making. This supports 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.

Delays in the NAS are primarily attributable to weather. Based on Operations Network (OPSNET) which is the official source of NAS air traffic operations and delay data, for 2003-2012 68 percent of air traffic delays over 15 minutes were due to weather. The NWP capabilities will decrease avoidable aircraft delays, diversions, and cancellations. Projected estimates of cost savings to airlines and passengers attributed to these advanced en route weather applications, including fuel costs and downstream connection delays for passengers, exceed $110 million per year.

Program Plans FY 2016 – Performance Output Goals
- Complete NWP WP1 System Requirements Review, System Design Review, and System Specification Review.

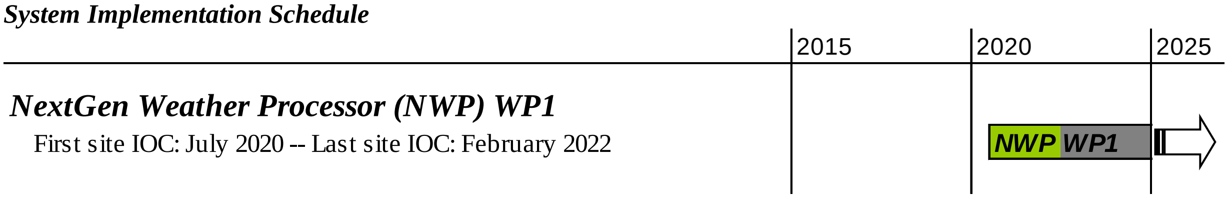
Program Plans FY 2017 – Performance Output Goals
- Complete NWP WP1 Preliminary Design Review (PDR).
- Complete NWP WP1 Critical Design Review (CDR).

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).

Program Plans FY 2020 – Performance Output Goals
- Complete NWP WP1 Operational Testing (OT).
- Achieve NWP WP1 Key Site Initial Operational Capability (IOC).

System Implementation Schedule



2A18, AIRBORNE COLLISION AVOIDANCE SYSTEM X (ACAS X)
FY 2016 Request $10.8M

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, which will replace the existing Traffic Alert and Collision Avoidance Systems II (TCAS II). TCAS II 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 “nuisance” Resolution Advisories (RA) in US airspace and better support future operations. The program will be performing simulations, developing prototypes, and advancing 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 those documents. The program will also provide sustainment of TCAS II field equipment, encounter models, toolsets and certification support for manufacturer equipment.

The ACAS X system will address shortfalls in the legacy TCAS II system. First, the system architecture will be designed so that changes to the threat detection and resolution logic can be made quickly using an automated process. This flexibility will be very useful for future adaptations to NextGen operations and for unmanned aircraft system (UAS) encounter profiles / patterns. Second, ACAS X will be able to accommodate a variety of different sensor types and will have enough flexibility to accommodate new generations of sensors where necessary (including data from ADS-B Airborne Position Messages); this will be especially important when it comes to adapting ACAS X for UAS. Third, ACAS X will reduce the number of “nuisance alerts” while simultaneously providing a reduced probability of near mid-air collision.

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

ACAS X will create fewer false warnings of potential midair collisions and therefore provide better performance than existing TCAS II v7.1 logic. This improvement will greatly enhance its role in maintaining the high level of aviation safety that is critical in terminal air traffic areas. Preliminary results of system performance and safety analysis shows that ACAS X could produce 54% fewer alerts and be over 50% safer than existing TCAS II v7.1 logic.

Program Plans FY 2016 – Performance Output Goals

- Formalize Limited Implementation Program Agreements.
- Draft ACAS Xa/Xo MOPS.

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)

2A19, NextGen – Data Communication in support of NextGen

FY 2016 Request $234.9M

Data Communications – Segment 1 Phase 1, G01C.01-05 / Data Communications – Segment 1 Phase 2 Initial En Route Services, G01C.01-06 / X, 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 the initial set of data communications services integrated with automation support tools, which provide NAS benefits and lays the foundation for a data-driven NAS. Segment 1 will be delivered in two phases. Segment 1 Phase 1 (S1P1) will deploy the 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 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 subnetworks 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.

<u>Data Communications – Segment 1 Phase 1 (G01C.01-05):</u>
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 DCL service will expedite the delivery of departure clearances to aircraft, streamline clearance delivery operations and enable quicker recovery from adverse weather events. 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 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

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 Controller-Pilot Data Link Communications (CPDLC) applications;
- DCNS expanded coverage and capacity; and
- TDLS software enhancements to provide additional services to Tower controllers.

An FID for S1P2 Initial En Route Services was achieved in October 2014.

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 tailored arrivals, holding instructions, advisory messages, speeds and headings, beacon codes, stuck microphone, 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 Controller-Pilot Data Link Communications (CPDLC) applications.

An 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 2015.

An FID for ATN Gateway is planned for FY 2019.

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 59,122, 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 2016 – Performance Output Goals
Data Communications – Segment 1 Phase 1 (G01C.01-05):
- Complete Operational Test & Evaluation (OT&E). (APB Milestone)
- Achieve Initial Operational Capability (IOC) for Tower Services. (APB Milestone)

Data Communications – Segment 1 Phase 2 Initial En Route Services (G01C.01-06):
- Complete high level system design.
- ERAM Data Comm contract definitization. (APB Milestone)

Data Communications – Segment 1 Phase 2 Full En Route Services (G01C.01-10):
- Achieve Final Investment Decision (FID) for Full En Route Services.

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 2017 – Performance Output Goals

Data Communications – Segment 1 Phase 1 (G01C.01-05):
- Achieve In-Service Decision (ISD). (APB Milestone)
- Achieve Operational Readiness Decision (ORD) for Tower Services. (APB Milestone)

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 30 of 56 airports.

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 detailed design.
- Complete In-process Design Review.
- Start software development for Full En Route Services.

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):
- Develop Final Program Requirements documentation and Enterprise Architecture artifacts.
- Develop program Business Case Documentation, Implementation Strategy and Planning Document.

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 all 56 airports.
- 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 software development for Full En Route Services.

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):
- Develop and finalize Acquisition Program Baseline.
- Achieve FID for ATN Gateway.

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 testing for Full En Route Services.

Data Communications – S1P1 and S1P2 Data Comm Integrated Services (DCIS) Network Services (G01C.01-07):

- Provide and maintain air-ground VDL-2 network services.

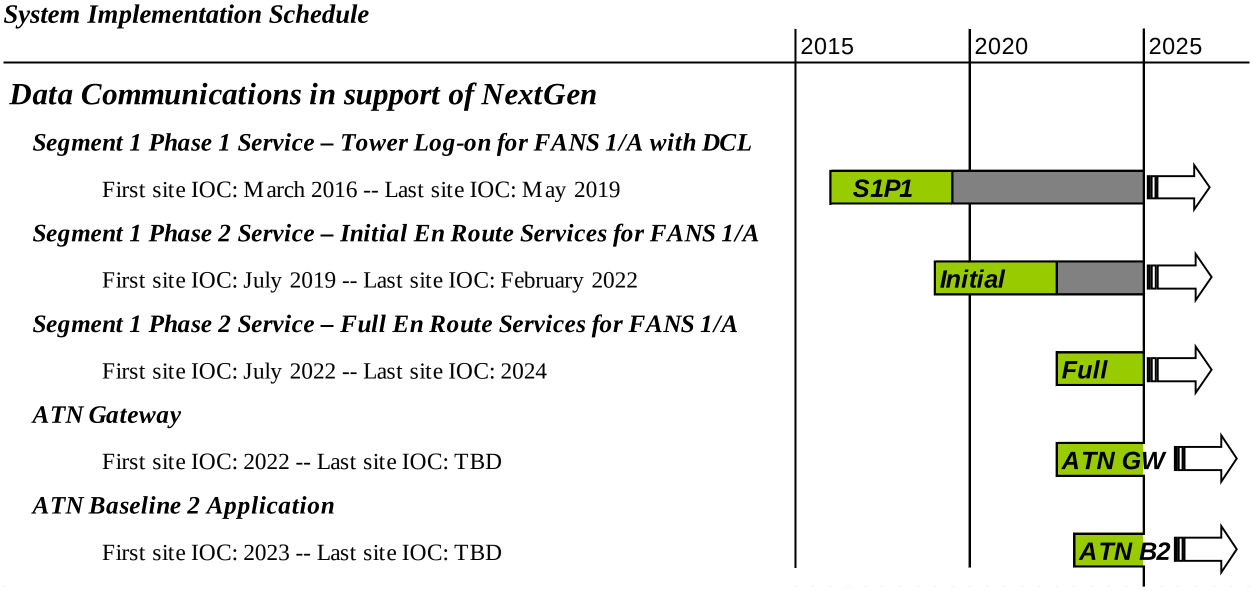
Data Communications – ATN Gateway (G01C.01-08):

- Complete design and perform software development for ATN gateway.

Data Communications – Aeronautical Telecommunications Network (ATN) Baseline 2 Application (G01C.01-09):

- Complete system requirements and design for Baseline 2 applications.

System Implementation Schedule



B: Terminal Programs

2B01, Airport Surface Detection Equipment - Model X (ASDE-X)

FY 2016 Request $13.5M

- A, Airport Surface Detection Equipment Model-X (ASDE-X) – Technology Refresh & Disposition, S09.01-01
- B, Airport Surface Detection Equipment Model-3 (ASDE-3) Service Sustainment, S01.05-01

A, 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 therefore a technology refresh of the ASDE-X system is required.

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 2016 – Performance Output Goals

- Complete installation of the ASDE-X Technology Refresh processor solution at 13 of the 35 airports, 43% complete.
- Complete UATR first site certified for operational use.

Program Plans FY 2017 – Performance Output Goals

- Complete installation of the ASDE-X Technology Refresh processor solution at 15 of the 35 airports, 86% 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 5 airports, 100% complete. (Prior year funds)
- Complete last site certified for operational use (100% complete) (Prior year funds)

Program Plans FY 2019-2020 – Performance Output Goals

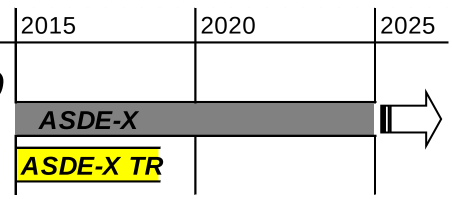
- None.

System Implementation Schedule

Airport Surface Detection Equipment – Model X (ASDE-X)

First ORD October 2003 -- Last ORD: July 2011

First Site Delivery: January 2015 -- Last Site Delivery: August 2018



B, Airport Surface Detection Equipment Model-3 (ASDE-3) Service Sustainment, S01.05-01

Program Description

The ASDE-3 is a primary radar that provides ground level surveillance of airport movement areas for use by tower air traffic controllers. It is a critical input to the ASDE-X system. Sustainment of the ASDE-3 system will ensure the continued operation of the ASDE-X system. The FAA deployed 38 operational ASDE-3 systems to the 32 largest airports and 2 special interest airports. Between 2002 and 2005, the FAA completed a Service Life Extension Program (SLEP) for the ASDE-3 system to extend its useful life to 2015.

Of the 34 original ASDE-3 sites, 18 have been converted to ASDE-X systems that use the ASDE-3 radar, seven have been replaced by ASDE-X systems that use the Surface Movement Radar (SMR), and the remaining nine are scheduled to be replaced with the Airport Surface Surveillance Capability (ASSC) system. There are a total of 22 operational ASDE-3 radars and two support systems that need to be included in the ASDE-3 service sustainment effort.

Many of the ASDE-3 radar components called line replaceable units (LRUs) are no longer supportable. In FY 2014 an ASDE-3 Sustainability Study was initiated to identify those LRUs that are obsolete, and/or are facing diminishing manufacturing sources. This program will determine a solution to sustain the ASDE-3 service and improve overall system availability and supportability. This service sustainment would include both modifications to the ASDE-3 receiver/transmitter, and structural modifications such as antenna sail, pedestal, rotary joint and radome repair or replacement as required.

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 ASDE-3 Service Sustainment program will ensure the continued operation of ASDE-3 radars and extend their designated lifecycle. The ASDE-3 radar provides essential sensor input to the ASDE-X system. It will help to keep the number of Category A&B runway incursions at the reduced levels attained during ASDE-X system deployments. Using the FAA's Aviation Safety Information Analysis and Sharing (ASIAS) System as a reference, the cumulative number of Category A&B runway incursions at the 35 ASDE-X sites from FY 2007 through FY 2013 was 31.

Program Plans FY 2016 – Performance Output Goals

- Identify parts to be procured and develop a plan for the procurement of ASDE-3 Obsolete Parts, 100% complete.

Program Plans FY 2017-2020 – Performance Output Goals

- None.

2B02, TERMINAL DOPPLER WEATHER RADAR (TDWR) – PROVIDE
FY 2016 Request $4.9M

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 wind shear 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 will replace TDWR components that have deteriorated due to aging, and have become obsolete or unsupportable, 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 is planned in Q1 of 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

The TDWR's required inherent availability (not including any logistics or administrative delays) is 99.967%. Since October 2008 (considering both scheduled and unscheduled outages), the TDWR has been in service about only 96.7% of the time. Even with a small portion of that time being due to logistics and administrative delays, significant improvement in the TDWR's reliability and availability are still required.

Program Plans FY 2016 – Performance Output Goals

- Achieve FID.
- Award contract to procure Circuit Card Assemblies for 47 sites.

Program Plans FY 2017 – Performance Output Goals

- Install new Circuit Card Assemblies at 10 sites (10 of 47, 21%).
- Complete Grounding System Refurbishment at 10 sites (10 of 47, 21%).
- Complete UPS Refurbishment at 10 sites (10 of 47, 21%).
- Complete First Article Testing for Direct Digital Controller.
- Complete First Article Testing for Wind Shear Ribbon Display

Program Plans FY 2018 – Performance Output Goals

- Install new Circuit Card Assemblies at 15 sites (25 of 47, 53%).
- Complete Ground System Refurbishment at 15 sites (25 of 47, 53%).
- Complete UPS Refurbishment at 15 sites (25 of 47, 53%).
- Complete First Article Testing for Antenna Controller.
- Install Direct Digital Controller at 12 sites (13 of 47, 28%).
- Install Wind Shear Ribbon Displays at 15 sites (16 of 47, 34%).

Program Plans FY 2019 – Performance Output Goals

- Complete new Circuit Card Assemblies at 15 sites (40 of 47, 85%).
- Complete Grounding System Refurbishment at 15 sites (40 of 47, 85%).
- Complete UPS Refurbishment at 15 sites (40 of 47, 85%).
- Install Antenna Controller at 12 sites (13 of 47, 28%).
- Install Direct Digital Controller at 13 sites (26 of 47, 55%)
- Install Wind Shear Ribbon Displays at 15 sites (28 of 47, 60%)

Program Plans FY 2020 – Performance Output Goals

- Complete new Circuit Card Assemblies at all sites (47 of 47, 100%).
- Complete Grounding System Refurbishment at all sites (47 of 47, 100%).
- Complete UPS Refurbishment at all sites (47 of 47, 100%).
- Install Antenna Controller at 12 sites (25 of 47, 53%).
- Install Direct Digital Controller at 13 sites (39 of 47, 83%).
- Install Wind Shear Ribbon Displays at all sites (47 of 47,100%).

2B03, STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS) (TAMR PHASE 1)

FY 2016 Request $81.1M

Standard Terminal Automation Replacement System (STARS) – Technology Refresh (TAMR Phase 1), A04.01-01 / X, Standard Terminal Automation Replacement System (STARS) – Technology Refresh Future Phases, 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 the aging air traffic control equipment at FAA Terminal Radar Approach Control (TRACON) facilities and Air Traffic Control Tower (ATCT) facilities. Air traffic controllers use the STARS automation and display systems to ensure the safe separation of aircraft (both military and civilian) within the nation's airspace.

STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):
The 47 STARS initial baseline sites and the 5 sites deployed by the TAMR Phase 2 program are complete, and these STARS systems are due for a hardware technology refresh. The technology refresh program provides updated high-resolution Liquid Crystal Display (LCD) color displays, processors, storage devices, and enhanced memory. Communications lines are also upgraded to accommodate the increased data requirements as a result of the upgrade and system performance requirements. Technology refresh addresses obsolescence and security gaps with the existing systems.

The program will also be providing software updates as needed to meet operational needs and to support NextGen initiatives. STARS software updates are needed for maintaining and improving system performance, efficiency, safety, corrective/perfective changes and security improvements to the existing software.

STARS – Technology Refresh Future Phases (A04.01-03):
The STARS Technology Refresh Future Phases program will continue to update and modernize the STARS and support NextGen enhancements and address obsolescence and security gaps. In FY 2020, this new program will be responsible for technology refresh of all existing STARS sites.

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

STARS has an 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. The STARS equipment uses Commercial Off the Shelf (COTS) components that have a life expectancy of 10 to 15 years. The current STARS equipment has been in the NAS since 1999 and is in need of equipment upgrades.

Program Plans FY 2016 – Performance Output Goals
STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):
- Procure processors for upgrades from G1 to G4 configuration at 12 operational sites.
- Procure flat panel displays for upgrades at 12 operational sites.
- Implement mandatory software security and safety enhancements, new functionality and upgrades needed for enhanced performance and capacity in support of NextGen initiatives.

STARS – Technology Refresh Future Phases (A04.01-03):
- None.

Program Plans FY 2017 – Performance Output Goals
STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):
- Procure processors for upgrades from G1 to G4 configuration at 11 operational sites.
- Procure flat panel displays for upgrades 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.

STARS – Technology Refresh Future Phases (A04.01-03):
- None.

Program Plans FY 2018 – Performance Output Goals
STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):
- Procure processor for upgrades from G1 to G4 configuration at 10 operational sites.
- Procure flat panel displays for upgrades at 10 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 26^{th} site (26 of 48). (APB milestone).

STARS – Technology Refresh Future Phases (A04.01-03):
- None.

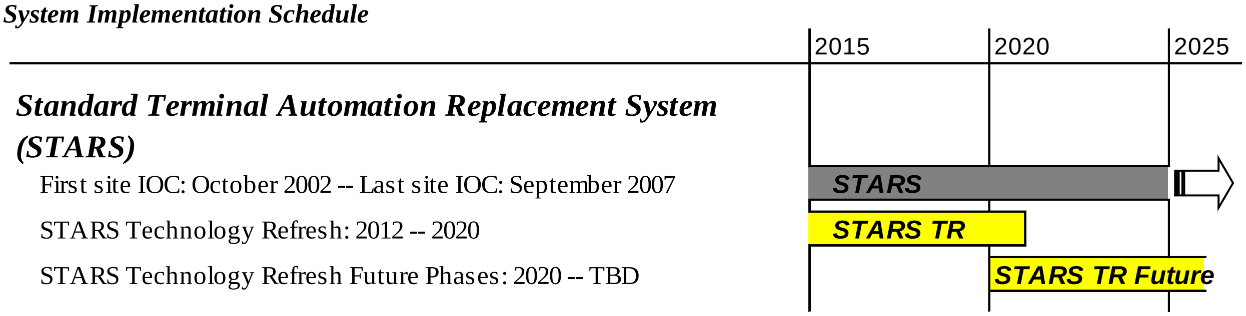
Program Plans FY 2019 – Performance Output Goals
STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):
- Complete IOC at 39th site. (APB milestone) (Prior year funds)

STARS – Technology Refresh Future Phases (A04.01-03):
- None.

Program Plans FY 2020 – Performance Output Goals
STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):
- Complete IOC at last site (48th). (APB milestone) (Prior year funds)

STARS – Technology Refresh Future Phases (A04.01-03):
- Output goals will be established at FID.

System Implementation Schedule



2B04, Terminal Automation Modernization/ Replacement Program (TAMR Phase 3)

FY 2016 Request $159.4M

- A, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1, A04.07-01 / Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements, A04.07-04
- B, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 2, A04.07-02

A, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1, A04.07-01 / Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 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.

On April 21, 2010 the JRC divided the TAMR Phase 3 program into two short term and long term segments 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 Tracking (CARTS) IIIE 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.

<u>Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 (A04.07-01):</u>
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 Common Automated Radar Terminal System (CARTS) and also eliminate redundant software development activities.

<u>Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements (A04.07-04):</u>
The STARS System Enhancements consists of capabilities above and beyond core STARS functionality. The STARS System Enhancements addresses needs identified by users of the STARS systems and FAA stakeholders after it was deployed and operational. As validated enhancements are identified and prioritized, the TAMR Program Office will develop a detailed implementation plan for the engineering, design, development, testing, integration and delivery of those enhancements.

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 59,122, 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 2016 – Performance Output Goals
<u>Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 (A04.07-01):</u>

- Complete IOC at 5th-10th sites (5th site IOC: APB date, October 2015)

<u>Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements (A04.07-04):</u>

- Begin system engineering of first release of additional enhancements.

Program Plans FY 2017 – Performance Output Goals
<u>Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 (A04.07-01):</u>

- Complete IOC at 11th site (11th site IOC: APB date, October 2016)
- Achieve continuous operations and ORD at 7th-10th sites

<u>Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements (A04.07-04):</u>

- Begin development of first release of enhancements.
- Begin system engineering of second release of additional enhancements.

Program Plans FY 2018 – Performance Output Goals
<u>Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 (A04.07-01):</u>

- Complete ORD at 11th site (11th site ORD: APB milestone October 2017) (Prior year funding)

Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements (A04.07-04):
- Complete development of first release of enhancements.
- Begin test and release of first release enhancements.

Program Plans FY 2019 – Performance Output Goals

Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 (A04.07-01):
- None.

Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements (A04.07-04):
- Begin system engineering of second release of additional enhancements. (Prior year funding)
- Begin development of second release of enhancements. (Prior year funding)

Program Plans FY 2020 – Performance Output Goals

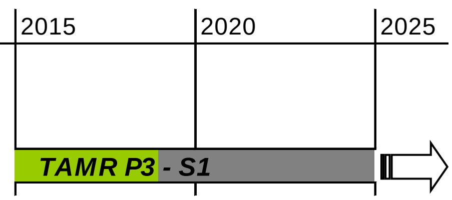
Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 (A04.07-01):
- None.

Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1 Enhancements (A04.07-04):
- Complete development of second release of enhancements. (Prior year funding)
- Begin test and release of second release enhancements. (Prior year funding)

System Implementation Schedule

Terminal Automation Modernization/Replacement (TAMR) Phase 3 - Segment 1

First site IOC: October 2012 -- Last site IOC: TBD



- 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.

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 streamline the need to sustain Common Automated Radar Terminal System (CARTS) and also eliminate redundant 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 59,122, 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 the efficiency in using system capacity.

Program Plans FY 2016 – Performance Output Goals
- Install hardware and complete Contractor Acceptance Inspection (CAI) at 36 operational sites and seven support sites.
- Procure 29 additional systems.
- Deliver 43 additional systems (37 operational and 6 support).
- Complete IOC at 12th ARTS IIE site. (APB milestone)
- Achieve IOC at 18 sites, for a cumulative total of 26 sites.

Program Plans FY 2017 – Performance Output Goals
- Procure 26 operational systems.
- Deliver 27 additional operational systems.
- Complete IOC at 34th ARTS IIE site. (APB milestone)
- Achieve IOC at 29 sites, for a cumulative total of 55 sites.

Program Plans FY 2018 – Performance Output Goals
- Procure 11 systems (10 operational and 1 support).
- Deliver 12 additional systems (11 operational and 1 support).
- Complete IOC at 65th ARTS IIE site. (APB milestone)
- Achieve IOC at 32 sites, for a cumulative total of 87 sites.

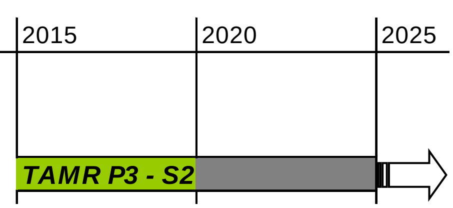
Program Plans FY 2019 – Performance Output Goal
- Deliver 4 additional operational systems. (Prior year funds)
- Complete IOC at last site, 91st (ARTS IIE). (APB Milestone) (Prior year funds)
- Complete ORD at last site (ARTS IIE). (APB Milestone) (Prior year funds)
- Complete ORD at last site (ARTS IE). (APB Milestone) (Prior year funds)

Program Plans FY 2020 – Performance Output Goal
- None.

System Implementation Schedule

Terminal Automation Modernization/Replacement (TAMR) Phase 3 - Segment 2

First site IOC: August 2014 -- Last site IOC: August 2019



Final Investment Decision for Segment 2 was approved September 2012.

2B05, TERMINAL AUTOMATION PROGRAM

FY 2016 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 system, both the Host Computer System (HOST) and 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 the HOST/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 in order to maintain system operational availability. In addition to replacing components its necessary to update provide a common IP infrastructure to support future En Route Automation Modernization (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.*

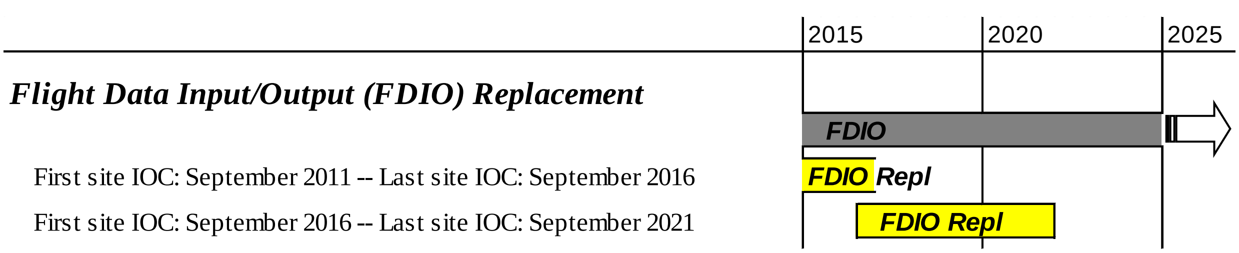
Relationship to Performance Metric

The FDIO program replaces end-of-life, obsolete FDIO equipment with modern and modified COTS equipment, thereby reducing potential outages and delays. Reports indicate FDIO equipment had an average operational availability of 99.875% from 2007 through 2010.

Program Plans FY 2016-2020 – Performance Output Goals

- Procure and field replacement Flight Data Input/Output (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

Terminal Work Package 1 is the next useful segment for the Standard Terminal Automation Replacement System platform, building upon previous investments to consolidate terminal automation to 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 FAAs' 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. This program continues the investment activities by developing all the required artifacts and the coordination to obtain the initial and final investment approval. The Initial Investment Decision (IID) and Final Investment Decision (FID) are both planned for 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 2 – Maintain an average daily capacity for Core airports of 59,122, 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 in the TRACON domain.

Program Plans FY 2016 – 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 Package.
- Achieve IID.
- Develop the following products in support of the FID:
    - Final Program Requirements documentation;
    - Enterprise Architecture Artifacts;
    - Business Case documentation;
    - Implementation Strategy and Planning Document; and
    - Acquisition Program Baseline (Execution Plan).
- Achieve FID.

Program Plans FY 2017-2020 – Performance Output Goals

- Milestones will be developed at FID.

2B06, Terminal Air Traffic Control Facilities - Replace

FY 2016 Request $45.5M

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 FAA's ATC Facilities Strategic Sustainment 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. Analysis will be completed over the next year and the FAA plans to provide the public with a complete list of which towers and TRACONs are going to be slated for replacement in future years. The FAA then plans to only initiate studies and construction for facilities in most dire need.

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 out-year funding tentatively supports the schedule below 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; and, in some cases, the tower must be replaced to ensure that controllers have an unobstructed view of the runways and taxiways, or new ATCTs must be constructed due to airport expansion. This program will ensure facilities are prepared to meet current and future levels of air traffic control services while supporting the performance metric of maintaining operational availability of the NAS.

Program Plans FY 2016 – Performance Output Goals

- Complete Land Acquisition for New York, NY TRACON (N90).
- Award a construction contract for one site (Charlotte, NC (CLT)).
- Initiate Disposition activities at two sites (West Palm Beach, FL (PBI) and Las Vegas, NV (LAS)).

Program Plans FY 2017 – Performance Output Goals

- Complete Land Acquisition for one site (Teterboro, NJ (TEB)).
- Initiate Design activities for three sites (Baltimore, MD (BWI), Teterboro, NJ (TEB) and New York, NY (N90)).
- Award a construction contracts for one site (Teterboro, NJ (TEB)).
- 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.
- Award construction contract for four sites.
- Complete equipment procurement and installation at four sites.

Program Plans FY 2019 – Performance Output Goals

- Award a design contract for three sites.
- Award construction contract for one site.
- Complete equipment procurement and installation at five sites.
- Complete Disposition at three sites.

