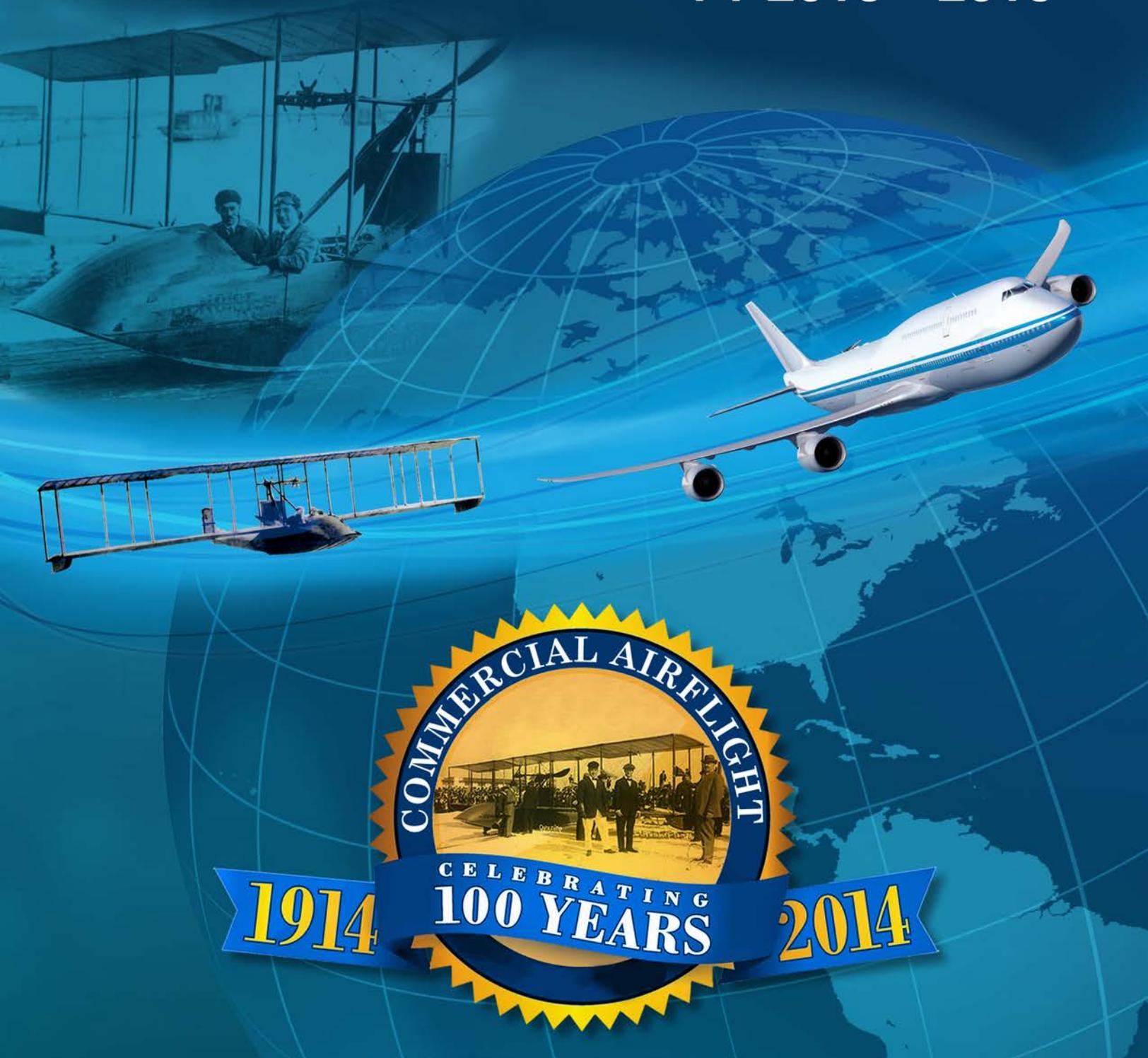




Federal Aviation  
Administration

# National Airspace System Capital Investment Plan FY 2015 - 2019





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# **Federal Aviation Administration National Airspace System Capital Investment Plan for Fiscal Years 2015–2019**

## **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 Appropriations Act of 2014 (Public Law 113-76) requires submittal of a five year CIP. The language requiring the CIP states “That upon initial submission to the Congress of the fiscal year 2015 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 2015 through 2019, 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.”

Section 1 of this Introduction discusses the Agency’s Strategic Priorities and important factors affecting the planning for the future. Section 2 “Key Considerations in Capital Planning” presents the main issues that must be addressed in developing a five year capital plan. Section 3 “Capital Investment Plan Summary” provides an overview of FAA’s fiscal year (FY) 2015 budget request and the planned capital funding for FY 2016 through FY 2019. Section 4, “NextGen Portfolios and Implementations”, describes the Next Generation Air Transportation System (NextGen) Portfolios and their planned Operational Improvements (OIs). Section 5, “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 the capital investment program descriptions, links programs to performance metrics and provides program milestones and implementation schedules. Appendix C contains the FY 2015 President’s budget request and the planned outyear funding amounts from FY 2016 through FY 2019 by Budget Line Item (BLI). Appendix D provides 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](http://fast.faa.gov/AcquisitionCategories.cfm?p_title=Special%20Topics)

Appendix E provides acronym and abbreviation definitions.

## 1.2 Strategic Priorities and the CIP

The 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, as well as Priority Initiatives and related Performance Metrics that will help achieve the priorities. The Administrator has defined four Strategic Priorities as follows:

- **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.
- **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.
- **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.
- **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.

These Strategic Priorities are being used as the organizing principle for agency business plans beginning in FY 2014 and replace the framework of Destination 2025.

Capital programs support the FAA’s Strategic Priorities and Performance Metrics. The Strategic Priorities guide the FAA in upgrading NAS systems and operating procedures to meet the demands of current and future growth. Performance Metrics are a tool the agency uses to track progress towards accomplishment of the Strategic Priorities. The agency frequently depends on capital investments to meet the Performance Metrics. Capital investment success is determined by comparing actual performance improvements to the Performance Metrics. The results can then be used to determine whether adjustments need to be made to the system design or its implementation schedule.

Each Budget Line Item 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; one program may not be

successful in meeting a performance metric without completing other supporting programs. Also, in the complex system used for air traffic control (ATC), system 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.

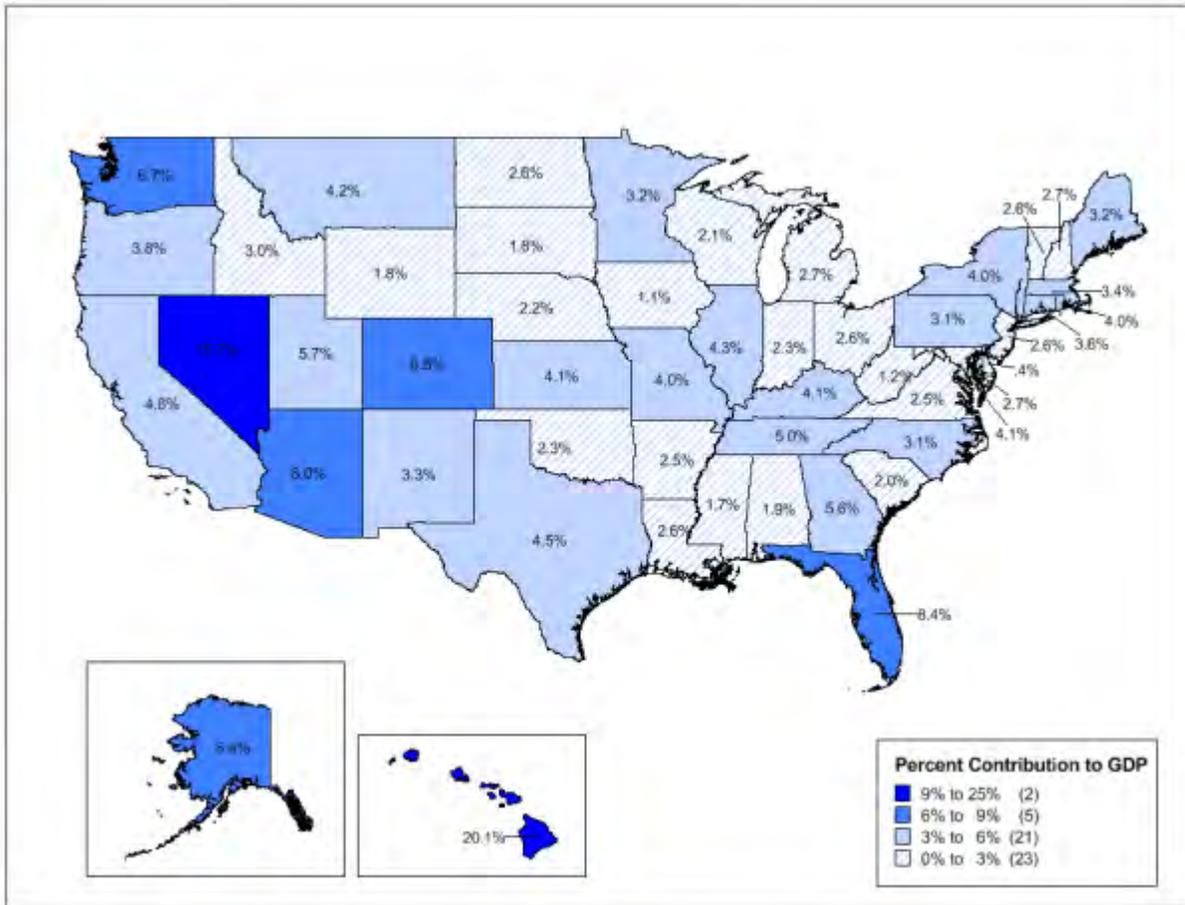
Each program in Appendix B has a section titled “Relationship of Program to FAA Performance Metric” which gives more specific information about how the program contributes to meeting a Performance Metric.

### **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 February 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.

Aviation spending also has a significant impact on the economy of most states as shown in figure 1-1 below. It encourages the growth of local economies and supports employment opportunities in a variety of occupations. Civil aviation’s contribution to state economies is as high as 20.1 percent in Hawaii. In several states, a large manufacturing base dedicated to producing aircraft and related aviation equipment provides a significant boost to their economies. Another significant factor in the amount of aviation’s economic impact is the contribution from tourism. Spending on air services and the related spending on food, hotels and entertainment provide a boost to several segments of local economies. In some states, such as Alaska, air service is an economic necessity for transporting a wide variety of goods and services due to a lack of other modes of transportation.



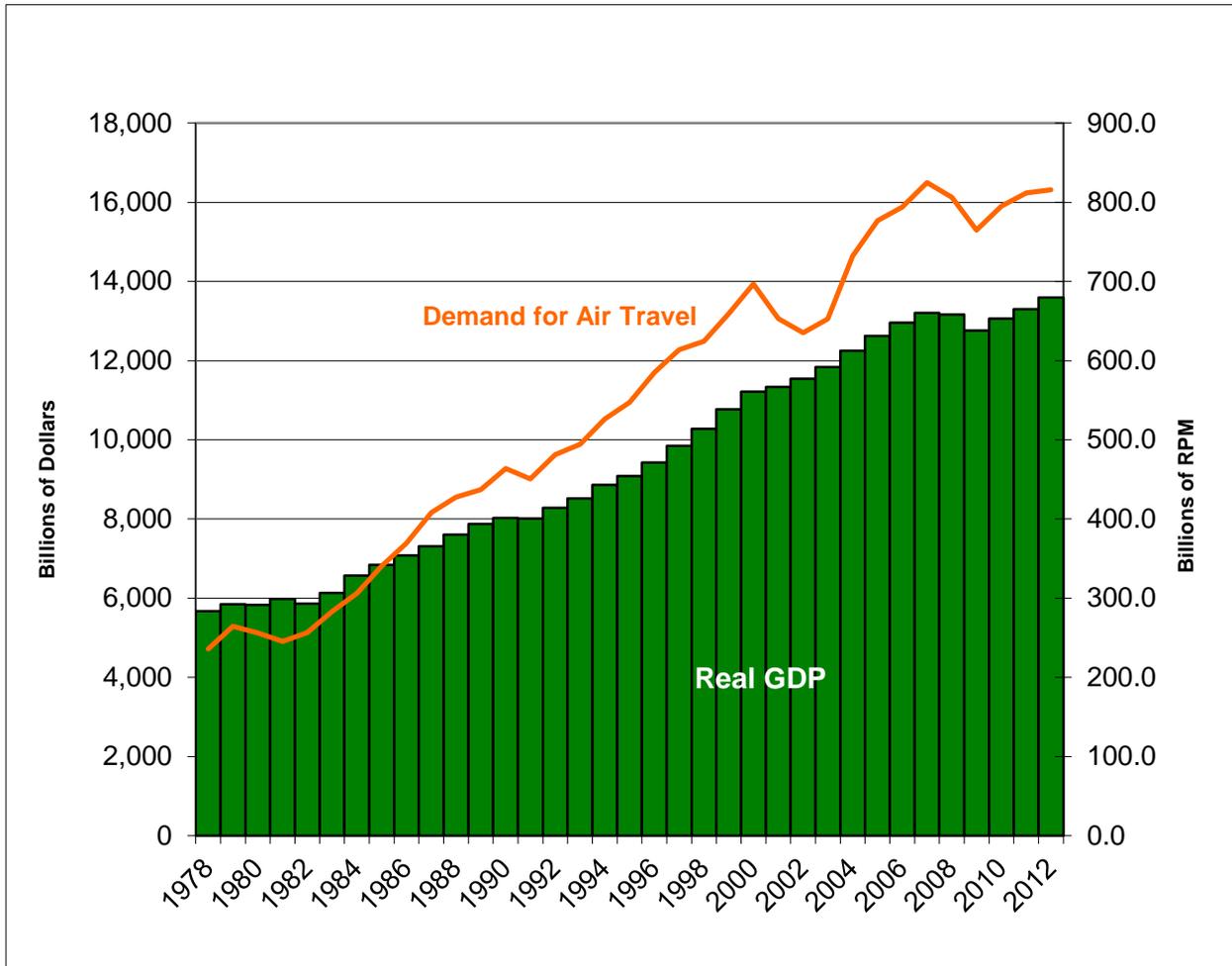
**Figure 1-1 Aviation Percent of State Gross Domestic Product<sup>1</sup>**

### 1.3.2 Air Travel Demand

Historically, the demand for air travel is closely related to changes in the economy. As figure 1-2 shows the growth trend in revenue passenger miles (RPM) over the last 30 years corresponds positively with the growth in Gross Domestic Product (GDP). The U.S. inflation-adjusted (real) economic output long-term growth trend has supported the continuing increases in the number of passengers and the miles traveled. There are some deviations in both GDP and RPM growth, which are caused by abnormal events, such as the terrorist attacks of September 11, 2001 and the slower than normal pace of economic recovery. Based on the data available for calendar year 2013, economic growth is positive. With the continuing growth in the economy, FAA expects future growth in demand for air travel, which ultimately will lead to more aircraft operations, and translate into increased workload for the FAA. It also translates into more pressure on the core airports to handle additional operations. Significant increases in operations at these airports

<sup>1</sup> Source: “The Economic Impact of Civil Aviation on the U.S. Economy,” February 2014.

could increase delays, therefore advanced NextGen capabilities to provide the improved services must be implemented to handle this growth.



**Figure 1-2 Air Travel Demand Growth Compared to Growth in GDP<sup>2</sup>**

### 1.3.3 Airport Expansion Projects

Ongoing efforts to increase airport capacity also affect the need for capital investment, especially at the Core airports, which are experiencing delays. Fort Lauderdale/Hollywood International Airport has an active project to extend a runway to support air carrier operations. Port Columbus International Airport recently completed its runway relocation project. John F. Kennedy International Airport has a runway reconstruction, widening, and extension underway to accommodate new large aircraft and to reduce delays. Chicago O’Hare International Airport completed Phase I of the O’Hare Modernization Program and has begun the first of three projects in Phase II. Philadelphia International Airport is beginning a major airport

<sup>2</sup> Sources: U.S. Department of Commerce, Bureau of Economic Analysis and U.S. Department of Transportation, Bureau of Transportation Statistics

reconfiguration program. Anchorage, Atlanta, and San Antonio International Airports recently completed runway extensions to improve efficiency of operations. Increasing capacity at large, delay-prone airports is critical to overall NAS performance because delays at the large airports may propagate to other airports where passengers are waiting for incoming flights. The 29 large hub airports handle about 71% of airline enplanements. The combined total of 62 large and medium hubs supports about 88% of all U.S. passenger enplanements. Delays at these airports affect a significant number of passengers, and delayed flights at these airports may cause passengers to miss connections for their next flight.

When local airport authorities (in coordination with FAA) build new runways or otherwise expand capacity, additional supporting navigation and surveillance equipment and new procedures may be needed to make that capacity fully usable. New or relocated runways often require that airspace around the airports be reconfigured to accommodate new approach and departure patterns. This frequently requires installing new navigational aids and precision landing systems to help pilots in the approach patterns for the runways. To achieve the full benefits of precision approach guidance systems, approach lights must be installed and visibility sensors positioned along the runway so that precision guidance 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 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, or 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 provide adequate funding to 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. Once an aircraft is airborne in controlled airspace, maintaining its separation from other aircraft for the entire flight from takeoff to landing 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 towers and 167 Terminal Radar Control (TRACON) facilities that control air traffic approaching, landing at and departing airports. The flow of air traffic is assisted by 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 will be necessary.

There are ongoing reviews to identify the level of support needed to renovate and replace existing infrastructure so that the air traffic control system can continue to operate efficiently. Preliminary data indicates that:

- Many en route control facilities require renovations and physical plant upgrades to protect equipment and employees from potentially unsafe working conditions,
- Tower renovations and replacements to meet operational needs and correct material defects in existing facilities will have costs that exceed \$100 million per year,
- Many of the radar systems that were installed in the 1990s will be retained as a backup for NextGen so they must be modernized and eventually replaced,
- Many navigation systems will be retained as either a back up to NextGen or to support operational improvements. These systems are old and a portion will have to be replaced over the next ten years,
- Radio communications between pilots and controllers is a key element of air traffic control and the radios must be updated with the newer technology that supports NextGen operations,
- Virtually all of the communications, navigation and surveillance systems are housed in shelters which must be renovated regularly. Defects that endanger the equipment inside must be addressed quickly to avoid disruptions to the flow of air traffic.

Reliable electrical power is critical for the operation of the ATC system. Super Storm Sandy is a recent example of commercial power failing and impacting the operation of the NAS, and how the FAA backup power equipment can minimize the impact. Massive commercial power outages occurred across the middle and northern Atlantic states starting on October 29, 2013. NAS facilities were without commercial power for a total of 9,438 hours. The FAA's backup power systems provided power to the NAS facilities for over 4,500 hours of those hours. Because of the backup power capability, no flight operations were affected and there were no

delays due to power outages. Emergency power generators have been installed at most air traffic facilities, and maintaining this backup power requires constant attention and replacement of both the power generators and the systems that condition the power to protect ATC automation systems.

The air traffic control infrastructure has an estimated \$4.7B backlog of requirements for sustaining its facilities which is a challenge in the current constrained budget environment. At current funding levels, the backlog is expected to grow to \$7.5B by 2024. 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 2015 Budget, a NAS Sustainment Strategy was developed to support the following 12 programs for emphasis in sustaining the NAS:

- ARTCC Building Improvements/Plant Improvements, BLI 2A05
- Air Traffic Control En Route Radar Facilities Improvements, BLI 2A08
- Terminal Air Traffic Control Facilities – Replace, BLI 2B06
- ATCT/Terminal Radar Approach Control (TRACON) Facilities – Improve, BLI 2B07
- NAS Facilities 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
- Energy Management and Compliance (EMC), BLI 2E08
- Hazardous Materials Management, BLI 3A01
- Mobile Assets Management Program, BLI 3A11

In addition to air traffic control infrastructure, the FAA has numerous other facilities that support operations and require periodic renewal and replacement including:

- A large training facility for new air traffic controllers and maintenance technicians,
- A logistics center that warehouses and ships parts to operational facilities,
- Repair shops that rebuild complex components that can be reused, and
- Several facilities that support research, test and evaluation of safety systems and new equipment.

## **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. The movement to the next generation of aviation is being enabled by a shift

from air traffic tactical control to strategic air traffic management, use of satellite-based navigation and surveillance, data communications, enhanced weather predictions and new procedures that combine to make air travel more convenient, predictable and environmentally friendly. NextGen will enhance safety, reduce delays, save fuel and reduce aviation's adverse environmental impact. 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. The transition to NextGen is proceeding and the FAA is making meaningful progress with the implementation of technologies and procedures on the ground and in the airspace.