Program Plans FY 2020 – Performance Output Goals

- Award a design contract for three sites.
- Award construction contract for four sites.
- Complete equipment procurement and installation at six sites.
- Complete Disposition at three sites.

2B07, ATCT/TERMINAL RADAR APPROACH CONTROL (TRACON) FACILITIES - IMPROVE

FY 2016 Request $59.0M

- A, Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Modernization, F01.01-00
- B, Facility Realignment, F02.10-01

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 FAA’s ATC Facilities Strategic Sustainment 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, and 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 also 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 2013, FCI ranged from 47 percent to 100 percent for towers and TRACONs.

Program Plans FY 2016-2020 – 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, F02.10-01

Program Description

The Facility Realignment effort is an initiative focused on analyzing staffed Air Traffic Control Facilities and developing recommendations to support the transition to NextGen and reduce capital, operating, maintenance, and administrative costs of the FAA.

The program focuses on the analysis of Terminal facilities and takes into account several factors, including automation systems, NextGen readiness, facility conditions, operational improvements, and costs and benefits associated with potential facility scenarios.

The program evaluates existing Terminal facilities, assesses the safety, risk, and operational efficiencies of potential scenarios, documents facility requirements and shortfalls, quantifies benefits and costs of potential facility scenarios, and develops and presents recommendations to leadership.

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 Facility Realignment effort focuses on opportunities to optimize the transition of NAS infrastructure from today's system towards the NextGen vision, while maintaining maximum operational availability.

Program Plans FY 2016 – Performance Output Goals

- Develop and present preliminary findings of FY 2016 analysis to ATO and FAA leadership in preparation for a report containing the FY 2016 recommendations of the Administrator on realignment and consolidation of facilities and services. The report may also include any public comments received after the report is published in the Federal Register for comment.

Program Plans FY 2017 – Performance Output Goals

- Develop and present preliminary findings of FY 2017 analysis to ATO and FAA leadership in preparation for a report containing the FY 2017 recommendations of the Administrator on realignment and consolidation of facilities and services. The report may also include any public comments received after the report is published in the Federal Register for comment.

Program Plans FY 2018 – Performance Output Goals

- Develop and present preliminary findings of FY 2018 analysis to ATO and FAA in preparation for a report containing the FY 2018 recommendations of the Administrator on realignment and consolidation of facilities and services. The report may also include any public comments received after the report is published in the Federal Register for comment.

Program Plans FY 2019 – Performance Output Goals

- Develop and present preliminary findings of FY 2019 analysis to ATO and FAA leadership in preparation for a report containing the FY 2019 recommendations of the Administrator on realignment and consolidation of facilities and services. The report may also include any public comments after the report is published in the Federal Register for comment.

Program Plans FY 2020 – Performance Output Goals

- Develop and present preliminary findings of FY 2020 analysis to ATO and FAA leadership in preparation for a report containing the FY 2020 recommendations of the Administrator on realignment and consolidation of facilities and services. The report may also include any public comments after the report is published in the Federal Register for comment.

2B08, Terminal Voice Switch Replacement (TVSR)

FY 2016 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 them to connect with desired locations. The controller can communicate with another controller position at his/her own facility or another air traffic control (ATC) facility, and with aircraft (via radio) as required.

The TVSR program replaces aging, obsolete voice switches in ATCTs and TRACONs and ensures that 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. The program also provides contract vehicles for the 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. This reduces outages and prevents delays.

Program Plans FY 2016 – Performance Output Goals

- Deliver 7 terminal voice switches to various FAA facilities.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

Program Plans FY 2017 – Performance Output Goals

- Deliver 7 terminal voice switches to various FAA facilities.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

Program Plans FY 2018 – Performance Output Goals

- Deliver 7 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

- Initiate Technology Refresh of legacy terminal voice switch systems.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

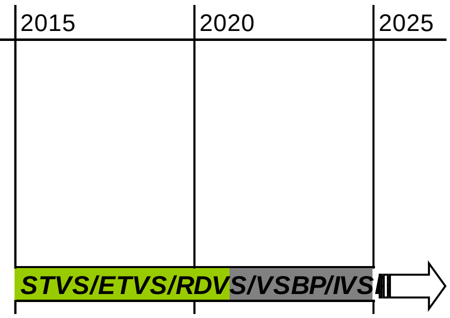
Program Plans FY 2020 – Performance Output Goals

- Continue Technology Refresh of legacy terminal voice switch systems.
- Recover, refurbish, and / or cannibalize all associated legacy systems for spare parts.

System Implementation Schedule

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).

First site IOC: 1994 (2006) -- Last site ORD: TBD



2B09, NAS FACILITIES OSHA AND ENVIRONMENTAL STANDARDS COMPLIANCE

FY 2016 Request $39.6M

NAS Facilities Occupational Safety and Health Administration (OSHA) & Environmental Standards Compliance, F13.03-00

Program Description

The Environmental and Occupational Safety and Health (EOSH) program ensures the health and safety of all FAA employees by complying with Federal, state, and local regulations and bargaining unit agreements. This program is included in FAA's ATC Facilities Strategic Sustainment Plan.

OSHA & Environmental Standards Compliance:

This program develops comprehensive FAA-wide environmental, occupational safety and health management initiatives to meet Occupational Safety and Health Administration (OSHA) & Federal Environmental Standards, state and local legal requirements in addition to negotiated collective bargaining agreements with employee labor unions. EOSH Services is the lead organization for the protection of employee well-being and the environment. Through the development and completion of policy guidance, technical assistance, employee training, job hazard assessments, compliance monitoring, and corrective actions, EOSH Services designs and manages national compliance programs that integrate risk management into FAA's infrastructure lifecycle from system and facility design, through infrastructure management to decommissioning. The Occupational Safety and Health (OSH) program's scope of responsibility applies to all FAA organizations.

Tower Fire Life Safety:
The Fire Life Safety program manages the implementation of projects to upgrade ATCTs and other critical NAS facilities to meet current regulatory and industry standards for conducting employee evacuation and designing fire suppression consistent with the requirements of negotiated agreements. To date, the program has completed projects in 329 of the 375 towers requiring upgrades. In addition to physical infrastructure upgrading, the program is responsible for developing policy and guidance, fire prevention and emergency action plans, and training tower occupants, resident engineers, maintenance technicians, and employees on maintenance requirements for new systems. Effective support and protection of employees and the air traffic control environment is essential to limiting the impacts of fire, explosion, or related events on NAS operations and facilities.

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 – Achieve a total workplace injury case rate of no more than 1.82 per 100 employees for the FAA. (FAA Business Planning Metric)*

Relationship to Performance Metric

The NAS Facilities OSHA and Environmental Standards Compliance program supports the Performance Metric by improving the safety of the FAA's workplaces through the implementation of such critical programs as: fall protection; electrical safety; indoor air quality, including mold; fire life safety; training and workplace inspections and abatement of safety hazards. The implementation of these programs results in making the FAA a healthful place to work which contributes to placing the FAA in the top 25 percent of best places to work in the federal government as ranked by employees.

The Workplace Inspections Program is responsible for overseeing the annual EOSH inspection of over 11,400 separate facilities nationwide. During these inspections, workplaces are evaluated for both Occupational Safety and Health and Environmental compliance and deficiencies are noted as workplace hazards. The Hazard Abatement Program then tracks the identified hazards until they are completely abated. As of FY 2012 the FAA Workplace Inspection Tool (WIT) is tracking 123,368 individually identified workplace hazards, of which 118,497 (96.0%) have been completely abated.

Program Plans FY 2016 – Performance Output Goals
OSHA & Environmental Standards Compliance:
- Upgrade 500 fall protection systems.
- Upgrade guardrails and lighting on 10 ASR towers.
- Conduct 10 Fall Hazard Evaluations for various facility types.
- Conduct radon testing at all FAA owned/operated residential housing.
- Provide first aid/ cardiopulmonary resuscitation (CPR)/automated external defibrillator (AED) training to 2000 ATSSs and volunteer responders.
- Provide fall protection training to 1300 employees.
- Conduct a total of 15 arc flash hazard analyses at large facilities.
- Complete annual inspections for 100% of staffed and at least 95% of unstaffed FAA workplaces, as listed in the FAA Workplace Inspection Tool database, are inspected as required by FAA Policy and Federal Regulation.
- Conduct FAA wide evaluation of the OSH program at six locations as required by FAA Policy and Federal Regulation.
- Provide safety awareness training to all new FAA personnel.
- File compliant abatement plans in the FAA WIT for all open workplace safety inspection findings within 30 days of their identification, as required by FAA Policy and Federal Regulation.
- Conduct Fall and Spring Safety Stand Downs for Technical Operations.
- Ensure 95% of employees eligible under the FAA Hearing Conservation Program (HCP) are identified and enrolled, and 80% of enrolled employees obtain audiometric medical surveillance and HCP training annually.

Tower Fire Life Safety:
- Complete a minimum of 10 ATCT fire life safety upgrades.

Program Plans FY 2017 – Performance Output Goals

OSHA & Environmental Standards Compliance:

- Upgrade 350 fall protection systems.
- Upgrade guardrails and lighting on 10 ASR towers.
- Conduct 10 Fall Hazard Evaluations for various facility types.
- Conduct radon testing at all FAA owned/operated residential housing.
- Provide fall protection training to 1000 employees.
- Provide recurring first aid/CPR/AED training to 2000 ATSSs and volunteer responders.
- Conduct a total of 15 arc flash hazard analyses at large facilities.
- Conduct FAA wide evaluation of the OSH program at six locations.
- Complete annual inspections for 100% of all staffed and at least 95% of all unstaffed FAA workplaces, as listed in the FAA WIT database.
- File compliant abatement plans in the FAA WIT for all open workplace safety inspection findings within 30 days of their identification.
- Provide safety awareness training to all new FAA personnel.
- Conduct Fall and Spring Safety Stand Downs for Technical Operations.
- Ensure 95% of employees eligible under the FAA Hearing Conservation Program (HCP) are identified and enrolled, and 80% of enrolled employees obtain audiometric medical surveillance and HCP training annually.

Tower Fire Life Safety:

- Complete a minimum of 10 ATCT fire life safety upgrades.

Program Plans FY 2018 – Performance Output Goals

OSHA & Environmental Standards Compliance:

- Upgrade 350 fall protection systems.
- Upgrade guardrails and lighting on 10 ASR towers.
- Conduct 10 Fall Hazard Evaluations for various facility types.
- Conduct radon testing at all FAA owned/operated residential housing.
- Provide recurring first aid/CPR/AED training to 2000 ATSSs and volunteer responders.
- Provide fall protection training to 1400 employees.
- Conduct a total of 10 arc flash hazard analyses at large facilities.
- Conduct FAA wide evaluation of the OSH program at six locations.
- Complete annual inspections for 100% of all staffed and at least 95% of all unstaffed FAA workplaces, as listed in the FAA WIT database.
- File compliant abatement plans in the FAA WIT for all open workplace safety inspection findings within 30 days of their identification.
- Provide Safety awareness training to all new FAA personnel.
- Conduct Fall and Spring Safety Stand Downs for Technical Operations.
- Ensure 95% of employees eligible under the FAA Hearing Conservation Program (HCP) are identified and enrolled, and 80% of enrolled employees obtain audiometric medical surveillance and HCP training annually.

Tower Fire Life Safety:

- Complete a minimum of 10 ATCT fire life safety upgrades.

Program Plans FY 2019 – Performance Output Goals

OSHA & Environmental Standards Compliance:

- Upgrade 350 fall protection systems.
- Upgrade guardrails and lighting on 10 ASR towers.
- Conduct 10 Fall Hazard Evaluations for various facility types.
- Conduct radon testing at all FAA owned/operated residential housing.
- Provide recurring first aid/CPR/AED training to 2000 ATSSs and volunteer responders.
- Provide fall protection training to 1400 employees.
- Conduct four Arc-flash analyses at large facilities.
- Conduct FAA wide evaluation of the OSH program at six locations.
- Complete annual inspections for 100% of all staffed and at least 95% of all unstaffed FAA workplaces, as listed in the FAA WIT database.
- File compliant abatement plans in the FAA WIT for all open workplace safety inspection findings within 30 days of their identification.
- Provide safety awareness training to all new FAA personnel.
- Conduct Fall and Spring Safety Stand Downs for Technical Operations.
- Ensure 95% of employees eligible under the FAA Hearing Conservation Program (HCP) are identified and enrolled, and 80% of enrolled employees obtain audiometric medical surveillance and HCP training annually.

Program Plans FY 2020 – Performance Output Goals

OSHA & Environmental Standards Compliance:

- Upgrade 350 fall protection systems.
- Upgrade guardrails and lighting on 10 ASR towers.
- Conduct 5 Fall Hazard Evaluations for various facility types.
- Conduct radon testing at all FAA owned/operated residential housing.
- Provide recurring first aid/CPR/AED training to 2000 ATSSs and volunteer responders.
- Provide fall protection training to 1400 employees.
- Conduct four Arc-flash analyses at large facilities.
- Conduct FAA wide evaluation of the OSH program at six locations.
- Complete annual inspections for 100% of all staffed and at least 95% of all unstaffed FAA workplaces, as listed in the FAA WIT database.
- File compliant abatement plans in the FAA WIT for all open workplace safety inspection findings within 30 days of their identification.
- Provide Safety awareness training to all new FAA personnel.
- Conduct Fall and Spring Safety Stand Downs for Technical Operations.
- Ensure 95% of employees eligible under the FAA Hearing Conservation Program (HCP) are identified and enrolled, and 80% of enrolled employees obtain audiometric medical surveillance and HCP training annually.

2B10, Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)

FY 2016 Request $3.8M

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 needed modifications, the ASR-9 system will continue to experience decreasing reliability and availability with increased supportability risk due to limited commercial availability of some components. The ASR-9 was procured in the mid-1980s, fielded between 1989 and 1994, and is intended to remain operational until the replacement begins in 2028. 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 99.4 percent, which is below the FAA performance metric of 99.7 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 2016 – Performance Output Goals
- Complete installation at 40 of 154 (52%) Digital Remote Surveillance Communication Interface Processor Replacement (DRSR) systems.
- Complete installation at 100 of 270 (44%) Transmitter Backplanes at ASR-9 sites.
- Complete installation of Radar Data Access Point (RDAP) at 25 ARTCCs.

Program Plans FY 2017 – Performance Output Goals
- Complete installation at 40 of 154 (78%) DRSR systems at ASR-9 sites.
- Complete installation at 66 of 270 (69%) Transmitter Backplanes at ASR-9 sites.
- Complete installation of ARTCC RDAP Backplanes at 12 ARTCCs (100% complete).
-

Program Plans FY 2018 – Performance Output Goals
- Complete installation at 24 of 154 (94%) DRSR systems ASR-9 sites.
- Complete installation at 84 of 270 (100%) Transmitter Backplanes at ASR-9 sites.

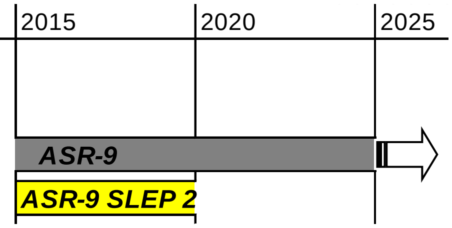
Program Plans FY 2019 – Performance Output Goals
- Complete installation at 10 of 154 (100%) DRSR systems ASR-9 sites. (Prior year funding)
- Installation at last site completed, September 2019. (APB Milestone) (Prior year funding)

Program Plans FY 2020 – Performance Output Goals
- None.

System Implementation Schedule

Airport Surveillance Radar-Model 9 (ASR-9) Service Life Extension Program (SLEP) Phase 2

First Site Install: 2015 -- Last Site Install: September 2019



2B11, TERMINAL DIGITAL RADAR (ASR-11) TECHNOLOGY REFRESH AND MOBILE AIRPORT SURVEILLANCE RADAR (MASR)

FY 2016 Request $9.9M

- 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 separate sequential 5-year segments.

<u>ASR-11 Technology Refresh Segment 2 (S03.02-05):</u>
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.

<u>ASR-11 Technology Refresh Segment 3 (S03.02-07):</u>
The ASR-11 Technology Refresh Segment 3 business case analysis will be performed 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. 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 Weather Radar Capability (NSWRC), which has a planned FID in December 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

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 repair or replacement is needed.

Program Plans FY 2016 – Performance Output Goals
ASR-11 Technology Refresh Segment 2 (S03.02-05):
- Complete Site Control Data Interface (SCDI) Development Test.
- Complete 15 site installations of UPS capacitor kits, 100% complete.

ASR-11 Technology Refresh Segment 3 (S03.02-07):
- None.

Program Plans FY 2017 – Performance Output Goals
ASR-11 Technology Refresh Segment 2 (S03.02-05):
- Complete Operational Test & Evaluation (OT&E). (APB milestone)
- Conduct Key site test for SCDI replacement.
- Deliver first site for SCDI replacement.
- 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.

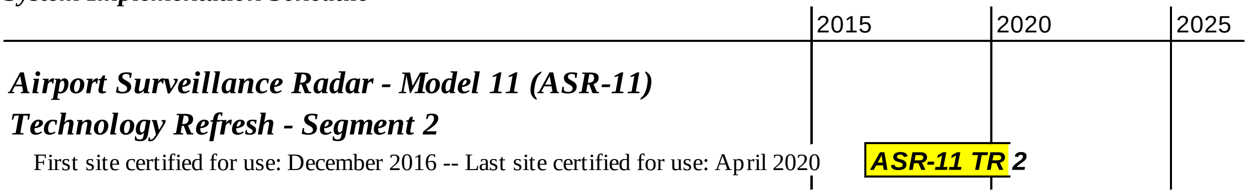
Program Plans FY 2019 – Performance Output Goals
ASR-11 Technology Refresh Segment 2 (S03.02-05):
- Certify for operational use for SCDI replacement, 75% complete. (Prior year funds)

ASR-11 Technology Refresh Segment 3 (S03.02-07):
- Complete draft documentation in support of the FID.

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):
- 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.
- Award contract.

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 FAAs 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 2016 – Performance Output Goals

- Development, test and evaluation (DT&E) completed by March 2016. (APB milestone)
- Operation test and evaluation (OT&E) completed by September 2016. (APB milestone)

Program Plans FY 2017 – Performance Output Goals

- In Service Decision for Mobile ASR-11 by December 2016. (APB milestone)

Program Plans FY 2018-2020 – Performance Output Goals

- None.

2B12, Runway Status Lights (RWSL)

FY 2016 Request $24.2M

- A, Runway Status Lights (RWSL) – Implementation – Phase 1, S11.01-02 / X, Runway Status Lights (RWSL) – Technology Refresh & Disposition, S11.01-04
- B, Runway Status Lights (RWSL) – Prototype Sustainment, S11.01-03

A, 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, and Las Vegas McCarran International. The FAA plans to have all RWSL systems operational in 2017.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):
The RWSL Technology Refresh program replaces and upgrades 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. This is an ongoing program to address obsolescence and maintenance issues. An Investment Analysis Readiness Decision (IARD) is planned in early 2018 and the Final Investment Decision (FID) in early FY 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 are a significant safety issue and installations 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. The 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 2016 – Performance Output Goals

Runway Status Lights (RWSL) – Implementation – Phase 1 (S11.01-02):
- Start construction at one of 17 operational sites.
- Complete installation at two of 17 operational sites.
- Achieve IOC at two of 17 (88%) operational sites.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):
- None.

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 17^{th} and last, operational sites. (APB Milestone)
- Complete Operational Readiness date (ORD) at San Francisco International Airport. (APB Milestone)

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 – Performance Output Goals

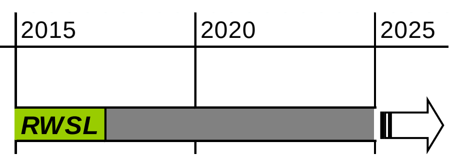
Runway Status Lights (RWSL) – Implementation – Phase 1 (S11.01-02):
- None.

Runway Status Lights (RWSL) – Technology Refresh & Disposition (S11.01-04):
- Milestones will be developed at FID.

System Implementation Schedule

Runway Status Lights (RWSL)

First site IOC: July 2011 -- Last site IOC: June 2017



B, Runway Status Lights (RWSL) – Prototype Sustainment, S11.01-03

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. RWSL is designed to independently supplement existing air traffic controller tools and procedures without increasing the controller workload by automatically providing a clear, prompt indication of runway status directly to pilots and ground vehicle operators. 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 (REL) provides this signal to aircraft planning to cross or enter a runway from an intersecting taxiway. Takeoff Hold Lights (THL) provide a signal to aircraft in position for takeoff.

There has been an ongoing operational evaluation of the prototype Runway Status Lights systems at Dallas/Fort Worth International Airport, Boston Logan International Airport, and San Diego International Airport. As agreed when the RWSL baseline was approved on July 17, 2013, these prototypes will continue as sites under evaluation through FY 2016. The FAA Surface Safety Initiative Team is considering alternative solutions at these sites to include infrastructure, procedural, and technology solutions to improve surface safety. For technology solutions that would be funded by Facilities & Equipment (F&E), the team is planning for an FY 2015 IID and FY 2016 FID for solutions at these sites, as well as the other sites not included in the baseline RWSL.

The alternatives will consider the full range of options including those relying on technology as well as non-technology approaches for these airports.

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 are a significant safety issue, and 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. The 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 23 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).

The Prototype Runway Status Light Systems will continue to contribute to the achievement of these goals at the airports where they are installed. The prototype systems will continue to be monitored and statistics will be collected and reported.

Program Plans FY 2016 – Performance Output Goals

- Operational evaluation of the Prototype Runway Status Lights systems will conclude in FY 2016. An Annual Performance Report from each prototype site will be delivered.
- Achieve FID.

Program Plans FY 2017-2020 – Performance Output Goals

- None.

2B13, NEXTGEN – NATIONAL AIRSPACE SYSTEM VOICE SYSTEM (NVS)
FY 2016 Request $53.6M

NAS Voice System (NVS) – Demonstration & Qualification, G03C.01-01 / NAS Voice System (NVS) – Contingency Work for NVS, G03C.01-03 / X, NAS Voice System (NVS) – Deployment, G03C.01-02

Program Description

The NVS will replace current voice switches in both en route and terminal facilities. It will be a real-time, critical part of the ATC infrastructure that provides the connectivity for efficient communications among air traffic controllers, pilots and ground personnel. It connects incoming and outgoing communication lines to the controller's workstation. The controller uses a panel on his workstation 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 expected 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. These capabilities require that lines connected to a controller's workstation panel be electronically changed to add or eliminate lines as the geographical boundaries of the sector change. The NVS will have the capacity to support current and forecasted future ATC operations.

NVS will replace the service that is currently provided by 11 different voice switch configurations including Terminal Voice Switches and the En Route Voice Switching and Control System. The focus will be on designing a replacement system that can be scaled to facility size with standardized components that will reduce 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 segmented approach will minimize risk and ensure the new switches will be consistent with agency priorities and constraints.

<u>NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):</u>
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 positive Final Investment Decision (FID) for NAS qualification 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 Joint Resources Council (JRC) in FY 2017 to request FID for deployment funding at operational facilities beyond key sites.

<u>NAS Voice System (NVS) – Contingency Work for NVS (G03C.01-03):</u>
The Contingency Work for NVS is a result of the fire that occurred in the Chicago Air Route Traffic Control Center (ARTCC) late FY 2014. The Air Traffic Organization (ATO) is currently working on a contingency Concept of Operations (CONOPS) which will include requirements for the expansion of Air to Ground (A/G) and Ground to Ground (G/G) interface capacity in the current legacy voice switches. The expansion of the A/G and G/G interface capacity allows for communications to be re-routed to adjacent facilities if required. Once the contingency planning requirements are finalized, the NVS program office will procure and install the additional radio and telephone interface cards for the existing voice switches.

<u>NAS Voice System (NVS) – Deployment (G03C.01-02):</u>
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 59,122, 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 2016 – Performance Output Goals

NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):
- Complete additional system development needed to conduct Factory Acceptance Test (FAT) on first and second test article systems at contractor's facility.
- Develop draft test procedures in preparation for FAT on test article systems.
- Procure the third article test system.

NAS Voice System (NVS) – Contingency Work for NVS (G03C.01-03):
- Procure and install additional hardware for existing legacy voice switches that will allow for the expansion of Air to Ground (A/G) and Ground to Ground (G/G) interface capacity in order to satisfy Air Traffic contingency planning requirements.

NAS Voice System (NVS) – Deployment (G03C.01-02):
- None.

Program Plans FY 2017 – Performance Output Goals

NAS Voice System (NVS) – Demonstration & Qualification (G03C.01-01):
- Complete FAT of test article systems.
- Complete Training Development Plan.
- Achieve FID for deployment funding at operational facilities beyond key sites.

NAS Voice System (NVS) – Contingency Work for NVS (G03C.01-03):
- Complete installation of additional hardware for existing legacy voice switches in order to satisfy Air Traffic contingency planning requirements. (Prior year funding)

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.
- 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) – Contingency Work for NVS (G03C.01-03):
- None.

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.
- Deliver key site systems and initiate key site testing.
- Complete Initial Operating Capability (IOC) at first key site.

NAS Voice System (NVS) – Contingency Work for NVS (G03C.01-03):
- None.

NAS Voice System (NVS) – Deployment (G03C.01-02):
- Order NAS Systems 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.

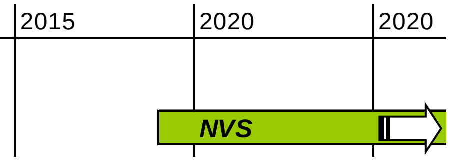
NAS Voice System (NVS) – Contingency Work for NVS (G03C.01-03):
- None.

NAS Voice System (NVS) – Deployment (G03C.01-02):
- Deliver and install additional NVSs in accordance with the FY 2017 FID.

System Implementation Schedule

NAS Voice System (NVS)

First site IOC: 2019 -- Last site ORD: TBD



2B14, Integrated Display System (IDS)

FY 2016 Request $23.3M

- A, Integrated Display Systems (IDS) – Replacement, A03.05-01 / X, 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 / X, 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. Integrated Display Systems consolidate operational information to provide a tool to exchange information that impacts the 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.

<u>IDS Replacement (A03.05-01):</u>
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 occur in 2017.

<u>IDS Replacement – Technology Refresh (A03.05-02):</u>
The IDS-4 is being replaced with a state-of-the-art system comprised mainly of Commercial-Off-The-Shelf (COTS) components. As in any COTS based system, a technology refresh of the replacement components is absolutely essential to sustain system services. Therefore, 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. Based on the system analysis, components will then be acquired to ensure continued operation of the 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 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 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 the 30 core airports.

Program Plans FY 2016 – Performance Output Goals
IDS Replacement (A03.05-01):
- Install IDS replacement workstations at 20 networks at Terminal Radar Approach Control (TRACON) Facilities and the associated Air Traffic Control Towers (ATCTs).
- Achieve Initial Operating Capability (IOC) at 20 networks by end of FY 2016. (50 of 71, 70%)

IDS Replacement – Technology Refresh (A03.05-02):
- None.

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):
- Award contract for Technology Refresh.
- 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):
- Implement tech refresh at 13 networks (13 of 71, 18% complete).

Program Plans FY 2019 – Performance Output Goals
IDS Replacement (A03.05-01):
- Complete In-Service Management transition.

IDS Replacement – Technology Refresh (A03.05-02):
- Implement tech refresh at 17 networks (30 of 71, 42% complete).

Program Plans FY 2020 – Performance Output Goals
IDS Replacement (A03.05-01):
- None.

IDS Replacement – Technology Refresh (A03.05-02):
- Implement tech refresh at 20 networks (50 of 71, 70% complete).

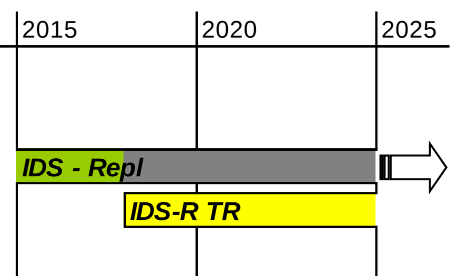
System Implementation Schedule

Integrated Display System (IDS) - Replacement - Technology Refresh*

First site IOC: September 2013 -- Last site ORD: July 2017

First site: 2018 -- Last site: 2037

*Note: Tech Refresh will be cyclical



B, Enterprise Information Display System (E-IDS), A03.05-03

Program Description

The Enterprise Information Display System (E-IDS) will replace obsolete standalone 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 (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, NOTAMS, and Pilot Reports, (b) 56-day static digital information (charts, approach plates, SOPs/LOA, FAA Orders), 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:

- address shortfalls that were de-scoped from the IDS-R program's baseline;
- contribute to achieving NextGen future Bravo timeline enhancements;
- provide common platform, picture, coordination, functionality, and training;
- provide access to trusted sources of real-time and static information;
- provide improved user functionality;
- provide for structured databases and maintenance thereof;
- automate data update processes;
- incorporate new interfaces, data protocols and formats via SWIM;
- enhance situational awareness and decision making through a shared common operations picture among users;
- reduce manual entry for operators and for data administrators by the centralization of updates;
- facilitate inter-facility coordination;
- integrate information and remove display clutter;
- expedite information retrieval; and
- assure data reliability by using SWIM as a data source.

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 Program.

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 that will be based on 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
  - Notice to Airmen (NOTAMs)
  - Special Activity Airspace (SAA)-Schedule and Status
  - Pilot Reports (PIREPS)
  - Weather
  - 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

JRC approval of the Investment Analysis Readiness Decision (IARD) is planned for March 2016, Initial Investment Decision (IID) March 2017, and Final Investment Decision (FID) 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 59,122, 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 caused to resolve differences in reported information.

Program Plans FY 2016 – Performance Output Goals

- Complete the following products in support of the IARD:
  - Final Shortfall Analysis Document
  - Solution ConOps
  - Functional Analysis document
  - Operational Safety Assessment (OSA)
  - Preliminary Program Requirements
  - Range of Alternatives Document
  - Rough order of magnitude Cost Estimate and
  - Initial Investment Analysis Plan
- Achieve IARD for E-IDS.
- Complete the following draft products in support of the IID:
  - Initial Business Case Definition (each alternative)
  - Initial Program Requirements (update pPR)
  - Initial Screening Information Request (SIR)
  - Initial Implementation Strategy and Planning Document (ISPD)
  - Initial Plan for Final Investment Analysis
  - Safety Assessment

Program Plans FY 2017 – Performance Output Goals

- Complete the following final products in support of the IID:
  - Initial Business Case Definition (each alternative)
  - Initial Program Requirements (update pPR)
  - Initial SIR
  - Initial ISPD
  - Initial Plan for Final Investment Analysis
  - Safety Assessment
- Achieve IID for E-IDS.
- Complete the following draft products in support of the FID:
  - Final Program Requirements (update fPR)
  - Add/revise Final Shortfall Analysis Document
  - Final Investment Analysis Plan
  - Strategy for Implementation and Life Cycle Support
  - Final SIR
  - Reduce Risks and Final Requirements
  - Independent Government Cost Estimate
  - Final Draft Business Case
  - Acquisition Program Baseline
  - Final ISPD

Program Plans FY 2018 – Performance Output Goals

- Complete the following final products in support of the FID:
  - Final Program Requirements (update fPR)
  - Add/revise Final Shortfall Analysis Document
  - Final Investment Analysis Plan
  - Strategy for Implementation and Life Cycle Support
  - System Specification Document (SSD)
  - Procurement Strategy
  - Final SIR
  - Reduce Risks and Final Requirements
  - Independent Government Cost Estimate
  - Final Draft Business Case
  - Acquisition Program Baseline
- Achieve FID for E-IDS.
- Award contract.
- Other output goals will be determined at FID.

Program Plans FY 2019-2020 – Performance Output Goals

- None.

2B15, Remote Monitoring and Logging System (RMLS)

FY 2016 Request $4.7M

- A, Remote Monitoring and Logging System (RMLS) – Technology Refresh, M07.04-02
- X, Automated Maintenance Management System (AMMS), M07.05-01

A, 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 is scheduled to begin in FY 2015 and 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 2016 – Performance Output Goals

- Complete Security Proof of Concept. (APB milestone)

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 Widows 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) and 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

System Implementation Schedule

X, Automated Maintenance Management System (AMMS), M07.05-01

Program Description

The FAA's ability to efficiently manage the maintenance of equipment and systems is critical to the operation of the NAS. Current stand-alone maintenance programs and processes are labor intensive with limited automated capability. The AMMS will provide new functionality and standards of data sharing using updated tools and technology to integrate data from existing operations and maintenance information systems for use by NAS and non-NAS users. This capability will lower information costs, reduce the time to establish system interfaces, and increase common situational awareness of system status.

AMMS will provide data retrieval to allow stakeholders to publish and subscribe to available services. AMMS will provide real time status information and facilitate access to data provided by navigation, surveillance, communication, safety management, aeronautical information, supply chain management, maintenance, training, and labor resource systems. AMMS will be implemented as a series of interfaces that will be developed with existing enterprise services and implemented on an individual basis. AMMS will not replace existing programs but rather improve information processing to comply with FAA's future vision of a net-centric environment by using web services to eliminate unnecessary duplication of legacy stand-alone processes.

Current and planned systems are being considered as candidates for inclusion in a secure net-centric data exchange environment provided by AMMS. These systems process information in seven broad categories:

- Aeronautical Information
- Command & Control Information
- FTI Information
- Air Traffic Information
- Logistics Information
- Administrative Information
- Safety Information

In order to streamline data collection and enhance data accuracy, AMMS will be applying bar codes to NAS components to provide unique identification for the Lowest Replaceable Unit (LRU) level. AMMS will also procure bar code scanners for technicians to read the barcodes. This will enable the capture of data tied to each individual asset. This data includes, but is not limited to, inventory tracking, configuration management, and other technical information such as run time information. This will result in better data analysis capabilities and will enable transitioning to a Reliability Centered Maintenance (RCM) capability. This type of information supports NAS sustainability decisions. The ability to perform workforce resource planning may also be enabled through barcoding.

Initial Investment Decision (IID) is planned for December 2015 and Final Investment Decision (FID) is planned for December 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

The AMMS will support operational availability by providing the Technical Operation Service with more timely and accurate information on system status and logistics thereby enabling more effective and efficient response to system issues. Technicians do not currently have real-time access to information they need to maintain and repair systems. Technicians must use manual processes, voice communications, email, and other inefficient methods to identify and resolve issues. AMMS will provide real-time access to system status, parts availability and ordering, technical guidance, resource availability, safety information and other important information.

Providing bar code reading devices to FAA's technicians and marking/barcoding of NAS assets will provide better information on parts availability and a streamlined ordering process which will allow quicker response to system failures thereby reducing outage times.

Program Plans FY 2016 – Performance Output Goals

- Develop the following products in support of the IID (Prior year funds):
    - 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 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.
- Develop interface requirements documentation for SWIM implementation.

Program Plans FY 2018-2020 – Performance Output Goals

- Output goals will be established at FID.

2B16, Mode S Service Life Extension Program (SLEP)

FY 2016 Request $16.3M

- 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 2028. 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, 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. The High Gain Open Planar Array (HGOPA) or refurbishment of existing antennas, Local, Remote and Radar Intelligent Tool (RIT) Maintenance Terminals, Keyboard Cathode Ray Tube (KCRT) and Non-Volatile Memory (NVMEM) chips will be purchased for depot replenishment to address obsolescence and supply/support issues. 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 99.3 percent, which is below the FAA performance metric of 99.7 percent. Providing for the Mode S service life extension modifications reduces the risk of unscheduled outages and ensures the continuation of service capabilities. Operational availability for Mode S systems will improve.

Program Plans FY 2016 – Performance Output Goals

- Production of 12 HGOPA or refurbishment of existing antennas and delivery to FAA Logistics Center.
- Complete BVR installation at last site in December 2015. (APB Milestone)

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 – 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 SLEP Phase 3 Planning program will determine the extent of re-engineering and system modifications needed to ensure supportability and sustainment of the ASR-9 and Mode S through 2028. Without this program, both the ASR-9 and Mode S will continue to experience decreasing operational availability and performance deterioration resulting from declining availability of replacement parts due to obsolescence. The program will assess and evaluate the technical alternatives using market surveys, engineering and supportability studies leading to a recommended alternative in support of the planned ASR-9 and Mode S SLEP Phase 3 investment decisions. The sustainment of the ASR-9 and Mode S systems aligns with the NAS Enterprise Architecture (EA) and the Surveillance and Broadcast Services (SBS) Automatic Dependent Surveillance Broadcast (ADS-B) back-up strategy.

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 AMASS and ASDE-X to aid in the prevention of accidents resulting from runway incursions.

The Mode S is a secondary surveillance radar system that provides beacon or secondary aircraft surveillance in en route and terminal airspace. 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.

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 99.4 and 99.3 percent respectively, which is below the FAA performance metric of 99.7 percent. With SLEP modifications, operational availability for the ASR-9 and Mode S systems will improve.

Program Plans FY 2016 – Performance Output Goals
- Develop Final Program Requirements documentation.
- Develop Implementation Strategy and Planning Document (ISPD).

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 2018-2020 – Performance Output Goals
- Output goals will be established at FID.

2B17, SURVEILLANCE INTERFACE MODERNIZATION (SIM)
FY 2016 Request $23.0M

Surveillance Interface Modernization (SIM), S13.01-01

Program Description

The Surveillance Interface Modernization (SIM) program will modernize the interfaces between FAA surveillance radar, automation, and specific weather systems, for both Terminal and En route. 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 of distribution of surveillance information to users at other facilities and require additional physical connections. This program will implement a common industry standard communications architecture and format.

SIM's 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 enforce security policies, ensure delivery to each customer, and provide direct performance metrics. The result will be improved interconnectivity with less downtime and errors, potentially increased data precision, increased aircraft surveillance information delivered to the air traffic automation system, and increased operational efficiency. It is anticipated by having all legacy radar interfaces and applications converged to a common data format, the cost of maintaining these interfaces as the NAS transitions to NextGen will be significantly reduced. The number of surveillance interface parts requiring repair and replacement will be reduced.

An Initial Investment Decision is planned for June 2015 and Final Investment Decision (FID) 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 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 backup to ADS-B surveillance, and to provide surveillance data critical to other government agency missions (e.g. Department of Defense, Homeland Security). In order to support the transfer and distribution of legacy radar data, these systems must be modernized to incorporate modern interface requirements. To align with future NextGen requirements, additional capabilities will be implemented into legacy surveillance systems. Legacy 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 2016 – 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.
- Establish platform Program Level Agreements (PLA) / Service Level Agreements (SLA).

Program Plans FY 2017-2020 – Performance Output Goals

- Output goals will be established at FID.

2B18, VOICE RECORDER REPLACEMENT PROGRAM (VRRP)
FY 2016 Request $3.0M

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 now require risk based monitoring of air traffic operational safety events which was not in effect when the Voice Recorder Replacement Program (VRRP) Digital Audio Legal Recorder (DALR) 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 such as:

- 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 experiencing obsolescence and supportability issues. Currently there are over 450 recorders operational in ATC facilities. The operational life cycle of the currently fielded voice recorder system is 10 years, and existing systems will begin to reach end of service life starting in 2017.

A Final Investment Decision (FID) 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 2016 – Performance Output Goals

- Develop products in support of the Investment Analysis Readiness Decision, which may include:
  - Quantified Shortfall Analysis
  - Solution Concept of Operations (CONOPS)
- Complete market survey and begin to develop Screening Information Request (SIR).

Program Plans FY 2017 – Performance Output Goals

- 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 Artifacts;
  - Business Case documentation;
  - Implementation Strategy and Planning Document (ISPD); and
  - Acquisition Program Baseline (Execution Plan).
- Achieve FID.

Program Plans FY 2019-2020 – Performance Output Goals

- Deliver approximately 100 systems; waterfall to be determined.

2B19, INTEGRATED TERMINAL WEATHER SYSTEM (ITWS) TECHNOLOGY REFRESH
FY 2016 Request $5.4M

Integrated Terminal Weather System (ITWS) – Technology Refresh & Disposition, W07.01-02

Program Description

The ITWS 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. 34 ITWS sites provide weather information to a total of 75 airports.

Technology Refresh of ITWS will include the systematic replacement of the ITWS Commercial Off-The-Shelf (COTS) system components (processors, displays, computer operating systems, and commercially available software) to assure continued supportability over the service life of the system. According to a supportability study conducted in 2010, the FAA will be unable to sustain the generation of ITWS Weather Products after 2015 without technology refresh. In addition, the technology refresh will allow ITWS to interconnect with the NextGen Weather Processor (NWP) and Common Support Services–Weather (CSS-Wx) systems and those of other NAS users (airport authorities, airlines, etc.) to permit seamless interoperability and common situational awareness in support of collaborative decision-making.

The current schedule is to develop the ITWS technology refresh system during FY 2015 and FY 2016 allowing deployment to begin in FY 2017 and to be completed in December 2019. A Final Investment Decision is planned for FY 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

ITWS Technology Refresh will support the Performance Metric for operational availability by replacing unsupportable equipment. The ITWS Requirements Specification states: "The ITWS shall have an inherent availability of at least 0.999815". ITWS has maintained this level of operational availability at all commissioned sites, including 26 of the 30 core airports where ITWS is currently installed, but the technology refresh is necessary to provide this availability in future years.

Program Plans FY 2016 – Performance Output Goals
- Update ITWS baseline documentation per Tech Refresh, Generate ITWS Tech Refresh System Support Modification (SSM).
- Acquire ITWS Technology Refresh hardware.

Program Plans FY 2017 – Performance Output Goals
- Complete ITWS Technology Refresh deployment and associated activities at targeted ITWS sites (25% complete).

Program Plans FY 2018 – Performance Output Goals
- Complete ITWS Technology Refresh deployment and associated activities at targeted ITWS sites (remaining 75% complete).

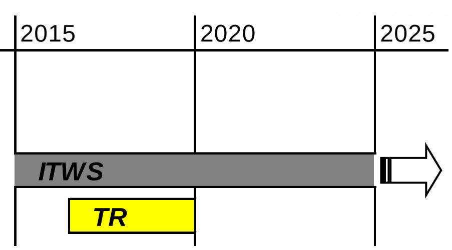
Program Plans FY 2019-2020 – Performance Output Goals
- Complete ITWS Technology Refresh deployment and associated activities at additional ITWS sites as needed. (Prior year funding)

System Implementation Schedule

Integrated Terminal Weather System (ITWS) - Technology Refresh

First ORD: April 2003 -- Last ORD: August 2010 (34th Unit)

Tech Refresh: First site Deployment: Nov 2016 -- Last site: Dec 2019



2B20, FLIGHT AND INTERFACILITY ATC DATA INTERFACE MODERNIZATION (FIADIM)
FY 2016 Request $9.0M

Flight and Interfacility ATC Data Interface Modernization (FIADIM), G08A.01-01

Program Description

The Flight and Interfacility Air Traffic Control Data Interface Modernization (FIADIM) will modernize the flight data exchange interfaces between the En Route Automation system and Terminal and Oceanic Automation systems. Currently, the data exchange is handled by the En Route Communications Gateway (ECG). The ECG NAS services being modernized are the Flight Data Entry and Printout (FDAT) and the Interfacility Data Transfer (IDAT). The FIADIM program will replace the FDAT and IDAT interfaces with modernized interfaces requiring only standard FTI network services. In conjunction with the Surveillance Interface Modernization program which allows the use of Internet Protocol (IP) switched network communications to relay radar date to automation systems; this program will enable the decommissioning of ECG equipment at all 20 en route centers. Benefits of FIADIM include:

- Reduced probability of flight data outages between facilities due to single facility failures and increased agility during contingency operations, utilizing network reconfigure-ability of network IP
- Reduced support costs of serial/ Time-Division Multiplexing (TDM) communication hardware in end systems by migrating the interfaces to IP/Ethernet standards
- Extension of Trajectory-Based operations to terminal airspace through improved access to flight data information in ATCTs and TRACONs, with resultant decreases in verbal coordination and increases in throughput/capacity utilization
- Reduced maintenance cost through platform elimination or consolidation, including ECG, FDIO-G, and EFSTS systems, and FDIO platforms separate from STARS automation in TRACONs

The ECG legacy communications technology is based on TDM serial interfaces which will be replaced by switched network IP services. The existing TDM serial lines do not allow reconfiguration of the communications links in the event of an outage.

The existing formats of the data communicated to terminal and oceanic automation systems depend on paper flight strips to inform controllers of the flight plans and equipage for the aircraft they are controlling. In the future, more detailed flight information consistent with international standards is required which will not fit on a paper flight strip. Modernizing the data interfaces will enable the electronic transmission of the full range of data controllers will need to implement NextGen operational improvements.

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 FIADIM program will modernize the data communications interfaces between en route and terminal automation systems which will reduce the number of outages and improve the availability of data exchanges between en route and terminal systems.

Program Plans FY 2016 – Performance Output Goals

- Identify acquisition alternatives for modernizing data communication systems.
- Develop the following products in support of the Initial Investment Decision (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 2017– Performance Output Goals

- Develop the following products in support of the Final Investment Decision (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 established at FID.

Program Plans 2020 – Performance Output Goals

- None.

C: Flight Service Programs

2C01, Aviation Surface Weather Observation System

FY 2016 Request $8.0M

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 following surface weather sensor systems: 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 AWOS Data Acquisition System (ADAS).

These systems, except the ADAS, are located at airports and measure and report weather conditions such as 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 weather processor systems like Integrated Terminal Weather System (ITWS) and Weather and Radar Processor (WARP).

The ASWON Technology Refresh program will provide compatible technology upgrades and/or replacements to five legacy ASWON systems (ASOS, AWOS, AWSS, DASI, F-420) experiencing obsolescence, supportability, and maintainability issues. This sustainment effort will enable these systems to continue their role of providing weather information to allow safe operation of the NAS. Successful implementation will also result in a common hardware platform and software baseline—this 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 contributes to maintaining operational availability by replacing obsolete and unsupportable 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 2016 – Performance Output Goals

- Install AWSS Technology Refresh at all remaining sites (44 of 44, 100%). (APB milestone)
- Install 100th AWOS Technology Refresh mod (100 of 187, 53%).
- Install 10th F-420 Technology Refresh mod (10 of 210, 5%).

Program Plans FY 2017 – Performance Output Goals

- Install AWOS Technology Refresh at all remaining sites (187 of 187, 100%). (APB milestone)
- Install 50th F-420 Technology Refresh mod (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 125th F-420 Technology Refresh mod (125 of 210, 60%).
- Install 90th DASI Technology Refresh mod (90 of 180, 50%).
- Install 100th ASOS Technology Refresh mod (100 of 571, 18%).

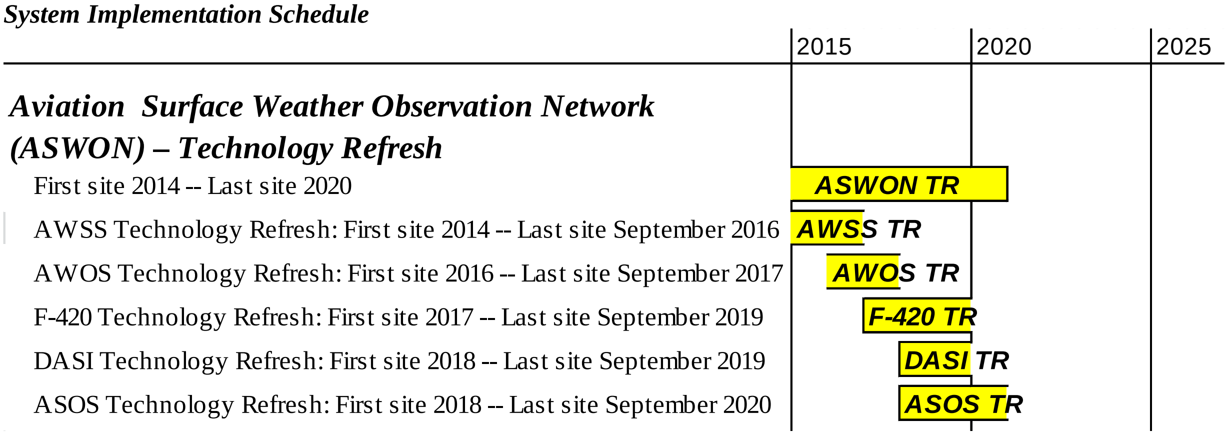
Program Plans FY 2019 – Performance Output Goals

- Complete F-420 Technology Refresh (210 of 210, 100%). (APB milestone)
- Complete DASI Technology Refresh (180 of 180, 100%). (APB milestone)
- Install 250th ASOS Technology Refresh mod (250 of 571, 44%).

Program Plans FY 2020 – Performance Output Goals

- Install ASOS Technology Refresh mods at all sites (571 of 571, 100%). (APB milestone)

System Implementation Schedule



2C02, FUTURE FLIGHT SERVICES PROGRAM (FFSP)

FY 2016 Request $3.0M

Future Flight Services Program, A34.01-01

Program Description

The FFSP will expand the web portion of flight services and reduce or eliminate human delivery of flight services as much as possible. The primary objective of FFSP is to realign the Flight Services Mission by modernizing services and delivery methodologies. This will be done by discontinuing 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.

Core Safety Functions currently being provided to the general aviation (GA) community within the Continental US, Puerto Rico, Alaska and Hawaii include the following:

- VFR search and rescue operations
- Emergency services to aircraft in distress
- Management of the NOTAM system
- Clearance relay
- Weather observation entry
- Pilot weather report (PIREP) entry
- Security related to Special Flight Rules Area / Air Defense Identification Zone / Flight Restricted Zone
- Services provided to DoD

Flight services in the lower 48 states are being provided by contractor personnel, while flight services in Alaska are being provided by government personnel. GA pilots can also access flight service information directly via a web portal that eliminates the need for speaking directly to a flight service specialist.

Flight services are currently being provided under three separate contracts, Direct User Access Terminal System (DUAT/S), Automated Flight Service Station (AFSS), and Operational and Supportability Implementation System (OASIS).

This program supports the transition to a new Flight Service Station (FSS) contract, which is planned to be awarded in the 3rd quarter FY 2017. 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 FY 2017.

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, which will allow pilots to make better decisions regarding how to avoid hazardous weather. FFSP will also provide, a more timely Search and Rescue response.

Program Plans FY 2016 – Performance Output Goals

- Develop the remaining Investment Analysis and acquisition artifacts for the new FSS contract:
  - Develop Independent Government Cost Estimate
  - Develop Chief Financial Officer Package
  - Develop Request For Proposal/Screening Information Request
- Achieve IID.

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; and
  - Acquisition Program Baseline (Execution Plan).
- Achieve a FID.
- Award new FSS contract.

Program Plans FY 2018-2020 – 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 2016 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 by reducing reliability of automation systems. 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 2016 – Performance Output Goals
These actions may be superseded if a higher priority need is entered into the Corporate Work Plan (CWP) prior to their beginning:
- Refurbish/upgrade building interior (break room, pilot briefing room, rest rooms, etc.) at Kenai FSS and Juneau AFSS.
- Complete roof replacement at Fairbanks FSS.
- Complete refurbishment of the Heating, Ventilation, and Air Conditioning (HVAC) System at Juneau FSS.

Program Plans FY 2017 – Performance Output Goals
These actions may be superseded if a higher priority need is entered into the CWP prior to their beginning:
- Complete roof replacement at Kenai FSS.
- Complete roof replacement at Juneau FSS.
- Complete refurbishment of the HVAC system 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 their beginning:
- Upgrade Heating System Boilers at Fairbanks FSS.
- Complete roof replacement at Deadhorse FSS.
- Complete roof replacement at Talkeetna FSS.
- Complete refurbishment of the 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 their beginning:
- 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 their beginning:
- Refurbish/upgrade building interior (break room, pilot briefing room, rest rooms, etc.) at Talkeetna FSS.
- Refurbish/upgrade building interior (break room, pilot briefing room, rest rooms, etc.) at Deadhorse FSS.
- Complete refurbishment of the HVAC system at Kotzebue FSS.

2C04, Weather Camera Program
FY 2016 Request $1.0M

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 and provides replacement of defective equipment identified in trouble tickets. The program provides logistics, spares, and technician training. It manages all of its procurement requirements and needs, equipment procurement, and manages its telecommunication contracts, site facility lease contracts, telecommunications contracts and site maintenance contracts and it maintains and reports its 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 saves millions of dollars of fuel expenses and reduces 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. Even though flying is essential, the rapidly changing weather presents challenges that affect the accident rate in Alaska. FAA data indicates accident rates in Alaska have been nearly 400 percent above the national average.

Limited 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 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 pictorial views of current weather conditions accessible to the aviation community in Alaska, and the FAA Weather Camera Program has installed aviation weather cameras as an aid to Visual Flight Rule (VFR) 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. The second goal is to reduce the number of unnecessary flight hours caused by lack of weather information.

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).

Program Plans FY 2016 – Performance Output Goals

- Replace legacy and failing cameras/routers at five sites.
- Refurbish or relocate mountain pass high-sites at: Merrill Pass High and Merrill Pass Low.

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, Lake Clark Pass West and Misty Fiords.

Program Plans FY 2018 – Performance Output Goals
- Replace legacy and failing cameras/routers at five sites.
- Refurbish remote powered camera sites: Grave Point, Cape Fanshaw, Skwentna and Summit.

Program Plans FY 2019 – Performance Output Goals
- Replace legacy and failing cameras/routers at five sites.

Program Plans FY 2020 – Performance Output Goals
- None.

D: Landing and Navigation Aids Programs

2D01, VHF OMNIDIRECTIONAL RADIO RANGE (VOR) WITH DISTANCE MEASURING EQUIPMENT (DME)
FY 2016 Request $4.5M

- 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 Operating 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 2016 – Performance Output Goals
- Procure two DVOR Doppler Antenna Kits.
- Procure two DVOR electronic kits.
- Complete one on-going DVOR project.

Program Plans FY 2017 – Performance Output Goals
- Procure two DVOR Doppler Antenna Kits.
- Procure two DVOR electronic kits.
- Complete one on-going DVOR project.

Program Plans FY 2018 – Performance Output Goals
- Procure two DVOR Doppler Antenna Kits.
- Procure two DVOR electronic kits.
- Complete one on-going DVOR project.

Program Plans FY 2019 – Performance Output Goals
- Procure 15 DVOR Doppler Antenna Kits.
- Procure 15 DVOR electronic kits.
- Complete two on-going DVOR projects.

Program Plans FY 2020 – Performance Output Goals
- Procure 15 DVOR Doppler Antenna Kits.
- Procure 15 DVOR electronic kits.
- Complete two on-going DVOR projects.

B, Very High Frequency Omni-Directional Range (VOR) – Minimum Operating Network (MON) Implementation Program, N06.01-01

Program Description

The VOR 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 safely 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 Minimum Operational Network (MON) will enable pilots to:

- Revert from PBN to conventional navigation;
- Tune and identify a VOR within 77 miles at a minimum altitude of 5,000 feet above ground level;
- Navigate using VOR procedures through a GPS outage area;
- Navigate using VOR procedures to a "Safe Landing" airport within 100 miles to fly an ILS or VOR instrument approach for landing;
- Navigate along VOR Airways especially in mountainous terrain where surveillance services are not available; and
- Navigate to an area where radar surveillance services are provided.

This program will transition the legacy network of approximately 967 VORs to a MON of approximately 650 VORs with a target date of 2025.

The program is currently in the Investment Analysis phase of the Acquisition Management System process. The Investment Analysis Readiness Decision (IARD) was approved in March 2014. The program is scheduled for Final Investment Decision (FID) in September 2015.

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 a PBN, which uses RNAV and RNP instrument flight procedures. RNAV and RNP navigation will rely 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 in 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 2016 – Performance Output Goals

- Removal, redesign, or replacement of VOR instrument flight procedures and routes tied to VORs planned for discontinuance;
- Performing facility work to remove unneeded equipment and reconfigure co-located services, as necessary; and
- Performing Safety Risk Management (SRM) activities to support VOR discontinuance.
- Additional activities and output goals will be dependent on FID.

Program Plans FY 2017-2020 – Performance Output Goals

- None.

2D02, INSTRUMENT LANDING SYSTEMS (ILS) – ESTABLISH
FY 2016 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 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 capacity for aircraft landing in adverse weather conditions at equipped runways.

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 (decision height) and how far the pilot can see the runway (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. It may also include airports with an Air Traffic Control Tower in one of the areas with at least one Major Hub airport with surrounding airports that may have a direct effect on air traffic.

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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

Establishing ILS precision approach capability allows lower minimums for landings and helps to maximize NAS use. Lowering minimums allows operations in poor weather conditions, which, in effect, is the same as an increase in airport capacity.

Program Plans FY 2016 – Performance Output Goals

- Procure five ILS systems and ancillary equipment.
- Complete approximately five ILS replacement projects.

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.
- Procure one ALSF-2 system.
- 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.
- Procure two ALSF-2 systems.
- Complete approximately seven ILS replacement projects.

2D03, WIDE AREA AUGMENTATION SYSTEM (WAAS) FOR GPS
FY 2016 Request $80.6M

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 continental United States and Alaska that monitor the 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 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 approaches to airports not equipped with ILS.