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

### **3 Capital Investment Plan Summary**

#### **3.1 FAA's FY 2015 President's Budget Request**

Capital Investment is one component of the overall budget for FAA. FAA's total FY 2015 Budget Request is \$15.4 billion, which includes \$9.75 billion for Operations, \$2.6 billion for Facilities and Equipment, \$2.9 billion for Airport Improvement Grants and \$156.75 million for Research, Engineering and Development. This capital investment plan discusses the F&E (capital programs) planned over the next five years. It begins with a base funding request of \$2.604 billion in FY 2015 reflecting the President's Budget Request and outyear funding totals of \$2.654 billion for FY 2016, \$2.711 billion for FY 2017, \$2.771 billion for FY 2018 and \$2.833 billion for FY 2019. (See Appendix C)

The FAA's FY 2015 Budget Request can be found at the following web address: <http://www.dot.gov/budget/dot-budget-and-performance>

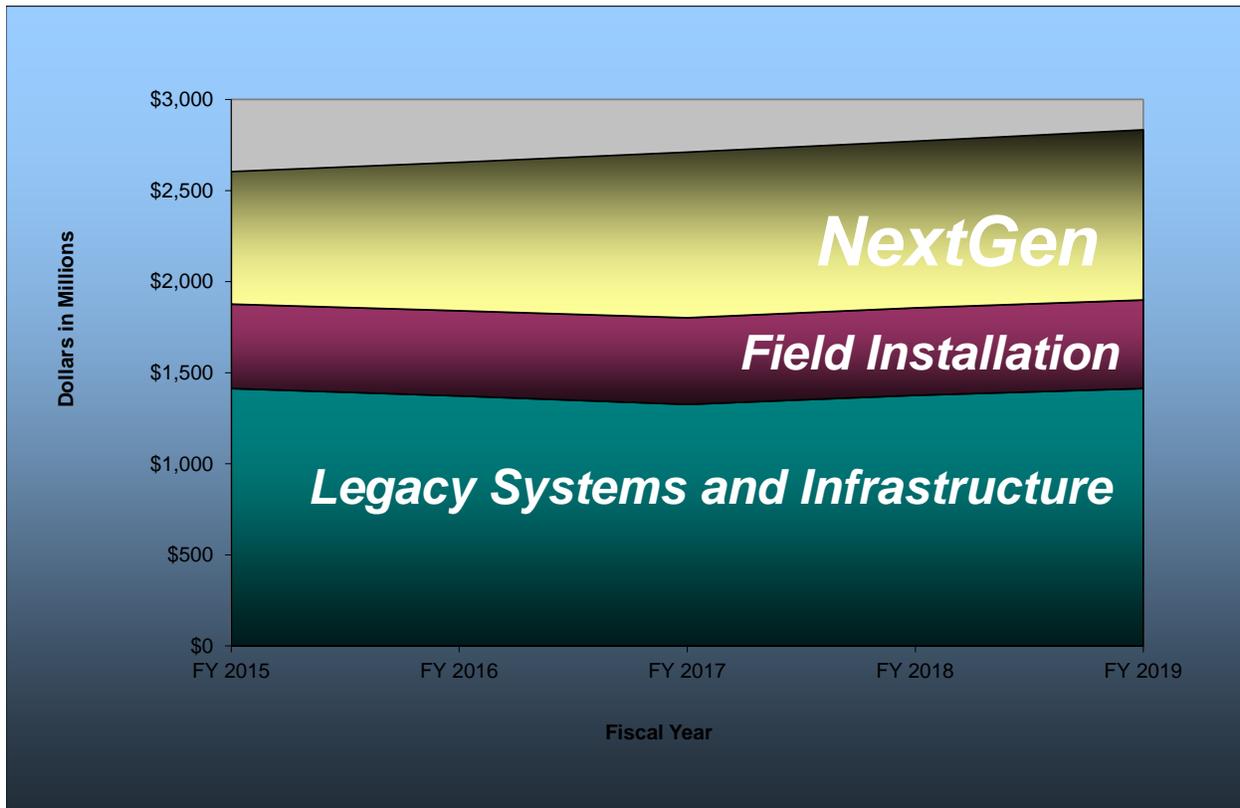
#### **3.2 Five Year Capital Plan Overview**

Capital investments are typically multi-year investments to support long-term Agency goals and objectives. New systems or facilities can take several years to plan, procure and implement. When a program is approved and baselined, the long term funding requirements to accomplish the program are identified and FAA management commits to funding these programs at the baseline levels. A program may have interdependencies with other programs and its success may depend upon the delivery of systems or interfaces implemented by other programs.

FAA’s capital investment portfolio is divided into three categories:

- NextGen which will provide new capabilities (\$727M, 28% of FY 2015 funding),
- Legacy Systems and Infrastructure which modernizes and sustains the current systems (\$1,413M, 54% of FY 2015 funding), and
- Field Installation which provides program management and Personnel Compensation, Benefits, and Travel (PCB&T) supporting the installation of equipment for both legacy and NextGen systems (\$463M, 18% of FY 2015 funding).

Figure 3-1 shows the balance between legacy systems and infrastructure investment and NextGen over the 5 year window of the CIP.



**Figure 3-1 FAA’s Capital Investment Portfolio**

### 3.3 Facilities and Equipment Budget Activities

Within the F&E account, the budget is broken down into five different activities. Activity 1 programs support the initial design, engineering, development, test and evaluation activities associated with producing end-product systems, technologies and capabilities for the NAS. Activity 2 supports ATC major systems acquisitions and facilities infrastructure programs in the implementation phase. Activity 3 supports modernization of systems and support infrastructure for non-air traffic control facilities. Activity 4 provides mission support services across the FAA organization. Activity 5 covers PCB&T.

Activity 5 funding is included in Appendix C, but it is not described as a standalone program plan in Appendix B because this activity supports the management and implementation of most of the programs in the CIP.

Table 3-1 presents the Capital Investment Portfolio allocated to budget Activities. The breakout shows yearly funding amounts for Activities 1 through 4 by NextGen and Legacy Systems and Infrastructure. Activity 5 Field Installation is broken out by NextGen and Legacy for FY 2015 only. NextGen personnel costs are refined each year in support of the budget submission.

	FY 2015 Budget		FY 2016		FY 2017		FY2018		FY 2019	
	Legacy	NextGen	Legacy	NextGen	Legacy	NextGen	Legacy	NextGen	Legacy	NextGen
Activity 1	\$55.1	\$115.8	\$50.1	\$150.8	\$59.6	\$212.2	\$59.2	\$256.5	\$56.8	\$261.3
Activity 2	\$1,007.3	\$578.4	\$977.8	\$629.0	\$929.2	\$661.3	\$975.0	\$622.3	\$1,022.3	\$641.4
Activity 3	\$139.6	\$18.7	\$129.7	\$17.0	\$111.2	\$18.0	\$107.4	\$18.0	\$103.7	\$18.0
Activity 4	\$211.2	\$14.7	\$215.5	\$18.1	\$225.9	\$17.9	\$234.2	\$18.0	\$230.2	\$13.0
Activity 5	\$416.5	\$46.5	\$467.0		\$475.7		\$480.5		\$486.3	
Total	\$1,829.7	\$774.0	\$1,840.1	\$815.0	\$1,801.6	\$909.4	\$1,856.3	\$914.7	\$1,899.3	\$933.7

**Table 3-1 Capital Investment Portfolio allocated to Budget Activities (\$M)**

A more detailed breakdown of funding amounts for each BLI within each Activity is provided in Appendix C. Outyear programs are grouped and aligned to the FY 2015 BLI structure. When the budget is revised each year, the BLI titles and numbers may change to adjust for programs that are ending or new programs that are added.

### 3.4 Legacy Systems and Infrastructure

The FAA has a large base of automation, navigation, surveillance, communications, and weather systems and thousands of facilities to house personnel and systems. These systems and facilities provide the basic infrastructure for the future NAS and must be modernized and replaced as they age or when operational needs change. The FY 2015 budget request provides \$1,413M for legacy systems and infrastructure which is distributed to Activities 1 through 4 as shown in Table 3-1. The total funding amounts for legacy and infrastructure programs for FY 2016 through 2019 is \$5,488M. Many of the programs requesting funding in FY 2015 have continuing funding requirements in the succeeding years.

Some key areas for investment in 2015 that support NAS long term system modernization are:

- **Terminal automation** – A long term effort is underway to upgrade all of the terminal automation systems. This effort is needed to replace systems that are not sustainable and do not provide the capability to support NextGen OI. Tower cab information systems will be upgraded and replaced to provide tower controllers information needed to better manage surface flow.
- **En route automation** – The new En Route Automation Modernization (ERAM) platform is planned to be installed and operational at all sites by the middle of FY 2015. 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 many OIs 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 unsupported systems.
- **Surveillance/Weather** – Modernization of en route and terminal primary and secondary surveillance radars will be implemented to upgrade or replace aging unsupported systems. Weather sensing and processing equipment will also be modernized.
- **Air Traffic Control Facilities** – Air Route Traffic Control Centers, Air Traffic Control Towers and Terminal Radar Approach Control Facilities need continual upgrading and modernization as those facilities age. These improvements are needed to support installation and operation of future systems.
- **Power systems** – NAS systems are dependent on reliable and high quality power. Emergency backup systems and power system components must be replaced as they age in order to maintain overall system reliability. New NAS systems supporting NextGen have increased sensitivity to power fluctuations so upgrading and replacing power systems is essential for future equipment investments.
- **Decommissioning** – The FAA has embarked on a concerted effort to eliminate those systems and facilities that are no longer needed. Decommissioning will reduce system maintenance, utilities and lease costs.

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

### 3.5 NextGen

The total NextGen F&E FY 2015 budget request includes \$727.5M for NextGen programs and \$46.5M for personnel costs totaling \$774M. The \$727.5M for NextGen programs is distributed to Activities 1 through 4 as shown in Tables 3-1 and 3-2. NextGen is structured into 11 portfolios for the development and implementation of OIs plus 8 NextGen programs. The total funding amount for FY 2016 through 2019 is \$3,572M.

Development of NextGen OIs can include concept development, modeling, safety analyses, demonstrations, international coordination, standards development, and other pre-implementation activities. When a concept matures and a solution is determined, the improvement is implemented by procedure changes, system enhancements, air space changes, training, and upgrades to aircraft avionics as necessary to support the improvement. Development of OIs involves participation by Operations, Research and Development, and F&E organizations and NAS users. Capital investment programs develop the solutions for NextGen OIs and support the activities leading up to the initial investment management decisions for implementation. A solution, when fully developed, is baselined for acquisition and implementation. Activities 2 through 4 support the implementation of the solutions by developing system enhancements or new systems.

Developmental NextGen work is conducted in support of the following Portfolios. (More detailed descriptions of the portfolios and associated OIs are included in Section 4):

- Separation Management – BLI 1A05
- Improved Surface/Terminal Flight Data Manager (TFDM) – BLI 1A06
- On Demand NAS – BLI 1A07
- Environment – BLI 1A08
- Improved Multiple Runway Operations – BLI 1A09
- NAS Infrastructure – BLI 1A10
- NextGen Support at WJHTC – BLI 1A11
- Performance Based Navigation and Metroplex – BLI 1A12
- Collaborative ATM (CATM) – BLI 2A15
- Time Based Flow Management (TBFM) – BLI 2A16
- System Safety Management – BLI 3A09

In addition to the activities within the portfolios to develop OIs, NextGen programs implement core capabilities that provide the foundation for the introduction of new NextGen OIs. Each of these programs can support multiple OIs and are described below:

- **En Route Automation Modernization System Enhancements and Technology Refresh** – ERAM System Enhancements will be upgrading the ERAM platform to support NextGen OIs and provides software and hardware enhancements to the ERAM system for the En Route sector controller team (BLI 2A02);
- **System Wide Information Management (SWIM)** – SWIM provides the standards, hardware and software to enable information management and data sharing required to support NextGen OIs. This includes Common Support Services – Weather (CSS-Wx) which provides access for NAS users to a unified aviation weather picture (BLI 2A12);
- **ADS-B NAS Wide Implementation (ADS-B)** – Automatic Dependent Surveillance-Broadcast provides more accurate and timely surveillance data needed to improve NAS operations (BLI 2A13);
- **NextGen Weather Processor (NWP)** – This program will establish a common weather processing platform which will provide improved weather products and support operations (BLI 2A17);
- **Data Communications in support of NextGen** – Data Comm provides data link communications between controller and pilot to facilitate information transfer (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 NextGen OIs (BLI 2B13);
- **Aeronautical Information Management (AIM) Program** – AIM provides digital aeronautical information to NAS users (BLI 4A09); and
- **Cross Agency NextGen Management** – This program provides for the continuation of the cross-agency planning and activities to support the long term objectives previously found in the Joint Planning and Development Office (JPDO). The program is being carried forward by the NextGen Organization and includes architecture, roadmapping, and technical analysis activities (BLI 4A10).

Table 3-2 below shows NextGen program funding by BLI from FY 2015 through 2019.

BLI Number	Program Name	FY 2015 Budget	FY 2016	FY 2017	FY 2018	FY 2019
<b>NextGen</b>		<b>\$194.7</b>	<b>\$225.7</b>	<b>\$283.1</b>	<b>\$318.1</b>	<b>\$319.5</b>
1A05	NextGen – Separation Management Portfolio	\$13.0	\$28.0	\$42.5	\$41.5	\$36.5
1A06	NextGen – Improved Surface/Terminal Flight Data Manager (TFDM) Portfolio	\$38.8	\$40.3	\$80.0	\$124.0	\$133.8
1A07	NextGen – On Demand NAS Portfolio	\$6.0	\$15.2	\$16.0	\$19.3	\$24.0
1A08	NextGen – Environment Portfolio	\$2.5	\$3.5	\$3.5	\$3.5	\$3.5
1A09	NextGen – Improved Multiple Runway Operations Portfolio	\$3.5	\$10.8	\$11.5	\$9.5	\$7.0
1A10	NextGen – NAS Infrastructure Portfolio	\$13.5	\$22.4	\$25.2	\$25.2	\$23.0
1A11	NextGen – Support Portfolio at WJHTC	\$13.0	\$11.0	\$12.0	\$12.0	\$12.0
1A12	NextGen – Performance Based Navigation & Metroplex Portfolio	\$25.5	\$19.7	\$21.5	\$21.5	\$21.5
2A02	NextGen – En Route Automation Modernization (ERAM) – System Enhancements and Technology Refresh	\$45.2	\$82.4	\$70.0	\$90.0	\$100.0
2A12	NextGen – System-Wide Information Management (SWIM)	\$60.3	\$57.9	\$52.9	\$43.6	\$40.2
2A13	NextGen – Automatic Dependent Surveillance - Broadcast (ADS-B) NAS Wide Implementation	\$247.2	\$183.9	\$166.4	\$155.8	\$163.3
2A15	NextGen – Collaborative Air Traffic Management Portfolio	\$13.5	\$20.8	\$22.7	\$35.3	\$36.3
2A16	NextGen – Time Based Flow Management (TBFM) Portfolio	\$21.0	\$22.2	\$28.2	\$35.8	\$54.9
2A17	NextGen – Next Generation Weather Processor (NWP)	\$23.3	\$42.4	\$48.1	\$35.2	\$22.7
2A19	NextGen – Data Communication in support of NextGen	\$147.3	\$194.4	\$233.0	\$186.6	\$174.0
2B13	NextGen – National Airspace System Voice System (NVS)	\$20.6	\$25.0	\$40.0	\$40.0	\$50.0
3A09	NextGen – System Safety Management Portfolio	\$18.7	\$17.0	\$18.0	\$18.0	\$18.0
4A09	NextGen – Aeronautical Information Management Program	\$12.7	\$15.1	\$14.9	\$15.0	\$10.0
4A10	NextGen – Cross Agency NextGen Management	\$2.0	\$3.0	\$3.0	\$3.0	\$3.0
Total		\$727.5	\$815.0	\$909.4	\$914.7	\$933.7

**Table 3-2 NextGen Program Summary**

More details on all NextGen programs are provided in Section 5 and Appendix B.

## 4 NextGen Portfolios and Implementations

As NextGen has progressed, much of the pre-implementation work has transitioned into programs in the implementation phase. In keeping with this natural progression, NextGen’s concept development and pre-implementation work is now focused on the next useful segments of capabilities utilizing these base programs. To deliver the next useful segment of capabilities, the NextGen pre-implementation efforts described in this section include the engineering and acquisition efforts to add functionality to these base systems and the complementary and necessary effort in standards, guidance and operational descriptions/procedures.

As part of this natural evolution towards implementation and to address RTCA Task Force 5 recommendations, the structure of NextGen planning documents has shifted to implementation portfolios in the NAS Segment Implementation Plan (NSIP) and the NextGen Implementation Plan (NGIP). This year both the budget request and the CIP contents have been realigned to this new portfolio structure. This structure provides clearer line-of-sight information across all NextGen budget documents, communications and plans and allows stakeholders to transparently move between documents and easily identify projected funding and find greater detail on when capabilities will be deployed and operational.

The NextGen implementation portfolios, listed in section 3.5 and below, will achieve increased levels of performance in delivery of ATM services. In each portfolio the next useful segment of capabilities are identified as a set of operational improvements (OI) that safely increase the efficiency of the air traffic control system. The OIs included in this section are targeted for implementation within the 2015-2019 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 5. 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 NAS Service, for example, 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>

#### **4.1 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 of varying navigation equipment and wake performance capabilities. The enhancements to this service are articulated in the following Operational Improvements:

##### **Oceanic In-trail Climb and Descent**

Air navigation service provider (ANSP) automation enhancements will take advantage of improved communication, navigation and surveillance coverage in the oceanic domain to allow climbs and descents with lower separation between aircraft. When authorized by the controller, pilots of equipped aircraft can use these established procedures for climbs and descents to more optimal flight altitudes. (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. The ANSP may select one of the resolutions to issue to the aircraft. (OI: 102114)

##### **Automation Support for Separation Management**

ANSP automation provides the controller with tools to manage aircraft separation in a mixed navigation and wake performance environment. Advanced aircraft types with changing wake characteristics and new entrants such as UAS with widely varying operational performance envelopes may lead to the use of multiple separation minima in the enroute and the need for advisory support to the controller. (OI: 102137)

## Wake Turbulence Mitigation for Arrivals: CSPR

Initially, dependent separation between aircraft on parallel approach paths 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 and larger aircraft based on a safety analysis of the airport geometry, local meteorology and other factors at each airport. (OI: 102144)

## Wake Re-Categorization

The current set of pairwise wake separation requirements are updated and expanded based on analysis of wake generation, wake decay and encounter effects for the current fleet of aircraft. This refines the required controller applied separation 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. This flexibility allows the user to more easily request trajectory changes to better fit the new conditions. FAA automation supports coordination and feedback on contention as well as planning and management for congested oceanic airspace. (OI: 104102)

## Integrated Arrival/Departure Airspace Management

This capability expands the use of terminal separation standards and procedures within the newly defined transition airspace. It extends further into current en route airspace (horizontally and vertically). A redesign of the airspace will permit a greater number of RNAV and RNP procedures within the transition airspace 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 other than operations in oceanic airspace. These reductions will allow the controller to use more flight efficient clearances to manage conflict resolution and the aircraft (OI: 102117)

## Automated Support for Conflict Resolution

ANSPs are responsible for separation management. Automated assistance is provided to probe pilot 4D trajectory change requests, consider flow requirements and constraint, and identify conflicts. By including flow constraints into consideration, the resolution alternatives provided to the ANSP to resolve the safely conflict will support both tactical and strategic objective. (OI: 104127)

## Improved Management of Special Activity Airspace (SAA)

Assignments, schedules, coordination, and changes to status of SAA are made readily available for operators and ANSPs using automation systems. Airspace use is optimized and managed in real-time, based on actual flight profiles and real-time operational use parameters. Airspace reservations for military operations, unmanned aircraft system flights, space flight and re-entry, restricted or warning areas, and flight training areas are managed on an as-needed basis. (OI: 108212)

## Flexible Routing

Leveraging enhanced flight capabilities based on RNP, flight operators can operate along preferred and dynamic flight trajectories based on an optimized and economical route for a specific flight, accommodating user preferred flight trajectories. (OI: 102146)

## Capital Investments That Support Separation Management

The Separation Management Portfolio is implemented through programs described in Section 5. Pre-implementation activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B.

- 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
- NextGen Oceanic Capabilities, G01A.01-07
- Separation Automation System Engineering, G01A.01-06

### 4.2 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 effectively manage traffic flows into, on, and departing from airports. 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 environment. Aircraft and vehicles are identified and tracked to provide a full comprehensive picture of the surface environment to ANSPs, equipped aircraft, and flight operations centers. (OI: 102406)

## Improved Runway Safety Situational Awareness for Controllers

At large airports, current controller tools provide surface displays and can alert controllers when aircraft taxi into areas where a runway incursion could result.

Additional ground-based capabilities, including expansion of runway surveillance technology, to additional airports, will be developed to improve runway safety. (OI: 103207)

### Enhanced Surface Traffic Operations

Tower automation provides the ability to transmit automated terminal information, departure clearances and amendments and taxi route instructions via Data Communications (Data Comm), including hold-short instructions. (OI: 104207)

### 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)

## Capital Investments That Support Improved Surface/TFDM

The Improved Surface/TFDM Portfolio is implemented through programs described in Section 5. Pre-implementation activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B.