WAAS provides or supports the following improvements and capabilities:
- WAAS is a critical enabling technology for NextGen by providing 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 low visibility access into airports;
- WAAS supports the redesign of airspace to establish Area Navigation (RNAV) routes in the terminal and en route environments (T and Q routes). These more direct routes will increase efficiency and capacity;
- In Alaska, WAAS enables users to operate under Instrument Flight Rules (IFR) on routes currently classified as uncontrolled airspace due to lack of radar coverage. WAAS enabled routes improve 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.

The program 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).

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.

The final investment decision 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 1,283 of the nation's 19,000 runway ends. WAAS is able to provide the same level of precision with 4,069 LPV and LP procedures, as of November 2014.

Program Plans FY 2016 – Performance Output Goals

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

- Technology Refresh:
  - Develop and complete GEO 5 Signal Generator Subsystem (SGS) installation.
  - Complete GEO 5 satellite launch and in-orbit test.
  - Complete processor/Operating System/Compiler upgrade design, development and test.
  - Replace WAAS Assurance Level D Processors and upgrade Operating System (OS) and Compiler at first site. (APB milestone)
  - Complete Telecommunications Upgrade and all cutovers.
  - Complete Third Generation Reference receiver (G-III) installation at last WAAS Reference Station site. (APB milestone)
- NAS Implementation:
  - Develop and publish 120 WAAS LPV/LP approach procedures.
- Technology Evolution:
  - Develop prototype ARAIM concepts for evaluation and preliminary minimum operational performance standards (MOPS) requirements.
  - Develop draft MOPS for Dual-Frequency/Multi-constellation WAAS.

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- None.

Program Plans FY 2017 – Performance Output Goals

Wide Area Augmentation System (WAAS) – Phase IV Segment 1 (N12.01-07):

- Technology Refresh:
  - Complete new G-III signal data processing.
  - Complete GEO 6 ground component development, test and installation.
  - Complete integration of GEO 5 into Operational WAAS. (APB milestone)
  - Replace WAAS Assurance Level D Processors and upgrade Operating System (OS) and Compiler at last site. (APB milestone)
- NAS Implementation:
  - Develop and publish 25 WAAS LPV/LP approach procedures.
- Technology Evolution:
  - Conduct initial evaluation of Prototype Dual Frequency Algorithms.
  - Establish draft MOPS for ARAIM and conduct testing of ARAIM system elements.

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):

- Technology Refresh:
  - Field new Safety Computer at first and last WAAS Master Station (WMS). (APB Milestones)
- Complete GEO 6 integration and testing of ground and satellite components.
  - Establish GEO 7 Contract.
- NAS Implementation:
  - Develop and publish 25 WAAS LPV/LP approach procedures.
- Technology Evolution:
  - Conduct system level evaluation of Prototype Dual Frequency Algorithms.
  - Conduct integrated testing of ARAIM.
  - Complete Final Draft of Dual-Frequency MOPS for SBAS.

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):

- Technology Refresh:
  - Complete DFO Release 5 deployment and integration of GEO 6 into operational WAAS.
  - Complete GEO 7 ground component development, test and installation.
- NAS Implementation:
  - Develop and publish 25 WAAS LPV/LP approach procedures.
- Technology Evolution:
  - Establish government/industry partnerships to support initial development and evaluation of dual-frequency MOPS.

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):

- Technology Refresh:
  - Complete design changes for new Ground Uplink Station-Type 1 receiver and Signal Generator. (Prior year funds)
  - Complete GEO 7 integration and testing of ground and satellite components. (Prior year funds)
  - Complete design of L5 algorithm changes. (Prior year funds)
- NAS Implementation:
  - Develop and publish 25 WAAS LPV/LP approach procedures. (Prior year funds)
- Technology Evolution:
  - Establish government/industry partnerships to support development and evaluation of dual-frequency avionics. (Prior year funds)

Wide Area Augmentation System (WAAS) – Phase IV Segment 2 (N12.01-08):

- Release DFO, Segment 2 screening information request (SIR).

2D04, RUNWAY VISUAL RANGE (RVR) & ENHANCED LOW VISIBILITY OPERATIONS (ELVO) PROGRAM

FY 2016 Request $6.0M

- 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; thus, 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 accidently 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 the equipment for sites that have recently qualified for an upgrade from a 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. This negatively affects 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 2016 – Performance Output Goals
- Procure 14 RVR systems.
- Complete 14 RVR replacement projects.

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.

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 that did not require 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) conditions 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. The benefit-cost ratio for these sites exceeds 1.7. 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 59,122, 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 Instrument Meteorological Conditions (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 2016 – Performance Output Goals

- Initiate execution schedule in FAA Corporate Work Plan (CWP) for new low visibility services at a minimum of five locations.
- Obtain full SA CAT II operational capability at Westchester County Airport, White Plains, NY, and Long Island MacArthur International Airport, Islip, NY, in the New York/New Jersey (NY/NJ) region. (APB Milestone)
- Obtain full SA CAT II operational capability at San Jose. (APB milestone)

Program Plans FY 2017 – Performance Output Goals

- Initiate execution schedule in FAA Corporate Work Plan (CWP) for 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 execution schedule in FAA Corporate Work Plan (CWP) for 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 four sites. (Prior year funds)

Program Plans FY 2020 – Performance Output Goals

- None.

2D05, APPROACH LIGHTING SYSTEM IMPROVEMENT PROGRAM (ALSIP)

FY 2016 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 MALSR and 1 ALSF-2 systems that do not meet the frangible requirements.

The High Intensity Approach Lighting System with Sequenced Flashing Lights (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 Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (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, allows an airport to remain open to traffic during low visibility conditions.

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 2016 – Performance Output Goals
- Procure approximately four MALSR systems and ancillary equipment.
- Replace a MALSR at approximately one location.

Program Plans FY 2017 – Performance Output Goals
- Procure approximately four MALSR systems and ancillary equipment
- Replace a MALSR at approximately one location.

Program Plans FY 2018 – Performance Output Goals
- Procure approximately four MALSR systems and ancillary equipment.
- Replace a MALSR at approximately one location.

Program Plans FY 2019 – Performance Output Goals
- Procure approximately four MALSR systems and ancillary equipment.
- Replace MALSR at approximately two locations.

Program Plans FY 2020 – Performance Output Goals
- Procure approximately four MALSR systems and ancillary equipment.
- Replace MALSR at approximately two locations.

2D06, Distance Measuring Equipment (DME)
FY 2016 Request $3.0M

Sustain Distance Measuring Equipment (DME), N09.00-00

Program Description

DME is a radio navigation aid that is 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; establishment of DMEs at qualifying airports; relocation of DME facilities; and establishment of DMEs in lieu of ILS markers.

In addition, 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 industry wants to discontinue using step-down or "dive-and-drive" non-precision approach procedures, in which the pilot descends to the minimum allowable altitude to try to see the runway. Using DME minimizes the need for these types of approaches because the continuous ranging information from a DME allows procedure designers more flexibility in terms of where step down fixes are placed and how many are needed, leading to better specification and control over the vertical descent profile; thus reducing 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 59,122, or higher, arrivals and departures.*

Relationship to Performance Metric

The state-of-the-art DME can provide distance information to more than 250 interrogators simultaneously, compared to less than 100 interrogators for the existing DME systems, thus increasing the number of aircraft that can simultaneously interrogate a single DME. Reliability of the new state-of-the-art DME is improved over the existing DME systems. Both of these factors have a positive impact on daily airport capacity.

The new DMEs meet all users' operational needs, while increasing capacity, efficiency, and predictability, and while enhancing safety, mitigating environmental impacts, and operating in a seamless global environment by:

- Increasing capacity by 150%
- Reducing 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

Program Plans FY 2016 – Performance Output Goals

- Procure 25 DME systems.
- Complete 25 DME establish/sustainment projects.

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.

2D07, Visual Navaids - Establish/Expand

FY 2016 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 consists of four lamp housing assemblies arranged perpendicular to the edge of the runway. The PAPI projects a pattern of red and white lights along the desired glide slope so a pilot can tell whether they are on the glide slope and how to correct their rate of descent if they are above or below it. 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 2016 – Performance Output Goals
- Procure seven PAPI systems.
- Install PAPI systems at seven locations.

Program Plans FY 2017 – Performance Output Goals
- Procure seven PAPI systems.
- Install PAPI systems at seven locations.

Program Plans FY 2018 – Performance Output Goals
- Procure seven PAPI systems.
- Install PAPI systems at seven locations.

Program Plans FY 2019 – Performance Output Goals
- Procure seven PAPI systems.
- Install PAPI systems at seven locations.

Program Plans FY 2020 – Performance Output Goals
- Procure seven PAPI systems.
- Install PAPI systems at seven locations.

2D08, INSTRUMENT FLIGHT PROCEDURES AUTOMATION (IFPA)
FY 2016 Request $3.4M

Instrument Flight Procedures Automation (IFPA) – Technology Refresh, Segment 1, A14.02-02 / X, 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. This program will be upgrading these tools to meet current and future demands.

As additional runways are equipped to handle instrument operations, new and revised instrument flight procedures must be developed and published. In addition, new approach and departure procedures are being developed to take advantage of Required Navigation Performance (RNP) capabilities and GPS assisted approaches. These procedures can reduce the distance flown 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 airport runways. These procedures are printed in booklets and used by pilots to determine the safe altitudes, appropriate headings and other information to successfully fly precision and non-precision approaches and departures into and out of airports.

The new Instrument Flight Procedures Automation (IFPA) system is more efficient and comprehensive in supporting instrument flight procedures development. It includes functionality for developing approaches, missed approaches, circling approaches, airways and departures. In addition, IFPA contains an integrated obstacle evaluation application, replacing a manual dependent process. As part of the development of the new IFPA tools, integration of systems is being accomplished between the AeroNav Products organization and the Flight Inspections Services organizations, eliminating manual effort and duplication of data. Transition to IFPA is complete.

A technology refresh of the equipment and software will be accomplished in 2 segments.

<u>IFPA – Technology Refresh, Segment 1 (A14.02-02):</u>
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 replaced with new Commercial Off The Shelf (COTS) business process workflow software. The APTS system will be renamed to AeroNav Products Workflow System (APWS) and will be built in 3 phases. Phase 1, scheduled for Q3 FY 2015, 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). Phase 2 will provide new workflow processes associated with IPDS enhancements and improve and streamline the processes used for developing and implementing IFPs as identified in the NAV Lean initiative. Phase 3 will provide a new management productivity suite of tools. Beginning in FY 2013, the IPDS software tool was upgraded for COTS architecture changes, including conversion for the Windows-7 operating system, and is scheduled to be deployed in Q2 FY15. Technology Refresh of the IFPA server infrastructure began in FY 2013 and was completed in FY 2014.

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 is planned for the first quarter of 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 7 – Achieve documented cost savings and cost avoidance of $30 million in FY 2015. (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. It has and continues to improve the quality of products through process re-engineering and elimination of manual processes. IFPA provides the ability to produce 350+ 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 2016 – Performance Output Goals
IFPA – Technology Refresh, Segment 1 (A14.02-02):
- Complete APWS upgrades with COTS Workflow Software Replacement Phase 3.
- Achieve IOC of COTS Workflow Software Replacement Phase 3. (APB milestone)
- Complete IOC of IPDS COTS Software Technology Refresh Phase 2. (APB milestone)

IFPA – Technology Refresh, Segment 2 (A14.02-03):
- None.

Program Plans FY 2017-2020 – Performance Output Goals
IFPA – Technology Refresh, Segment 1 (A14.02-02):
- None.

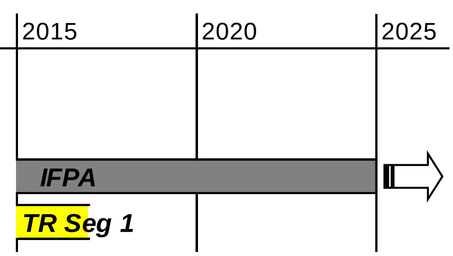
IFPA – Technology Refresh, Segment 2 (A14.02-03):
- Milestones will be determined after Technology Refresh Segment 2 Investment Analysis and finalized in the Approved Program Baseline (APB) at Final Investment Decision (FID).

System Implementation Schedule

Instrument Flight Procedures Automation (IFPA) - Technology Refresh 1

First site IOC: June 2007 -- Last site IOC: September 2012

First site: September 2013 -- Last site: September 2016



2D09, NAVIGATION AND LANDING AIDS – SERVICE LIFE EXTENSION PROGRAM (SLEP)
FY 2016 Request $3.0M

Navaids – Sustain, Replace, Relocate, N04.04-00

Program Description

This program sustains and/or replaces Approach Lighting Systems at sites where there is a high risk for failure of these systems and where failure would result in the loss of the precision approach and/or increased visibility minima. 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.

This program replaces Instrument Landing Systems (ILS) at airports that do not 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. ILS components include electronic devices such as localizers, glide slopes and marker beacons. In some cases Mark-1F ILSs 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. The replacement or upgraded equipment will require less maintenance and repair time, which reduces system downtime and contributes to maintaining operational availability of the NAS.

Program Plans FY 2016 – 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 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.

2D10, VASI Replacement – Replace with Precision Approach Path Indicator

FY 2016 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 to allow pilots to determine visually that they are on the proper glideslope 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 2016 – 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 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.

2D11, GLOBAL POSITIONING SYSTEM (GPS) CIVIL REQUIREMENTS
FY 2016 Request $27.0M

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 in order 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 (PPS), 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. Currently, GPS consists of second generation satellites (GPS-II) and the Operational Control Segment (OCS). The GPS program is entering into a period of transition from GPS-II to the third generation (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 (L1C, L1-C/A, L2C, and L5 (a frequency that will be added in the next generation of satellites)) and forward this information to the processing facilities where a suite of software algorithms will monitor the accuracy, integrity, continuity, and availability of performance to verify that modernized GPS is performing properly.

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 the 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

This project has been directed by the Department of Transportation (DOT) per a 2008 DoD/DOT Memorandum of Agreement on Civil Use of GPS to fulfill responsibilities to fund civil unique capabilities (L1C and Civil Signal Monitoring) under the National PNT Policy NSPD-39, December 2004.

Program Plans FY 2016 – Performance Output Goals

- Provide funding to the Air Force GPS Directorate for development and implementation of the OCX baseline contract and Civil Signal Monitoring specific requirements of civil signal monitoring.
- Provide funding for GPS program oversight and technical support.
- Review technical deliverables and validate the software development.

Program Plans FY 2017 – Performance Output Goals

- Provide funding to the Air Force GPS Directorate for development and implementation of the OCX baseline contract and Civil Signal Monitoring specific requirements of civil signal monitoring.
- Provide funding for GPS program oversight and technical support.
- Review technical deliverables and validate the software development.

Program Plans FY 2018-2020 – Performance Output Goals

- None.

2D12, RUNWAY SAFETY AREAS – NAVIGATION MITIGATION
FY 2016 Request $30.0M

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 in the event of an aircraft's excursion from the runway by significantly reducing the extent of personal injury and aircraft damage during overruns, undershoots and veer-offs. This program will address FAA-owned equipment that do not conform to the current RSA standards and modify them to ensure their compliance with Part 139 in Title 14 of the US CFR.

Program Plans FY 2016 – Performance Output Goals
- Complete 70 F&E-funded RSA improvements.

Program Plans FY 2017 – Performance Output Goals
- Complete 70 F&E-funded RSA improvements.

Program Plans FY 2018 – Performance Output Goals
- Complete 11 F&E-funded RSA improvements.

Program Plans FY 2019-2020 – Performance Output Goals
- None.

E: Other ATC Facilities Programs

2E01, FUEL STORAGE TANK REPLACEMENT AND MANAGEMENT
FY 2016 Request $18.7M

Fuel Storage Tank Replacement Management, F13.01-00

Program Description

The FAA Fuel Storage Tank (FST) Replacement and Management program designs, replaces, 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 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 company outages. Prime generators provide the sole source for electrical power for NAS operations. A loss of integrity on any FST component will affect the operation of the generator systems and may ultimately result in a total facility failure.

Storage tanks have historically contained 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, the various state legislatures, county governments and city jurisdictions have passed statutes specifying the minimum requirements for the construction, installation, removal, and operations 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 a 20 year system lifecycle. An average of 180 FST system replacements is required annually to sustain 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.

Current major initiatives for the FST Program include system upgrades at the ARTCC and TRACON facilities. These systems have been redesigned to provide enhanced technician control, increase redundant capacity and comply with current regulations.

The FST Program uses a prioritization scheme to develop field implementation schedules once funding allocations have been established. This program is included in FAA's ATC Facilities Strategic Sustainment 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 the proper functioning of navigation aids, automation systems and other air traffic control systems. 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 2016 – Performance Output Goals

- Replace, modernize, or upgrade 93 fuel systems at facilities selected under the FST Program Prioritization Scheme and validated through the Air Traffic Control Facilities division Portfolio Model.

Program Plans FY 2017 – Performance Output Goals

- Replace, modernize, or upgrade 114 fuel systems at facilities selected under the FST Program Prioritization Scheme and validated through the Air Traffic Control Facilities division Portfolio Model.

Program Plans FY 2018 – Performance Output Goals

- Replace, modernize, or upgrade 114 fuel systems at facilities selected under the FST Program Prioritization Scheme and validated through the Air Traffic Control Facilities division Portfolio Model.

Program Plans FY 2019 – Performance Output Goals

- Replace, modernize, or upgrade 114 fuel systems at facilities selected under the FST Program Prioritization Scheme and validated through the Air Traffic Control Facilities division Portfolio Model.

Program Plans FY 2020 – Performance Output Goals

- Replace, modernize, or upgrade 114 fuel systems at facilities selected under the FST Program Prioritization Scheme and validated through the Air Traffic Control Facilities division Portfolio Model.

2E02, Unstaffed Infrastructure Sustainment

FY 2016 Request $39.6M

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 FAA's ATC Facilities Strategic Sustainment 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 replacement and/or upgrading of real property and structures, which do not have staff permanently assigned to them. The 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 will protect electronic equipment and help 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 then directly reduce the capacity of the NAS.

Program Plans FY 2016 – Performance Output Goals

- Complete 150 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 20 antenna towers to improve maintenance and safety conditions for FAA employees.

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 20 antenna towers to improve maintenance and safety conditions for FAA employees.

Program Plans FY 2018 – Performance Output Goals
- Complete 160 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 32 antenna towers to improve maintenance and safety conditions for FAA employees.

Program Plans FY 2019 – Performance Output Goals
- Complete 160 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 32 antenna towers to improve maintenance and safety conditions for FAA employees.

Program Plans FY 2020 – Performance Output Goals
- Complete 160 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- Replace 32 antenna towers to improve maintenance and safety conditions for FAA employees.

2E03, AIRCRAFT RELATED EQUIPMENT PROGRAM

FY 2016 Request $9.0M

- A, Aircraft Related Equipment (ARE) Program, M12.00-00
- X, 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 provides equipment and upgrades to FAA's flight inspection (FI) aircraft in order to meet airborne inspection requirements for new and existing navigation and surveillance systems. The FAA's worldwide FI mission is to evaluate and certify instrument flight procedures (IFPs) and to evaluate and certify both ground-based and space based navigational equipment including facilities for Federal, State, Department of Defense (DoD), private and international customers. This mission requires aircraft equipped with specialized test equipment such as the Automated Flight Inspection System (AFIS) and the Next Generation Automated Flight Inspection System (NAFIS). The ARE program updates the FAA's FI aircraft fleet with systems required for inspecting, certifying, modernizing and sustaining the NAS and to meet Next Generation Air Transportation System (NextGen) requirements. In addition flight inspection aircraft must be equipped with modern avionics to operate in the evolving NAS environment.

The FI aircraft fleet is composed of 30 specially equipped aircraft. This program provides the technical equipment upgrades and/or replacements to existing aircraft, avionics, and FI mission equipment to meet current and future performance requirements. The program 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 handles the dissemination of post flight inspection results.

The new equipment provides the capability for 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)
- GPS Landing System (GLS)

The ARE program is grouped into three activities:

<u>Aircraft Modernization:</u>
Projects support avionics technology refresh and new/changing regulatory requirements for operating aircraft in domestic and international airspace.

<u>Flight Inspection System (Sustainment):</u>
Projects support mission equipment technology refresh and new/changing regulatory requirements necessary to continue flight inspection of legacy NAS systems.

<u>Flight Inspection System Modernization:</u>
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 do this the fleet of FI aircraft must be modernized and updated to be compatible with the latest equipment and procedures. As the data below shows, the checks identify discrepancies that are fixed before they cause delays and diversions of aircraft.

In FY 2012 through FY 2013, a total of 37,130 flight inspections were conducted of existing ground based navigational aids and existing IFPs and 2,096 had reportable discrepancies. This equates to 5.6% of published IFPs and associated ground based navigational aids requiring further attention. In addition, 6,991 IFPs required flight inspection in order to publish a new or amended flight procedure. The results of those flight inspections required 935 IFPs to be adjusted or found to be unsatisfactory. Of the new or amended IFPs, 14% required correction and thereby avoided potentially unsafe IFPs from being published.

Program Plans FY 2016 – Performance Output Goals
<u>Aircraft Modernization:</u>

- Acquire and/or install:
  - Pro Line 21 avionics suite on five BE-300 aircraft and two CL-605 aircraft.
  - Integrated Flight Information System (IFIS) for the BE-300 fleet based on the multi-year schedule established in FY 2015.
  - Equipment to establish wireless connectivity based on the multi-fleet, multi-year schedule established in FY 2015.
  - Publish fleet plan proposal based on fleet study recommendations

Flight Inspection System Sustainment:
- Acquire 12 replacement Spectrum Analyzers for Automated Flight Inspection System (AFIS).
- Complete NAFIS Phase I for deployed aircraft.
- Complete plan for NAFIS Phase II updates for deployed aircraft.

Flight Inspection System Modernization:
- Deploy or complete:
  - NAFIS Phase I on one BE-300 aircraft.
  - NAFIS Phase II on four BE-300 aircraft.
  - NAFIS Phase II on three CL-600 series aircraft.
  - Complete NAFIS Phase II Development.

Program Plans FY 2017 – Performance Output Goals

Aircraft Modernization:
- Acquire and/or install:
  - Pro Line 21avionics suite on one CL604 aircraft.
  - Integrated Flight Information System (IFIS) for BE-300 aircraft based on the multi-year schedule updated in FY 2016.
  - Equipment to establish wireless connectivity based on the multi-fleet, multi-year schedule updated in FY 2016.
  - ADS-B Transponders for 12 aircraft.
  - GLS equipment for Challenger fleet.

Flight Inspection System Sustainment:
- Execute NAFIS interim updates for deployed aircraft.

Flight Inspection System Modernization:
- Deploy NAFIS Phase II on six BE-300 aircraft.

Program Plans FY 2018 – Performance Output Goals

Aircraft Modernization:
- Acquire and/or install:
  - Integrated Flight Information System (IFIS) for BE-300 aircraft based on the multi-year schedule updated in FY 2017.
  - Wireless connectivity equipment based on the multi-year schedule updated in FY 2017.
  - ADS-B Transponders for 12 aircraft.
  - Modified cabin to accommodate NAFIS Phase II on 3 CL-601 aircraft.

Flight Inspection System Sustainment:
- Complete NAFIS updates for deployed aircraft.

Flight Inspection System Modernization:
- Deploy NAFIS Phase II on six BE-300 aircraft.
- Deploy NAFIS Phase II on one CL-601 aircraft.

Program Plans FY 2019 – Performance Output Goals

Aircraft Modernization:
- Acquire and/or install:
  - Global Positioning System (GPS) antennas to include the L5 band on the fleet.
  - Pro Line 21 avionics suite on two CL-600 series aircraft and complete the project for the fleet.
  - Wireless connectivity equipment based on the multi-year schedule established in FY 2015.
  - Complete Integrated Flight Information System (IFIS) for BE-300 aircraft.

Flight Inspection System Sustainment:
- Install NAFIS Phase II updates for the fleet.
- Install NAFIS Phase II Block Upgrades.

Flight Inspection System Modernization:
- Deploy NAFIS Phase II on two CL-601 aircraft.
- Deploy NAFIS Phase II on two BE-300 aircraft.

Program Plans FY 2020 – Performance Output Goals

Aircraft Modernization:

- Acquire and/or install:
  - Global Positioning System (GPS) antennas to include the L5 band.
  - Complete wireless connectivity equipment.
  - Other modernization decisions are dependent on the FY 2015 fleet study.

Flight Inspection System Sustainment:

- Install NAFIS Phase II updates for the fleet.

Flight Inspection System Modernization:

- Deploy NAFIS Phase II on two CL-601 aircraft.

X, 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 the simulators will enable FAA to analyze and test the viability of these improvements for use in the NAS and develop the appropriate regulations regarding their use.

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 new technology implementations 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 Q3 2015 the FAA will install an A320 flight package capability into the existing Airbus 330/340 simulator as part of the M12.01-03 CIP program.

The 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 and supporting 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 during introduction of new NextGen technology initiatives. This simulator supports NextGen, NAS modernization and National Transportation Safety Board safety initiatives.

A final investment decision (FID) is planned in FY 2017 which will define the specific components in each simulator that will need to be refreshed.

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 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 via a high level architecture with an air traffic control lab to support on-going and future research and development projects providing regulators with analysis data to ensure safe implementation of new technologies. The aircraft simulators will improve safety by providing accident investigators, other inspectors, and analysts with capability to replicate incident and trend data for analysis and potential input into procedure and/or equipment modifications.

Program Plans FY 2016 – Performance Output Goals
- None.

Program Plans FY 2017 – Performance Output Goals
- 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 simulator.
- Purchase and install the upgraded input/output Interface including a new host computer for the FBW simulator.

Program Plans FY 2018 – Performance Output Goals
- Purchase and install latest Flight Management System version for the Boeing simulator.
- Purchase and install the upgraded input/output Interface including a new host computer for the Boeing simulator.

Program Plans FY 2019 – Performance Output Goals
- Purchase and install the Boeing 737 Max8 upgrade.
- Purchase and install the latest industry standard Aircraft Flight Data update for the A320 Flight Package.
- Purchase and install a new 10 year Aircraft Flight Data license A330.
- Purchase and install the latest industry standard Aircraft Flight Data update for the A330 simulator.

Program Plans FY 2020 – Performance Output Goals
- Purchase and install A320 New Engine Operations Flight Package.
- Purchase and install A330 New Engine Operations simulator update.
- Complete update of Visual System for both simulators.

2E04, AIRPORT CABLE LOOP SYSTEMS – SUSTAINED SUPPORT

FY 2016 Request $12.0M

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

The Airport Cable Loop Systems Sustained Support will reduce the number of unplanned outages attributed to deteriorating on-airport copper cables by replacing existing unsupportable communications equipment and the deteriorated FAA-owned underground cable itself. The program improves signaling and communications, which allows for increased operational availability of infrastructure systems. There have been 981 delays associated with 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 2016 – Performance Output Goals

- Complete electronics installation at Dallas-Ft Worth, TX (DFW).
- Complete reconfiguration and electronics installation activities at San Francisco, CA (SFO).
- Complete electronics installation and construction at John F Kennedy (JFK) in New York
- Complete construction at Ontario, CA (ONT).
- Start electronics installation at Ontario, CA (ONT).
- Develop detailed plan and start construction for Ft Lauderdale, FL (FLL) and Oakland, CA (OAK).
- Complete four smaller scale projects (regionals), sites to be determined at the A/G Communications Integrated Requirements Team (AGIRT) in FY 2016.
- Start development of the following products in support of AeroMacs:
    - Requirements document
    - Screen Information Request

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 AGIRT in FY 2017.
- Complete procurement and key site activities for AeroMacs.

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 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.

2E05, ALASKAN SATELLITE TELECOMMUNICATION INFRASTRUCTURE (ASTI)
FY 2016 Request $12.5M

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 such as:

- 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)
- Improved information system security to meet Federal standards;
- Reduced number and duration of outages;
- More efficient use of satellite transponder bandwidth;
- Containment of Operations and Maintenance (O&M) costs; and
- Improved life cycle support (i.e., training, second level engineering support, radome maintenance and depot level supply support).

The ASTI Modernization Contract was awarded in August 2011.

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 2016 – Performance Output Goals

- Complete Installation at 64th site. (APB milestone)

Program Plans FY 2017 – Performance Output Goals

- Complete removal of legacy equipment.

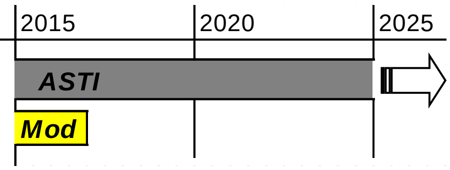
Program Plans FY 2018-2020 – Performance Output Goals

- None.

System Implementation Schedule

Alaskan Satellite Telecommunications Infrastructure

Key site IOC: November 2014 -- Last site IOC: September 2016



2E06, Facilities Decommissioning

FY 2016 Request $6.0M

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 the excess property or 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 requires disposal of the 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 FAA's ATC Facilities Strategic Sustainment 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 $30 million in FY 2015. (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 avoidance averaging $5M per year results from leases eliminated and maintenance costs avoided because of completed disposition of legacy real properties, which are no longer required.

Program Plans FY 2016 – Performance Output Goals
- Complete approximately 50 Real Property Disposal Projects. These projects will focus on disposal of Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.

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 Omni-directional Radio (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 Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.
- Dispose of 8 Very-High Omni-directional Radio (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 Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.
- Dispose of 12 Very-High Omni-directional Radio (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 Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.
- Dispose of 12 Very-High Omni-directional Radio (VOR) sites.

2E07, ELECTRICAL POWER SYSTEMS – SUSTAIN/SUPPORT
FY 2016 Request $125.0M

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 flights that remain grounded, 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, refurbishes and renews 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 FAA's ATC Facilities Strategic Sustainment Plan.

<u>Power Systems Sustained Support (PS3) (F11.01-01):</u>
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.

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 2016 – 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 (4 Sets).
- LPGBS elements (7 Sets).
- ELD Replacements (9 Sets).
- Engine Generators Replacement (109 Sets).
- CPDS (4 Sets).
- AES (9 Sets).
- ERMS (90 Sets).
- PS3 Program Management and System Engineering (10 Sets).

Power Systems Sustained Support (PS3) – Future Segments (F11.01-02):

- None.

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 (76 Sets).
- PCS / UPS (21 Sets).
- DC BUS (27 Sets).
- ACEPS (4 Sets).
- LPGBS elements (7 Sets).
- ELD Replacements (9 Sets).
- Engine Generators Replacement (109 Sets).
- CPDS (4 Sets).
- AES (9 Sets).
- ERMS (90 Sets).
- PS3 Program Management and System Engineering (10 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 (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).
- PS3 Program Management and System Engineering (14 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).
- PS3 Program Management and System Engineering (14 Sets).

2E08, FAA EMPLOYEE HOUSING AND LIFE SAFETY SHELTER SYSTEM SERVICE

FY 2016 Request $2.5M

FAA Employee Housing and Life Safety Shelter System Services, F20.01-01

Program Description

FAA Employee Housing and Life Safety Shelter Services manage, sustain, and buy/build/lease adequate housing and shelters for FAA employees at locations where private market housing is scarce or non-existent. This program also establishes a standard housing and shelter services policy, internal cost controls, life-cycle planning, exploration of use of commercially-managed housing services, and infrastructure management (including roads, community heating systems, water supply, sewage treatment/disposal, and other utilities). This program is included in FAA's ATC Facilities Strategic Sustainment Plan.

In remote locations or overseas the FAA owns, or in a few cases leases, approximately 150 dwelling units that are used for three purposes:

- Provide permanent housing for FAA employees in remote locations;
- Provide temporary quarters for FAA employees at remote locations (for example islands in the Bering Sea); and
- Provide a system of life-safety emergency shelters in harsh environments (i.e., remote arctic and mountaintop locations).

Employees who use these facilities provide air traffic control services and/or NAS facilities maintenance services. Additionally aviation inspectors and flight standards routinely use temporary lodging. All employees work to ensure safe, efficient, and expeditious movement of air traffic. Adequate and reasonably priced housing is not commercially available in these locations for employees and their families. All FAA organizations including ATO and non-ATO use these housing and shelter services. FAA Housing and Life Safety Shelter System Services are vital elements of the Human Resources Management Plan.

This program refurbishes facility structures and roofs, mechanical systems, heating, ventilating, and air conditioning (HVAC) systems, roads and grounds, and other infrastructure directly related to housing and shelters.

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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

The location of this housing is in areas where commercial housing is limited or non-existent. Maintenance of the NAS equipment and manning of air traffic facilities in these locations is vital to the safety of the traveling public. Without this investment in the existing housing, the cost of maintaining the air traffic services in the remote areas will be greatly increased due to the increased cost of travel needed to perform the work. In many cases, the technicians would need to travel to the worksite and back each day by aircraft as there is no housing available. Manning of the Flight Service Stations in remote Alaska is highly dependent on having adequate housing available. Air traffic controllers at the Grand Canyon would have a 60 mile commute over a mountain pass if the housing at Grand Canyon were not there.

Program Plans FY 2016 – Performance Output Goals

- Complete 21 projects of housing infrastructure repairs or replacements based on prioritized requirements from previously completed assessments.
- Revise facility condition assessment.

Program Plans FY 2017-2020 – Performance Output Goals

- None.

2E09, Energy Management and Compliance (EMC)

FY 2016 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 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 FAA's ATC Facilities Strategic Sustainment 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 Orders 13423 and 13514, 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 Orders 13423 and 13514.
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 $30 million in FY 2015. (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 NAS 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 2016 – Performance Output Goals
- Install advanced electric meters at four facilities.
- Perform energy and water improvements at three facilities.
- Complete the design for energy and water improvements 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 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 five facilities.
- 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 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).

2E10, CHILD CARE CENTER SUSTAINMENT

FY 2016 Request $1.6M

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 11 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 Trible 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 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 the 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 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 2016 – Performance Output Goals

- Complete upgrade/modernization projects at 11 centers including but is not limited to HVAC, building/structural renovations, shade systems, hot water heaters, security systems, kitchen appliances and roofs. The number of projects will be based on a facility condition survey.

Program Plans FY 2017 – Performance Output Goals

- Complete upgrade/modernization projects at 11 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 11 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 2019-2020 – Performance Output Goals

- None.

2E11, FAA TELECOMMUNICATIONS INFRASTRUCTURE - 2 (FTI-2)

FY 2016 Request $1.0M

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 (SOA) technologies and specialized infrastructure services such a domain name service (DNS), network time protocol (NTP) service, security gateway services, and a highly accurate time synchronization service. The scope of the FTI-2 program will be to provide all of the capabilities currently available with 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. In addition, the FTI-2 program will address the challenges associated with the phase-out of telecommunication services offered by commercial carriers that are based upon time division multiplexing (TDM). Today, nearly 92% of the FAA’s telecommunications services are dependent upon TDM-based technology. Since 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 have 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 will begin market research and analysis activities to assess telecommunications industry and technology trends and the ability to satisfy critical FAA requirements.

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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Target

This program enables the FAA to begin initial planning for the FTI-2 program which will seek to acquire telecommunications services as more of a commercial commodity rather than the specialized services obtained under the legacy FTI program that are tailored to support unique NAS interfaces. Analysis is under way to determine the potential cost benefits of the program.

Program Plans FY 2016 – Performance Output Goals

- Conduct market research.
- Develop range of technical alternatives.
- Develop high-level ROM costs.
- Conduct internal assessments of future FAA requirements for telecommunications services.

Program Plans FY 2017 – Performance Output Goals

- Develop artifacts to achieve Initial Analysis Readiness Decision (IARD):
  - Preliminary Program Requirements
  - Initial Investment Analysis Plan

Program Plans FY 2018 – Performance Output Goals

- Develop artifacts to achieve IARD:
  - Enterprise Architecture Products/Views

Program Plans FY 2019-2020 – Performance Output Goals

- None.

2E12X, Independent Operational Test and Evaluation

FY 2016 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 2016-2020 – 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 2016 Request $26.4M

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. The FAA has, at the beginning of FY 2015, identified approximately 708 contaminated sites at approximately 153 distinct locations 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 FAA's ATC Facilities Strategic Sustainment Plan.

Annually, in September, the Environmental Site Cleanup Report (ESCR) is published. This document contains current and expected future cleanup activities for the 708 contaminated sites mentioned above. An estimate of out-year Environmental Remediation (ER) Liabilities is also included in this report. At the beginning of FY 2015 the ER Liability was estimated at approximately $716M uninflated, and with contingency and inflation the ER Liability was estimated at approximately $1.4B. We continue to make good progress toward remediating sites. Approximately five percent of the existing locations are closed each year; however, additional sites are also added each year, and some higher cost sites are expected to remain open for many years or decades. During FY2014, the total number of identified sites decreased by eight percent from 681 to 624 which resulted in the total number of locations decreasing by 32 percent from 129 to 87. However, during FY 2014, 84 new sites at 66 locations 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 $30 million in FY 2015. (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 2016-2020 – 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 2016 Request $20.2M

Regulation and Certification Infrastructure for System Safety (RCISS) – Segment 2, A17.01-02 / X, 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) and System Approach for Safety Oversight (SASO) programs.

RCISS Segment 2 (A17.01-02):

Segment 2 will upgrade and improve the hardware and software that helps safety and aircraft certification inspectors integrate information from several safety databases to improve their oversight of the industry. It will also increase the rate of data transfer from centralized databases to their mobile devices which will increase the time available for safety inspections. The portable devices that inspectors use during field work to maintain connection with the available databases will be updated on a four-year cycle to keep up with advances in mobile computing technologies. Segment 2 will also upgrade the protection of safety data systems to prevent this important data from being externally corrupted or destroyed by natural disaster. It will improve protection of the facility where the data is stored and prevent access to the data by unauthorized users.

Segment 2 program activities include technology refresh of the following IT infrastructure components supporting AVS's Safety Workforce of over 6,000 people:

- mobile toolkits (consisting of mobile tablet computers and peripherals);
- telecommunications services;
- application servers and data storage devices hosting national AVS safety applications; and
- COTS Software licenses.

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.

RCISS Segment 3 (A17.01-03):
RCISS Segment 3 will perform technology refresh on the AVS IT infrastructure established by Segments 1 and 2. A Final Investment Decision (FID) is planned for Q1 FY 2016 which will define the scope and activities for this segment.

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 (e.g. inspectors, engineers, investigators, and medical examiners) while working in the field, to airline safety records and the actions required to meet regulations and directives. RCISS enables 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.

Program Plans FY 2016 – Performance Output Goals
RCISS Segment 2 (A17.01-02):

- Complete technology refresh of 25% of the safety workforce mobile toolkits with enhanced telecommunications services.
- Complete Contract Award - Mobility Deployment 9 for annual technology refresh of safety workforce mobile toolkits. (APB Milestone)
- Complete Contract Award - Enterprise Data Center (EDC) Deployment 9 for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment. (APB Milestone)
- Complete contract award for annual technology refresh of disaster recovery equipment.
- Complete Deployment 9 Technology Refresh.

RCISS Segment 3 (A17.01-03):

- 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 for RCISS Segment 3.

Program Plans FY 2017 – Performance Output Goals

RCISS Segment 2 (A17.01-02):

- None.

RCISS Segment 3 (A17.01-03):

- 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.

Program Plans FY 2018 – Performance Output Goals

RCISS Segment 2 (A17.01-02):

- None.

RCISS Segment 3 (A17.01-03):

- 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.

Program Plans FY 2019 – Performance Output Goals

RCISS Segment 2 (A17.01-02):

- None.

RCISS Segment 3 (A17.01-03):

- 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.

Program Plans FY 2020 – Performance Output Goals

RCISS Segment 2 (A17.01-02):

- None.

RCISS Segment 3 (A17.01-03):

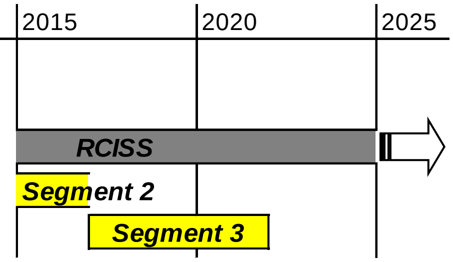
- Complete technology refresh of 25% of the safety workforce mobile toolkits with enhanced telecommunications services.
- Complete Mobility Deployment 13 contract award for annual technology refresh of safety workforce mobile toolkits.
- Complete Enterprise Data Center Deployment 13 contract award for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment.

System Implementation Schedule

Aviation Safety Analysis System (ASAS) - Regulation and Certification Infrastructure for System Safety (RCISS)

Segment 2: First site Delivery: 2012 -- Last site Delivery: 2016

Segment 3: First site Delivery: 2017 -- Last site Delivery: 2021



3A03, LOGISTICS SUPPORT SYSTEM AND FACILITIES (LSSF)

FY 2016 Request $4.0M

Logistics Center Support System (LCSS) – Segment 2, M21.04-01

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. The program modernizes the FAA's supply chain management by replacing the 20-year old Logistics Inventory System (LIS).

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.

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 was baselined in 2012 and final operational capability was originally planned for 2014. Due to delays in the development effort, a baseline change was approved in April 2014 and final operational capability is now scheduled for 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

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 2016 – Performance Output Goals

- Achieve Final Operational Capability. (APB milestone)
- Decommission legacy Logistics Inventory System (LIS).

Program Plans FY 2017-2020 – Performance Output Goals

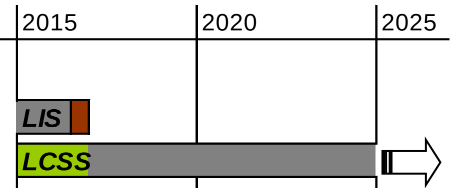
- None.

System Implementation Schedule

Logistics Center Support System (LCSS)

Decom: 2016

IOC: May 2015 -- FOC: April 2016



3A04, NATIONAL AIRSPACE SYSTEM (NAS) RECOVERY COMMUNICATIONS (RCOM)

FY 2016 Request $12.0M

NAS Recovery Communications (RCOM), C18.00-00

Program Description

Under the RCOM program the FAA emergency Command and Control Communications (C3) system provides FAA with the capability to directly manage the NAS during local, regional and national emergencies when normal common-carrier communications are interrupted. The C3 system provides and enhances a variety of fixed-position, portable, and transportable emergency communications systems that support crisis management. The C3 system enables the FAA and other Federal agencies to exchange classified and unclassified communications to protect national security. The C3 system also supports and modernizes the Washington Operations Center Complex and several FAA "continuity of operations" sites, which ensures FAA executives have command and communications during times of crisis. 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 Communications 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 FAA Administrator shares this information with staff members, key regional managers, the Secretary of Transportation, and other national-level executive personnel.

Program Plans FY 2016 – Performance Output Goals
- Procure and install VHF-FM equipment for Cleveland District.
- Complete SharePoint 2013 migration.
- 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 technical refresh of network servers, firewalls, routers, and video monitors.
- Procure fixed satellite test system.

Program Plans FY 2017 – Performance Output Goals
- Procure and install VHF-FM equipment for Philadelphia District.
- Complete technical refresh of the Disaster Recovery application.
- Perform vehicle upgrades and quarterly testing for CST.
- Complete technical refresh of workstations, laptops, and monitors.
- Replace aging STEN with new satellite network.

Program Plans FY 2018 – Performance Output Goals
- Procure and install VHF-FM equipment for Columbia District.
- Create Geographic Information System (GIS) applications for use on cellular phones and tablets.
- Perform vehicle upgrades and quarterly testing for CST.
- Complete technical refresh on Homeland Security Data Network system.

Program Plans FY 2019 – Performance Output Goals
- Procure and install VHF-FM equipment for Washington District.
- Complete technical refresh of EON GIS hardware/software.
- Replace CST Emergency Response Vehicle.
- Complete technical refresh of secure facsimile equipment.
- Complete technical refresh of Storage Area Network and network switches.

Program Plans FY 2020 – Performance Output Goals
- Procure and install VHF-FM equipment for Dallas District.
- Complete technical refresh of network servers, firewalls, routers, and video monitors.
- Perform technical refresh on facility equipment at the PAF.
- Upgrade software systems for EON.

3A05, FACILITY SECURITY RISK MANAGEMENT
FY 2016 Request $15.0M

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, such as ARTCC, ATCT, and TRACON 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 FAA's ATC Facilities Strategic Sustainment 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. The program supports the operational availability metric because enhanced security prevents loss of NAS service.

Program Plans FY 2016 – Performance Output Goals

- Complete installation of X-ray machines (30 sites) by September 30, 2016. (APB milestone)
- Complete PIV access control retro-fit (75 sites).
- Complete installation of security upgrades at William J. Hughes Technical Center.

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).

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).

3A06, INFORMATION SECURITY
FY 2016 Request $12.0M

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, NextGen, and Mission Support functions, 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 entire FAA and 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 entire 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 as well as the more sophisticated and dangerous targeted cyber-attacks. The Advanced Persistent Threat events are one type of event the team at 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. Establish oversight by 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 by: (1) ensuring effective preparedness, detection, response, and recovery regarding cyber-attacks; (2) integrating information security efforts into all acquisition and operation phases to protect FAA people, buildings, and information; and (3) supporting efforts to safeguard homeland security, in particular the FAA's component of the nation's critical infrastructure and industry.

Program Plans FY 2016 – Performance Output Goals

- Implement solutions and services to achieve continuous diagnostics and mitigation (CDM) endpoint integrity goals of managing: hardware, software, configuration settings and known vulnerabilities.
- Implement Security dashboard technologies to provide near real-time visualization of FAA's hardware, software, and vulnerabilities.
- Evaluate and deploy, if appropriate, a new technology to combat APT.
- Deploy full packet capture capability through Flexible Analysis System (FAS) 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.
- Conduct software code vulnerability security analysis on 100 legacy and developmental agency systems.
- Deploy wireless intrusion detection/wireless application protocol (WID/WAP) to 145 FAA facilities.
- Develop architecture and engineering efforts for alternative solutions to secure new FAA systems.

Program Plans FY 2017 – Performance Output Goals

- Evaluate solutions and services to achieve 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, if appropriate, a new technology to combat APT.
- Validate full packet capture capability through FAS at two new strategic network points.
- Integrate advanced and evolved vulnerability and USGCB scanning within the FAA's IP based networks.
- Evaluate new technologies to address complex and rapidly changing cyber threats and vulnerabilities.
- Deploy WID/WAP to 145 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.

Program Plans FY 2018 – Performance Output Goals

- Implement solutions and services to achieve 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, if appropriate, new technologies to combat APT.
- Deploy full packet capture capability through FAS at two new strategic network points.
- 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, if appropriate, new technologies to combat APT.
- Deploy full packet capture capability through FAS at two new strategic network points.
- 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, if appropriate, new technologies to combat APT.
- Deploy full packet capture capability through FAS at two new strategic network points.
- Evaluate new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.

3A07, SYSTEM APPROACH FOR SAFETY OVERSIGHT (SASO)

FY 2016 Request $18.9M

System Approach for Safety Oversight (SASO) – Phase 2a, A25.02-01 / 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). SMS within AFS consists of four primary "pillars" or 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:

- Development of a positive safety culture between AVS, AFS and certificated and non-certificated entities;
- Communication of ongoing SMS efforts and outputs to all employees;
- Establishment of 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.

SASO Phase II Alpha (A25.02-01):
SASO Phase II Alpha covers the years FY 2010 through FY 2016. During Alpha, the AFS SAS Pilot Project is being further developed and implemented and adds functionality to support AFS oversight of Title 14 CFR Parts 121 (major air carriers), 135 (commuter and on-demand operators) and 145 (repair stations). In October 2010, a prototype demonstration failed a risk-based analysis, a key requirement of the AFS SAS. A rework effort of the business processes was completed and changes were incorporated into the SAS design. Also, changes to the testing and implementation strategies were instituted to help mitigate any further program risk. As a result, the SAS development and deployment was delayed by approximately twenty eight months and the original completion of this phase is now scheduled for completion in Q2 FY 2016. The program achieved the first SAS Key Site initial operational capability (IOC) in June, 2014 and the first SAS Production IOC in September, 2014. Full deployment of the SAS to approximately 100 field sites and headquarters is planned for completion by Q2 FY 2016 in accordance with the revised Phase II Alpha Acquisition Program Baseline (APB) schedule. The SASO Phase II Alpha Baseline Change Decision (BCD) was finalized and approved by the Joint Resource Council (JRC) in September 2013, to reflect these program changes.

SASO Phase II Beta (A25.02-02):
SASO Phase II Beta covers the period from FY 2015 through FY 2020. 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 2019).** 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. It also includes a planning effort to prepare for Segment 2 which includes an analysis of AFS business processes, systems, and data management, and developing a business case. The Phase 2b, Segment 1 Final Investment Decision (FID) is scheduled for Q4, FY 2015.

- **Segment 2 (FY 2017 - FY 2020).** 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 2b, Segment 2 FID is scheduled for Q2, FY 2017.

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 implements 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 2016 – Performance Output Goals
SASO Phase II Alpha (A25.02-01):
- Complete Last Site IOC for the SAS. (APB Milestone)

SASO Phase II Beta (A25.02-02):
- Complete Developmental Testing 1.

Program Plans FY 2017 – Performance Output Goals
SASO Phase II Alpha (A25.02-01):
- None.

SASO Phase II Beta (A25.02-02):
- Complete Developmental Testing 2.
- Achieve Phase II Beta, Segment 2 FID.

Program Plans FY 2018 – Performance Output Goals
SASO Phase II Alpha (A25.02-01):
- None.

SASO Phase II Beta (A25.02-02):
- Segment 1: User Acceptance Testing (UAT) Completion.
- Segment 1: SAS First Key Site Deployment and First Key Site IOC.
- Segment 1: SAS First Production Deployment and First Production IOC.
- Segment 2: Business Process/System Consolidation Implementation Start.

Program Plans FY 2019 – Performance Output Goals
SASO Phase II Alpha (A25.02-01):
- None.

SASO Phase II Beta (A25.02-02):
- Segment 1: SAS Final Operational Capability (FOC).

Program Plans FY 2020 – Performance Output Goals
SASO Phase II Alpha (A25.02-01):
- None.

SASO Phase II Beta (A25.02-02):
- Segment 2: Business Process/System Consolidation Implementation Complete.

System Implementation Schedule

3A08, Aviation Safety Knowledge Management Environment (ASKME)

FY 2016 Request $7.5M

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 was established to provide a comprehensive automation environment for critical safety business processes for Aviation Safety (AVS) through deployment of integrated business solutions/projects between Fiscal Year 2008 and 2017. Segment 1, approved by the JRC in 2007, covers FY 2008 – 2012. Segment 2, approved by the JRC in September 2011, covers FY 2013 to 2017. Segment 2 is in progress.

ASKME projects will provide electronic storage and retrieval of FAA safety data and information from FAA technical documentation, and lessons learned from previous certifications that involved aircraft design and manufacturing safety issues, so that they can be accessed and shared more efficiently. ASKME will provide a comprehensive automated system and 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. This will help inspectors in approving new operating certificates, and ensuring that design or modification of aircraft meets aircraft safety regulations. It will also aid in designee management, evaluation and compliance and evaluation (audit) of certification activities, answering external inquiries, necessary enforcement actions, continued operational safety management, and international coordination.

Segment 2 IT Application Deliverables Include:

- Electronic File System (EFS) – Production Support and Historical Scanning
- Work Tracking Software – Budget Management (WTS-BMgmt)
- Airworthiness Directives Development (ADD)
- Airworthiness Certifications
- 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 2016 – Performance Output Goals

- Complete Segment 2 planning activities in support of an integrated design and implementation framework.
- Complete integrated design activities in support of the Segment 2 implementation.
- Begin integrated development activities in support of Segment 2 implementation.
- Complete deployment of the Work-Tracking Software – Budget Management (WTS-BMgmt) functional component. (APB milestone)
- Complete deployment of Airworthiness Directives Development (ADD) functional component. (APB milestone)

Program Plans FY 2017 – Performance Output Goals

- Complete scanning of all historical documents for Electronic File System (EFS).
- Complete requirements document identifying additional user needs.
- Conduct user in service training.
- Complete deployment of the Compliance and Enforcement Actions (CEA) functional component. (APB milestone)
- Complete development, implementation and release of ASKME Segment 2. (APB milestone)

Program Plans FY 2018-2020 – Performance Output Goals

- None.

3A09, AEROSPACE MEDICAL EQUIPMENT NEEDS (AMEN)

FY 2016 Request $2.5M

Aerospace Medical Equipment Needs (AMEN) – Phase 2, M53.01-02 / 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, physicians, and engineers is becoming obsolete. This aging equipment places several accreditations at risk (i.e., American Board of Forensic Toxicologists; College of American Pathologists; 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.

<u>Aerospace Medical Equipment Needs (AMEN) – Phase 2 (M53.01-02):</u>
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, 10 of which are Commercial-Off-The-Shelf (COTS) products. The equipment to be replaced includes five computer-based flight operations and 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 is currently preparing for a planned August 2015 Final Investment Decision (FID) to begin replacement of this equipment.

<u>Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3 (M53.01-03):</u>
AMEIN Phase 3 will provide for the continued technology refresh of CAMI aerospace medical and human factors research divisions' laboratory assets.

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 at which time all research and safety analysis activities were suspended. Some education activities were temporarily performed at a local college swimming pool while the tank wall was repaired. The continued deterioration of that wall, which cannot be further repaired, presents a high risk of catastrophic structural failure and will ultimately lead to the WSRF tank becoming completely unusable in the near future.

CAMI plans to construct a new Wind and Wave Evacuation & Survival (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 necessary 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 wave generating capability necessary to challenge the design and function of water safety and survival equipment and procedures.

The program will follow the Acquisition Management System (AMS) process for future decisions.

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

More 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).

WiWAVES 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 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 2016 – Performance Output Goals

<u>Aerospace Medical Equipment Needs (AMEN) – Phase 2 (M53.01-02):</u>

- Contract Awards for six items:
  - One biochemistry/forensic toxicology testing system (Micro Gas Chromatograph (GC))
  - One specialized camera
  - One anthropometric test device
  - One engineering calibration device
  - One miniature data acquisition & processing system
  - GATTOR research simulator

<u>Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3 (M53.01-03):</u>

- None.

Program Plans FY 2017 – Performance Output Goals

Aerospace Medical Equipment Needs (AMEN) – Phase 2 (M53.01-02):

- Contract Awards for two items:
  - TAGARS
  - AURS
- In Service (available for use) – five items:
  - GC
  - One specialized camera
  - One anthropometric test device
  - One engineering calibration device
  - One miniature data acquisition & processing system

Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3 (M53.01-03):

- None.

Program Plans FY 2018 – Performance Output Goals

Aerospace Medical Equipment Needs (AMEN) – Phase 2 (M53.01-02):

- Contract Award for four items:
  - ATCARS
  - One biochemistry/forensic toxicology testing system (Ultraviolet and Visible Absorption Spectroscopy (UV/VAS))
  - One specialized camera
  - ARS
- In Service (available for use): GATTOR.

Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3 (M53.01-03):

- Complete Architectural design.
- Complete Engineering and Ground Studies.

Program Plans FY 2019 – Performance Output Goals

Aerospace Medical Equipment Needs (AMEN) – Phase 2 (M53.01-02):

- In Service (available for use): (Prior year funds)
  - TAGARS
  - AURS
  - UV/VAS
  - One Specialized camera

Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3 (M53.01-03):

- Contract Award: General Contractor for facility.

Program Plans FY 2020 – Performance Output Goals

Aerospace Medical Equipment Needs (AMEN) – Phase 2 (M53.01-02):

- In Service (available for use): (Prior year funds)
  - ATCARS
  - AURS

Aerospace Medical Equipment & Infrastructure Needs (AMEIN) – Phase 3 (M53.01-03):

- Start facility installation.
- Complete acquisition of specialized equipment.

3A10, NextGen – System Safety Management Portfolio

FY 2016 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 fuses these data sources in order 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 information analysis and sharing mission directly supports safety promotion and safety assurance initiatives with 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 new systems in NextGen as well as 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 precursors to accidents. ASIAS aggregates multiple sources of aviation safety data in a central repository, increasing its potential value for analysis-based insight and providing insights only available through shared data. ASIAS also has advanced safety analytical capabilities and performs analyses that would not 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 that might otherwise remain hidden until uncovered 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 evolves to NextGen.

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 textural and numeric 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, to others in the aviation community. Participants will leverage insights 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 (e.g., commercial, general aviation (GA), helicopters) and other civilian agencies involved with aviation operations (e.g., airport operators, airport authorities) and specifically to the FAA as it develops and implements NextGen. ASIAS supports promotion and expansion of safety information efforts, particularly as a FAA-industry partnership and data-driven safety program to identify, prioritize and address risks and/or vulnerabilities before they lead to accidents.

Program Plans FY 2016 – Performance Output Goals

- Establish an initial data sharing agreement with at least one Rotorcraft operator, develop standards for Rotorcraft digital flight data sharing, and develop requirements for tools to analyze Rotorcraft data.
- Develop and implement a process to investigate know risks and safety issues specific to the GA community; and enhance ASIAS architecture to support the collection of GA safety data.
- Deploy an ASIAS capability to automatically incorporate select ATC voice data into ASIAS data sets, and increase routine processing of Surveillance Broadcast Services (SBS) data for safety analysis.
- Develop an automated safety trend/anomaly detection capability to find high-risk safety events, and develop new safety metrics for Part 121 operations using ASIAS Flight Story data fusion (text and digital) capability.
- Complete an expanded set of safety data products (e.g., data fusion) to support development and analysis NextGen Operational Capabilities.
- Develop automated voice-to-text data classification models/algorithms for use in ASIAS safety studies and metrics.