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

### 4.3 On-Demand NAS Portfolio

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

### Improved Management of Special Activity Airspace

Changes regarding whether special use airspace is active or not in use are readily available for operators and the ANSP. The status changes are transmitted to the flight deck via voice or Data Communications. Flight trajectory planning is managed dynamically based on real-time use of airspace. (OI: 108212)

### On-Demand NAS Information

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

## Capital Investments That Support On-Demand NAS

The On-Demand NAS Portfolio is implemented through programs described in Section 5. 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.

- Flight Object, G05A.02-03
- International Harmonization Demonstration, G08M.01-01
- Common Status and Structure Data, G05A.02-01
- Advanced Methods, G05A.02-02
- Collaborative Information Management, G05M.02-01
- Flight Object Exchange Services (FOXS), G05A.02-08
- Dynamic Airspace, G05A.04-01
- Airspace Resource Management System (ARMS), G05A.02-09

### 4.4 Environment Portfolio

This portfolio focuses on explorations, demonstrations, and development of methods to integrate environmental impact mitigation and energy efficiency in the NextGen infrastructure including enabling activities leading to the establishment and implementation of the NextGen Environmental Management System, the strategy for ensuring compliance with the National Environmental Policy Act and technologies that support NextGen environmental goals.

#### Implement EMS Framework - Phase I

Enable the use of the Environmental Management System (EMS) framework, including environmental goals and decision support tools, to address, plan and mitigate environmental issues, through development of an initial EMS framework, pilot analysis, and outreach programs. (OI: 109309)

#### Implement EMS Framework - Phase II

Establish NextGen EMS in initial stakeholder organizations and FAA, including environmental goals, targets, and performance evaluation, pilot activities and communications programs. It will include multiple increments delivered over time. (OI: 109310)

#### Implement NextGen Environmental Engine and Aircraft Technologies - Phase I

Mature technologies will be developed to reduce noise, emissions, and fuel burn of commercial subsonic jet aircraft. Demonstrate these technologies at sufficient readiness levels to achieve goals of the FAA's Continuous Lower Energy, Emissions, and Noise (CLEEN) program. It will include multiple time sequenced deliverables. (OI: 109315)

#### Increased Use of Alternative Aviation Fuels - Phase I

Determine the feasibility and market viability of alternative aviation fuels for commercial aviation use. Obtain American Society for Testing and Materials (ASTM) International approval of Hydrotreated Renewable Jet (HRJ) blends and other advanced sustainable

fuel blends from renewable resources that are compatible with existing infrastructure and fleet, thus meeting requirement to be a drop-in fuel. (OI: 109316)

### Implement NextGen Environmental Engine and Aircraft Technologies - Phase II

Support certification and commercialization of aircraft technologies for enhanced environmental and energy efficiency improvements demonstrated during Phase I. Demonstrate additional technologies meeting CLEEN goals, including wing laminar flow, advanced aircraft noise reduction, and a lower drag vertical tail. It will include multiple increments delivered over time. (OI: 109318)

### Increased Use of Commercial Aviation Alternative Fuels - Phase II

Obtain ASTM International approval of "drop-in" blends as well as other advanced sustainable alternative fuels. These advanced "drop-in" fuels may dramatically reduce fuel production time and cost and will reduce environmental impacts, improve energy security, and enable carbon neutral growth by 2020. It will include multiple increments delivered over time. (OI: 109321)

## Capital Investments That Support Environment

The Environment Portfolio is a combination of research related to fuels, engines and airframes and F&E funding which includes implementation with the NAS and investigates the impact on 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.

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

### 4.5 Improved Multiple Runway Operations Portfolio

The Improved Multiple Runway Operations portfolio enables the FAA to improve runway access 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 using wake modeling and visualization. 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 dependent and independent operations, enabled operations in lower-visibility conditions and changes in separation responsibility between air traffic control and the flight deck. (OI: 102141)

## 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 large aircraft based on a safety analysis of the airport geometry, local meteorology and other factors at each airport. (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 approach minima at airports with 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

The Improved Multiple Runway Portfolio is implemented through programs described in Section 5. Pre-implementation activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B.

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

### 4.6 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.

## 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)

## Capital Investments That Support NAS Infrastructure

The NAS Infrastructure Portfolio is implemented through programs described in Section 5. Pre-implementation activities which provide developmental engineering, standards, implementation guidance and operational descriptions/procedures include these programs which are described in Appendix B.

- Weather Observation Improvements, G04W.02-01
- Weather Forecast Improvements, G04W.03-01
- Surface/Tower/Terminal Systems Engineering, G06A.02-01
- NextGen Navigation Engineering, G06N.01-03
- New ATM Requirements, G01M.02-02
- Information Management, G05M.03-01

#### **4.7 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 detail in Appendix B.

- NextGen Laboratories at WJHTC, G03M.02-01

#### **4.8 Performance-Based Navigation & Metroplex Portfolio**

The PBN portfolio leverages emerging satellite navigation technology and improved aircraft navigation performance to improve access and flexibility for point-to-point navigation using RNAV and RNP.

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

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

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

This improvement will allow RNAV and RNP to enable more efficient aircraft trajectories. Combined with airspace changes, RNAV and RNP increase airspace efficiency and capacity. 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.

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

### **4.9 Collaborative Air Traffic Management Portfolio**

The Collaborative Air Traffic Management portfolio addresses shortfalls in the areas of modeling strategic traffic management initiatives, decision support tools, collaboration between traffic managers and airspace users and capabilities to manage traffic flow strategically. It involves helping 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. (OI: 101102)

#### **Interactive Planning Using 4D Trajectory Information in the Oceanic Environment**

Flexible entry times into oceanic tracks or flows allow greater use of user-preferred trajectories. (OI: 104102)

#### **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 impacting weather, congestion and system outages. (OI: 105208)

#### **Continuous Flight Day Evaluation**

Continuous (real-time) constraints are provided to ANSP traffic management decision-support tools and the NAS users. (OI: 105302)

## **Capital Investments That Support Collaborative Air Traffic Management**

The Collaborative Air Traffic Management Portfolio is implemented through programs described in Section 5. Pre-implementation activities which provide developmental engineering, standards,

implementation guidance and investment support include these programs which are described in Appendix B.

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

#### **4.10 Time-Based Flow Management (TBFM) Portfolio**

This Time-Based Flow Management portfolio enhances system efficiency by transitioning improvements in Time-Based Metering (TBM) capability and its trajectory modeler to additional locations; by enhancing departure capabilities; and by expanding air traffic merging into the terminal environment to enhance efficiency of PBN procedures and optimize balancing demand with capacity.

##### **Current Tactical Management Of Flow in the En Route for Arrivals/Departures**

Proper spacing and sequencing of air traffic maximizes NAS efficiency and capacity in the arrival and departure phases of flight. (OI: 104115)

##### **Improved Management of Arrival/Surface/Departure Flow Operations**

This improvement integrates advanced arrival/departure flow management with advanced surface operation functions 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. The interval management concept is designed to improve aircraft spacing by precisely managing the distance between aircraft whose trajectories are common or merging. This concept increases airspace throughput while enabling aircraft to reduce fuel burn and environmental impacts. (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, 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, with the aid of ground automation and a new set of voice or datalink procedures. The controllers will direct flight crews to establish and maintain a given time or distance from a designated aircraft. (OI: 102118)

## Capital Investments That Support Time Based Flow Management

The Time Based Flow Management Portfolio is implemented through programs described in Section 5. Pre-implementation activities which provide developmental engineering, standards, implementation guidance and investment support include these programs which are described in Appendix B.

- 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

### 4.11 System Safety Management Portfolio

This portfolio contains activities that ensure that changes introduced with NextGen enhance or do not degrade safety while delivering benefits which result from 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 with analytical results 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: 109303)

## 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: 109304)

## 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 tailored, domain-specific baseline and predictive risk models including automated operational anomaly detection, analysis and forecasting models. (OI: 109326)

## Capital Investments That Support System Safety Management

The System Safety Management Portfolio is implemented through these programs described in Appendix B.

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

## **5 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 to modernize the NAS. The roadmaps show planned modernization that extends beyond the 5-year financial horizon covered in the CIP, because planning to meet new demands and technology improvements to the NAS must look beyond near term improvements. The roadmaps present an executive view of the schedule for programs that modernize or replace systems and the length of time those systems or their replacements will remain in service. They help FAA anticipate future engineering and financial challenges and integrate the modernization efforts by showing program managers how updating other systems will impact their program.

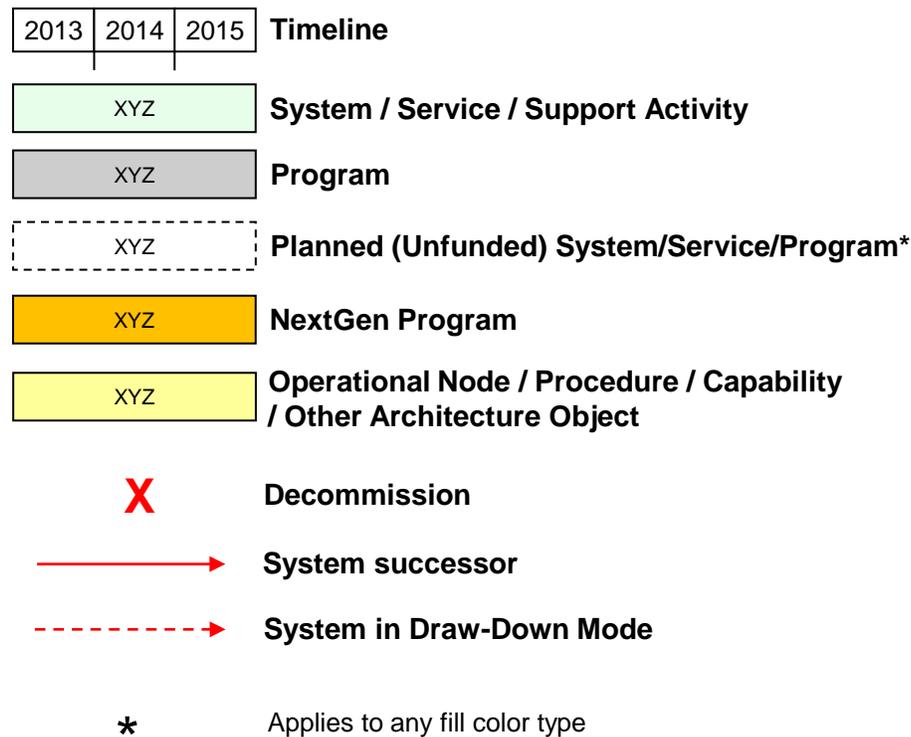
Many changes shown in the roadmaps will also require aviation users to add equipment to their aircraft and adopt new procedures, so the roadmaps serve to inform them what they should expect regarding changes to their equipment and crew training. These roadmaps are updated annually to reflect results 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, as shown under the CY column. 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 timeline; the box reflects the timeframe for funding the programs. Legacy programs are shown as gray bars and NextGen programs are shown as orange bars. The funding tables within each roadmap subsection contain the F&E BLIs for that functional area. The tables depict the FY 2015 budget request and outyear estimates for FY 2016-2019. To associate the BLIs with the programs and systems in the FAA Enterprise Architecture, BLI number references are included at the end of each of the descriptions contained within this section.

The functional areas are shown in the following sections:

- Automation
- Communications
- Surveillance
- Navigation
- Weather
- Facilities

Figure 5-1 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; ending 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 5-1 Infrastructure Roadmap Legend**

## 5.1 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 50,000 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.

Other important features of automation include the following:

- Maintaining flight information and controller-in-charge data from pre-flight to post-flight, which supports coordination between air traffic controllers as they hand off

responsibility of the flight from the tower to the terminal control facility to the en route sector and then back to terminal and tower as the aircraft approaches its destination.

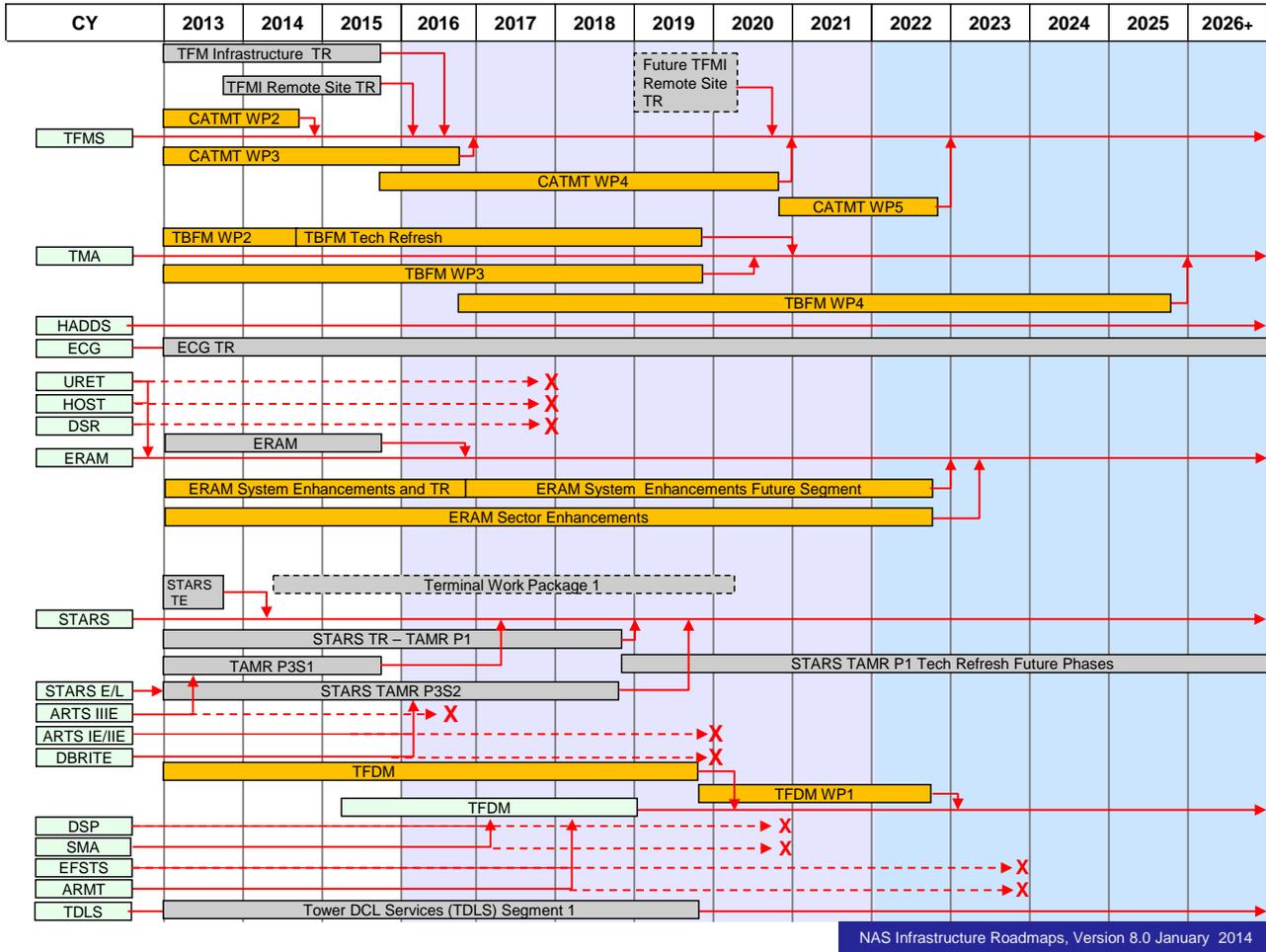
- Generating symbols displaying information on routes, restricted areas, and several other fixed features of the controller's sector.
- Providing automated alerts to controllers regarding potential aircraft conflicts and warnings that an aircraft may be approaching a terrain hazard.
- Displaying data from weather sensors, giving the status of runway lights and navigational aids, and providing flight plan information on monitored aircraft.
- Providing traffic management capabilities and decision support tools to forecast and provide solutions for future demand. The solutions may involve adjusting routes or speed, controlling airport departures, or other actions.

Automation systems provide the platform for implementation of many of the NextGen OIs. NextGen programs provide the necessary automation system enhancements to support the improvements. Program descriptions in Appendix B provide details on those enhancements.

Automation implementation, including the plans to sustain, upgrade, replace or decommission current systems is planned out from 2013 through 2026 based on the following three different NAS EA roadmaps:

1. Roadmap 1 (figure 5-2) - Air Traffic Control and Air Traffic Management
2. Roadmap 2 (figure 5-3) - Oceanic Air Traffic Control and NAS Information Management
3. Roadmap 2 (figure 5-4) - Information Support Systems

## Automation Roadmap (1 of 3)



NAS Infrastructure Roadmaps, Version 8.0 January 2014

**Figure 5-2 Air Traffic Control and Air Traffic Management Roadmap**

The first two systems on the left side of the roadmap are used for traffic management. The Traffic Flow Management System (TFMS) and the Traffic Management Advisor (TMA) are installed at air traffic control facilities including the Air Traffic Control System Command Center (ATCSCC), en route centers, and major terminal control facilities. They are used to analyze future demand for en route and terminal services and to strategically plan for how to best accommodate that demand. These systems use real-time displays both of aircraft in flight and of weather affecting aviation to assess which routes are best and to prevent severe congestion at airports. The FAA will continue to improve TFMS and TMA with the Collaborative Air Traffic Management Technologies (CATMT) and the Time Based Flow Management (TBFM) work packages which will expand collaboration to individual pilots and improve information exchange between the FAA and airline dispatch offices. TMA will be enhanced to support the introduction of NextGen trajectory based operations, which allow aircraft to fly more direct routes with fewer deviations for conflicting air traffic. TFM Infrastructure and Remote Site Technology Refresh and TBFM Technology Refresh programs will upgrade the hardware that supports those systems.

TFMS infrastructure and software enhancements are funded through BLIs 2A06 and 2A15. TMA infrastructure and software enhancements are funded through BLIs 1A10E and 2A16.

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 air traffic management systems 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 receive a technology refresh. 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). These systems are being replaced with new hardware and revised ATC software and integrated into ERAM. ERAM is being installed and, when fully operational, it will be the foundation for the agency's transition to NextGen. ERAM and ECG are funded through BLIs 2A01 and 2A03 respectively.

Improvements to ERAM will include ERAM System Enhancements and Technology Refresh and ERAM Sector Enhancements. The System Enhancements segment is intended to improve aircraft separation services by reducing levels of missed and false alerts from tactical and strategic conflict alerting functions. ERAM Technology Refresh consists of any necessary upgrades or modernization of system components; as well as enhancements outside the scope of the original core ERAM system. ERAM system enhancements and technology refresh are funded through BLI 2A02. 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 to the ERAM system for the En Route sector controller team. It is a multi-year effort to improve the efficiency and effectiveness of En-Route Sector operations by facilitating increased strategic and tactical cooperation between the Radar Controller position (R-Position) and the Radar Associate position (D-Position) as well as establish a common processing platform, with similar tool sets, that may be tailored for either position. ERAM Sector Enhancements is funded through BLI 2A02.

The next four systems provide ATC automation for the terminal domain: Standard Terminal Automation Replacement System (STARS), STARS Enhanced Local Integrated Tower Equipment (ELITE)/ Local Integrated Tower Equipment (LITE) (STARS E/L), Automated Radar Terminal System model IIIE (ARTS IIIE), and ARTS 1E/IIIE. 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. The 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 existing four 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 IIIIE 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 ELITE and 6 ARTS IE systems (at the smallest airports) with STARS 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.

Digital Bright Radar Indicator Tower Equipment (DBRITE) is a terminal automation and display model in current use. DBRITE has a tower display that allows tower cab controllers to determine the location of approaching traffic before it becomes visible to them.

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.