Program Plans FY 2017 – Performance Output Goals

- Enable full 3-D visualization of selected safety events using aggregate fused data for use by ASIAS participants in their internal analyses.
- 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

- Establish the participation in ASIAS of UAS operators based upon risk-based, statistically significant standards.
- Transition non-protected ASIAS data to a FAA cloud-based architecture for improved data storage and analytical capabilities, and to provide enhanced data sharing and access to other ASIAS stakeholders.
- 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

- Develop capability to monitor and assess data quality for ASIAS participants' Safety Reporting Programs.
- Expand the ASIAS Information Technology architecture to support Rotorcraft vulnerability discovery, monitoring metrics and benchmarks in ASIAS.
- Develop open standards for Flight Operational Quality Assurance (FOQA) data to be used in ASIAS to improve data processing efficiency and capabilities.
- 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

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.
- Deploy advanced visualization (e.g. 3-D) tools on the ASIAS portal that include user customized parameters and displays for improved safety analysis.
- Conduct ASIAS Directed Studies using tailored analytical techniques in support of NextGen system changes (e.g., Air Traffic Management procedures, airspace redesign) and community changes (e.g., fleet changes, avionics upgrades) to support NAS-wide safety analysis.
- Provide ASIAS study results and analysis, and develop metrics in support of CAST safety risk mitigation activities.

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 an acceptable level. 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 system to provide integrated safety analysis for hazard assessments. Mechanisms to define and support integrated risk-based approaches to safety and safety oversight will be prototyped to monitor operational safety and determine the safety implications to the air transportation system of operational changes primarily related to NextGen.

The activities included in the Systems Safety Management Transformation program include:

<u>Airport and Terminal Risk Baseline and Forecast:</u>
An Airport and Terminal area 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.

<u>Integrated Safety Assessment Model (ISAM) Baseline and Forecast:</u>
Integrated system risk analysis baseline software programs and 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 including 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 in the research supporting 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 making all stakeholders more effective in their approach to managing safety. Processes will be re-engineered, 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 2016 – Performance Output Goals

Integrated Safety Assessment Model Baseline and Forecast:

- Produce a detailed functional Concept of Operations (ConOps) for ISAM, including a data-interchange protocol and a precursor data tracking requirements document to link FAA data sources to ISAM feeds.
- Incorporate a specific risk/barrier model assessment capability into the ISAM software to support ATO risk analysis.
- Directly integrate the outputs of the airport and terminal risk baseline forecasting model into the ISAM risk model.
- Increase the scope of the ISAM model to include domestic operations of international carriers, international operations of domestic carriers, and the impact of planned Single European Sky Air Traffic Management Research (SESAR) segments as relevant to each.
- Update the ISAM model to cover planned NAS-wide changes due to NextGen, Rulemaking, and new vehicle implementations, and deliver annual NAS-wide risk impact assessment for NextGen implementation segments with a risk report and metric assessment using ISAM model and expert assessments.

Program Plans FY 2017 – Performance Output Goals

Airport and Terminal Risk Baseline and Forecast:

- Demonstrate near real time (15 minute interval) location specific risk baseline capability at three major airports.
- Demonstrate near real time (15 minute interval) location specific risk forecasts capability at three major airports.
- Produce a service assessment report of the trial risk baseline test with recommendations for extension beyond a small number of airports.

Integrated Safety Assessment Model Risk Baseline and Forecast:

- Enhance the ATO-barrier model analysis with a direct interface to ATO source data on accidents and incidents via an FAA Enterprise service such as SWIM. Validate data interface for reliability and accuracy.
- Produce monthly NAS-wide risk metrics and reports for system baselines and operational impacts of NextGen changes.
- Produce monthly NAS-wide risk forecasts, trend modeling and reporting, evaluation of NAS-wide implementation of NextGen, rulemaking and/or new vehicle operations.
- Include General Aviation operations-related incident and accident data in the ISAM Event Sequence Diagrams /Fault Tree models, recalculate risk baseline and forecast accordingly.

Program Plans FY 2018 – Performance Output Goals

Airport and Terminal Risk Baseline and Forecast:

- Produce validation report and functional concept of operations document.

Integrated Safety Assessment Model Risk Baseline and Forecast:

- Produce monthly NAS-wide risk metrics and report including system baselines and trends.
- Develop monthly commercial operations report highlighting aircraft-specific risks.
- Develop monthly commercial operations report for ATO operations.
- Produce monthly NAS-wide risk forecasts, trend modeling and reporting.
- Develop monthly general aviation operations report (to cover top 100 airports).
- Develop Cloud-architecture ConOps for transition of airport and terminal risk baseline and forecast.

Program Plans FY 2019 – Performance Output Goals
Integrated Safety Assessment Model Risk Baseline and Forecast:
- Produce monthly NAS-wide risk metrics and report including system baselines and trends.
- Produce monthly commercial operations report highlighting aircraft-specific risks.
- Produce monthly commercial operations report for ATO operations.
- Produce 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 monthly NAS-wide risk metrics and report including system baselines and trends.
- Produce monthly commercial operations report highlighting aircraft-specific risks
- Produce monthly commercial operations report for ATO operations.
- Produce monthly NAS-wide risk forecasts, trend modeling and reporting.

3A11, National Test Equipment Program
FY 2016 Request $4.0M

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.

Analysis conducted 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, replacement of some analog test equipment must be done for compatibility with digital technology now being deployed to support NextGen initiatives and other FAA programs. 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.

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 supplies of test equipment have the potential to increase the mean-time-to-restore a system that has experienced an outage. Modern test equipment that is readily available to technician’s decreases the time necessary to repair and return equipment to service in the NAS.

Program Plans FY 2016 – 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 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.

3A12, Mobile Assets Management Program
FY 2016 Request $4.8M

Mobile Asset Management Program, F31.01-01

Program Description

The Mobile Asset Management Program (MAMP) provides easily moveable 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 ATCT or other NAS system is out of service due to a disaster or extensive repair/modernization/upgrade and to augment air traffic control functions during major public events which may impact air traffic safety. 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 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. The inventory consists of 104 assets, of which 45 are significant. The assets range from 30 kilowatt Mobile Engine Generators (MX) to four-position, mobile ATCTs (MATCTs). The near term need is to replace eight obsolete large four-position MATCTs and restore the remaining assets to a full operational capability. The MATCTs, which were acquired in the 1990s are experiencing serious material failures and must be replaced. With an increase in frequency of ATCT modernization projects the requirements for use of MATCT’s and MATCT’s with a TRACON capability has also increased. MAMP is developing an additional modular air traffic control tower type with ability to incorporate TRACON positions and equipment in a code compliant working environment designed specifically for longer term deployments of 12 months or more. The new version will be referred to as a Deployable Air Traffic Control Facility (DATCF). 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 significant difficulty in providing functional mobile assets when emergency conditions warrant their use. MAMP will provide the mobile assets and the means to manage those assets. This program is included in FAA’s ATC Facilities Strategic Sustainment Plan.

A National Mobile Asset Deployment Center (MADC) was established in the Central Service Area. The MAMP will assist Eastern Service Area and Western Service Area to establish their Mobile Asset Deployment Centers in FY 2015. 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 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 NAS restoral 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, necessitating the development of “work around” procedures that result in extending the duration of the projects. Additionally, the majority of the 264 FAA owned permanent ATCTs are over 50 years old resulting in an increased frequency of modernization projects and an increasing number of unforeseen outages requiring mobile assets to maintain operations.

Program Plans FY 2016 – Performance Output Goals
- Acquire two Deployable Air Traffic Control Facilities (DATCF).
- Upgrade and perform technology refresh to four existing mobile assets.

Program Plans FY 2017 – Performance Output Goals
- Acquire one DATCF.
- Repair / modernize two MATCTs.

Program Plans FY 2018 – Performance Output Goals
- Acquire one large self-contained MATCT.
- Repair / modernize two MATCTs.

Program Plans FY 2019 – Performance Output Goals
- Acquire one large self-contained MATCT.
- Repair / modernize two MATCTs.

Program Plans FY 2020 – Performance Output Goals
- None.

3A13, Aerospace Medicine Safety Information System (AMSIS)

FY 2016 Request $3.0M

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 400,000 pilots and ATCSs each year and maintains millions of medical records as part of AAM's role in the oversight of three quarters of a million 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 become 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 4,500 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. This AMSIS segmentation strategy was approved by the JRC in Q4 FY 2014.

The scope of each Segment is:

- Segment 1 (Mature Requirements)
    - Medical Certification (Airman) Module
    - Medical Clearance (ATCS) Module
    - Industry Substance Abuse Module
    - Reporting & Data Services Module
    - Business Process Management Module
- Segment 2 (Additional Analysis Required)
    - Employee Substance Abuse Module
    - Aerospace Medical Analysis Module
    - Reporting & Data Services Module (New Reports & Analytics)
    - Budget Module

AMSIS completed an Investment Analysis Readiness Decision (IARD) in Q4 FY 2013 and an Initial Investment Decision (IID) in Q1 FY 2015. Final Investment Decision (FID) for Segment 1 is planned for Q1 FY 2016.

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 hazardous to aviation safety;
- Improving the ability to analyze medical data and identify and mitigate hazards related to specific and/or systemic airmen and ATCS health issues;
- Improving 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;
- Leveraging the National Health Information Network (NHIN), Health Information Exchange (HIE) system medical records, and Ad Hoc, Regional, Multi-Regional HIEs, to improve the accuracy of airmen and ATCS medical data; and
- Improving the surveillance and oversight of designees and aviation industry substance abuse programs.

Program Plans FY 2016 – Performance Output Goals

- Develop the following products in support of the FID (Segment 1):
  - Final Program Requirements documentation
  - Enterprise Architecture Artifacts
  - Business Case documentation
  - Implementation Strategy and Planning Document (ISPD)
  - Acquisition Program Baseline (Execution Plan)
- Achieve FID (Segment 1).
- Complete System Design (Segment 1).

Program Plans FY 2017 – Performance Output Goals

- Complete System Development (Segment 1).
- Complete Integration and Testing of IT system (Segment 1).
- Achieve FID for Segment 2.
- Complete System Design (Segment 2).

Program Plans FY 2018 – Performance Output Goals

- Complete System Development (Segment 2).
- Complete Integration and Testing (Segment 2).

Program Plans FY 2019 – Performance Output Goals

- Achieve Final Operational Capability (FOC) (Segment 1).
- Achieve FOC (Segment 2).

Program Plans FY 2020 – Performance Output Goals

- Complete program close-out, transition to Operations.

3A14, TOWER SIMULATION SYSTEM (TSS) TECHNOLOGY REFRESH

FY 2016 Request $7.0M

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 airport locations (i.e., hubs); provides satellite capabilities for an additional 138 facilities including systems for the FAA Academy at the Mike Monroney Aeronautical Center and the William J. Hughes Technical Center; and 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 and when that training is complete, 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 8 years old and is becoming more expensive to operate and maintain. The projection screens need to be replaced with updated visual technology and video processors to increase fidelity, processing power, and reduce maintenance costs. Based upon the successes realized under the TSS program, additional airport locations and satellite facilities are under consideration. Procuring and implementing mobile platforms for expansion will provide additional service and coverage at a greatly reduced cost.

The Investment Analysis Readiness Decision is planned for 1Q FY 2016. The Final Investment Decision (FID) is planned in Q4 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 7 – Achieve documented cost savings and cost avoidance of $30 million in FY 2015. (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 2016 – Performance Output Goals

- Achieve FID.

Program Plans FY 2017 – Performance Output Goals

- Procure and install updated TSS equipment and capabilities at locations to be determined.

Program Plans FY 2018 – Performance Output Goals

- Procure and install updated TSS equipment and capabilities at locations to be determined.

Program Plans FY 2019-2020 – Performance Output Goals

- None.

B: Training, Equipment, and Facilities

3B01, Aeronautical Center Infrastructure Modernization

FY 2016 Request $15.2M

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 (Navaids)), 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, supporting the work of 7,100 FAA employees, students, and contractors on a daily basis; and approximately 11,000 visitors annually; the largest concentration of FAA personnel outside of Washington D.C. Many buildings are approximately 50 years old and in need of renovation and building system replacement.

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 loss of productivity.

The aging infrastructure, in combination with growth and improvements to the NAS and business services, affects Aeronautical Center personnel and facility requirements in which they work. This program extends the useful life of facilities at the Center for 25-30 years, 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 $30 million in FY 2015. (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 resident and computer-based 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 2016 – Performance Output Goals

- Award renovation construction contract for Phase 1 (of 7) of Multi-Purpose Building #24, to replace elevators, windows, remove uninsulated exterior building panels, add insulation that complies with industry standards, and provide energy efficient lighting.
- Complete Phases 3 & 4 (final phases) renovation construction of the Systems Training Building.
- Award contracts for Phase 5 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, security in 16 of 78 buildings. Includes security assessments, upgrades, disaster recovery testing and installation of fiber/copper cable for network diversity and availability.
- Complete network design, test, reconfiguration, security assessments and upgrades, disaster recovery testing and installation of communication duct banks/fiber.

Program Plans FY 2017 – Performance Output Goals

- Complete renovation construction of Bldg 152, the Environmental Systems Support facility.
- Complete relocation and construction of Common Air Route Surveillance Radar (CARSR) classrooms and laboratories to the west side of the campus.
- Award construction contracts to relocate classrooms and laboratories for the Air Surveillance Radar (ASR-8) to the west side of the campus.
- Award contracts for Phase 6 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, security in 9 of 78 buildings. Includes security assessments and 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 assessments and upgrades, disaster recovery testing and installation of communication duct banks/fiber cable.

Program Plans FY 2018 – Performance Output Goals

- Complete Phase 1 (of 7) Multi-Purpose Building renovation to replace elevators, windows, remove uninsulated exterior building panels, add insulation that complies with industry standards, and provide energy efficient lighting.
- Award contract for Phase 2 (of 7) Multi-Purpose Building 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 78 buildings. Includes security assessments and upgrades, disaster recovery testing and installation of fiber/copper cable for central campus network diversity and availability.
- Complete network design, test, reconfiguration, security assessments, security upgrades, disaster recovery testing, and installation of communication duct banks/fiber cable.

Program Plans FY 2019 – Performance Output Goals

- Complete Phase 2 (of 7) renovation of Multi-Purpose Building to add seismic and wind bracing to the building to mitigate earthquake and high wind damage.
- Complete construction to relocate classrooms and laboratories for the Air Surveillance Radar (ASR-8) to the west side of the campus.
- 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 2 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, security in 13 of 78 buildings. Includes security assessments, upgrades, and disaster recovery testing and fiber/copper cable for northwest campus network diversity and availability.
- Complete network design, test, reconfiguration, security assessments, security upgrades, disaster recovery testing, and installation of communication duct banks/fiber cable.

Program Plans FY 2020 – Performance Output Goals

- Award renovation/construction contract for Phase 3 (of 7) of Multi-Purpose Building to replace mechanical systems, upgrade electrical wiring, plumbing, and provide energy efficient lighting.
- Complete construction to relocate classrooms and laboratories for the Air Surveillance Radar (ASR-9/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, security in 10 of 78 buildings. Includes security assessments, upgrades, and disaster recovery testing and fiber/copper cable for east campus network redundancy and availability.
- Complete network design, test, reconfiguration, security assessments, security upgrades, disaster recovery testing, and east campus communication duct banks/fiber installation.

3B02, Distance Learning

FY 2016 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 (CBI) 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: 2275 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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

The major benefit of distance learning is the substantial reduction in student time away from work, and student travel and per diem costs associated with resident-based training. In addition, distance learning delivery methods increase training effectiveness, increase training opportunities for all FAA employees, and 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 2016 – Performance Output Goals

- Award contract to provide for the technology refresh of 565 out of 2275 (a cumulative total of 82.4%) DLPs at Air Traffic Organization Technical Operations (ATO-TO) and Federal Contract Tower (FCT) learning centers by Sept-2016.
- Provide updates to courseware and application via network and/or DVD’s to 2275 DLPs by Sept-2016.

Program Plans FY 2017 – Performance Output Goals

- Award contract to provide for technology refresh of 400 out of 2275 (a cumulative total of 100%; end of refresh cycle FY14-FY17) DLPs at 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 to provide for technology refresh of 475 out of 2275 (a cumulative total of 20.9%) DLPs 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 to provide for technology refresh of 450 out of 2275 (a cumulative total of 40.7 %) DLPs 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 to provide for technology refresh of 450 out of 2275 (a cumulative total of 60.4%) 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.

System Implementation Schedule

ACTIVITY 4: FACILITIES AND EQUIPMENT MISSION SUPPORT

4A01, SYSTEM ENGINEERING (SE2020) AND DEVELOPMENT SUPPORT

FY 2016 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 (SE-2020) program manages a portfolio of contracts providing 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

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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

The SE2020 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 2016 – Performance Output Goals

- Conduct Monthly meetings with 2020 vendors.
- Conduct Quarterly Vendor Program Management Reviews.
- Conduct CFO Quarterly Reviews.
- Develop Contract and Financial Status Report (monthly basis).
- Develop 2020 Update to FAA NextGen Executive Team (monthly basis).
- Conduct Monthly briefings for NextGen Directorates with SE2020 task orders.
- Exercise Full and Open Option for one 2020 prime vendor.
- Perform vendor fee reconciliation for one 2020 prime vendor.

Program Plans FY 2017 – Performance Output Goals
- Conduct Monthly meetings with 2020 vendors.
- Conduct Quarterly Vendor Program Management Reviews.
- Conduct CFO Quarterly Reviews.
- Develop Contract and Financial Status Report (monthly basis).
- Develop 2020 Update to FAA NextGen Executive Team (monthly basis).
- Conduct Monthly briefings for NextGen Directorates with SE2020 task orders.

Program Plans FY 2018 – Performance Output Goals
- Conduct Monthly meetings with 2020 vendors.
- Conduct Quarterly Vendor Program Management Reviews.
- Conduct CFO Quarterly Reviews.
- Develop Contract and Financial Status Report (monthly basis).
- Develop 2020 Update to FAA NextGen Executive Team (monthly basis).
- Conduct Monthly briefings for NextGen Directorates with SE2020 task orders.
- Exercise Second Option Period for 2020 Full and Open prime vendors.
- Perform vendor fee reconciliation.

Program Plans FY 2019 – Performance Output Goals
- Conduct Monthly meetings with 2020 vendors.
- Conduct Quarterly Vendor Program Management Reviews.
- Conduct CFO Quarterly Reviews.
- Develop Contract and Financial Status Report (monthly basis).
- Develop 2020 Update to FAA NextGen Executive Team (monthly basis).
- Conduct Monthly briefings for NextGen Directorates with SE2020 task orders.
- Perform vendor fee reconciliation.
- Exercise Second Option Period for 2020 Full and Open prime vendor.

Program Plans FY 2020 – Performance Output Goals
- Conduct Monthly meetings with 2020 vendors.
- Conduct Quarterly Vendor Program Management Reviews.
- Conduct CFO Quarterly Reviews.
- Develop Contract and Financial Status Report (monthly basis).
- Develop 2020 Update to FAA NextGen Executive Team (monthly basis).
- Conduct Monthly briefings for NextGen Directorates with SE2020 task orders.
- Issue new full and open contract awards (Strategy to be determined)
- Perform 2020 vendor fee reconciliation.

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 $30 million in FY 2015. (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 2016-2020 – Performance Output Goals

- Implement projects as required and approved in the budget year.

4A02, PROGRAM SUPPORT LEASES
FY 2016 Request $46.7M

Program Support Leases, M08.06-00

Program Description

The Program Support Leases line item funds over 2,900 leases that support air traffic operations. This program provides oversight of both existing and new leases. FAA leases land needed for buildings, shelters, and transmission towers for communication, surveillance, and navigation systems. The program also leases land and commercial space for Air Traffic Control Towers (ATCTs), system support facilities, and other mission related activities. New leases are required when ATC facilities are relocated or when airspace redesign requires new sites for additional navigation and communications equipment. New leases may also be needed when new ATCTs or service area technical facilities are built to provide new services or meet new mission requirements.

Leases typically have a term of 5-20 years and are renegotiated prior to expiration, with approximately 500 leases expiring each year. Existing leases are examined prior to expiration to validate the need and to determine reasonable future lease provisions. A site survey is performed to determine the current level of use of the leased property and to examine nearby sites owned or leased by FAA for potential colocation. Lease arrangements can be complex requiring negotiations with multiple owners regarding cost, the arrangements for personnel and equipment relocation, and the need to meet stringent site specific requirements related to specific operational needs. The program supports the new Aviation Logistics (ALO) Space Proposal Process, which identifies opportunities to downsize leased space or consolidate into other owned or leased space.

Lease costs normally escalate because the market value of land continues to increase. When lease costs increase, it can be more cost effective to purchase a property rather than continue to lease it. In those cases, the program will negotiate the purchase of the land or facility. 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 property. Due to resistance on behalf of some Lessors to negotiate new leases with the Government, the FAA is facing more holdover leases under which the Government still has a valid need to use the property and continues to occupy it beyond the term of the lease. The number of purchases continues to increase and 12% of our budget is allocated to purchases. FAA currently has approximately 200 leases in a holdover status because of an impasse either from the terms of the contract or the 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 $30 million in FY 2015. (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; thus, contributing to the cost effectiveness of air navigation infrastructure and associate systems. 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 2016-2020 – Performance Output Goals

- Conduct six site surveys (may include multiple facilities within the area) to determine best alternatives to pursue regarding next year's expiring leases.
- Conduct quarterly teleconference meetings with Service Areas on Facilities & Engineering (F&E) Portfolio issues.
- Complete payment on 95% of leases using the Lease Automation process and make those payments on time to avoid late payments.

4A03, LOGISTICS SUPPORT SERVICES (LSS)
FY 2016 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 National Logistics Division in direct support of Capital Investment Plan (CIP) projects, accounting system capitalization, and property control-related activities.

These services currently represent a significant portion of 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 a significant portion of 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 program provides key support functions which 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 (over $100K) in less than 180 calendar days (Office of Acquisition Services (AMQ)) and in less than 120 days (Logistics Service Areas) from the time a purchase request is received from the requiring organization.

Program Plans FY 2016 – Performance Output Goals

- Complete 91% 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.

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.

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.

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.

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.

4A04, MIKE MONRONEY AERONAUTICAL CENTER LEASES

FY 2016 Request $18.8M

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 (Navaids)), 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 Level IV security site 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 $30 million in FY 2015. (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 Navaids. 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, $17.09 per net square foot compared to the $25.04 General Services Administration (GSA) rate for Oklahoma City; a $15.1M cost avoidance in FY 2014. Leasing is more cost effective than investing in the $696M replacement cost of the leased facilities.

Program Plans FY 2016 – Performance Output Goals
- Complete monthly lease payments on time.
- Award construction design contract to replace Hangars 8 and 9 lighting & electrical distribution controls/thermostats.
- Award construction design contract to replace Building 15 Heating, Ventilation, Air Conditioning (HVAC) & electrical systems.
- Complete Leased engineering assessment.
- Award contract for Building 2 energy assessment.

Program Plans FY 2017-2020 – Performance Output Goals
- Complete monthly lease payments on time.

4A05, TRANSITION ENGINEERING SUPPORT
FY 2016 Request $19.2M

- 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 into the NAS to enhance NAS efficiency and improve safety of the flying public. NISC also provides technical expertise to support compliance with laws, regulations and Congressional directives. This supports 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.

The program also supports the FAA’s Aviation Safety line-of-business (AVS) by installing Information Technology systems such as automation of the safety rulemaking process; automation of collection and storage of the vast amount of safety data used by inspectors to develop recommendations that result in safer aircraft, and better trained air personnel. Additionally, NISC supports AVS by providing support for 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 will require over 1000 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 $30 million in FY 2015. (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. 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. Finally, to ensure cost effectiveness, the NISC program has implemented an affordability methodology across all Task Orders. Through this affordability methodology, which involves workforce alignment, infrastructure resizing, and process improvements, NISC has achieved both significant cost savings and cost avoidance.

Program Plans FY 2016-2020 – 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. It also captures the paperwork for all proposed and actual changes to these systems so that maintenance workers and replacement programs have accurate 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 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 $30 million in FY 2015. (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 2016 – Performance Output Goals

- Achieve Initial Operation Capabilities (IOC) for Segment I.
- Achieve Final Investment Decision for Segment II.

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 2019-2020 – 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 – Performance Output Goals
- None.

4A06, TECHNICAL SUPPORT SERVICES CONTRACT (TSSC)

FY 2016 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 by performing site surveys and selection; engineering; environmental; fire/life safety; equipment installation; and removal of asbestos and obsolete equipment. Services also 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) technical employee level of support 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 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 $30 million in FY 2015. (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.

Another cost savings by the TSSC program resulted from moving the TSSC regional management counterparts into vacant, unused FAA space when available, thereby saving tens of thousands of dollars in lease rental agreements that would have been paid through the contract vehicle. This cost-effective measure has taken place at several offices within all three FAA Service Area organizations.

Program Plans FY 2016-2020 – Performance Output Goals
- Two award fee performance ratings per year, which measure FAA satisfaction with Contractor performance with regard to cost, schedule and quality.

4A07, RESOURCE TRACKING PROGRAM (RTP)

FY 2016 Request $4.0M

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 2016-2020 – 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 2016 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. In June 2010 a new FFRDC contract was awarded to MITRE Corporation for program efforts starting in FY 2010 with a base period through FY 2015. The contract includes an option for five years of continuing coverage 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 coordinating 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 regimens 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 2016-2020 – 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 2016 Request $5.0M

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 quality of static and planned constraint data including NOTAMs, airport, Special Activity Airspace (SAA), and other relevant aeronautical information such as Standard Operating Procedure (SOP)-Letter of Agreement (LOA) constraints, procedures, and obstacles data. This 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, 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 serve up fused data 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 much improved access and increased functionality embedded in the information services with respect to filtering, 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.

Concept and Requirements Definition Readiness Decision (CRDRD) is scheduled for FY 2016. Investment Analysis Readiness Decision (IARD) is scheduled for FY 2017.

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 2016 – Performance Output Goals
<u>AIM Modernization Segment 2 (G05A.02-05):</u>
- Complete Release 1 Development and Test.
- Achieve Initial Operational Capability for Release 1.
- Complete Preliminary Design Review (PDR) for Release 2 that includes draft Release 2 Software Requirements Specifications (SRS), Software Design Document (SDD) and Web Service Description Documents (WSDD).
- Complete Detailed Design Review (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 2.

<u>AIM Modernization Segment 3 (G05A.02-06):</u>
- None.

Program Plans FY 2017 – Performance Output Goals
<u>AIM Modernization Segment 2 (G05A.02-05):</u>
- Complete PDR for Release 3 that includes draft Release 3 SRS, SDD and WSDD.
- Complete DDR for Release 3 that includes the final Release 3 SRS, SDD and WSDD.
- Complete Release 3 code development and development of test procedures.
- Achieve Operational Capability for Release 3.

<u>AIM Modernization Segment 3 (G05A.02-06):</u>
- None.

Program Plans FY 2018 – Performance Output Goals
<u>AIM Modernization Segment 2 (G05A.02-05):</u>
- Complete delivery of SAA information into NAS Automation.

<u>AIM Modernization Segment 3 (G05A.02-06):</u>
- Develop documents related to pre-implementation for AIM Modernization S3, including:
  - Statement of Work
  - Independent Government Cost Estimate

Program Plans FY 2019 – Performance Output Goals
<u>AIM Modernization Segment 2 (G05A.02-05):</u>
- Complete post implementation review for any identified trouble reports.

<u>AIM Modernization Segment 3 (G05A.02-06):</u>
- Complete acquisition preparation activities including:
  - Develop acquisition strategy
  - Develop Statement of Work
  - Proposal Evaluation
- 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.

4A10, NextGen – Cross Agency NextGen Management

FY 2016 Request $3.0M

Cross Agency NextGen Management, G08M.04-01

Program Description

The development of NextGen is a priority for the Administration. Active participation by the NextGen partners in this undertaking, including the Department of Commerce, Department Of Homeland Security, National Aeronautics and Space Administration, and Department of Defense, is necessary to modernize the air transportation system and safely manage the expected growth in air traffic. 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 $30 million in FY 2015. (FAA Business Planning Metric)*

Relationship to Performance Metric

Upgrading technology and infrastructure to support NextGen requires collaboration with industry and partner agencies. This effort will ensure efficient coordination between all Federal partners whose decisions impact NextGen. Without a dedicated interagency focus, increased costs and schedule delays could result from lapses in identifying data sharing requirements and defining Federal surveillance requirements for NextGen. The FAA's ability to leverage research and expertise from other agencies would also be reduced.

Program Plans FY 2016-2020 – Performance Output Goals

- Coordinate across partner agencies on the future of the aviation transportation system through collaboration on architecture and work plans.
- Ensure a coordinated 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.
- Ensure a coordinated multi-agency plan for research (including schedules and dependencies), and integrate the transition of high-priority multiagency NextGen R&D to support NextGen implementation.
- Ensure a coordinated multi-agency plan in the architecture framework for NextGen implementation to include schedules and dependencies.
- Ensure a coordinated multi-agency plan for the architectural efforts and institute 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.
- Coordinate and manage interaction with the private sector via the NextGen Institute to leverage industry and academia expertise in support of NextGen planning and implementation.

ACTIVITY 6: ADS-B SERVICES AND WAAS GEOS

6A01, ADS-B SERVICES AND WAAS GEOS

FY 2016 Request $166.0M

- A, Automatic Dependent Surveillance Broadcast (ADS-B) – Sustain Leased Services, G02S.03-05
- B, Wide Area Augmentation System (WAAS) – Sustain Leased Services, N12.01-09

A, Automatic Dependent Surveillance Broadcast (ADS-B) – Sustain Leased Services, G02S.03-05

Program Description

This program provides for continuing ADS-B Baseline Services subscription charges for utilizing ADS-B infrastructure owned and operated by the prime contractor. The infrastructure is in place in the NAS and performance based service fees support the operation of the system, 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. ADS-B is an advanced surveillance technology that provides highly accurate and more comprehensive surveillance information. Aircraft position (longitude, latitude, altitude, and time) is determined using the Global Navigation Satellite System (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 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 (CARTS), Standard Terminal Automation Replacement System (STARS), Microprocessor En Route Automated Radar Tracking System (Micro EARTS), En Route Automation Modernization (ERAM), and Advanced Technologies and Oceanic Procedures (ATOP).

This system is an essential element of NextGen and supports implementation of the Operational Improvements that it provides to make air travel more efficient and safer. 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 and will result in fewer delays and more optimal routing for aircraft. The other efficiency benefits include reductions in weather deviations, and reduced cancellations resulting from increased access to some Alaskan villages during reduced weather conditions. The 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.

Program Plans FY 2016-2020 – Performance Output Goals

- Provide service at more than 630 radio stations and more than 300 service volumes within specified requirements. 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 / En Route Control) is made up of one or more service volumes.

B, Wide Area Augmentation System (WAAS) – Sustain Leased Services, N12.01-09

Program Description

The WAAS requires a minimum of three commercial geostationary satellites (GEOs) to meet its performance requirements. This program funds the required lease services for the 3 WAAS GEOs.

WAAS consists of a network of 38 precisely located ground reference stations distributed across the continental United States and Alaska that monitor the 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.

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 1,283 of the nation’s 19,000 runway ends. WAAS is able to provide the same level of precision with 4,069 LPV and LP procedures, as of November 2014.

Program Plans FY 2016-2020 – Performance Output Goals

- Provide leases for three WAAS geostationary satellites.

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Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix C

Fiscal Years 2016 – 2020

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(Dollars in Millions)

BLI Number	Capital Budget Line Item (BLI) Program	FY 2016 Budget	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.
	Activity 1: Engineering, Development, Test and Evaluation	**$151.1**	**$220.2**	**$261.2**	**$292.9**	**$302.0**
1A01	Advanced Technology Development and Prototyping (ATDP)	$21.3	$41.1	$45.4	$37.1	$41.1
1A02	NAS Improvement of System Support Laboratory	$1.0	$1.0	$1.0	$1.0	$1.0
1A03	William J. Hughes Technical Center Facilities	$19.1	$19.0	$19.0	$19.0	$19.0
1A04	William J. Hughes Technical Center Infrastructure Sustainment	$12.2	$10.3	$10.0	$10.0	$11.6
1A05	NextGen – Separation Management Portfolio	$26.5	$26.8	$27.0	$40.0	$42.5
1A06	NextGen – Improved Surface/Terminal Flight Data Manager (TFDM) Portfolio	$17.0	$53.0	$90.6	$116.3	$100.8
1A07	NextGen – On Demand NAS Portfolio	$11.0	$14.5	$17.0	$18.0	$32.0
1A08	NextGen – Environment Portfolio	$1.0	$1.0	$0.0	$0.0	$0.0
1A09	NextGen – Improved Multiple Runway Operations Portfolio	$8.0	$9.5	$5.0	$4.0	$5.0
1A10	NextGen – NAS Infrastructure Portfolio	$11.0	$14.0	$15.2	$13.0	$15.0
1A11	NextGen – Support Portfolio at WJHTC	$10.0	$12.0	$13.0	$13.0	$13.0
1A12	NextGen – Performance Based Navigation & Metroplex Portfolio	$13.0	$18.0	$18.0	$21.5	$21.0
	Activity 2: Procurement and Modernization of Air Traffic Control Facilities and Equipment	**$1,671.2**	**$1,651.6**	**$1,660.3**	**$1,672.0**	**$1,666.8**
	A. En Route Programs	**$659.4**	**$671.8**	**$694.0**	**$733.1**	**$684.3**
2A01	NextGen – En Route Automation Modernization (ERAM) – System Enhancements and Technology Refresh	$79.4	$59.0	$87.6	$106.1	$126.4
2A02	En Route Communications Gateway (ECG)	$2.7	$2.0	$2.0	$4.1	$2.0
2A03	Next Generation Weather Radar (NEXRAD)	$6.5	$6.3	$5.5	$5.5	$4.0
2A04	ARTCC Building Improvements/Plant Improvements	$74.2	$73.5	$73.5	$63.8	$63.5
2A05	Air Traffic Management (ATM) – Traffic Flow Management (TFM)	$13.7	$23.3	$9.2	$8.0	$8.0
2A06	Air/Ground Communications Infrastructure	$9.8	$8.2	$8.2	$8.3	$3.2
2A07	Air Traffic Control En Route Radar Facilities Improvements	$5.8	$5.2	$5.2	$5.2	$5.2
2A08	Voice Switching Control System (VSCS)	$9.9	$11.3	$12.8	$11.4	$11.7
2A09	Oceanic Automation System (OAS)	$20.0	$19.0	$27.0	$27.0	$20.0
2A10	Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)	$43.6	$50.0	$60.0	$62.0	$64.0
2A11	NextGen – System-Wide Information Management (SWIM)	$37.4	$40.9	$50.7	$47.1	$40.4
2A12	NextGen – Automatic Dependent Surveillance - Broadcast (ADS-B) NAS Wide Implementation	$45.2	$37.7	$27.9	$39.7	$43.5
2A13	Windshear Detection Service (WDS)	$5.2	$4.5	$1.0	$2.8	$1.0
2A14	NextGen – Collaborative Air Traffic Management Portfolio	$9.8	$14.7	$15.3	$25.3	$25.0
2A15	NextGen – Time Based Flow Management (TBFM) Portfolio	$42.6	$45.3	$39.2	$50.2	$30.0
2A16	ATC Beacon Interrogator (ATCBI) - Technology Refresh	$1.0	$0.0	$0.0	$0.0	$0.0
2A17	NextGen – Next Generation Weather Processor (NWP)	$7.0	$20.3	$18.3	$20.0	$16.8

Estimated Funding
Organized by Budget Line Item
(Dollars in Millions)

BLI Number	Capital Budget Line Item (BLI) Program	FY 2016 Budget	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.
2A18	Airborne Collision Avoidance System X (ACAS X)	$10.8	$8.9	$7.7	$7.7	$6.9
2A19	NextGen – Data Communication in support of NextGen	$234.9	$241.7	$242.9	$238.9	$212.6
	B. Terminal Programs	**$592.8**	**$607.0**	**$575.1**	**$520.0**	**$572.2**
2B01	Airport Surface Detection Equipment - Model X (ASDE-X)	$13.5	$8.4	$0.0	$0.0	$0.0
2B02	Terminal Doppler Weather Radar (TDWR) – Provide	$4.9	$7.4	$3.8	$3.7	$1.0
2B03	Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)	$81.1	$60.0	$52.8	$56.1	$40.0
2B04	Terminal Automation Modernization/ Replacement Program (TAMR Phase 3)	$159.4	$151.3	$62.5	$8.0	$0.0
2B05	Terminal Automation Program	$7.7	$12.7	$17.8	$17.8	$17.9
2B06	Terminal Air Traffic Control Facilities - Replace	$45.5	$100.5	$156.7	$181.8	$182.5
2B07	ATCT/Terminal Radar Approach Control (TRACON) Facilities - Improve	$59.0	$61.2	$60.2	$57.4	$57.2
2B08	Terminal Voice Switch Replacement (TVSR)	$6.0	$6.0	$6.0	$6.0	$6.0
2B09	NAS Facilities OSHA and Environmental Standards Compliance	$39.6	$36.0	$36.0	$36.0	$36.0
2B10	Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)	$3.8	$3.5	$1.2	$0.0	$0.0
2B11	Terminal Digital Radar (ASR-11) Technology Refresh and Mobile Airport Surveillance Radar (MASR)	$9.9	$6.1	$3.2	$4.4	$4.4
2B12	Runway Status Lights (RWSL)	$24.2	$4.3	$1.2	$0.0	$3.5
2B13	NextGen – National Airspace System Voice System (NVS)	$53.6	$47.7	$68.4	$32.2	$116.6
2B14	Integrated Display System (IDS)	$23.3	$10.2	$6.1	$7.1	$6.2
2B15	Remote Monitoring and Logging System (RMLS)	$4.7	$11.9	$10.4	$23.1	$16.4
2B16	Mode S Service Life Extension Program (SLEP)	$16.3	$37.4	$42.0	$37.0	$45.0
2B17	Surveillance Interface Modernization (SIM)	$23.0	$28.0	$27.0	$28.0	$25.0
2B18	Voice Recorder Replacement Program (VRRP)	$3.0	$2.0	$8.0	$11.3	$14.5
2B19	Integrated Terminal Weather System (ITWS) Technology Refresh	$5.4	$1.5	$1.8	$0.0	$0.0
2B20	Flight and Interfacility ATC Data Interface Modernization (FIADIM)	$9.0	$11.0	$10.0	$10.0	$0.0
	C. Flight Service Programs	**$14.7**	**$25.5**	**$38.1**	**$39.9**	**$24.8**
2C01	Aviation Surface Weather Observation System	$8.0	$10.0	$10.0	$10.0	$2.0
2C02	Future Flight Services Program (FFSP)	$3.0	$9.5	$21.8	$27.0	$20.0
2C03	Alaska Flight Service Facility Modernization (AFSFM)	$2.7	$2.8	$2.8	$2.8	$2.8
2C04	Weather Camera Program	$1.0	$3.2	$3.5	$0.1	$0.0
	D. Landing and Navigation Aids Programs	**$174.5**	**$142.5**	**$125.3**	**$127.5**	**$130.0**
2D01	VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME)	$4.5	$2.5	$2.5	$8.9	$8.9
2D02	Instrument Landing Systems (ILS) – Establish	$7.0	$7.0	$7.0	$10.0	$11.0
2D03	Wide Area Augmentation System (WAAS) for GPS	$80.6	$83.5	$78.7	$71.4	$67.0
2D04	Runway Visual Range (RVR) & Enhanced Low Visibility Operations (ELVO) Program	$6.0	$6.5	$4.0	$6.0	$6.0

(Dollars in Millions)

BLI Number	Capital Budget Line Item (BLI) Program	FY 2016 Budget	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.
2D05	Approach Lighting System Improvement Program (ALSIP)	$3.0	$3.0	$3.0	$5.0	$5.0
2D06	Distance Measuring Equipment (DME)	$3.0	$3.0	$3.0	$5.0	$5.0
2D07	Visual Navaids - Establish/Expand	$2.0	$2.0	$2.0	$2.0	$2.0
2D08	Instrument Flight Procedures Automation (IFPA)	$3.4	$2.0	$2.0	$2.2	$3.1
2D09	Navigation and Landing Aids – Service Life Extension Program (SLEP)	$3.0	$3.0	$6.0	$7.0	$12.0
2D10	VASI Replacement – Replace with Precision Approach Path Indicator	$5.0	$5.0	$5.0	$10.0	$10.0
2D11	Global Positioning System (GPS) Civil Requirements	$27.0	$11.0	$0.0	$0.0	$0.0
2D12	Runway Safety Areas – Navigation Mitigation	$30.0	$14.0	$12.1	$0.0	$0.0
	E. Other ATC Facilities Programs	**$229.9**	**$204.8**	**$227.8**	**$251.6**	**$255.5**
2E01	Fuel Storage Tank Replacement and Management	$18.7	$19.0	$19.0	$19.0	$19.0
2E02	Unstaffed Infrastructure Sustainment	$39.6	$38.8	$43.8	$44.1	$43.8
2E03	Aircraft Related Equipment Program	$9.0	$12.0	$12.5	$13.0	$13.0
2E04	Airport Cable Loop Systems – Sustained Support	$12.0	$10.0	$10.0	$10.0	$10.0
2E05	Alaskan Satellite Telecommunication Infrastructure (ASTI)	$12.5	$1.5	$0.0	$0.0	$0.0
2E06	Facilities Decommissioning	$6.0	$6.0	$10.0	$10.0	$10.0
2E07	Electrical Power Systems – Sustain/Support	$125.0	$110.0	$125.0	$150.0	$150.0
2E08	FAA Employee Housing and Life Safety Shelter System Service	$2.5	$0.0	$0.0	$0.0	$0.0
2E09	Energy Management and Compliance (EMC)	$2.0	$2.0	$2.0	$2.0	$6.2
2E10	Child Care Center Sustainment	$1.6	$1.0	$1.0	$0.0	$0.0
2E11	FAA Telecommunications Infrastructure - 2 (FTI-2)	$1.0	$1.0	$1.0	$0.0	$0.0
2E12X	Independent Operational Test and Evaluation	$0.0	$3.5	$3.5	$3.5	$3.5
	Activity 3: Non-Air Traffic Control Facilities and Equipment	**$171.0**	**$169.8**	**$176.6**	**$154.8**	**$148.0**
	A. Support Programs	**$154.3**	**$154.8**	**$161.6**	**$139.8**	**$133.0**
3A01	Hazardous Materials Management	$26.4	$20.0	$20.0	$20.0	$20.0
3A02	Aviation Safety Analysis System (ASAS)	$20.2	$11.3	$15.3	$11.0	$18.2
3A03	Logistics Support System and Facilities (LSSF)	$4.0	$0.0	$0.0	$0.0	$0.0
3A04	National Airspace System (NAS) Recovery Communications (RCOM)	$12.0	$12.0	$12.0	$12.0	$12.0
3A05	Facility Security Risk Management	$15.0	$15.1	$15.1	$15.9	$15.0
3A06	Information Security	$12.0	$12.0	$12.0	$12.0	$12.0
3A07	System Approach for Safety Oversight (SASO)	$18.9	$23.2	$25.8	$19.5	$21.0
3A08	Aviation Safety Knowledge Management Environment (ASKME)	$7.5	$4.2	$0.0	$0.0	$0.0
3A09	Aerospace Medical Equipment Needs (AMEN)	$2.5	$3.0	$7.0	$19.6	$12.8
3A10	NextGen – System Safety Management Portfolio	$17.0	$18.0	$18.0	$18.0	$18.0
3A11	National Test Equipment Program	$4.0	$7.0	$4.0	$5.0	$3.0

(Dollars in Millions)

BLI Number	Capital Budget Line Item (BLI) Program	FY 2016 Budget	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.
3A12	Mobile Assets Management Program	$4.8	$2.0	$3.0	$1.8	$0.0
3A13	Aerospace Medicine Safety Information System (AMSIS)	$3.0	$22.0	$24.4	$5.0	$1.0
3A14	Tower Simulation System (TSS) Technology Refresh	$7.0	$5.0	$5.0	$0.0	$0.0
	B. Training, Equipment and Facilities	**$16.7**	**$15.0**	**$15.0**	**$15.0**	**$15.0**
3B01	Aeronautical Center Infrastructure Modernization	$15.2	$14.0	$14.0	$14.0	$14.0
3B02	Distance Learning	$1.5	$1.0	$1.0	$1.0	$1.0
	Activity 4: Facilities and Equipment Mission Support	**$225.7**	**$240.4**	**$237.4**	**$250.2**	**$265.3**
4A01	System Engineering (SE2020) and Development Support	$35.0	$35.0	$35.0	$35.0	$35.0
4A02	Program Support Leases	$46.7	$46.6	$49.7	$50.0	$62.7
4A03	Logistics Support Services (LSS)	$11.0	$11.0	$11.0	$11.0	$11.0
4A04	Mike Monroney Aeronautical Center Leases	$18.8	$19.3	$19.7	$20.2	$20.6
4A05	Transition Engineering Support	$19.2	$24.1	$19.3	$17.0	$15.0
4A06	Technical Support Services Contract (TSSC)	$23.0	$25.0	$25.0	$30.0	$30.0
4A07	Resource Tracking Program (RTP)	$4.0	$7.0	$7.8	$8.0	$8.0
4A08	Center for Advanced Aviation System Development (CAASD)	$60.0	$60.0	$60.0	$65.0	$65.0
4A09	NextGen – Aeronautical Information Management Program	$5.0	$10.4	$6.9	$11.0	$15.0
4A10	NextGen – Cross Agency NextGen Management	$3.0	$2.0	$3.0	$3.0	$3.0
	Activity 5: Personnel Compensation, Benefits and Travel	**$470.0**	**$479.7**	**$490.1**	**$496.5**	**$512.3**
5A01	Personnel and Related Expenses	$470.0	$479.7	$490.1	$496.5	$512.3
	Activity 6: ADS-B Services and WAAS GEOs	**$166.0**	**$150.3**	**$144.5**	**$133.5**	**$135.6**
6A01	ADS-B Services and WAAS GEOs	$166.0	$150.3	$144.5	$133.5	$135.6
	Total Year Funding	**$2,855.0**	**$2,912.0**	**$2,970.0**	**$3,000.0**	**$3,030.0**
	Targets	**$2,855.0**	**$2,912.0**	**$2,970.0**	**$3,000.0**	**$3,030.0**

Note: BLI numbers with X represent outyear programs not requested in the FY 2016 President's Budget.
Note: FY 2017-2020 outyear funding amounts are estimates.

Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix D

Fiscal Years 2016 – 2020

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APPENDIX D

FAA CAPITAL PROGRAM

INFORMATION FOR MAJOR PROGRAMS

Because of the criticality of on-budget and on-time acquisitions to the efficient transition to NextGen, The Government Accountability Office (GAO) was directed to determine the status of ATO's performance in acquiring ATC systems.

In December 2007 the GAO issued its report GAO-08-42 entitled, "AIR TRAFFIC CONTROL FAA Reports Progress in System Acquisitions, but Changes in Performance Measurement Could Improve Usefulness of Information". This report documented the findings and provided recommendations to the FAA.

One of GAO's recommendations was to identify or establish a vehicle for regularly reporting to Congress and the public on FAA's overall, long-term performance in acquiring ATC systems by providing original budget and schedule baselines for each program and the reasons for any baseline revision. The table provided in this section provides the most current information for FAA's Major Active Programs and is in direct response to the GAO's recommendation.

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline: Original APB Date	Original Baseline: Completion Date	Original Baseline: Budget $M	Current Baseline: Current APB Date	Current Baseline: Revised Completion Date	Current Baseline: Revised Budget $M	Current Estimate: Completion Date	Current Estimate: Budget $M	Comments
Automatic Dependent Surveillance Broadcast (ADS-B) – Baseline Services & Applications FY14 - 20 ACAT 1	May-12	Sep-20	$960.4	May-12	Sep-20	$960.4	Sep-20	$960.4	
Collaborative Air Traffic Management Technologies (CATMT) Work Package 2 ACAT 3	Sep-08	Sep-14	$109.5	Sep-08	Sep-14	$109.5	Mar-15	$107.7	Current Estimate vs Current Baseline: The completion date for CATMT WP2 has slipped from Sep-14 to Mar-15 resulting in a 6 month schedule delay (-8.3% variance). The slip in schedule is associated with a delay in Operational Test & Evaluation (OT&E) of Traffic Flow Management System (TFMS) Release 8 scheduled for March-April 2013. The delay results from Sequestration impacting the air traffic controllers' availability to conduct testing. OT&E was rescheduled to the next available testing window in early October 2013 but was then delayed further due to the government shutdown. This results in a cascading negative effect on the development, testing and deployment of subsequent TFMS Releases which contain CATMT WP2 functionality. The TFMS Release 11 (final APB milestone) is now projected to be completed by March 2015, 6 months later than planned.
Data Communications (Data Comm) Segment 1, Phase 1 (S1P1) ACAT 1	May-12	May-19	$741.4	May-12	May-19	$741.4	May-19	$741.4	
Data Communications (Data Comm) Segment 1, Phase 2 (S1P2), Initial Services ACAT 1	Oct-14	Feb-21	$816.7	Oct-14	Feb-21	$816.7	Feb-21	$816.7	NOTE: New Addition to Appendix D. Final Investment Decision (FID) approved by JRC in Oct-14.

FAA Capital Programs
Current Information for Major Programs

	Original Baseline			Current Baseline			Current Estimate		
Programs	Original APB Date	Completion Date	Budget $M	Current APB Date	Revised Completion Date	Revised Budget $M	Completion Date	Budget $M	Comments
En Route Automation Modernization (ERAM) ACAT 1	Jun-03	Dec-10	$2,154.6	Jun-11	Aug-14	$2,484.6	Mar-15	$2,579.7	Current Baseline vs Original Baseline: The completion date for ERAM has slipped to Aug-14 resulting in a 44 month schedule variance (-49%) to the original baseline. The budget has increased by $330M (-15.3% variance). The budget and schedule variances are associated with the following factors: (1) project plan did not factor in the risks associated with the operational complexity at the selected sites; (2) insufficient testing environment failed to identify software issues before deployment to key sites; (3) insufficient communication between the Program office and field sites; and (4) uneven stakeholder engagement during development/deployment. Current Estimate vs Current Baseline: Cost Variance - $43.9M of the variance results from transferring O&M funding to the F&E budget line to cover second level engineering cost. $51.2M of this variance is related to the schedule slip of 7 months due to sequestration. This results in a total cost variance of $95.1M (-3.8%) to the current baseline. The impact of the sequestration in March 2013 which reduced funding in the F&E and Operations accounts severely impacted the availability of resources to support site teams from March 2013 to May 2013. Specific impacts were to Subject Matter Experts (SMEs), program overtime, and travel funding, as well as the inability to proceed with any material re-planning until these teams were allowed to resume their work which occurred in late May 2013. These impacts have resulted in a schedule delay of 7 months (-5.2%) from the baseline schedule completion date of August 2014, approved by the JRC in June 2011.
ERAM System Enhancements and Technology Refresh (SETR) ACAT 1	Sep-13	Sep-17	$152.9	Sep-13	Sep-17	$152.9	Sep-17	$152.9	

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline: Original APB Date	Original Baseline: Completion Date	Original Baseline: Budget $M	Current Baseline: Current APB Date	Current Baseline: Revised Completion Date	Current Baseline: Revised Budget $M	Current Estimate: Completion Date	Current Estimate: Budget $M	Comments
Facility Security and Risk Management (FSRM) 2 ACAT 2	Jun-11	Sep-22	$182.5	Jun-11	Sep-22	$182.5	Sep-22	$182.5	
Logistics Center Support System (LCSS) ACAT 2	Apr-10	Feb-14	$67.4	Apr-14	Apr-16	$79.4	Apr-16	$79.4	Current Baseline vs Original Baseline: The schedule delay of 24 months (-50% variance) and cost increase of $12M (-17.8% variance) is associated with the following factors: 1) Business processes developed during the Business Process Reengineering (BPR) phase did not address system interactions between functional areas; 2) delays in developing interfaces with legacy systems; 3) complexity of the tool integration required for interfaces; and 4) changes in contract and program management. In April-14, the JRC approved a Baseline Change Decision (BCD) for LCSS.
NAS Voice System (NVS) Demonstration and Qualification Phase	Sep-14	Mar-20	$294.2	Sep-14	Mar-20	$294.2	Mar-20	$294.2	NOTE: New Addition to Appendix D. Final Investment Decision (FID) approved by JRC in Sept-14.
Next Generation Air-to-Ground Communication System (NEXCOM) - Segment 2, Phase 1 ACAT 2	Sep-11	Sep-18	$285.9	Sep-11	Sep-18	$285.9	Sep-18	$285.9	
Regulation and Certification Infrastructure for System Safety (RCISS) - Segment 2 ACAT 3	Oct-10	Sep-16	$90.7	Oct-10	Sep-16	$90.7	Sep-16	$90.7	

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline: Original APB Date	Original Baseline: Completion Date	Original Baseline: Budget $M	Current Baseline: Current APB Date	Current Baseline: Revised Completion Date	Current Baseline: Revised Budget $M	Current Estimate: Completion Date	Current Estimate: Budget $M	Comments
Runway Status Lights (RWSL) ACAT 1	Jan-10	Oct-15	$327.4	Jul-13	Sep-17	$366.7	Sep-17	$366.7	Current Baseline vs Original Baseline: In July-13 the JRC approved a Baseline Change Decision (BCD) for the RWSL program. The JRC has determined to minimize the cost exposure to the baseline, deployment will be limited to the 16 airports that have been fully committed to date and San Francisco International airport. This results in a reduction of 6 airports (-26.1% variance) from the original 23 airports approved at the FID in Jan-10. The cost ($39.3M, -12%) and schedule (-26.1%) variances are attributed to the following factors: (1) construction plans changed due to costlier techniques by Airport Authorities; (2) limited runway/taxiway surface availability to meet installation schedules; (3) requirement changes that included increases in the light count, the switch from incandescent lights to LED, and the increased supportability for these requirements; (4) costly duct bank and shelter installations; (5) under estimation of site and depot spares costs; and (6) additional engineering development for supportability enhancements.

FAA Capital Programs
Current Information for Major Programs

	Original Baseline			Current Baseline			Current Estimate		
Programs	Original APB Date	Completion Date	Budget $M	Current APB Date	Revised Completion Date	Revised Budget $M	Completion Date	Budget $M	Comments
System Approach for Safety Oversight (SASO) Phase IIa ACAT 3	Sep-08	Sep-13	$88.0	Sep-13	Jan-16	$126.9	Jan-16	$126.9	Current Baseline vs Original Baseline: The completion date for SASO Phase IIa has slipped to Jan-16 resulting in a 28 month schedule delay (-46.7% variance). This is associated with: (1) the initial development of the prototype version of the Safety Assurance System (SAS) failing to meet user expectations; (2) subsequent SAS redesign; (3) software development delays; and (4) a new incremental testing strategy that was implemented that added additional testing to the schedule. As the issues were raised, concerns at the executive level were addressed through several means. A SAS Executive Review Board and SAS Steering Committee were established for guidance and oversight, a Technical Status (TechStat) Review of the Program was conducted and a new program management team was assigned to the program. During development testing and bug fixes it was determined that an increase in FAA automation requirements was needed to achieve the desired functionality. In addition, software development delays have led to an increase in costs, resulting in a -44.2% cost variance. In Sep-13, the Joint Resources Council (JRC) approved the Baseline Change Decision (BCD) for SASO Phase IIa.
System Wide Information Management (SWIM) Segment 1 ACAT 2	Jul-09	Sep-15	$310.2	Jul-12	Sep-15	$310.2	Sep-15	$306.4	
System Wide Information Management (SWIM) Segment 2A ACAT 2	Jul-12	Dec-17	$120.2	Jul-12	Dec-17	$120.2	Dec-17	$120.2	

FAA Capital Programs
Current Information for Major Programs

Programs	Original Baseline: Original APB Date	Original Baseline: Completion Date	Original Baseline: Budget $M	Current Baseline: Current APB Date	Current Baseline: Revised Completion Date	Current Baseline: Revised Budget $M	Current Estimate: Completion Date	Current Estimate: Budget $M	Comments
Terminal Automation Modernization and Replacement (TAMR), Phase 3, Segment 1 (P3, S1) ACAT 1	Dec-11	Oct-17	$438.0	Dec-11	Oct-17	$438.0	Oct-17	$526.7	Current Estimate vs Current Baseline: The cost increase of $88.7M (-20.3% variance) is associated with the following factors: 1) A number of new software requirements (gaps) have been identified from deploying to the first sites. These first deployments demonstrated the significant complexity of transitioning to STARS at large TRACONs which had not been considered with the original baseline and are critical for operational suitability; 2) In addition, the complexity of operations and over a decade of CARTS tailoring by sites was not understood and under-estimated; and 3) Costs were underestimated and not considered for support costs and site spares. During FY14, the Joint Resources Council (JRC) was notified of the current estimate to complete the program.
Terminal Automation Modernization and Replacement (TAMR), Phase 3, Segment 2 (P3, S2) ACAT 1	Sep-12	Aug-19	$462.5	Sep-12	Aug-19	$462.5	Aug-19	$505.7	Current Estimate vs Current Baseline: The cost increase of $43.2M (-9.3% variance) is associated with the impact of higher prime costs and a funding reduction in FY16, which may require additional funding to complete the program. The Program Office is reviewing the overall program and assessing potential mitigation actions to minimize the impact to the baseline. Assessments and estimates are being validated to project the amount and years of any potential shortfall. During FY14, the Joint Resources Council (JRC) was notified of the current estimate to complete the program.
Terminal Automation Modernization and Replacement (TAMR), Phase 1 Technology Refresh ACAT 1	Sep-12	Feb-20	$531.5	Sep-12	Feb-20	$531.5	Feb-20	$531.5	
Wide Area Augmentation System (WAAS) Phase IV, Segment 1 - Dual Frequency Operations (DFO)	May-14	Sep-19	$603.2	May-14	Sep-19	$603.2	Sep-19	$603.2	NOTE: New Addition to Appendix D. Final Investment Decision (FID) approved by JRC in May-14.