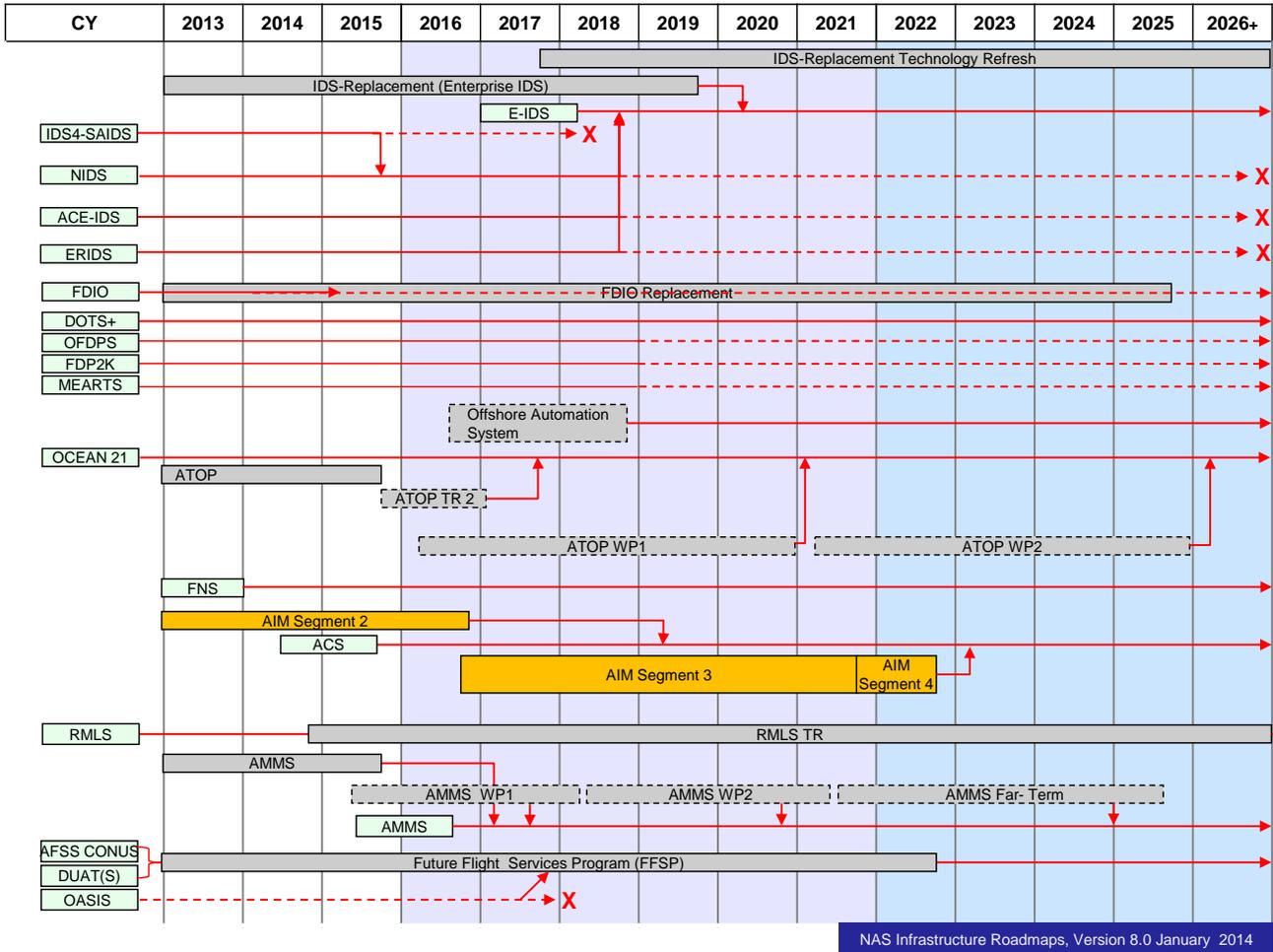
The Terminal Flight Data Manager (TFDM) system supports a phased implementation of a new terminal local area network (LAN) based infrastructure to reduce redundant displays and integrate flight data functions. TFDM will provide System Wide Information Management (SWIM) enabled flight data exchanges with other NAS subsystems. TFDM initially will integrate data from three existing systems, and it will be enhanced in TFDM Work Package 1. 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 1 will be providing upgrades to the TDLS system.

## Automation Roadmap (2 of 3)



**Figure 5-3 Oceanic Air Traffic Control and NAS Information Management Roadmap**

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 beginning in 2013 and completing in 2017. IDS Replacement Technology Refresh will provide system sustainment and upgrades starting in 2017. The proposed Enterprise IDS (E-IDS) program will continue the upgrade/replacement of systems not included in the IDS replacement program. IDS Replacement 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 Enhanced IDS (E-IDS) in 2018.

The En Route Information Display System (ERIDS) will be transitioned to the proposed E-IDS system in 2018. 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 flight plan and other data to operational facilities. 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 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 Ocean 21, the oceanic control system, which has been developed by the Advanced Technologies and Oceanic Procedures (ATOP) program. Upgraded versions of ATOP will remain in operation throughout the roadmap timeframe. ATOP Technology Refresh and 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. ATOP is funded through BLI 2A10.

The Aeronautical Information Management (AIM) Segments 2, 3 and 4 are funded through BLI 4A09 to consolidate and automate the storage and dissemination of aeronautical data used by pilots and aviation planners. They will upgrade the two systems shown on the roadmap:

- Federal NOTAM System (FNS) – collects and provides access to NOTAMs, which are notices of temporary changes, such as temporary flight restrictions and runway closures for construction.
- Aeronautical Common Services (ACS) – stores information about airports, navigational aids and other aeronautical data.

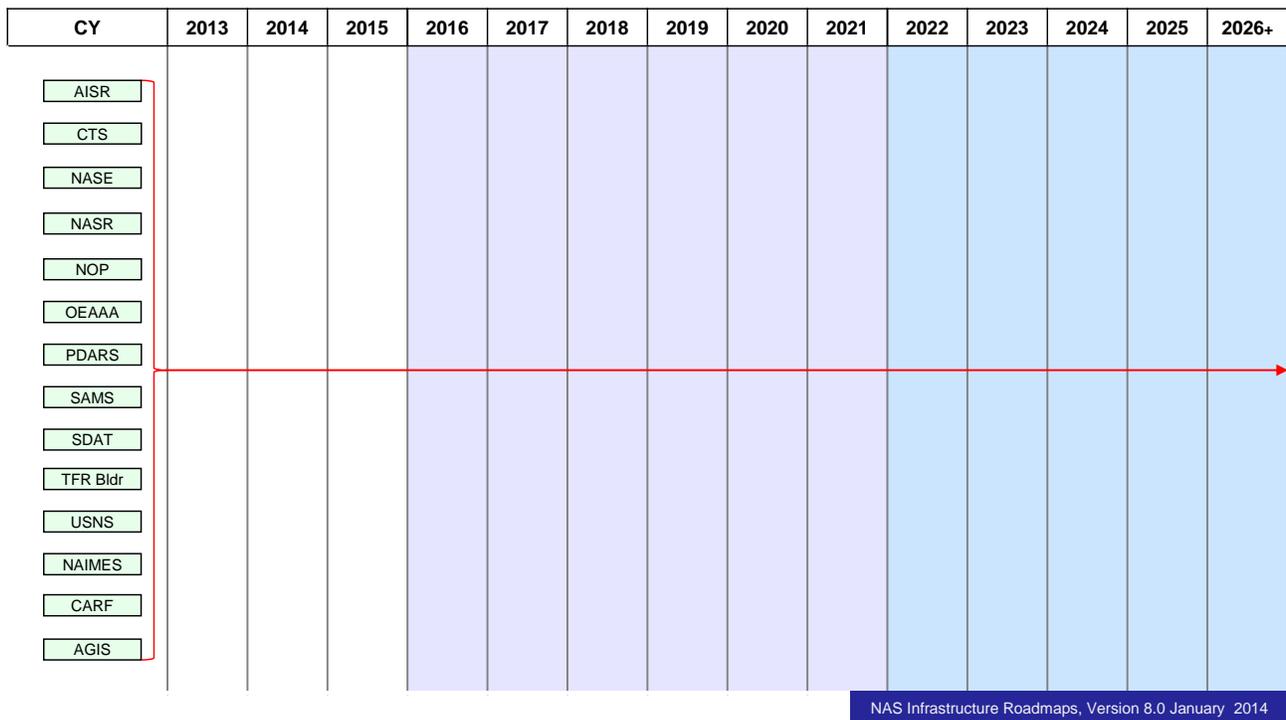
The Remote Maintenance Logging System (RMLS) serves two functions. It allows the maintenance staff to monitor equipment performance electronically from a central location, and it provides software for management of workforce hours and maintenance actions. The existing system is undergoing a technology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

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) will provide continued availability of accurate and consistent flight service information currently provided by DUATS, AFSS and OASIS, whose contracts end in 2016. The acquisition strategy is being developed and a future initial investment decision is planned. FFSP is funded through BLI 2C02.

### Automation Roadmap (3 of 3)



**Figure 5-4 Information Support Systems Roadmap**

Figure 5-4 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 would 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. NOTAM information is that aeronautical information that could affect a pilot's decision to make a flight;
- 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.

Figure 5-5 shows future capital investments for automation programs. Funding amounts are in Millions of Dollars.

BLI Number	Program Name	FY 2015 Budget	FY 2016	FY 2017	FY 2018	FY 2019
<b>Automation Functional Area</b>		<b>\$332.0</b>	<b>\$354.5</b>	<b>\$339.0</b>	<b>\$303.5</b>	<b>\$308.5</b>
2A01	En Route Automation Modernization (ERAM)	\$10.5	\$0.0	\$0.0	\$0.0	\$0.0
2A02	NextGen – En Route Automation Modernization (ERAM) – System Enhancements and Technology Refresh	\$45.2	\$82.4	\$70.0	\$90.0	\$100.0
2A03	En Route Communications Gateway (ECG)	\$6.6	\$2.8	\$2.0	\$2.0	\$4.1
2A06	Air Traffic Management (ATM) – Traffic Flow Management (TFM)	\$5.7	\$0.0	\$8.0	\$7.0	\$5.0
2A10	Oceanic Automation System (OAS)	\$3.5	\$0.0	\$0.0	\$0.0	\$0.0
2A15	NextGen – Collaborative Air Traffic Management Portfolio	\$13.5	\$20.8	\$22.7	\$35.3	\$36.3
2A16	NextGen – Time Based Flow Management (TBFM) Portfolio	\$21.0	\$22.2	\$28.2	\$35.8	\$54.9
2B03	Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)	\$50.7	\$81.1	\$60.0	\$52.8	\$56.0
2B04	Terminal Automation Modernization/ Replacement Program (TAMR Phase 3)	\$136.2	\$110.0	\$111.9	\$35.5	\$0.0
2B05	Terminal Automation Program	\$1.6	\$2.7	\$2.7	\$2.8	\$2.8
2B14	Integrated Display System (IDS)	\$16.9	\$13.3	\$5.7	\$1.1	\$7.1
2B15	Remote Monitoring and Logging System (RMLS)	\$3.9	\$1.1	\$3.4	\$4.5	\$5.2
2C02	Future Flight Services Program (FFSP)	\$1.0	\$3.0	\$9.5	\$21.8	\$27.0
3A13	Tower Simulation System (TSS) Technology Refresh	\$3.0	\$0.0	\$0.0	\$0.0	\$0.0
4A09	NextGen – Aeronautical Information Management Program	\$12.7	\$15.1	\$14.9	\$15.0	\$10.0

Note: BLI numbers with X represent outyear programs not requested in the FY 2015 President's Budget.

Note: FY 2016-2019 outyear funding amounts are estimates.

**Figure 5-5 Funding amounts in the Automation Functional Area**

## 5.2 Communications Roadmaps

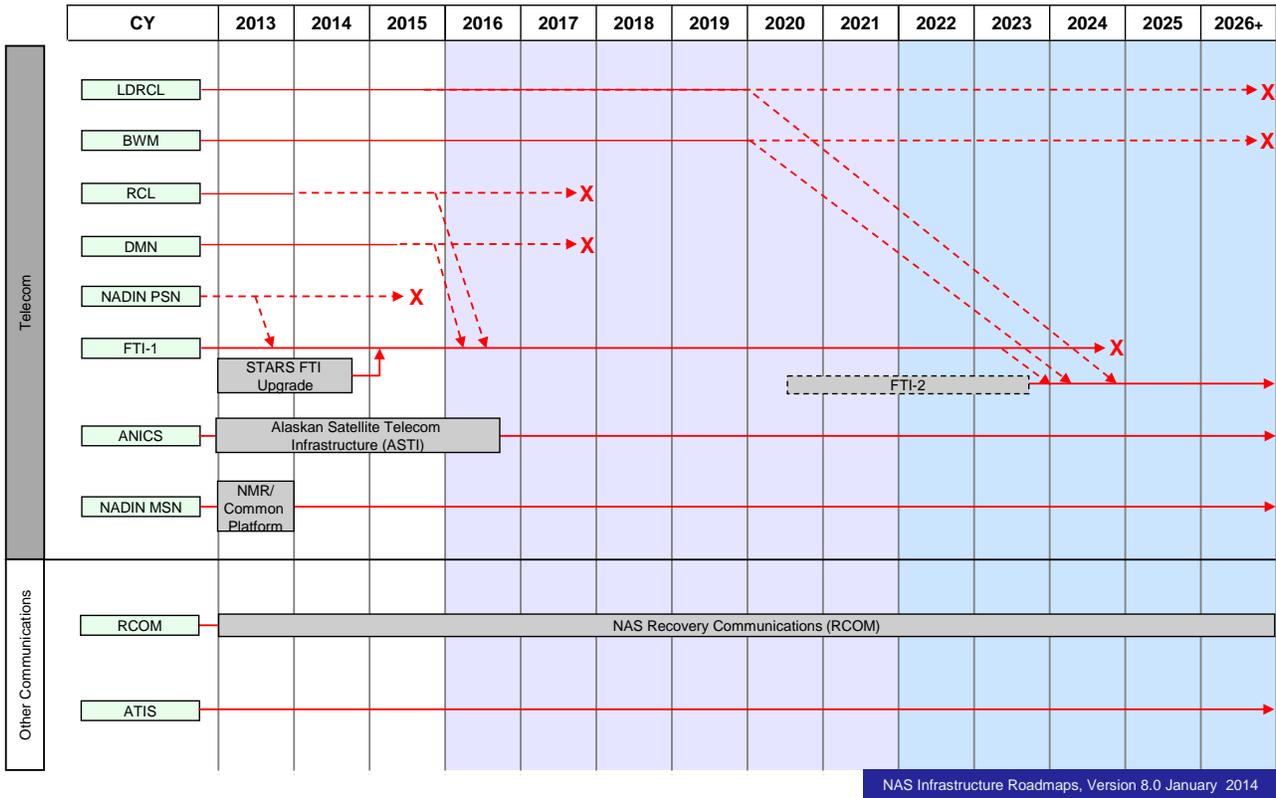
Communication between pilots and controllers is an essential element of air traffic control. Pilots and controllers primarily use radios for communication. Because en route control sectors cover areas that extend beyond direct radio range, remotely located radio sites are used to provide extended coverage. The controller activates radios at remote sites and ground telecommunication lines carry the verbal exchange to and from air traffic control facilities. If ground links are not available, communication satellite links can be used to connect pilots with controllers. Backup systems are always available to provide 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 four different NAS EA roadmaps:

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

## Communications Roadmap (1 of 4)



**Figure 5-6 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, and these systems were linked in a national network to transmit operational and administrative information to and from air traffic control facilities. Many of the RCL communication links have already transitioned their functions to the FAA Telecommunications Infrastructure (FTI) to carry this data. The LDRCL will remain in service for areas with limited commercial services, but their functions will be transitioned to the newly awarded FTI contract beginning in 2020. 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 and a new contract to continue the service. 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 is a contract service to provide communications services between FAA facilities. In 2020, work will begin on preparing for a transition to a new FTI - Phase 2 (FTI-2) contract. The

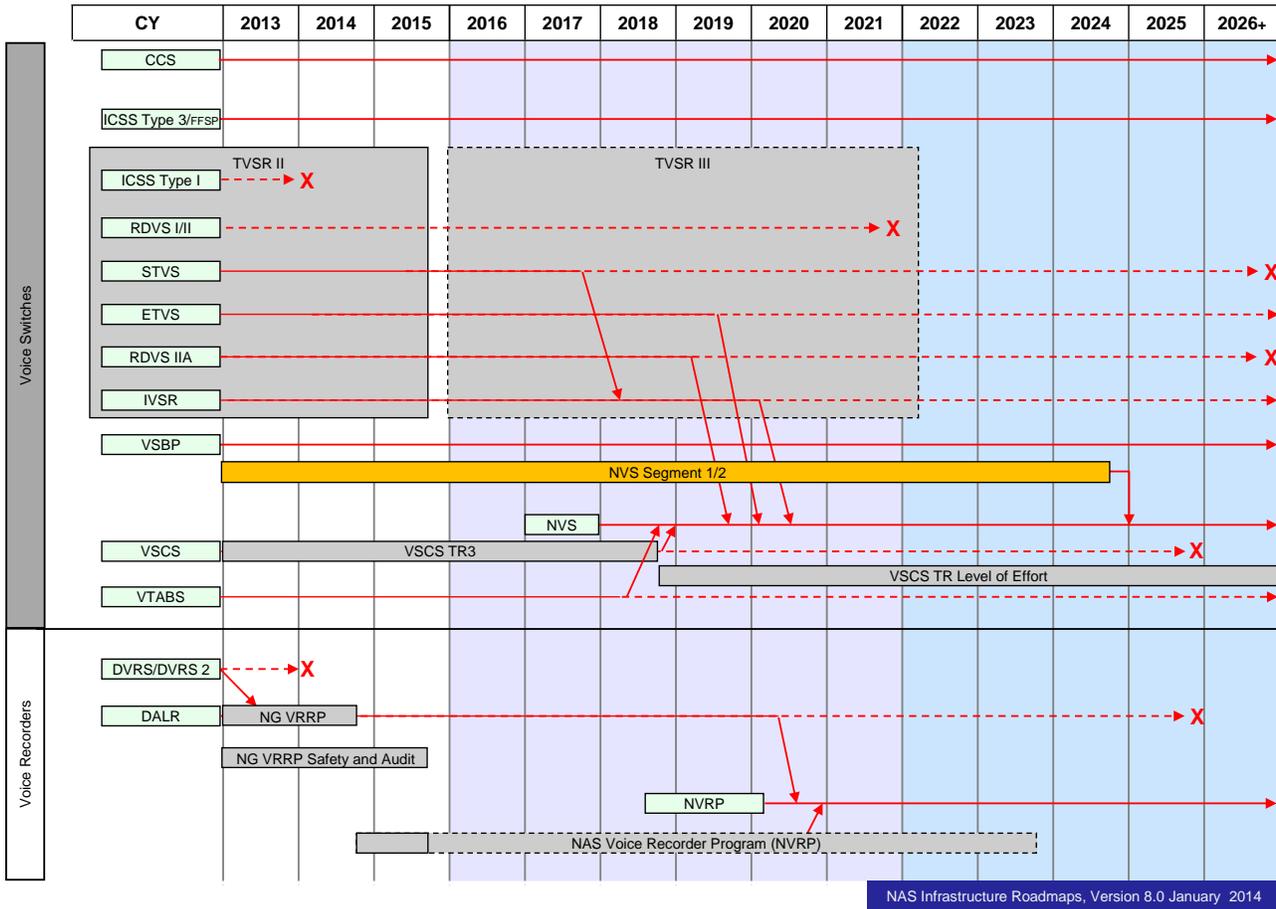
STARS FTI Upgrade is establishing a diverse and redundant core Internet Protocol infrastructure across the FTI telecommunications backbone that will significantly reduce the impact of any unforeseen events on service.

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 smaller and larger facilities. ASTI is funded through BLI 2E05.

Recovery Communications (RCOM) is an emergency network to be used for command and control of the ATC system when all 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 4)



**Figure 5-7 Voice Switches and Recorders Roadmap**

Figure 5-7 shows the roadmap for NAS Voice Switches and Recorders. Voice switches in air traffic facilities enable controllers to select among the different channels they need to communicate with one another, with traffic management and weather specialists, with emergency services, and with pilots.