FAA Capital Programs
Major Programs with Completed Acquisition Phase

Programs	Original Baseline			Current Baseline			Actual Results		Comments
	Original APB Date	Completion Date	Budget $M	Current APB Date	Revised Completion Date	Revised Budget $M	Completion Date	Budget $M	
Automatic Dependent Surveillance Broadcast (ADS-B) Segments 1 & 2 ACAT 1	Aug-07	Sep-14	$1,681.5	Mar-11	Sep-14	$1,695.1	Sep-14	$1,711.9	Actual Result vs Current Baseline: In September 2014, IOC of Surface Advisory Services was achieved at JFK, Las Vegas, and Honolulu, the final 3 sites of 35 ASDE-X sites, completing the schedule baseline. The ADS-B program is completing with a -1.0% variance to the cost baseline. The increase is due to a $6.8M funding earmark in FY 2009 to conduct a Target Level of Safety study to obtain approval for 3 nautical mile separation standards for En Route; a funding earmark of $9.3M in FY 2008 to accelerate Future Air to Air
Time Based Flow Management (TBFM) WP2 ACAT 3	Apr-10	Nov-14	$115.0	Apr-10	Nov-14	$115.0	Nov-14	$114.3	Actual Result vs Current Baseline: The national System Support Modification (SSM) for Release 4.3 was issued November 26, 2014, completing the TBFM WP2 functionality deployment.

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Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix E

Fiscal Years 2016 – 2020

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LIST OF ACRONYMS AND ABBREVIATIONS

--Number--	
4D	four dimensions
4DT	four dimensional trajectory
--A--	
AA&C	arrivals, approach, and cruise
AAM	FAA Office of Aerospace Medicine
AAR	airport acceptance rate
AAR	airport arrival rate
ABAAS	architectural barriers act accessibility standards
ABRR	airborne reroute execution
AC	advisory circular
ACAS X	airborne collision avoidance system X
ACAS Xp	airborne collision avoidance system - general aviation user class
ACAS Xu	airborne collision avoidance system - UAS user class
ACAT	acquisition category
ACE-IDS	automated surface observing system controller equipment-information display system
ACEPS	ARTCC critical and essential power systems
ACM	adjacent center metering
ACM	asbestos contaminated materials
ACS	aeronautical common services
ADA	Americans with Disabilities Act
ADAS	automated weather observation data acquisition system
ADD	airworthiness directives development
ADD	algorithm data description document
ADS-B	automatic dependent surveillance-broadcast
ADSIM+	airfield delay simulation model
AED	automated electronic defibrillator
AEDT	aviation environmental design tool
AEFS	advanced electronic flight strip system
AeroMACS	aeronautical mobile airport communications system
AeroNav	aeronautical navigation
AES	alternative energy systems
AFIS	automatic flight inspection system
AFS	FAA Fight Standards Service
AFSFM	Alaskan flight service facility modernization
AFSS	automated flight service station
A/G	air-to-ground
AGIRT	A/G communications integrated requirements team
AGIS	airport geographic information system
AIM	aeronautical information management
AIMM	aeronautical information management modernization
AIR	FAA Aircraft Certification Service
AirNav	airports and navigations aids database
AISR	aeronautical information system replacement

AIXM	aeronautical information exchange model
ALDARS	automated lightning detection and reporting system
ALO	aviation logistics
ALS	approach lighting system
ALSF-2	approach lighting system with sequenced flashing light model 2
ALSIP	approach lighting system improvement program
AMASS	airport movement area safety system
AMEN	aerospace medical equipment needs
AMEIN	aerospace medical equipment and infrastructure needs
AMMS	automated maintenance management system
AMQ	Office of Acquisition Services
AMS	acquisition management system
AMSIS	aerospace medicine safety information system
ANF	air navigation facilities
ANICS	Alaskan national airspace system inter-facility communications system
ANSP	air navigation service provider
AOCC	Atlantic operations control center
APB	acquisition program baseline
APMT	aviation environment portfolio management tool
APNT	alternate positioning navigation and timing system
APP	automated procurement process
APT	advanced persistent threat
APTS	automated process tracking system
APWS	AeroNav products workflow system
ARAIM	advanced receiver autonomous integrity monitoring
ARC	aviation rulemaking committee
ARE	aircraft and related equipment
ARMS	airspace resource management system
ARMT	airport resource management tool
ARS	advanced rotorcraft simulator
ARSR	air route surveillance radar
ARTCC	air route traffic control center
ARTS IE/IIE/IIIE	automated radar terminal system model IE, IIE, and IIIE
ASAS	aviation safety analysis system
ASDE-3	airport surface detection equipment model 3
ASDE-X	airport surface detection equipment model x
ASIAS	aviation safety information analysis and sharing
ASKME	aviation system knowledge management environment
ASOS	automated surface observing system
ASPM	aviation system performance metrics
ASR-7, 8, 9, 11	airport surveillance radar model 7, 8, 9, and 11
ASSC	airport surface surveillance capability
AST	FAA Office of Commercial Space Transportation
ASTI	Alaskan satellite telecommunication infrastructure
ASTM	American Society for Testing and Materials
ASWON	automated surface weather observation network
ATC	air traffic control
ATCARS	air traffic control advanced research simulator
ATCBI-4, 5, 6	air traffic control beacon interrogator model 4, 5, and 6
ATCS	air traffic control specialist
ATCSCC	air traffic control system command center
ATCT	air traffic control tower

ATDP	advanced technology development and prototyping
ATIS	automated terminal information service
ATM	air traffic management
ATN	aeronautical telecommunication network
ATN	aviation training network
ATO	Air Traffic Organization
ATOP	advanced technologies and oceanic procedures
ATPA	automated terminal proximity alert
ATSS	airway transportation system specialist
ATTIK	ASIAS tagging, tracking, and integration of knowledge
AURS	advanced unmanned aircraft system
AVN	Aviation System Standards
AVS	FAA Office of Aviation Safety
AWIPS II	advanced weather interactive processing system II
AWOS	automated weather observing system
AWSS	automated weather sensor systems
--B--	
BADA	base of aircraft data
BCAR	business case analysis report
BCD	baseline change decision
BLI	budget line item
BPM	business process management
BPR	business process reengineering
BUEC	back up emergency communication
BVR	beacon video reconstitutor
BWM	bandwidth manager
--C--	
CA	conflict alert
C3	command and control communications
CAASD	Center for Advanced Aviation System Development
CAI	contractor acceptance inspection
CAMI	Civil Aerospace Medical Institute
CARF	central altitude reservation function
CARTS	common automated radar tracking system
CARSR	common air route surveillance radar
CAS	commercially available software
CAS	collision avoidance system
CAST	commercial aviation safety team
CAT	category of precision landing requirements
CATM	collaborative air traffic management
CATMT	collaborative air traffic management technologies
CAVS	CDTI assisted visual separation
CBI	computer-based instruction
CCS	conference control switch
CD 2	common digitizer
CDDS	CIWS data distribution system
CDM	continuous diagnostic and mitigation
CDM	collaborative decision making
CDR	critical design review

CDTI	cockpit display of traffic information
CEA	compliance and enforcement actions
CERAP	center radar approach control
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFE	communications facilities enhancement
CFIT	controlled-flight-into-terrain
CFO	Chief Financial Officer
CFR	code of federal regulations
CIM	collaborative information management
CIP	Capital Investment Plan
CIWS	corridor integrated weather system
CIX	collaborative information exchange
CLEEN	continuous lower energy, emissions and noise
CM	configuration management
CMA	configuration management automation
CMC	corrective maintenance contract
CMTD	concept maturity technology demonstration
CNS	communications, navigation and surveillance
COI	community of interest
CONOPS	concept of operations
COMSEC	secure communications
CONUS	continental United States
COTS	commercial off-the-shelf
CPDLC	controller-pilot data link communications
CPDS	critical power distribution system
CRD	concept and requirements definition
CRDRD	concept and requirements definition readiness decision
CREWS	CTAS remote weather system
CSPO	closely spaced parallel runway operations
CSPR	closely spaced parallel runways
CSSD	common status and structure data
CST	communication support team
CSS-Wx	common support services – weather
CTAS	center TRACON automation system
CTD	common terminal digitizer
CTOP	collaborative trajectory operations program
CTS	coded time source
CWP	corporate work plan
--D--	
DA	decision altitude
D&I	design and implementation
DALR	digital audio legal recorder
DASI	digital altimeter setting indicator
Data Comm	data communications
DATCF	deployable air traffic control facility
DB	database
DBRITE	digital bright radar indicator tower equipment
DC BUS	direct current backup system
DCIS	data communications integrated services
DCL	departure clearance
DCNS	data communication air/ground network service

DCP	document change proposal
DDCS	direct digital control systems
DDR	detailed design review
DELPHI	DOT accounting system
DEX	data exchange
DF	direction finder
DH	decision height
DHS	Department of Homeland Security
DLP	distance learning platform
DME	distance measuring equipment
DMN	data multiplexing network
DMSMS	diminishing manufacturing sources and material shortages
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DOTS+	dynamic ocean tracking system plus
DR	data repository
DRNP	dynamic required navigation performance
DRSR	digital remote surveillance communication interface processor replacement
D-side	data controller position
DSP	departure spacing program
DSR	display system replacement
DST	decision support tool
DT	development test
DT&E	development test and evaluation
DUAT/S	direct user access terminal system
DVOR	Doppler VOR
DVRS	digital voice recorder system
--E--	
EA	enterprise architecture
EBUS	enhanced backup surveillance system
ECG	en route communication gateway
EDC	enterprise data center
EDDA	environmental due diligence audits
EDMS	electronics drawing management system
eFAROS	enhanced final approach runway occupancy signal
EFD	electronic flight data
EFS	electronic file system
EFSTS	electronic flight strip transfer system
EFVS	enhanced flight vision systems
E-IDS	enterprise information display system
EISA	Energy Independence and Security Act of 2007
ELD	electrical line distribution
ELITE	enhanced local integrated tower equipment
ELVO	enhanced low visibility operations
EMC	energy management and compliance
EMS	environmental management system
EOL	end of life
EON	emergency operations network
EoR	established-on-RNP
EOS	end of service

EOSH	environmental & occupational safety and health
EPA	Environmental Protection Agency
EPACT	Energy Policy Act of 2005
ER	environmental remediation
ERAM	en route automation modernization
ERIDS	en route information display system
ERMS	environmental remote monitoring system
ERP	enterprise resource planning
E-Scan	electronic scan
ESCR	environmental site cleanup report
ESD	electrostatic discharge
ESM	enterprise service monitoring
ESSC	enhanced service small communities
ETR	emergency transmitter replacement
ETVS	enhanced terminal voice switch
EUROCONTROL	European ANSP
EV	enhanced vision
EVS	enhance vision systems
EWD	enhanced WINS distribution
--F--	
F-420	wind sensor
FAALC	FAA Logistics Center
FACT	future airport capacity task
FANS	future air navigation system
FAROS	final approach runway occupancy signal
FAS	flexible analysis system
FAT	factory acceptance test
FBW	fly by wire
FBWTG	FAA bulk weather telecommunications gateway
FCI	facility condition index
FCT	federal contract tower
FDIO	flight data input/output
FDP2K	flight data processing 2000
FDPS	flight data publication service
F&E	facilities and equipment
FFRDC	federally funded research and development center
FFSP	future flight service program
FI	flight inspection
FIB	flight information broker
FICAM	federal identify credential and access management
FID	final investment decision
FIM	flight-deck-based interval management
FIR	flight information region
FIS-B	flight information service – broadcast
FISPD	final implementation strategy and planning document
FIXM	flight information exchange model
FMS	flight management system
FNS	federal NOTAM system
FOC	final operational capability
FOC	flight operations center
FOMS	flight operations management system

FOQA	flight operation quality assurance
FOTT	fiber optic tie trunk
FOXS	flight object exchange service
FPDS-NG	federal procurement data system- next generation
FISPD	final implementation strategy and planning document
fPRD	final program requirements document
FPS	fixed position surveillance
FSIAR	flight standards inspector aircraft replacement
FSRM	facility security risk management
FSS	flight service station
FST	fuel storage tank
FTB	Florida NextGen test bed
FTE	full time equivalent
FTI	FAA telecommunications infrastructure
--G--	
G-III	third generation reference receiver
GA	general aviation
GAO	Government Accountability Office
GAST-D	GBAS approach service type D
GATTOR	general air traffic and technical operations research
GBAS	ground-based augmentation system
GC	gas chromatograph
GDP	gross domestic product
GEO	geostationary communication satellite
G/G	ground to ground
GIM	ground based interval management
GIS	geographic information system
GLS	GPS landing system
GNAS	general national air space system
GNSS	global navigation satellite system
GOMEX	Gulf of Mexico
GPS	global positioning system
GSA	General Services Administration
GUI	graphical user interface
--H--	
HADDS	HOST ATM data distribution system
HAZMAT	hazardous materials
HCS	HOST computer system
HCP	hearing conservation program
HEFA	hydroprocessed esters and fatty acid
HF	human factors
HGOPA	high gain open planar array
HIE	health information exchange
HITL	human-in-the-loop
HOST	en route computer system
HP	high power
HP DME	high power distance measuring equipment
HPSB	high performance sustainable building
HRJ	hydrotreated renewable jet

HSPD	Homeland Security Presidential Directive
HUD	head-up display
HVAC	heating, ventilating and air conditioning
--I--	
IAM	identity and access management
IAP	initial investment analysis plan
IAPs	instrument approach procedures
IARD	investment analysis readiness decision
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICSS	integrated communications switching system
IDEA	aviation integrated demonstration & experimentation for aeronautics
IDAC	integrated departure arrival capability
IDLM	interference detection, location and mitigation
IDS	information display system
IDS	integrated display system
IESP	integrated enterprise service platform
IFIS	integrated flight information system
IFP	instrument flight procedures
IFPA	instrument flight procedures automation
IFR	instrument flight rule
IGCE	independent government cost estimate
IID	initial investment decision
ILS	instrument landing system
IM	interval management
IMC	instrument meteorological conditions
IM-S	interval management spacing
INDP	integrated NAS design and procedure planning
IOA	independent operational assessment
IOC	initial operating capability
IP	internet protocol
IPDS	instrument procedure development system
IPR	initial program requirements
IRU	inertial reference unit
ISAM	integrated safety assessment model
ISD	in service decision
ISO	International Standards Organization
ISPD	implementation strategy and planning document
ISR	in-service review
IT	information technology
ITP	in trail procedures
ITWS	integrated terminal weather system
IVSR	interim voice switch replacement
--J--	
JAWS	Juneau airport wind system
JPDO	Joint Planning and Development Office
JRC	joint resources council

--K--	
KCRT	keyboard cathode ray tube
KVM	keyboard video mouse
KVM	kinetic vertical modeling
--L--	
L5	second civil frequency
LAAS	local area augmentation system
LAHSO	land and hold short operations
LAN	local area network
L-band	frequency range from 1-2 gigahertz
LCGS	low cost ground surveillance
LCSS	logistical center support system
LDACS	L-band digital aeronautical communication system
LDIN	lead in light system
LDRCL	low-density radio communication link
LED	light emitting diode
LIDAR	light detection and ranging
LIS	logistics and inventory system
LITE	local integrated tower equipment
LLWAS	low-level wind shear alert system
LNAV	lateral navigation
LOA	letters of agreement
LOB	FAA line of business
LOC	localizer
LP	low power
LP	localizer performance
LPDME	low power distance measuring equipment
LPGBS	lightning protection, grounding, bonding, and shielding
LPV	localizer performance with vertical guidance
LRR	long-range radar
LRU	line replaceable unit
LRU	lowest replaceable unit
LSS	logistics support services
LSSF	logistics support system and facilities
LVO	low visibility operations
--M--	
MADC	mobile asset deployment center
MALSR	medium-intensity approach light system with runway alignment indicator lights
MAMP	mobile asset management program
MASR	mobile/transportable airport surveillance radar
MATCT	mobile air traffic control tower
MAX	mobile asset exchange tool
MB	marker beacon
MDR	multimode digital radio
MDS	meteorological data server
MEARTS	microprocessor en route automated radar tracking system
Micro EARTS	microprocessor en route automated radar tracking system
MMAC	Mike Monroney Aeronautical Center

MOA	memorandum of agreement
MOCC	mid-states operations control center
Mode S	mode select
MOIE	mission oriented investigation and experimentation
MON	minimum operational network or minimum operating network
MOPS	minimum operational performance standards
MPAR	multi-function phased array radar
MSN	message switching network
MSSR	monopulse secondary surveillance radar
MTR	military training route
MX	mobile engine generator
--N--	
NADIN MSN	national airspace data interchange network – message switching network
NADIN PSN	national airspace data interchange network – package switching network
NAFIS	next generation flight inspection system
NAIMES	NAS aeronautical information enterprise system
NARP	national aviation research plan
NAS	national airspace system
NASA	National Aeronautics and Space Administration
NASDOC	national airspace system document
NASE	NAS adaptive services environment
NAS EA	NAS enterprise architecture
NASPAC	national airspace system performance analysis capability
NASR	national airspace system resources
NAVAIDS	navigation aids
NAV Lean	FAA navigation procedures program to streamline IFP development and implementation
NBSC	NextGen backup surveillance capability
NCAR	National Center for Atmospheric Research
NCP	NAS change proposal
NCR	NAS common reference
NDB	non-directional beacon
NEMC	network enterprise management center
NEMS	NAS enterprise messaging service
NESG	NAS enterprise security gateway
NEXCOM	next generation air/ground communications
NEXRAD	next generation weather radar
NextGen	next generation air transportation system
NIDS	NAS information display system
NGIP	NextGen implementation plan
NHIN	national health information network
NIEC	NextGen integration and evaluation capability
NISC	NAS implementation support contract
NLN	national logging network
NM	nautical mile (6,076 ft.)
NMR	NADIN MSN rehost
NNEW	NextGen network enabled weather
NOAA	National Oceanic and Atmospheric Administration
NOCC	national operations control center
NOP	national offload program
NOTAM	notice to airmen

NPI	NEXRAD product improvement
NPS	NextGen performance snapshots
NRN	national remote maintenance monitoring network
NSAAP	national special activity airspace project
NSIP	NAS segment implementation plan
NSOC	NextGen surface observation capability
NSOS	national security officer service
NSPD	National Security Presidential Directive
NSWRC	next generation surveillance and weather radar capability
NTEP	national test equipment program
NTML	national traffic management log
NTSB	National Transportation Safety Board
NTP	network time protocol
NVMEM	non-volatile memory
NVRP	NAS voice recorder program
NVS	national airspace system voice system
NWP	NextGen weather processor
NWS	National Weather Service
--O--	
OA	operational analysis
OAPM	optimization of airspace and procedures in the metroplex
OARS	operational analysis and reporting system
OAS	oceanic automation system
OASIS	operational and supportability implementation system
OCS	operational control segment
OCX	modernized operational control segment
ODALS	omnidirectional airport lighting system
ODS	operational data services
OE	obstacle evaluation
OEAAA	obstruction evaluation/airport airspace analysis
OFDPS	offshore flight data processing system
OI	operational improvement
O&M	operations and maintenance
OMB	Office of Management and Budget
OMT	operator maintenance terminal
OPD	optimum profile descent
OPS	operations
OPSNET	operations network
ORD	operational readiness demonstration
OS	operating system
OSA	operational safety assessment
OSHA	Occupational Safety and Health Administration
OSI	organization success indicators
OT	operational testing
OT&E	operation test and evaluation
OTM 4D	oceanic trajectory management in four dimensions
OTTM	oceanic tactical trajectory management
--P--	
PA	paired approach

PAF	primary alternate facility
PAPI	precision approach path indicator
PBN	performance based navigation
PBWP	product based work plan
PCB	polychlorinated biphenyl
PCB&T	personnel compensation, benefits and travel
PCPS	purchase card purchasing system
PCS	power conditioning system
PDARS	performance data analysis and reporting system
PDR	preliminary design review
PGW	protocol gateway
PIREPS	pilot reports
PIV	personal identification verification
PLA	program level agreement
PLM	programming language for microcomputers
PLOVTR	protected low visibility taxi routes
PNT	position, navigation and timing
POCC	pacific operations control center
PPD-21	presidential program directive-21
pPR	preliminary program requirements
pPRD	preliminary program requirements document
PPS	precise positioning service
PR	procurement request
PRISM	procurement information system for management
PRM	precision runway monitor
PRM-E	precision runway monitor – electronic scan radar
PRM-R	precision runway monitor - replacement
PS3	power systems sustained support
PSR	primary surveillance radar
PTM	pairwise trajectory management
--Q--	
QMS	quality management system
--R--	
RA	resolution advisory
RAPCON	radar approach control
RAPPI	random access planned position indicator
RASP	regional ADAS service processor
RCAG	remote communication air/ground
RCE	radio control equipment
RCF	radio communication facilities
RCISS	regulation and certification infrastructure for system safety
RCL	radio communication link
RCLR	radio communications link repeater
RCLT	radio communications link terminal
RCM	reliability centered maintenance
RCOM	recovery communications
RCRA	resource conservation and recovery act
R&D	research and development
RDA	radar data acquisition

RDVS	rapid deployment voice switch
R,E&D	research, engineering and development
REIL	runway end identifier lights
REL	runway entrance lights
RepCON	replacement documentation and configuration identification system
RFI	radio frequency interference
RI	runway incursion
RID	runway incursion device
RIRP	runway incursion reduction program
RIT	radar intelligent tool
RMLS	remote monitoring and logging system
RLMS	replacement lamp monitoring system
RMM	remote maintenance monitoring
RMP	resource and management plan
RNAV	area navigation
RNP	required navigation performance
ROC	radar operations center
RPG	radar product generator
RPM	revenue passenger mile
RSA	runway safety areas
RSA	runway safety assessment
R-side	radar controller position
RTCA	Radio Technical Commission for Aeronautics
RTP	resource tracking program
RTR	remote transmitter/receiver
RVR	runway visual range
RVSM	reduced vertical separation minimum
RWSL	runway status lights
RX	receiver
--S--	
S1P1	segment 1, phase 1
S1P2	segment 1, phase 2
S3	segment 3
SA	special authorization
SAA	special activity airspace
SAIDS	system Atlanta information display system
SAMS	special use airspace management system
SARA	Superfund Amendment and Reauthorization Act of 1986
SARPs	standards and recommended practices
SAS	safety assurance system
SASS	small airport surveillance sensor
SASO	system approach for safety oversight
SAT	site acceptance test
SAWS	standalone weather sensors
SBAS	satellite based augmentation system
SBS	surveillance and broadcast service
SCDI	site control data interface
SCIP	Surveillance communication interface processor
SCM	surface conformance monitoring
SDA	system design approval
SDAT	sector design and analysis tool

SDD	software design document
SE2020	systems engineering 2020 contract
SESAR	Single European Sky ATM Research
SETR	system enhancements and technology refresh
SFMA	strategic flow management application
SFMEE	strategic flow management engineering enhancement
SGS	signal generator subsystem
SIDs	standard instrument departures
SIIA	simultaneous independent instrument approach
SIM	surveillance interface modernization
SIR	screening information request
SLA	service level agreement
SLEP	service life extension program
SMA	surface movement advisor
SME	subject matter expert
SMGCS	surface movement guidance control system
SMR	surface movement radar
SMS	safety management system or surface management system
SOA	service oriented architecture
SOC/CSMC	security operations center/cyber security management center
SOPs	standard operating procedures
SOW	statement of work
SOW Gen	statement of work generator module
SPO	safety policy
SPR	safety promotion
SPS	standard positioning service
SRM	safety risk management
SRMTS	safety risk management tracking system
SRS	software requirements specifications
SSC	system support center
SSD	system specification document
SSDI	system security design and integration
SSM	system support modification
SSMT	systems safety management transformation
SSPP	strategic sustainability performance plan
SSR	secondary surveillance radar
SSS	system segment specification
STAR	standard terminal arrival routes
STARS	standard terminal automation replacement system
STARS E/L	STARS enhanced local integrated tower equipment/local integrated tower equipment
STBO	surface trajectory based operations
STDDS	SWIM terminal data distribution system
StdAC	standard airworthiness certifications
STEN	satellite telephone emergency network
STEP	sustainment and technology evolution plan
STF	surface tactical flow
STM	surface traffic management
STVS	small tower voice switch
SUA	special use airspace
SWAC	system-wide analysis capability
SWIM	system-wide information management
SYNC	synchronization

--T--	
TACAN	tactical air navigation antenna
TAF	terminal area forecast
TAGARS	technically advanced general aviation research simulator
TAMR	terminal automation modernization replacement
TBFM	time-based flow management
TBM	time-based metering
TBO	trajectory based operations
TCAS II	traffic alert and collision avoidance system II
TCS	terrestrial communication subsystem
TDLS	tower data link service
TDM	time division multiplexing
TDWR	terminal Doppler weather radar
TechNET	technicians network
TechStat	technical status
TF	track-to-fix
TFDM	terminal flight data manager
TFM	traffic flow management
TFMS	traffic flow management system
TFR Bldr	temporary flight restriction builder
THL	takeoff hold lights
TIS-B	traffic information service-broadcast
TMI	traffic management initiative
TMU	traffic management unit
TPC	TFM production center
TR	technology refresh
TRACON	terminal radar approach control
TRS	traffic flow management infrastructure field/remote site
TRS-R	traffic flow management remote site – reengineering
TSO	technical standard order
TSS	tower simulation system
TSSC	technical support services contract
TVSR	terminal voice switch replacement
--U--	
UAS	unmanned aircraft systems
UATR	universal access transceiver receiver
UAV	unmanned aerial vehicles
UCS	unified contracting system
UHF	ultra high frequency
UIS	unstaffed infrastructure sustainment
UPS	uninterruptible power source
URET	user request evaluation tool
USGCB	United States government configuration baseline
USNS	United States NOTAM system
UV/VAS	ultraviolet and visible absorption spectroscopy
--V--	
VASI	visual approach slope indicator
VDB	VHF data broadcast

VDL	VHF data link
VFR	visual flight rules
VHF	very high frequency
VMC	visual meteorological conditions
VoIP	voice over internet protocol
VOR	very high frequency omnidirectional range
VORTAC	very high frequency omnidirectional range collocated with tactical air navigation
VOT	VOR test range
VRRP	voice recorder replacement program
VRTM	verification requirements traceability matrix
VSCS	voice switching and control system
VSBP	voice switch bypass system
VTABS	VSCS training and backup switch
--W--	
WAAS	wide-area augmentation system
WAFS	world area forecast system
WAM	wide area multilateration
WAP	wireless application protocol
WARP	weather and radar processor
WARP RAMP	WARP radar and mosaic processor
WBS	work breakdown structure
WCS	web coverage service
WDS	windshear detection service
WebCM	web configuration management
WEF	wind equipment F-400 series
WID	wireless intrusion detection
WIFS	weather internet file service
WiWaves	wind and wave evacuation & survival
WFI	weather forecast improvements
WFS	web features services
WINS	weather information network server
WIT	workplace inspection tool
WJHTC	William J. Hughes Technical Center
WME	wind measuring equipment
WMS	web map services
WMSCR	weather message switching center replacement
WP	work package
WSDD	web service description documents
WSDS	wind shear detection services
WSP	weather systems processor
WSRF	water survival research facility
WSS	wind shear services
WTMA	wake turbulence mitigation for arrivals
WTMA-P	wake turbulence mitigation for arrivals - procedural
WTMA-S	wake turbulence mitigation for arrivals - system
WTMD	wake turbulence mitigation for departures
WTS-BMgmt	work tracking software – budget management
Wx	weather
WXXM	weather information exchange model