The Command Center Conference Control Switch (CCS) installed at the Air Traffic Control System Command Center (ATCSCC) facility 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 voice switches shown below the CCS are used in terminal and flight service facilities. Voice switches enable air traffic controllers to select lines to communicate with pilots as well as other air traffic control facilities. They are:

- Integrated Communication Switching System (ICSS) Type 1 and 3 – The ICSS Type 3 will remain in operation at flight service stations;

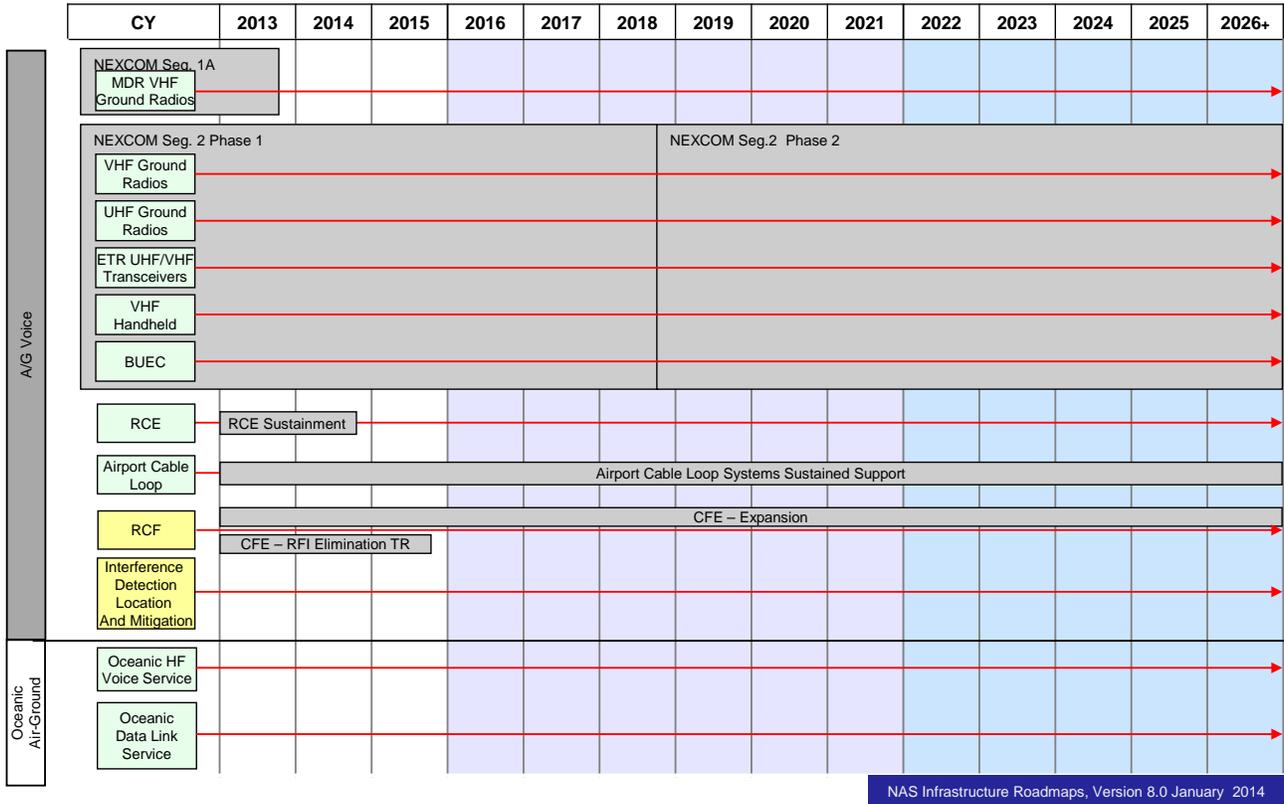
- The Terminal Voice Switch Replacement (TVSR) II program, funded through BLI 2B08, is an umbrella program to replace terminal voice switches at the rate of about 5 per year, refurbish approximately 2 voice switches per year and install voice switches in newly constructed airport traffic control towers. This effort will be continued starting in 2016 by the planned TVSR III program. The switches are:
  - Rapid Deployment Voice Switch (RDVS) I, II and IIA;
  - Small Tower Voice Switch (STVS);
  - Enhanced Terminal Voice Switch (ETVS); and
  - Interim Voice Switch Replacement (IVSR).
- 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 installed in their facility.

The FAA has awarded the contract for a two segment procurement of the NAS Voice System (NVS). The first segment will buy and test prototype new voice switches to determine operational suitability. The second segment will be for the full scale procurement of both en route and terminal voice switches to replace existing switches. The NVS program will include voice switches and 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. 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 2A09.

The Digital Audio Legal Recorder (DALR) is the voice recorder that is replacing Digital Voice Recorder Systems (DVRS). DALR is also installed in newly constructed airport traffic control towers. 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 funded through BLI 2B18. NAS Voice Recorder Program (NVRP) is proposed to develop the next generation of recorders.

## Communications Roadmap (3 of 4)



**Figure 5-8 Air to Ground Voice and Oceanic Communications Roadmap**

The third communications roadmap (figure 5-8) shows the replacement programs for the radios used for A/G communications and some of the supporting services to sustain NAS operations.

The Next Generation Air/Ground Communications (NEXCOM) program is upgrading Very High Frequency (VHF) radios used by civil aviation and Ultra High Frequency (UHF) radios used by FAA to communicate with military aircraft. NEXCOM Segment 1A replaced the radios used for high and ultrahigh en route sectors. 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 2A11.

The Radio Control Equipment (RCE) program modernized the electronic equipment that allows controllers to control the radios they use at remote sites.

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.

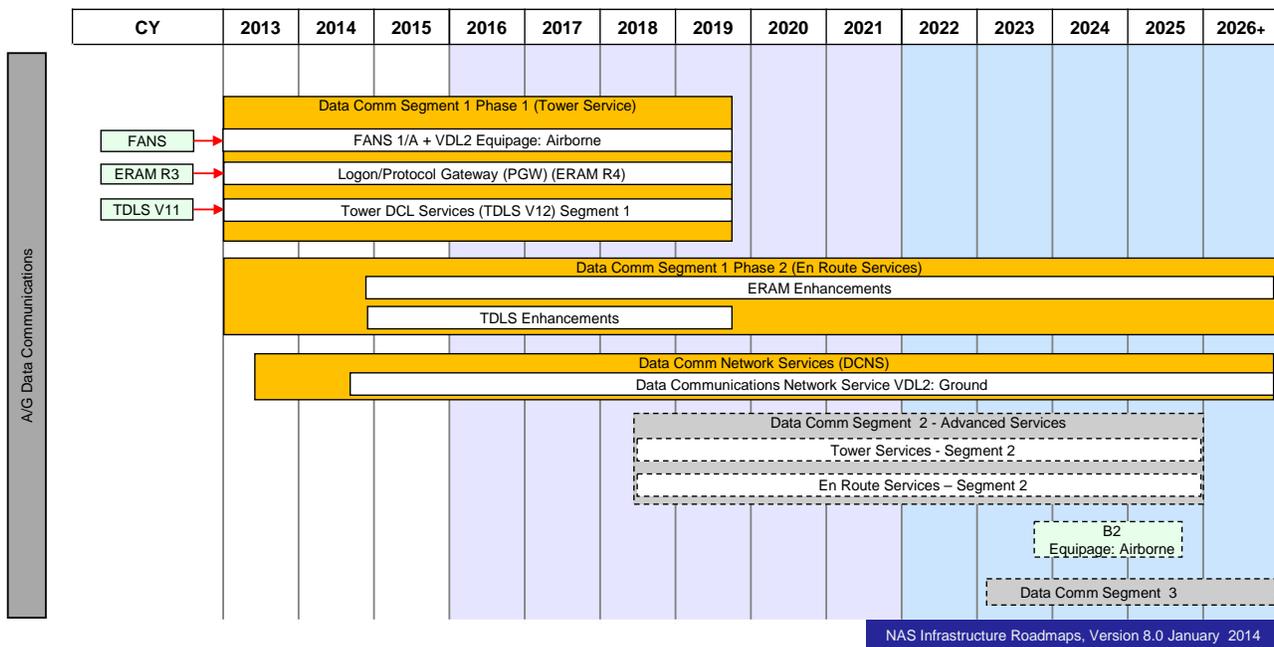
FAA is replacing copper wires with fiber optics and adding dual path operations so that a break in the cable does not stop the flow of information. The Airport Cable Loop program is funded through BLI 2E04.

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 program also installs equipment to eliminate radio frequency interference (RFI) between radio frequencies. The program is funded through BLI 2A07.

The Interference Detection, Location and Mitigation (IDLM) program investigate 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.

### Communications Roadmap (4 of 4)



**Figure 5-9 Air-to-Ground (A/G) Data Communications Roadmap**

The fourth communications roadmap (figure 5-9) shows the planned transition from voice to data communications services for routine communications between controllers and pilots that can be transmitted by data link from en route and terminal ATC automation system.

Data Comm Segment 1 Phase 1 will provide service for three existing communication protocols. Future Air Navigation System (FANS), a generic term for capabilities mainly used for oceanic operations, will take advantage of already installed datalink capability. Aircraft that are FANS equipped will experience more sophisticated data link connections with ATC facilities as new systems evolve during the roadmap timeframe. The Logon/Protocol Gateway (PGW) upgrade began development in 2012 to assure security of transmissions to pilots. The Terminal Data Link System (TDLS) is currently used to transmit departure clearances (DCL) and other information to aircraft preparing to depart the airport. It is being upgraded and modernized by the Data Comm Segment 1 program.

Data Comm Segment 1 Phase 2 will provide en route services to pilots. More sophisticated applications will be developed through the entire period to 2025.

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 add enhanced services to the terminal and en route capabilities developed in segment 1.

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

Figure 5-10 shows the future capital investments for replacing communications systems and improving and modernizing communications channels. Funding amounts are in Millions of Dollars.

BLI Number	Program Name	FY 2015 Budget	FY 2016	FY 2017	FY 2018	FY 2019
<b>Communication Functional Area</b>		<b>\$257.0</b>	<b>\$301.1</b>	<b>\$356.0</b>	<b>\$314.6</b>	<b>\$310.7</b>
2A07	Air/Ground Communications Infrastructure	\$3.9	\$3.0	\$3.2	\$3.2	\$3.3
2A09	Voice Switching Control System (VSCS)	\$13.8	\$9.9	\$11.3	\$12.8	\$11.4
2A11	Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)	\$40.0	\$43.3	\$50.0	\$50.0	\$50.0
2A19	NextGen – Data Communication in support of NextGen	\$147.3	\$190.4	\$233.0	\$186.6	\$174.0
2B08	Terminal Voice Switch Replacement (TVSR)	\$2.0	\$0.0	\$0.0	\$0.0	\$0.0
2B13	NextGen – National Airspace System Voice System (NVS)	\$20.6	\$25.0	\$40.0	\$40.0	\$50.0
2B18	Voice Recorder Replacement Program (VRRP)	\$1.0	\$0.0	\$0.0	\$0.0	\$0.0
2E04	Airport Cable Loop Systems – Sustained Support	\$5.0	\$5.0	\$5.0	\$10.0	\$10.0
2E05	Alaskan Satellite Telecommunication Infrastructure (ASTI)	\$11.4	\$12.5	\$1.5	\$0.0	\$0.0
3A04	National Airspace System (NAS) Recovery Communications (RCOM)	\$12.0	\$12.0	\$12.0	\$12.0	\$12.0

Note: BLI numbers with X represent outyear programs not requested in the FY 2015 President's Budget.

Note: FY 2016-2019 outyear funding amounts are estimates.

**Figure 5-10 Funding amounts in the Communications Functional Area**

### 5.3 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:

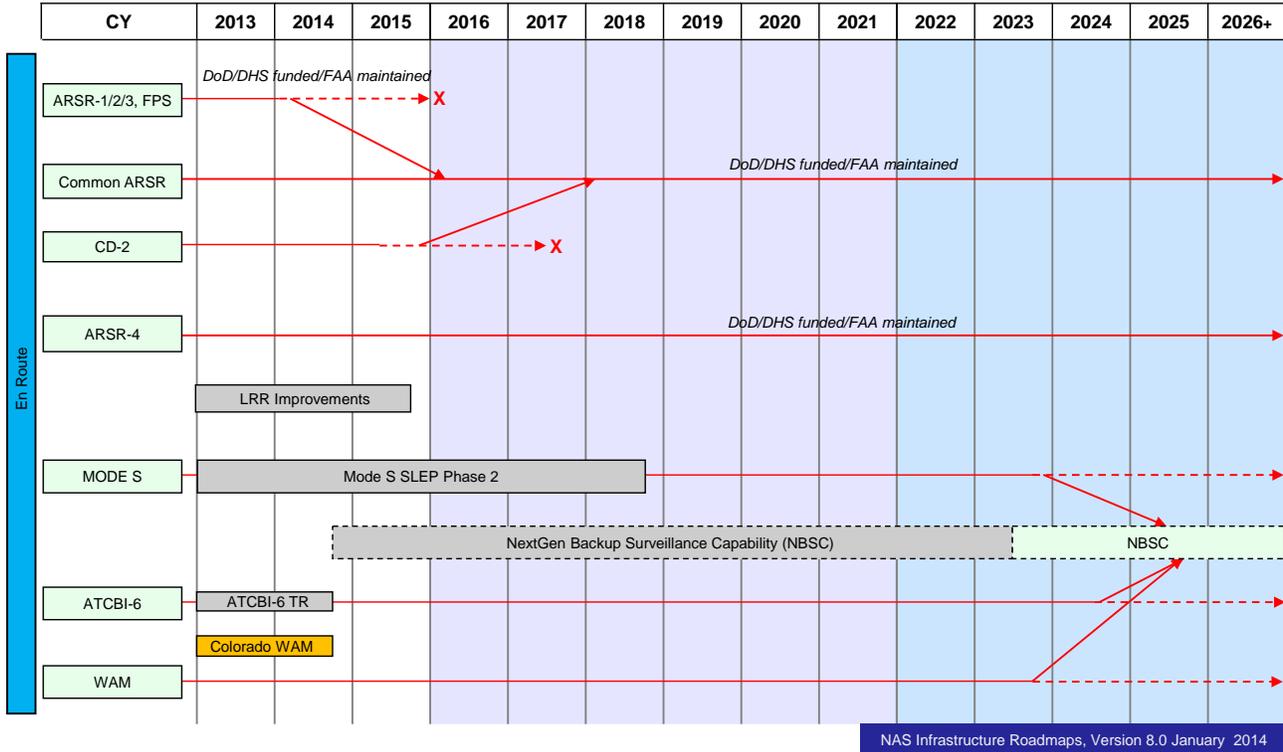
- Primary radar – the radar beam is bounced off the aircraft and reflected back to the radar receiver;
- Secondary radar – a reply is generated by the aircraft transponder and sent back to the radar in response to a secondary radar signal;
- Multilateration – multiple ground sensors receive aircraft electronic signals and triangulate this information to determine aircraft position; and
- ADS-B – the aircraft determines its location using GPS or other navigation equipment and broadcasts that information to an ADS-B ground station. Position data determined by these sensors is relayed to automation systems which process the data and send it to the displays.

NextGen operational improvements will rely on advanced surveillance capabilities provided by ADS-B and Wide Area Multilateration which will provide more accurate information for 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 5-11) - En Route Surveillance
2. Roadmap 2 (figure 5-12) - Terminal Surveillance
3. Roadmap 3 (figure 5-13) - Surface, Approach and Cross Domain Surveillance

## Surveillance Roadmap (1 of 3)



**Figure 5-11 En Route Surveillance Roadmap**

En route facilities use the Air Route Surveillance Radar (ARSR), and terminal facilities use Airport Surveillance Radar (ASR) as primary radars. The ARSR and ASR radars do not require a cooperative transmission from an aircraft to detect and track its location. En route and terminal facilities normally use secondary radars called the Air Traffic Control Beacon Interrogators (ATCBI) or the Mode Select (Mode S) for traffic separation. Secondary radar sends a signal to aircraft equipped with a transponder. The transponder reply contains the aircraft call sign, altitude, speed and can be processed to determine its position. 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.

The major en route systems are the various ARSR models, the Fixed Position Surveillance (FPS) system, Common Digitizer (CD-2), the Air Traffic Control Beacon Interrogator (ATCBI), and the Mode S.

The ARSR and FPS have a range exceeding 200 miles and provide aircraft location information to the en route centers. They are “skin-paint” radars (do not require cooperation from the detected aircraft) that transmit radio 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, and the direction from the radar based on the antenna position. Existing early model long range radars are being converted to the Common Air Route Surveillance Radar (CARSR) configuration. Features of the existing Common Digitizers (CD-2), which convert analog

information to digital, will be incorporated in the CARSR. 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) are funded by the LRR Improvements program through BLI 2A08.

The ATCBI and the more advanced Mode S transmit an electronic signal to aircraft, which triggers a transponder. An ATCBI triggers all transponders within its beam, while the Mode S is able to address each aircraft within its beam separately. The NextGen Surveillance and Weather Radar Capability will replace the ASR systems; an investment decision is scheduled for 2017. ATCBI technology refresh and Mode S service life extension programs are funded through BLI 2B16. The NextGen Backup Surveillance Capability (NBSC) is a planned activity to identify and implement a backup surveillance capability to ADS-B which will allow for potential decommissioning of secondary radar systems. An initial investment decision is planned for 2016.

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.

### Surveillance Roadmap (2 of 3)

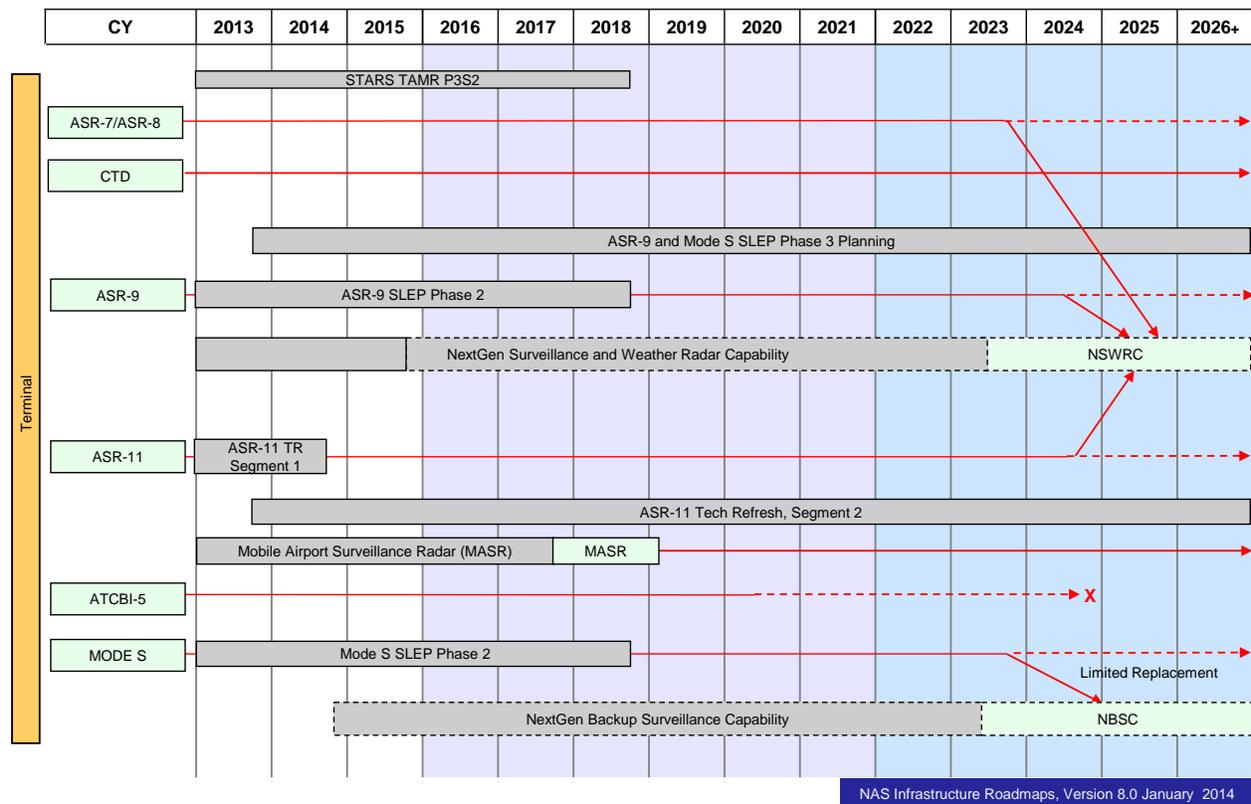


Figure 5-12 Terminal Surveillance Radar

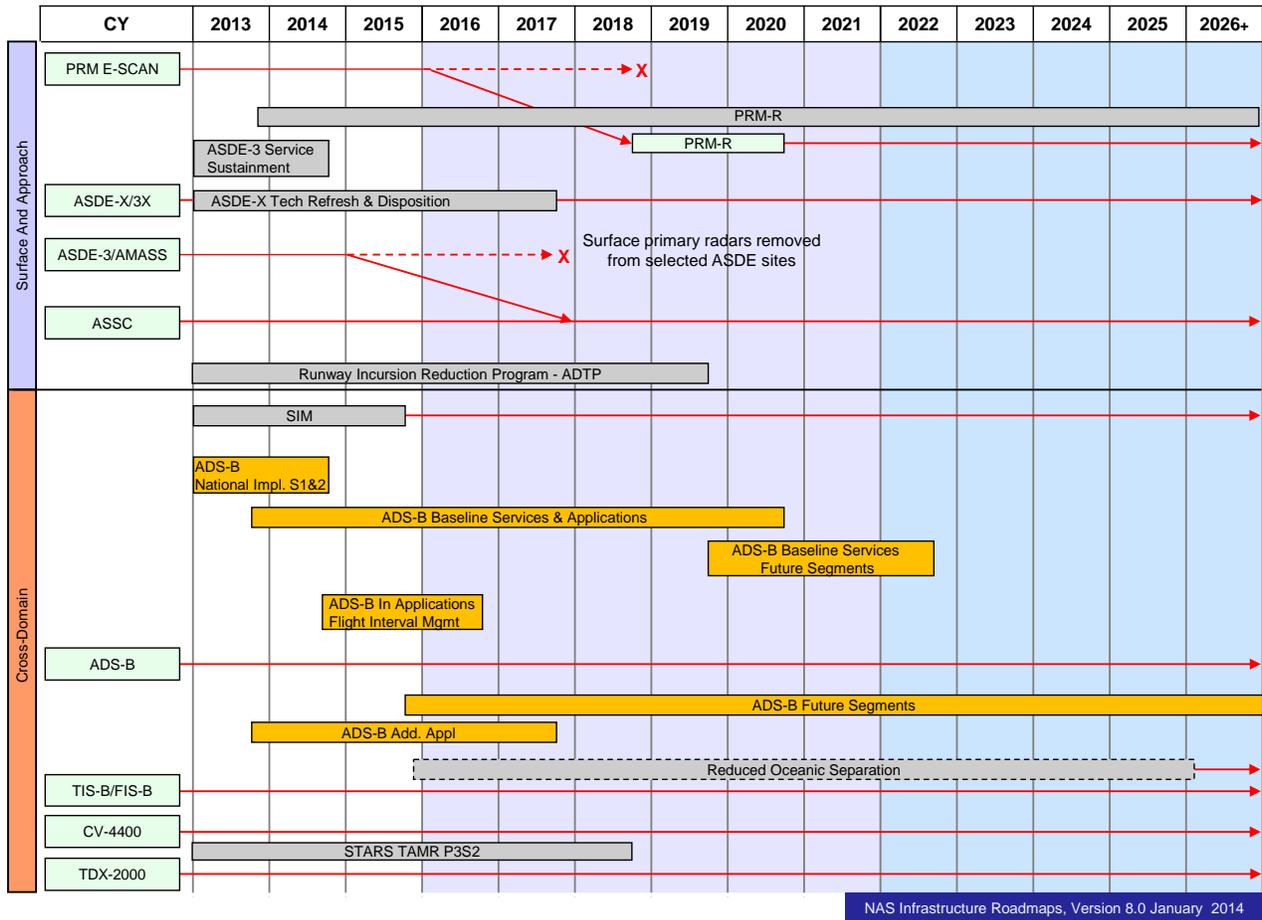
Figure 5-12 shows that there are four models of terminal radars currently in use. The Airport Surveillance Radar Model 11 (ASR-11) is the newest and has replaced several of the radars that were not replaced by an earlier ASR-9 program. The ASR-9, which serves larger airports, will have a Service Life Extension Programs (SLEP) to update and modernize its components. The existing ASR 7/8 systems will require a Common Terminal Digitizer (CTD) be installed to convert their analog outputs to digital as older terminal automation systems are replaced by STARS, which requires a digital input of radar information. A decision will be made in 2023 whether to replace all 4 terminal radar systems with new systems providing NextGen Surveillance and Weather Radar Capability (NSWRC).

ASR-9 and Mode S SLEP Phase 3 Planning will develop the strategies for providing primary radar backup while addressing needs for safety, security, and weather detection requirements. ASR-9 service life extension and ASR-11 technology refresh programs Segments 1 and 2 are funded through BLI 2B10 and 2B11 respectively. Development of NSWRC is funded through BLI 1A01I.

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 NextGen Backup Surveillance Capability (NBSC) is proposed to replace terminal ATCBI and Mode S systems with an investment decision scheduled for 2017. ATCBI technology refresh and Mode S service live extension programs are funded through BLI 2B16.

## Surveillance Roadmap (3 of 3)



**Figure 5-13 Surface, Approach and Cross Domain Surveillance Roadmap**

The block titled Surface and Approach in the third Surveillance roadmap (figure 5-13) shows the systems used to track aircraft and vehicles on the airport surface and aircraft approaching the runway. The Automatic Dependent Surveillance-Broadcast (ADS-B) system shown in the lower area called Cross-Domain also is used on the airport surface and approach areas.

The Precision Runway Monitor (PRM) 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 PRM-Replacement (PRM-R) program is evaluating alternatives for continuing PRM system operations at San Francisco and Atlanta. PRM-R is funded through the Precision Runway Monitor Alternate (PRMA) BLI 2B19.

The FAA uses several systems for tracking aircraft on or near the airport surface. The ASDE-3 is a primary radar system that provides a display of aircraft and ground vehicles in the airport

operating areas (runways and taxiways). This helps controllers manage aircraft on the ground and warn them of potential runway collisions. The ASDE-X merges primary and secondary radar, multilateration and ADS-B information to improve detection of aircraft and provide a clear display of the positions of aircraft and vehicles on or near taxiways and runways. A third system which uses multilateration is the Airport Surface Surveillance Capability (ASSC), and it will replace nine of the ASDE-3 radars.

Controllers currently use two systems to maintain aircraft separation on the airport surface. Some airports have ASDE-3/AMASS, which uses radar and a display in the tower to depict the location of aircraft on or approaching the taxiways and runways. These displays help controllers determine aircraft location when weather or darkness makes it difficult to see the entire airport surface. ASDE-X uses several technologies to perform the same function, and 18 of the 35 ASDE-X sites use an existing ASDE-3 radar. Seven ASDE 3 sites have been replaced by ASDE-X, and the Airport Surface Surveillance Capability (ASSC) program has replaced nine of the ASDE-3 radar systems. The ASSC will use multilateration and ADS-B aircraft information to display aircraft location for the airport tower controllers. ASDE-X will have a technology refresh to update some of its components. The technology refresh program is funded through BLI 2B01. The ASSC program is funded through BLI 2A13.

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.

In FY 2016, the FAA will begin fielding Surveillance Interface Modernization (SIM) equipment 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 will enable 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 others to be funded in the Future Segments program. Implementation of ADS-B, TIS-B and FIS-B are funded through BLI 2A13.

The CV-4400 is a legacy system that allows use of terminal radar information for 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 legacy analog radars (for example, ASR-8) for use by more modern digital automation systems, such as STARS. These adaptations will need to be continued until TAMR Phase 3 Segment 2 installs STARS to replace existing terminal automation systems.

Figure 5-14 shows the future capital investments associated with upgrading the surveillance systems. Funding amounts are in Millions of Dollars.

BLI Number	Program Name	FY 2015 Budget	FY 2016	FY 2017	FY 2018	FY 2019
<b>Surveillance Functional Area</b>		<b>\$305.5</b>	<b>\$219.4</b>	<b>\$198.4</b>	<b>\$177.2</b>	<b>\$179.7</b>
2A08	Air Traffic Control En Route Radar Facilities Improvements	\$5.1	\$0.0	\$0.0	\$0.0	\$0.0
2A13	NextGen – Automatic Dependent Surveillance - Broadcast (ADS-B) NAS Wide Implementation	\$247.2	\$183.9	\$166.4	\$155.8	\$163.3
2B01	Airport Surface Detection Equipment - Model X (ASDE-X)	\$5.4	\$10.5	\$8.4	\$0.0	\$0.0
2B10	Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)	\$13.6	\$3.8	\$3.5	\$1.2	\$0.0
2B11	Terminal Digital Radar (ASR-11) Technology Refresh and Mobile Airport Surveillance Radar (MASR)	\$21.1	\$9.9	\$6.1	\$3.2	\$4.4
2B16	Mode S Service Life Extension Program (SLEP)	\$8.1	\$11.3	\$14.0	\$17.0	\$12.0
2B17	Surveillance Interface Modernization (SIM)	\$4.0	\$0.0	\$0.0	\$0.0	\$0.0
2B19	Precision Runway Monitor Alternate (PRMA)	\$1.0	\$0.0	\$0.0	\$0.0	\$0.0

Note: BLI numbers with X represent outyear programs not requested in the FY 2015 President's Budget.

Note: FY 2016-2019 outyear funding amounts are estimates.

**Figure 5-14 Funding amounts in the Surveillance Functional Area**

## 5.4 Navigation Roadmaps

Navigation aids provide pilots the information needed for them to safely arrive at their destination. Navigation aids (also Navaids) can be both electronic and visual. Electronic aids have traditionally been radio transmitters with associated aircraft avionics that provide pilots direction and/or distance from their location. Visual Navaids are ground based lighting systems that provide pilots the path they need to follow or give visual queues of their position and direction of flight relative to the aid. Navigational aids are used to assist pilots while operating in all domains (en route, terminal, and surface) during clear or low visibility conditions.

Precision and non-precision approaches allow pilots to land on a runway when the visibility is limited. Precision approaches allow descents to lower minimum altitudes than are possible with non-precision approaches. Non-precision approaches only provide lateral guidance, not vertical guidance. Ground based landing systems, aircraft avionics and approach lighting systems help the pilot to conduct precision or non-precision approaches and land safely.

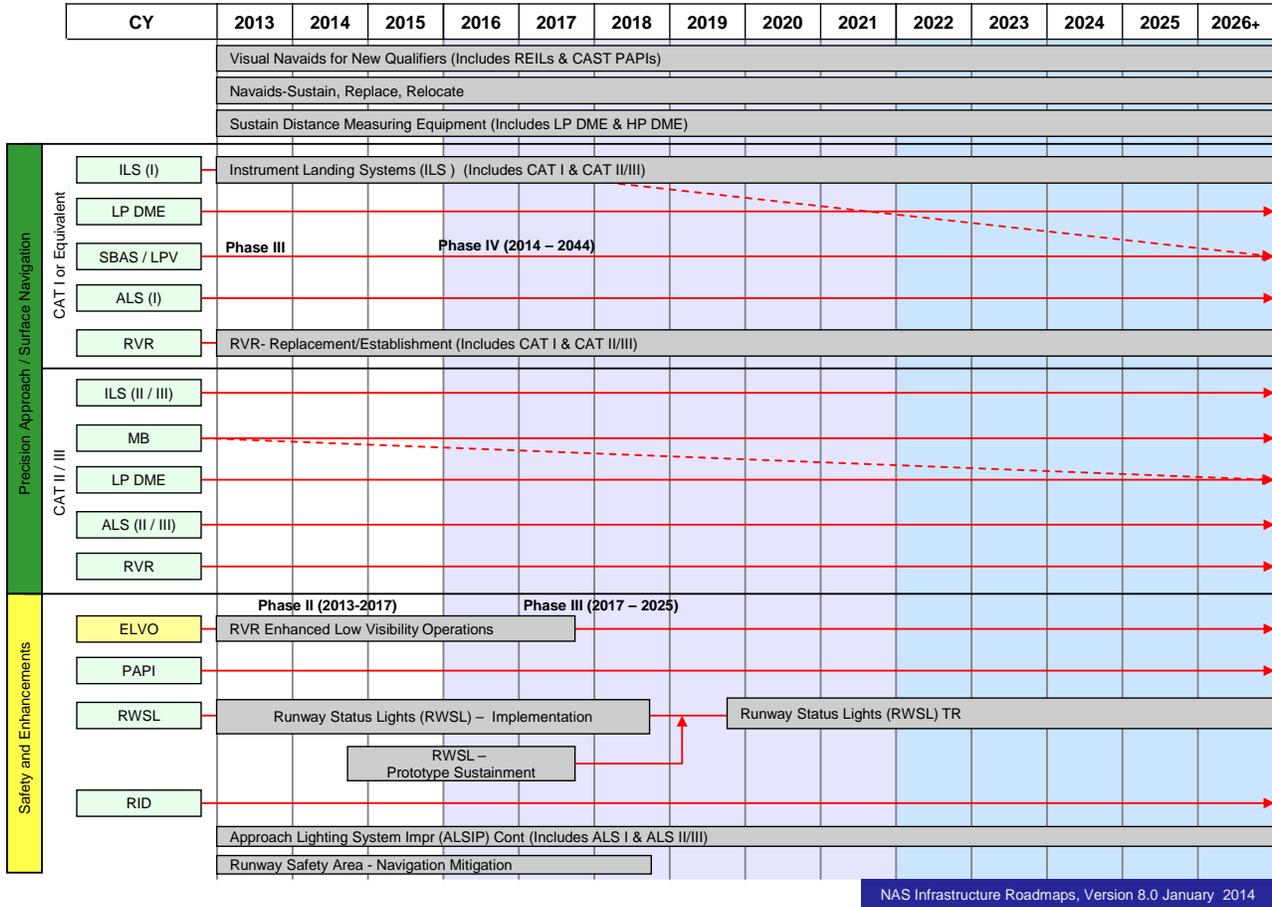
Many NextGen OIs to improve pilots navigation capabilities rely on improved position information provided by the Global Positioning System (GPS) satellite navigation system. See descriptions in Appendix B which provide more information on program activities.

Navigational aid programs are portrayed in two different roadmaps:

1. Roadmap 1 (figure 5-15) - Precision Approach/Surface Navigation and Safety and Enhancements

2. Roadmap 2 (figure 5-16) - Infrastructure and En Route/ Terminal/Non-Precision Approach

### Navigation Roadmap (1 of 2)



NAS Infrastructure Roadmaps, Version 8.0 January 2014

**Figure 5-15 Precision Approach, Surface Navigation and Safety and Enhancements Roadmap**

At the top of the roadmap (figure 5-15) are 3 programs that support the continued operation of existing systems. Visual Navaids assist pilots in staying on the proper glide path. 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) installed DMEs. Visual Navaids, navigation aids and DMEs are funded through BLIs 2D06, 2D07 and 2D09.

The current most widely used precision landing aids are Instrument Landing Systems (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. ILS systems provide three categories of precision approach

which provide the ability for aircraft to land in low visibility conditions. Category I is the most common. 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). Currently, ILS is the primary system used for precision approaches. Category II and III ILS have higher redundancy and reliability levels that reduce the risk of equipment failures and allow lower minimums. There are more than 1,200 ILSs installed in the United States. The ILS program provides for the replacement of aging ILS systems. ILSs are funded through BLI 2D02.

The Low Power DME (LPDME) is being installed to support advanced procedures requiring performance based navigation equipage and allow specially trained pilots to minimize the length of approach paths and, as discussed below, to replace marker beacons. LPDMEs 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 telecommunications satellites. WAAS-equipped aircraft can use the information to fly a precision approach to a runway in low-visibility conditions. There are a total of 3,404 WAAS Localizer Performance with Vertical Guidance (LPV) based precision approaches in place. WAAS is funded through BLI 2D03.

An alternative for precision approach guidance to a 200 foot decision height is the SBAS/LPV-200 which is enabled by GPS/WAAS. As this alternative comes into broader use, the FAA can consider decommissioning ILS. The FAA plans to make an initial decision in 2016 on the drawdown of Category I ILS.

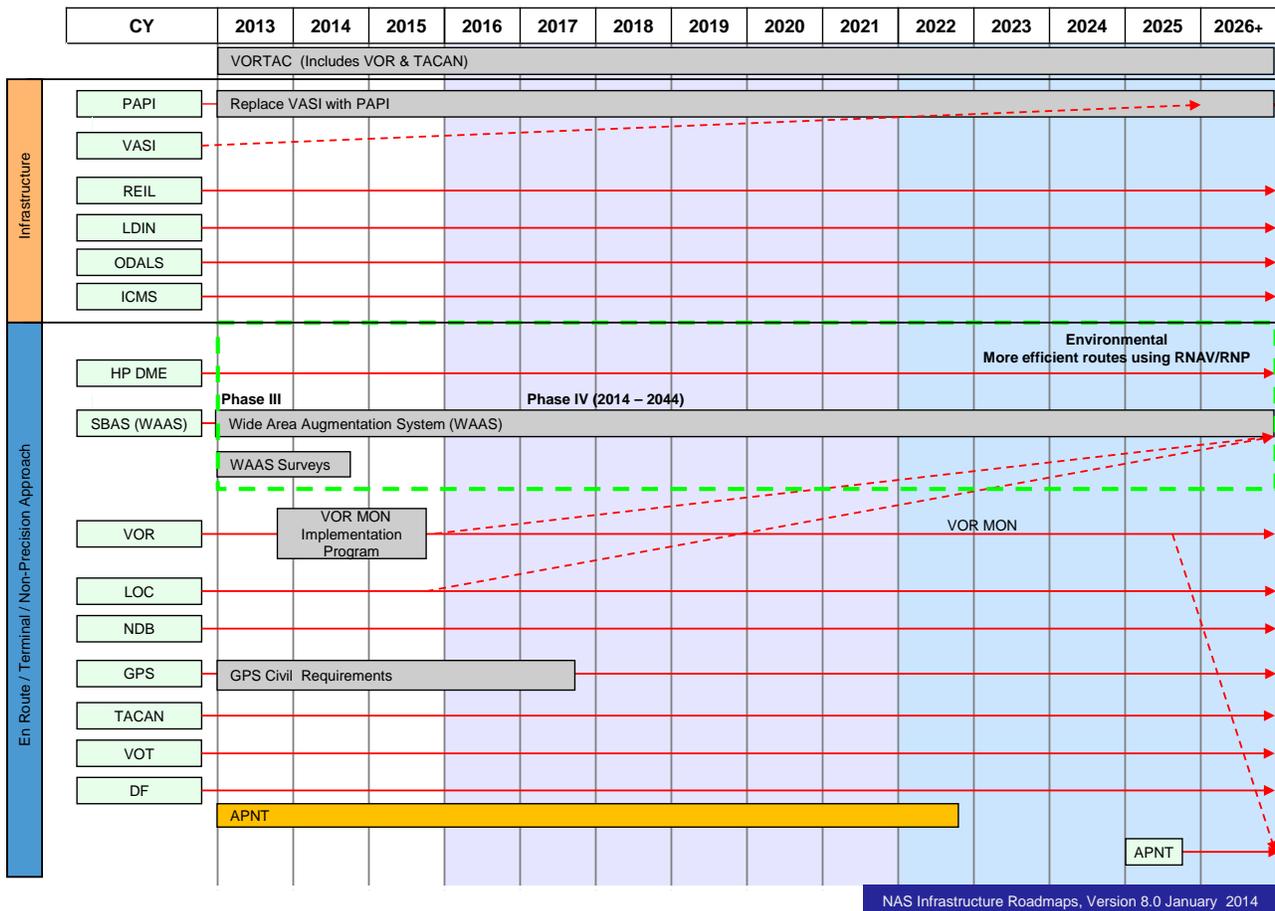
In both Category I and II/III sections of the roadmap, the Approach Light System (ALS) and the Runway Visual Range (RVR) systems are shown. The ALS helps the pilot see the end of the runway and transition from instrument to visual flight for landing before reaching runway minimums. The RVR informs the 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 lower 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 and 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 5-16 Approach and Runway Lights and En Route, Terminal and Non-Precision Approach Roadmap**

En route navigation has traditionally been provided by radio transmitters that provide pilots direction and/or distance from their location. 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 enable pilots to determine an accurate position and also define the Victor and Jet airways, which are published routes based on straight lines from VOR to VOR. With GPS capabilities, pilots are now able to navigate without the ground based aids.

The VORTAC program at the top of the roadmap (Figure 5-16) shows that combined VOR and Tactical Navigation System (TACAN) sites will be supported indefinitely based on the need to retain them. TACAN is the military equivalent of VOR and DME systems installed jointly. VORTAC is a site with a VOR and the military TACAN co-located, and the VOR uses the TACAN for DME information. The VORTAC program is funded through BLI 2D01.

Vertical Approach Slope Indicator (VASI) is being replaced by Precision Approach Path Indicator (PAPI) program 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 PAPI system 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.

High Power DME supports navigation for both en route and terminal operations. Analysis is being performed by the NextGen Navigation Engineering program to determine the DME expansion needed to meet future requirements. NextGen Navigation Engineering is funded through BLI 1A10D.

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 telecommunications satellites. The FAA also has more than 5,800 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 2D01.

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, 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. The APNT program is funded through BLI 1A05C.

Figure 5-17 shows the future capital investments for navigation systems. Funding amounts are in Millions of Dollars.

BLI Number	Program Name	FY 2015 Budget	FY 2016	FY 2017	FY 2018	FY 2019
<b>Navigation Functional Area</b>		<b>\$244.6</b>	<b>\$215.9</b>	<b>\$171.8</b>	<b>\$145.2</b>	<b>\$151.3</b>
2B12	Runway Status Lights (RWSL)	\$41.7	\$23.7	\$4.3	\$1.2	\$0.0
2D01	VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME)	\$8.3	\$2.5	\$2.5	\$2.5	\$8.9
2D02	Instrument Landing Systems (ILS) – Establish	\$7.0	\$7.0	\$7.0	\$7.0	\$10.0
2D03	Wide Area Augmentation System (WAAS) for GPS	\$103.6	\$105.7	\$105.0	\$104.9	\$97.4
2D04	Runway Visual Range (RVR) & Enhanced Low Visibility Operations (ELVO)	\$6.0	\$6.0	\$6.5	\$4.0	\$6.0
2D05	Approach Lighting System Improvement Program (ALSIP)	\$3.0	\$3.0	\$3.0	\$3.0	\$5.0
2D06	Distance Measuring Equipment (DME)	\$3.0	\$3.0	\$3.0	\$3.0	\$5.0
2D07	Visual Navaids - Establish/Expand	\$2.0	\$2.0	\$2.0	\$2.0	\$2.0
2D09	Navigation and Landing Aids – Service Life Extension Program (SLEP)	\$3.0	\$3.0	\$3.0	\$6.0	\$7.0
2D10	VASI Replacement – Replace with Precision Approach Path Indicator	\$5.0	\$5.0	\$5.0	\$5.0	\$10.0
2D11	Global Positioning System (GPS) Civil Requirements	\$27.0	\$25.0	\$11.0	\$0.0	\$0.0
2D12	Runway Safety Areas – Navigation Mitigation	\$35.0	\$30.0	\$19.5	\$6.6	\$0.0

Note: BLI numbers with X represent outyear programs not requested in the FY 2015 President's Budget.

Note: FY 2016-2019 outyear funding amounts are estimates.

**Figure 5-17 Funding amounts in the Navigation Functional Area**

## 5.5 Weather Roadmaps

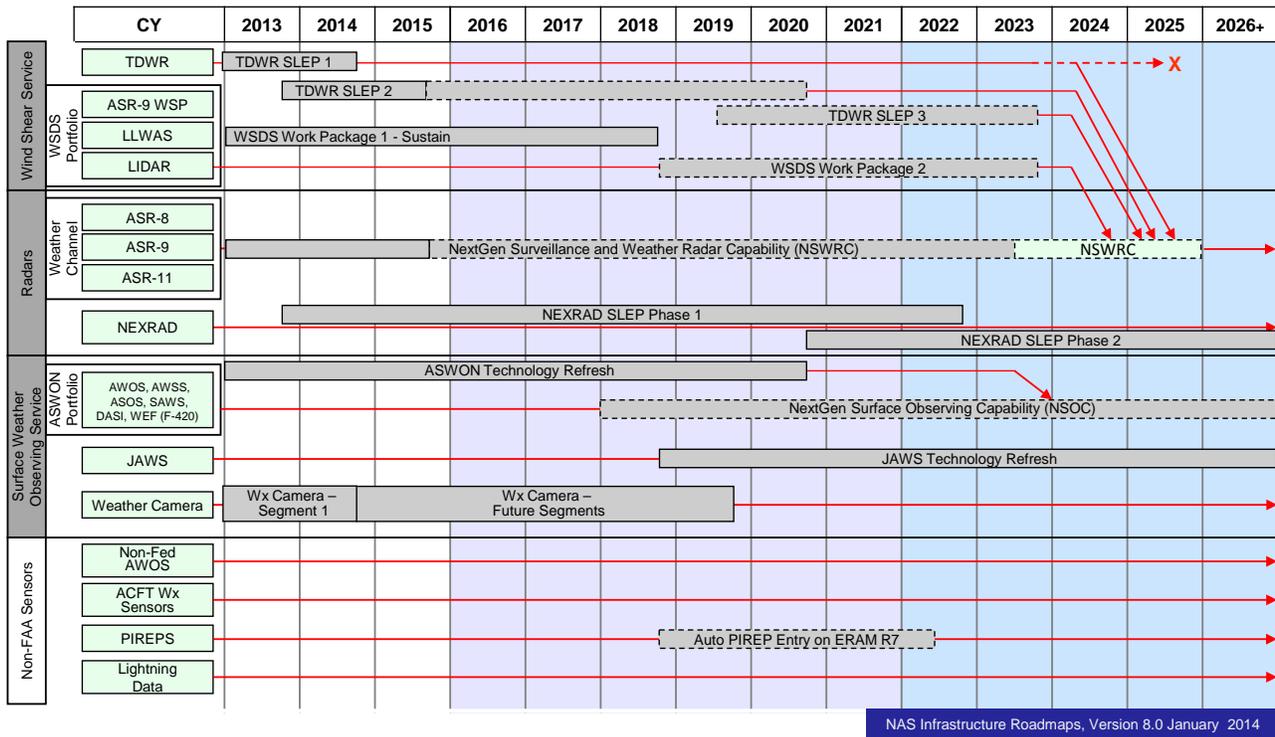
Timely and accurate weather observations and forecasts are essential to aviation safety and for making the best use of aviation capacity. Weather information will be even more important when NextGen direct or user chosen trajectory routing becomes routine. Pilots need to know the direction and speed 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 potentially 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 system implementation is broken down into two different roadmaps:

1. Roadmap 1 (figure 5-18) - Weather Sensors
2. Roadmap 2 (figure 5-19) - Weather Dissemination, Processing, and Display

## Weather Roadmap (1 of 2)



**Figure 5-18 Weather Sensors Roadmap**

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.

Figure 5-18 shows the current and planned status of weather sensors. The Terminal Doppler Weather Radar (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. The TDWR service life extension program is funded through BLI 2B02.

The Wind Shear Detection Services (WSDS) Portfolio includes: the Airport Surveillance Radar-9 (ASR-9) Wind Shear Processor (WSP); the Low Level Wind Shear Alerting System (LLWAS); and the Light Detection and Ranging (LIDAR) system. ASR-9 radars, wind sensors and lasers are used to detect wind shear conditions near the runways and approach areas of airport. 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. The Wind Shear Detection Portfolio is funded through BLI 2A14.

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 can only measure surface winds and do not detect wind shear 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 LIDAR system uses lasers to detect dry microbursts and gust fronts that radar systems such as TDWR 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.

The WSDS Work Package 1 sustain program will provide for modernization of these systems. The Wind Shear Detection Portfolio is funded through BLI 2A14.

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 NSWRC is funded through BLI 1A01I.

Development of NEXRAD occurred under a joint program of the Department of Commerce's National Weather Service, Department of Defense, and FAA. These 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 program is funded through 2A04.

The Automated Surface Weather Observation Network (ASWON) Portfolio includes several surface sensors (AWOS/ASOS/AWSS/SAWS/DASI/F-420) 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 surface 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

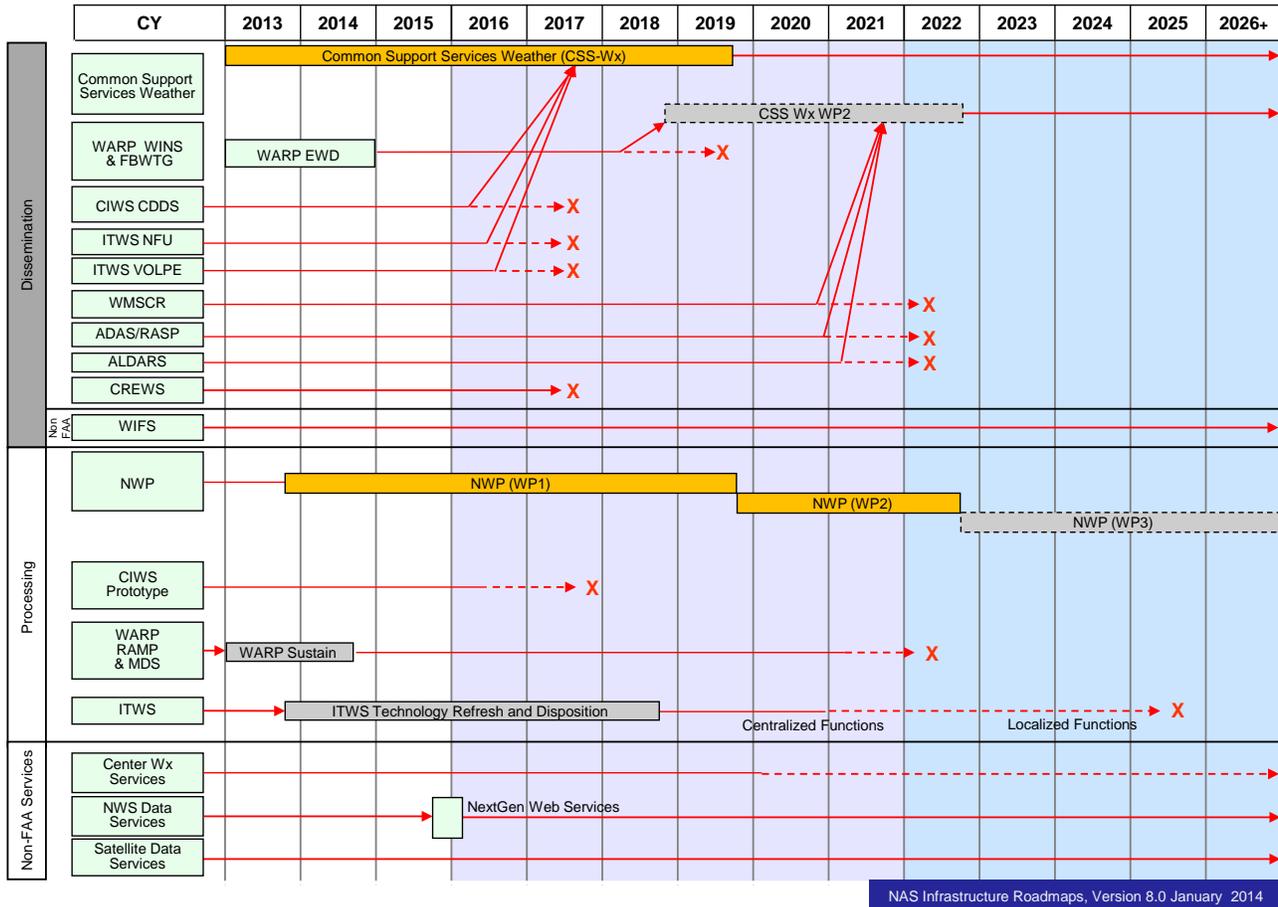
runway at touchdown. The F-420 is an indicator that shows the wind direction and velocity on the runways. These systems feed data directly to air traffic control facilities and support automated broadcast of weather information to pilots. They also provide regular updates for the forecast models that 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 2A14.

The Weather Camera program installs cameras along flight routes in Alaska, 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. 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 into the automation system. Lightning Data provides air traffic facilities important information about the location and intensity of thunderstorms.

## Weather Roadmap (2 of 2)



**Figure 5-19 Weather Dissemination, Processing, and Display Roadmap**

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.

Figure 5-19 shows the systems that process, display, and disseminate weather observations and forecast information. Weather forecasts are integrated into decision support system algorithms to produce more sophisticated forecasts of how weather will impact NAS operations. Common Support Services – Weather (CSS - Wx) which is supported by the SWIM program will be the source for weather information and provide access to all users throughout the NAS. This capability is planned to initiate in 2017. The CCS-Wx program is funded through BLI 2A12C.

Currently, 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 a runway change as aircraft approach an airport. 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.

ITWS will receive technology refresh to sustain the function for the near term. After 2017, its data collection functions will be incorporated into the CSS-Wx. ITWS is funded through BLI 2B20.

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 after 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 center and terminal facility controllers coordinate the flows of air traffic into busy terminal facilities.

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 RAMP (Radar and Mosaic Processor) and MDS (Meteorological Data Server) are components which process 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.

NextGen Web Services is 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 NextGen Web Services into the NAS is funded through the CSS-Wx program as part of the SWIM BLI under 2A12.

Figure 5-20 shows the future capital investments for weather sensors and weather dissemination and processing systems. Funding amounts are in Millions of Dollars.

BLI Number	Program Name	FY 2015 Budget	FY 2016	FY 2017	FY 2018	FY 2019
<b>Weather Functional Area</b>		<b>\$49.2</b>	<b>\$68.6</b>	<b>\$77.1</b>	<b>\$59.0</b>	<b>\$41.1</b>
2A04	Next Generation Weather Radar (NEXRAD)	\$7.1	\$6.5	\$6.3	\$5.5	\$5.5
2B02	Terminal Doppler Weather Radar (TDWR) – Provide	\$1.9	\$0.0	\$0.0	\$0.0	\$0.0
2B20	Integrated Terminal Weather System (ITWS) Technology Refresh	\$4.4	\$5.4	\$5.0	\$3.8	\$0.0
2A14	Windshear Detection Service (WDS)	\$4.3	\$5.2	\$4.5	\$1.0	\$2.8
2A17	NextGen – Next Generation Weather Processor (NWP)	\$23.3	\$42.4	\$48.1	\$35.2	\$22.7
2C01	Aviation Surface Weather Observation System	\$8.0	\$8.0	\$10.0	\$10.0	\$10.0
2C04	Weather Camera Program	\$0.2	\$1.1	\$3.2	\$3.5	\$0.1

Note: BLI numbers with X represent outyear programs not requested in the FY 2015 President's Budget.

Note: FY 2016-2019 outyear funding amounts are estimates.

**Figure 5-20 Funding amounts in the Weather Functional Area**

## 5.6 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 have exceeded service life and 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 2015 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 airport 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. ATCT/TRACON replace program is funded through BLI 2B06.

The Future Facilities program has been refocused to replace the New York TRACON with a new extensible facility at a new location on Long Island. The existing N90 facility is old, does not meet operational requirements and needs to be replaced. FAA is currently developing site selection and facility requirements 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 2A05.

Figure 5-21 shows the future capital investments for facilities programs for the air traffic control system. Funding amounts are in Millions of Dollars.

BLI Number	Program Name	FY 2015 Budget	FY 2016	FY 2017	FY 2018	FY 2019
<b>Facilities Functional Area</b>		<b>\$457.4</b>	<b>\$491.9</b>	<b>\$507.0</b>	<b>\$666.8</b>	<b>\$739.4</b>
1A02	NAS Improvement of System Support Laboratory	\$1.0	\$1.0	\$1.0	\$1.0	\$1.0
1A03	William J. Hughes Technical Center Facilities	\$12.0	\$12.0	\$12.0	\$12.0	\$12.0
1A04	William J. Hughes Technical Center Infrastructure Sustainment	\$12.2	\$9.2	\$10.3	\$10.0	\$10.0
2A05	ARTCC Building Improvements/Plant Improvements	\$63.7	\$60.8	\$63.5	\$63.5	\$63.8
2B06	Terminal Air Traffic Control Facilities - Replace	\$29.8	\$86.0	\$97.0	\$213.2	\$262.5
2B07	ATCT/Terminal Radar Approach Control (TRACON) Facilities - Improve	\$45.0	\$52.9	\$53.7	\$53.7	\$53.9
2B09	NAS Facilities OSHA and Environmental Standards Compliance	\$43.5	\$26.0	\$26.0	\$29.0	\$26.0
2C03	Alaska Flight Service Facility Modernization (AFSFM)	\$2.8	\$2.8	\$2.8	\$2.8	\$2.8
2E01	Fuel Storage Tank Replacement and Management	\$15.5	\$14.0	\$14.0	\$16.0	\$14.0
2E02	Unstaffed Infrastructure Sustainment	\$32.3	\$32.9	\$33.8	\$43.8	\$44.1
2E03	Aircraft Related Equipment Program	\$9.0	\$11.4	\$9.0	\$9.0	\$9.0
2E06	Facilities Decommissioning	\$5.7	\$6.0	\$6.0	\$10.0	\$10.0
2E07	Electrical Power Systems – Sustain/Support	\$102.0	\$100.0	\$100.0	\$125.0	\$150.0
2E08	Energy Management and Compliance (EMC)	\$1.0	\$2.0	\$2.0	\$2.0	\$2.0
3A01	Hazardous Materials Management	\$22.0	\$20.0	\$20.0	\$20.0	\$20.0
3A03	Logistics Support System and Facilities (LSSF)	\$8.0	\$1.0	\$1.5	\$0.0	\$1.4
3A05	Facility Security Risk Management	\$14.3	\$15.0	\$15.1	\$15.1	\$15.9
3A10	National Test Equipment Program	\$2.0	\$4.0	\$4.0	\$4.0	\$5.0
3A11	Mobile Assets Management Program	\$4.0	\$2.0	\$2.0	\$3.0	\$1.8
3B01	Aeronautical Center Infrastructure Modernization	\$13.2	\$14.1	\$14.0	\$14.0	\$14.0
4A04	Mike Monroney Aeronautical Center Leases	\$18.4	\$18.8	\$19.3	\$19.7	\$20.2

Note: BLI numbers with X represent outyear programs not requested in the FY 2015 President's Budget.

Note: FY 2016-2019 outyear funding amounts are estimates.

**Figure 5-21 Funding amounts in the Facilities Functional Area**

## 6 Conclusion

The capital investment plan contains an annual summary of the ongoing planning to modernize and expand the air traffic control and supporting systems. It balances planned improvements between maintaining 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 planned NextGen operational improvements are implemented. Investment in legacy equipment, facilities and IT systems cannot be suspended, because these systems must continue to provide services during and after the transition. Computer systems and other technology that FAA uses for air traffic control continue to face obsolescence issues. As legacy systems age, reliability becomes an issue and they must be replaced 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. The resulting functional requirements are used to create a system architecture that supports those 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. It is important to note that these improvements often take several years after the appropriation of funding to be integrated into daily operations. The complex equipment necessary to support operational improvements takes time to develop, build, install, and test to ensure it will operate error free. Allowing adequate time to train controllers in the use of the new equipment and procedures is critical to successful implementation.

FAA is focusing on implementing NextGen capabilities that produce the greatest benefits. The delivery of ADS-B services throughout much the United States is already providing safety and efficiency benefits to operators. The ADS-B ground station network is complete and services are available for pilots giving them information on weather conditions and surrounding traffic. Sharing airport surface information with airline operators using SWIM has improved both the FAA and carriers ability to plan for surface operations at congested airports, especially in inclement weather where there are large surface delays and operational complexity. The expansion of the Time Based Flow Management Capability to more airports and across greater distance assures that the airport capacity is more efficiently used resulting in minimum delay cost for the users. The Metroplex approach to developing new RNP routes and procedures for terminal approach paths coupled with ongoing development of advanced decision tools has resulted in significant fuel savings for the air carriers that routinely use these approaches and optimum profile descents. These successes demonstrate that NextGen operational improvements can be implemented, and they do produce benefits. As time progresses, more enhanced procedures associated with NextGen advanced tools will result in greater efficiencies and support the expected long-term future growth in aviation activity.

## 7 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 2015–2019.
- Shows system implementation schedules.

### Appendix C

- Provides funding amounts from FY 2015 through FY 2019 by Budget Line Item (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 2015 – 2019

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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 over the next five years. 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 Administrator has defined four Strategic Priorities as follows:

- 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 titled "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 for which a program's contribution is most significant. Only CIP programs with funding in any or all of the years Fiscal Year (FY) 2015-2019 are included in Appendix A, B, and C.

To provide a complete picture of FAA performance additional Performance Metrics are tracked by the FAA to achieve internal organizational performance objectives and these metrics are used in the CIP and the FAA business plan. The metrics are identified in the tables in this appendix.

Each program, listed under its performance metric includes the following information: FY 2015 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 2015 President's Budget, but future funding is planned within the FY 16-19 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, that 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 2015 BLI	CIP #	CIP Name
2A14A	W05.03-01	Wind Shear Detection Services – Work Package 1
2A18	M54.01-01	Airborne Collision Avoidance System X (ACAS X) – Segment 1
2B18A	C23.02-01	Voice Recorder Replacement Program – NAS Voice Recorder Program (NVRP)
2B18B	C23.01-01	Voice Recorder Replacement Program – New Requirements Safety & Audit
2D05	N04.03-00	Visual Nav aids – ALSIP Continuation
2D07	N04.01-00	Visual Nav aids – Visual Nav aids for New Qualifiers
2D12	N17.01-01	Runway Safety Area – Navigation Mitigation
2E03X	M12.01-04	Airbus Simulator Purchase – Advanced Fly-By-Wire Simulator – Additional Technology Refresh Projects
2E09X	M25.00-00	Independent Operational Assessment (IOA)
3A02	A17.01-02	Regulation and Certification Infrastructure System Safety (RCISS) – Segment 2
3A02X	A17.01-03	Regulation and Certification Infrastructure 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
3A09A	G07A.02-01	Aviation Safety Information Analysis and Sharing (ASIAS)
3A09B	G07M.02-01	Systems Safety Management Transformation
3A12A	A35.01-01	Aerospace Medicine Safety Information System (AMSIS)
3A12X	M53.01-02	Aerospace Medical Equipment Needs (AMEN) – Technology Refresh Phase 2
4A09	G05A.02-05	AIM Modernization Segment 2
4A09X	G05A.02-06	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 2015 BLI	CIP #	CIP Name
2C02	A34.01-01	Future Flight Services Program
2C04	M08.31-02	Weather Camera Program – Future Segments
2D03	N12.01-00	Wide Area Augmentation System (WAAS)

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

**1. FAA Strategic Priority: Safer and Smarter**

FY 2015 BLI	CIP #	CIP Name
		Currently no Capital programs are required to support this Metric.

- **Performance Metric 4:** Reduce Category A & B (most serious) runway incursions at a rate of no more than 0.395 per million operations, and maintain or improve through FY 2018.

FY 2015 BLI	CIP #	CIP Name
1A01A	S09.02-00	Runway Incursion Reduction Program (RIRP) – ATDP
2B01	S09.01-01	ASDE-X –Technology Refresh & Disposition
2B12A	S11.01-02	Runway Status Lights (RWSL) – Implementation – Phase 1
2B12B	S11.01-03	Runway Status Lights (RWSL) – Prototype Sustainment

- **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 2015 BLI	CIP #	CIP Name
1A01H	M08.32-03	Operational Analysis and Reporting System (OARS)

- **Performance Metric 6:** Utilize Continuous Diagnostics and Mitigation (CDM) capabilities to continuously enhance our ability to prevent, deter, detect, and respond to cyber attacks against the FAA's infrastructure for 95% of non-NAS IP-based systems and pilot CDM capabilities on a NAS IP-based system.

FY 2015 BLI	CIP #	CIP Name
3A06	M31.00-00	Information Systems Security

- **Performance Metric 7:** Exceed Federal Emergency Management Agency continuity readiness levels by 5 percent. (FAA Business Planning Metric)

FY 2015 BLI	CIP #	CIP Name
3A04	C18.00-00	Command & Control Communications (C3)

## 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 Core airports.

FY 2015 BLI	CIP #	CIP Name
1A05C	G06N.01-06	Alternative Positioning Navigation and Timing (APNT)
2A03	A01.12-02	En Route Communication Gateway (ECG) – Technology Refresh
2A04	W02.02-02	NEXRAD – Service Life Extension Program (SLEP) Phase 1
2A05	F06.01-00	ARTCC Modernization
2A07	C06.01-00	Communications Facilities Enhancement – Expansion
2A07	C06.03-01	Communications Facilities Enhancement – Air/Ground Communications RFI Elimination – Technology Refresh
2A08	S04.02-03	Long Range Radar Improvements – Infrastructure Upgrades/Sustain
2A09	C01.02-04	Voice Switching and Control System (VSCS) – Technology Refresh – Phase 3
2A09X	C01.02-05	Voice Switching and Control System (VSCS) – Technology Refresh – Level of Effort
2A11	C21.02-01	Next-Generation VHF and UHF A/G Communication System (NEXCOM) – Segment 2 – Phase 1 of 2
2A11X	C21.02-02	Next-Generation VHF and UHF A/G Communication System (NEXCOM) – Segment 2 – Phase 2 of 2
2A14X	W10.01-02	Juneau Airport Wind System (JAWS) – 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
2B05	A01.11-01	Flight Data Input/Output (FDIO) Replacement
2B06	F01.02-00	ATCT/TRACON Replacement
2B07	F01.01-00	ATCT/TRACON Modernization
2B08	C05.02-00	Voice Switches – Terminal Voice Switch Replacement (TVSR) II
2B10	S03.01-09	Terminal Radar (ASR) Program – ASR-9 SLEP, Phase 2
2B11B	S03.02-06	Terminal Radar (ASR) Program – ASR-11 – Mobile Airport Surveillance Radar (MASR)
2B14	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
2B15B	M07.05-01	Automated Maintenance Management System (AMMS)
2B16A	S03.01-08	Terminal Radar (ASR) Program – Mode S SLEP – Phase 2

**2. FAA Strategic Priority: Benefits Through Technology**

<b>FY 2015 BLI</b>	<b>CIP #</b>	<b>CIP Name</b>
2B16B	S03.01-11	Terminal Radar (ASR) Program – ASR-9 and Mode S SLEP – Phase 3 Planning
2B17	S13.01-01	Surveillance Interface Modernization (SIM)
2B19	S08.01-02	Precision Runway Monitor (PRM) – Replacement (PRMR)
2B20	W07.01-02	ITWS – Technology Refresh & Disposition
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	Nav aids – Sustain, Replace, Relocate
2E01	F13.01-00	Fuel Storage Tank Replacement and Management
2E02	F12.00-00	FAA Buildings & Equipment Sustain Support – Unstaffed Infrastructure Sustainment
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
3A03X	M21.04-02	Logistics Center Support System (LCSS) – Technology Refresh
3A05	F24.01-02	Facility and Infrastructure Security Program – Two
3A10	M17.01-01	National Test Equipment Program
3A11	F31.01-01	Mobile Assets Management Program

- **Performance Metric 2:** Maintain an average daily capacity for Core airports of 58,166, or higher, arrivals and departures.

<b>FY 2015 BLI</b>	<b>CIP #</b>	<b>CIP Name</b>
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
1A05A	G01S.02-01	ADS-B In Applications – Flight Interval Management
1A05B	G01A.01-01	Modern Procedures
1A05X	G06M.02-02	Wake Turbulence Re-Categorization
1A05X	G01A.02-02	Oceanic Tactical Trajectory Management
1A05X	G01A.01-07	NextGen Oceanic Capabilities
1A05X	G01A.01-06	Separation Automation System Engineering
1A06A	G06A.03-01	Terminal Flight Data Manager (TFDM)
1A06X	G02A.01-01	Surface Tactical Flow
1A06X	G02A.01-02	Surface Conformance Monitoring
1A07A	G05A.02-03	Flight Object

**2. FAA Strategic Priority: Benefits Through Technology**

<b>FY 2015 BLI</b>	<b>CIP #</b>	<b>CIP Name</b>
1A07B	G08M.01-01	International Harmonization Demonstration
1A07X	G05A.02-01	Common Status & Structure Data
1A07X	G05A.02-02	Advanced Methods
1A07X	G05M.02-01	Collaborative Information Management (CIM)
1A07X	G05A.02-08	Flight Object Exchange Services (FOXS)
1A07X	G05A.04-01	Dynamic Airspace
1A09A	G06N.01-02	Closely Spaced Parallel Runway Operations
1A09B	G06A.01-02	Wake Turbulence Mitigation for Arrivals (WTMA)
1A09X	G06N.01-01	Ground Based Augmentation System
1A10A	G04W.02-01	Weather Observation Improvements
1A10B	G04W.03-01	Weather Forecast Improvements
1A10C	G06A.02-01	Surface/Tower/Terminal Systems Engineering
1A10D	G06N.01-03	NextGen Navigation Engineering
1A10E	G01M.02-02	New ATM Requirements
1A10X	G05M.03-01	Information Management
1A12C	G05A.02-04	Concept Development for Integrated NAS Design & Procedure Planning
2A01	A01.10-01	En Route Automation Modernization (ERAM)
2A02A	G01A.01-05	ERAM System Enhancements and Technology Refresh
2A02B	G01A.01-04	ERAM Sector Enhancements
2A02X	G01A.01-08	ERAM System Enhancements Future Segment
2A12C	G05C.01-06	System Wide Information Management (SWIM) – Common Support Services Weather (CSS-Wx)
2A15B	G05A.01-01	Strategic Flow Management Application
2A15C	G05A.01-02	Strategic Flow Management Engineering Enhancement
2A16	G02A.01-06	Time Based Flow Management (TBFM) Work Package 3
2A16	G02A.01-07	Time Based Flow Management (TBFM) Technology Refresh
2A16X	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
2A19X	G01C.01-08	Data Communications – ATN Gateway
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
2B13	G03C.01-01	NAS Voice System – Segment 1/2
2D02	N03.01-00	Instrument Landing Systems (ILS)
2D04B	N08.03-01	Enhanced Low Visibility Operations (ELVO)
2D06	N09.00-00	Sustain Distance Measuring Equipment (DME)

**2. FAA Strategic Priority: Benefits Through Technology**

- **Performance Metric 3:** Achieve a NAS on-time arrival rate of 88 percent at Core airports.

FY 2015 BLI	CIP #	CIP Name
1A07X	G05A.02-09	Airspace Resource Management System (ARMS)
2A06	A05.01-12	TFM Infrastructure – Technology Refresh
2A06	A05.01-13	TFM Infrastructure – Field/Remote Site Technology Refresh
2A10	A10.03-00	Advanced Technologies and Oceanic Procedures (ATOP)
2A13A	G02S.03-01	ADS-B NAS Wide Implementation – Baseline Services and Applications (Service Volume)
2A13X	G02S.01-02	ADS-B NAS Wide Implementation – Future Segments
2A15A	G05A.05-02	Collaborative Air Traffic Management Technologies (CATMT) – Work Package 3
2A15X	G05A.05-03	Collaborative Air Traffic Management Technologies (CATMT) – Work Package 4
2D10	N04.02-00	Visual Nav aids – Replace Visual Approach Slope Indicator (VASI) with Precision Approach Path Indicator (PAPI)
4A08	M03.02-00	CIP Systems Engineering & Technical Assistance – MITRE

- **Performance Metric 4:** Improve NAS energy efficiency by 16% as measured relative to the base year of FY 2001 (revenue ton per kilometer).

FY 2015 BLI	CIP #	CIP Name
1A08	G06M.02-01	Environmental Management System & Noise/Emission Reduction

- **Performance Metric 5:** 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 2015 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	VOR – Minimum Operating Network (MON) Implementation Program

- **Performance Metric 6:** Improve throughput at Core airports during adverse weather by 14 percent by 2018. (FAA Business Planning Metric)

FY 2015 BLI	CIP #	CIP Name
2A17	G04W.03-02	Weather Forecast Improvements – NextGen Weather Processor (NWP), Work Package 1

- **Performance Metric 7:** Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)

FY 2015 BLI	CIP #	CIP Name
1A01G	M08.46-01	Unified Contracting System (UCS)
1A01I	S14.01-01	Next Generation Surveillance and Weather Radar Capability (NSWRC)
1A01X	M08.48-01	Strategic Initiatives Analysis and Validation
1A02 / 1A03	F14.00-00	System Support Laboratory Sustained Support

**2. FAA Strategic Priority: Benefits Through Technology**

<b>FY 2015 BLI</b>	<b>CIP #</b>	<b>CIP Name</b>
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 at WJHTC
1A12B	G05N.01-02	NextGen Performance Based Navigation (PBN) – NAV Lean
2A12A	G05C.01-01	System-Wide Information Management (SWIM) – Segment 1
2A12B	G05C.01-04	System Wide Information Management (SWIM) – Segment 2A
2A12X	G05C.01-05	System-Wide Information Management (SWIM) – Segment 1 Technology Refresh
2A12X	G05C.01-08	NextGen – System-Wide Information Management (SWIM) – Segment 2B
2B11A	S03.02-05	Terminal Radar (ASR) Program – ASR-11 – Technology Refresh, Segment 2
2B11X	S03.02-07	Terminal Radar (ASR) Program – ASR-11 – Technology Refresh, Segment 3
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	F13.04-02	Energy Cost Savings – Energy Management and Compliance
3A01	F13.02-00	Environmental Cleanup / HAZMAT
3A13	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
4A01A	M03.03-01	CIP Systems Engineering & Development Support – SE2020
4A01B	M08.01-00	Provide ANF/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:** Maintain 90 percent of major system investments within 10 percent variance of current baseline total budget at completion. (FAA Business Planning Metric)

<b>FY 2015 BLI</b>	<b>CIP #</b>	<b>CIP Name</b>
1A01F	M47.01-01	Dynamic Capital Planning
4A07	M08.14-00	Resource Tracking Program (RTP)

### 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 1.88 per 100 employees for the FAA.

FY 2015 BLI	CIP #	CIP Name
2B09	F13.03-00	NAS Facilities 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 2015 BLI	CIP #	CIP Name
2D11	N12.03-01	GPS Civil Requirements
4A03	M05.00-00	NAS Regional/Center Logistics Support Services

Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix B

Fiscal Years 2015 – 2019

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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 as presented in the FY 2015 President's Budget Request. Budget Activities group budget line items with similar objectives. There are 5 Budget Activities in the request, and they cover categories such as: engineering development, air traffic investments, other FAA investments, and support contracts (Activity 5 which includes personnel costs is not discussed in this document). Budget line items (BLI) within each Activity contain the detailed descriptions for specific programs. There may be more than one program in a BLI which occurs when the programs have the same overall objectives, but deal with different aspects of the solution, in which case each program is described separately within the BLI. If multiple programs in a BLI have the same specific objective, one write-up is provided. Some programs are not planned to be funded until after FY 2015 and are not represented in the President's budget request; those programs are indicated with "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 within the overall program; if so, these activities are separately described. Each program activity will have its own description and 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 that builds on and replaces Destination 2025. The metrics are based on the approved Agency Organization Success Indicators (OSI) which are in many cases the same as or updated metrics used in the previous FAA strategic plan and latest DOT strategic plan. To map all programs to an appropriate metric, some business planning metrics have been included to supplement the OSI metrics. Even though many programs contribute to more than one metric; only the primary metric alignment is addressed to maintain focus on the strategic priorities.

#### **RELATIONSHIP TO PERFORMANCE METRIC**

This section presents information that shows how the program supports the aligned Performance Metric. Whenever available, quantifiable information is provided. Also described is how NAS safety or operations will change as a result of the new system, service or capability provided by this program.

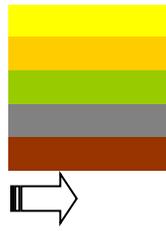
#### **PERFORMANCE OUTPUT GOALS**

Output goals are the specific accomplishments, deliverables or work products that will be delivered for each funded year within the 5 year window of the plan. "None" indicates that no funding is planned to be available for that year. Programs baselined for cost, schedule and performance have specific approved Acquisition Program Baseline (APB) milestones that are tracked for accomplishment. These milestones are included as output goals. Since Facilities and Equipment (F&E) funds can be obligated for an additional 2 years after the year of appropriation, some of the APB milestones may occur after the final year of appropriation and are included as output goals in future years.

#### **SYSTEM IMPLEMENTATION SCHEDULE**

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

Upgrades  
Development  
Implementation  
Operational  
Decommissioning  
Continued



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## ACTIVITY 1: ENGINEERING, DEVELOPMENT, TEST, AND EVALUATION

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### 1A01, ADVANCED TECHNOLOGY DEVELOPMENT AND PROTOTYPING (ATDP)

#### FY 2015 Request \$29.9M

- 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
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- H, Operational Analysis and Reporting System (OARS), M08.32-03
- I, Next Generation Surveillance & Weather Radar Capability (NSWRC), S14.01-01
- X, Strategic Initiatives Analysis and Validation, M08.48-01

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

##### Program Description

The Runway Incursion Reduction Program (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 for 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 at 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 aim to provide direct and preventive alerting 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 2015 – Performance Output Goals

- Develop documentation such as the Business Case Analysis Report (BCAR) required for an eFAROS Investment Analysis Readiness Decision (IARD) in support of terminal PMO.
- Develop annual technical and operational evaluation report of eFAROS units at all prototype locations.

- Complete report on testing of safety logic enhancements to Runway Incursion (RI) detection and prevention products.
- Publish initial Project Plan for evaluation of new initiative identified for Runway Incursion (RI) detection and prevention.

***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 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 fiber optics as a 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 fiber optics 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 fiber optics as a 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 fiber optics as a sensor to drive the activation of direct to pilot alerting safety logic.
- Complete preliminary 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) which 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 their environmental impacts;
- PDARS provides 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;
- The benchmarking of ATO performance with other Air Navigation Service Providers (ANSP) to support joint projects with EUROCONTROL and as part of International Civil Aviation Organization (ICAO), Civil Air Navigation Services Organization (CANSO) and Aerospace Transportation Advisory Group (ATAG) 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 critical information for studies such as the Future Airport Capacity Task (FACT); and,
- Provide performance modeling and economic analysis to develop a business case with ICAO member states for space base ADS-B over the North Atlantic.

The program provides a means for experts from the FAA, academia, and industry collaborate to analyze and develop recommendations for improving capacity and system efficiency, and reducing delays at specific airports. It has the added capability of using its performance measurement systems and operations research to quantify the efficiency of the NAS and form the basis of proposals for overall 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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

This program will facilitate the modeling, measurement and analysis of new runways, airfield improvements, air traffic procedures, and other technological implementations to improve airport capacity and system efficiency. Study Teams evaluate alternatives for increasing capacity at specific airports that are experiencing or are projected to experience significant flight delays. Capacity studies provide recommendations for improving airspace and airport capacity. For example recent capacity studies were completed to improve operations at Newark Liberty International Airport (EWR), John F. Kennedy International Airport (JFK), San Francisco International Airport (SFO), and Seattle-Tacoma International Airport (SEA).

***Program Plans FY 2015 – Performance Output Goals***

- Develop concept of operations to convert PDARS into a net centric system.
- Support PDARS system enhancement as needed to support NextGen Programs and Technologies.
- Support NextGen reporting capabilities to improve NextGen Program and Technology analysis.
- Complete connectivity to ERAM to include remaining available sites.
- Provide PDARS baseline data for before/after analysis of NextGen programs.
- Incorporate noise profiling technology via the Aviation Environmental Design Tool (AEDT) module.
- Complete PDARS analysis to evaluate and improve the weather metric.
- Produce Joint Performance Benchmark Report with EUROCONTROL.
- Complete PDARS modernization plan.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space base ADS-B Out over the North Atlantic.

***Program Plans FY 2016 – Performance Output Goals***

- Complete design of PDARS into a net centric system.
- Support PDARS system enhancement as needed to support NextGen Programs and Technologies.
- Support NextGen reporting capabilities to improve NextGen Program and Technology analysis.
- Provide airport capacity modeling and annual service volume analysis report to support the Future Airport Capacity Task (FACT) report.
- 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.
- Initiate PDARS modernization.
- Complete enhancement of Harmonize FAA Metrics webpage.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space base ADS-B Out over the North Atlantic.

***Program Plans FY 2017 – Performance Output Goals***

- Initiate implementation of PDARS into a net centric system.
- Initiate connectivity of PDARS to SWIM.
- Support PDARS system enhancement as needed to support NextGen Programs and Technologies.
- Support NextGen reporting capabilities to improve NextGen Program and Technology analysis.
- 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, through put, predictability and efficiency.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space base ADS-B Out over the North Atlantic.

***Program Plans FY 2018 – Performance Output Goals***

- Complete implementation of PDARS into a net centric system.
- Continue connectivity of PDARS capability to SWIM.
- Support PDARS system enhancement as needed to support NextGen Programs and Technologies.
- Support NextGen reporting capabilities to improve NextGen Program and Technology analysis.
- 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.
- Complete PDARS modernization.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space base ADS-B Out over the North Atlantic.

***Program Plans FY 2019 – Performance Output Goals***

- Complete connectivity of PDARS capability to SWIM.
- Support PDARS system enhancement as needed to support NextGen Programs and Technologies.
- Support NextGen reporting capabilities to improve NextGen Program and Technology analysis.

- Produce Joint Performance Benchmark Report with EUROCONTROL.
- Provide performance modeling and economic analysis information to support the development of a business case with ICAO member states for space base 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's 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. In addition, this project 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 58,166, 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:

- Impact/Improvement to Air Traffic Service Providers, airspace users, and automation that could increase capacity,
- Impact/Improvement on airspace structure which may increase productivity and hence capacity,
- Impact/Improvement on communication, navigation, and surveillance (CNS) requirements to support the FAA's efforts to reducing cost, increasing capacity and efficiency and;
- Impact/Improvement on automation, display, and facility configuration elements to increase productivity and hence capacity.

***Program Plans FY 2015 – 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 2014.
- 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 2014.

***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.

**D, Major Airspace Redesign – ATDP, M08.28-04**

**Program Description**

The Major Airspace Redesign program (formerly known as the Airspace Management Program) supports increased efficiency and enhanced safety by funding 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 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.

Current projects include:

- New York/New Jersey/Philadelphia Airspace Redesign: Encompasses a complete redesign of the airspace in the New York and Philadelphia metropolitan areas to accommodate growth while enhancing safety, reducing delay, and taking advantage of new technologies. Planned project implementation is scheduled for December 2016.
- Las Vegas Airspace Optimization: Addresses operational problems in the Las Vegas metropolitan area by optimizing airspace without any airfield construction. Western Service Area has the planned project implementation scheduled by the end 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 2 – Maintain an average daily capacity for Core airports of 58,166, 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 National Airspace System performance.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Conduct post- implementation evaluations.
- Conduct engineering for airspace redesign implementation.
- Support infrastructure changes resulting from airspace redesign.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Conduct post- implementation evaluations.
- Support infrastructure changes resulting from airspace redesign.
- Support Las Vegas Airspace Optimization Implementation.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Implement NY/NJ/PHL Airspace Redesign.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Conduct post- implementation evaluations.
- Support infrastructure changes resulting from airspace redesign.
- Conduct engineering for airspace redesign implementation.

#### ***Program Plans FY 2019 – Performance Output Goals***

- Conduct post- implementation evaluations.
- Support infrastructure changes resulting from airspace redesign.
- Conduct engineering for airspace redesign implementation.

## **E, Strategy and Evaluation – ATDP, M46.01-01**

### **Program Description**

The Strategy and Evaluation Program develops and maintains mathematical models of the National Airspace System (NAS) which are used to help guide NextGen investments. 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 are obsolete and cannot support the analysis of advanced Air Traffic Management (ATM) concepts. The Strategy and Evaluation program is developing two new computer models to rectify these shortfalls. These models will 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, etc.) on NAS performance.

1. An Airport Capacity Model is being developed for use in analyzing new airport capacity-related projects. The model facilitates rapid analysis of airport improvements, the impact of air travel demand changes, and ATM technology insertions. The model will be used for runway capacity studies, investment analyses, NextGen analyses, and the evaluation of airport infrastructure changes. The model provides a de facto standard for airport capacity analyses. A Beta version of this model, known as ADSIM+, has been delivered to the FAA.
2. A System-Wide NAS Model is being developed to replace the existing National Airspace System Performance Analysis Capability (NASPAC) model. A 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 is being developed in a "spiral" fashion, which adds enhancements to the initial model as they are completed. Some components of the new model, now known as the System-Wide Analysis Capability (SWAC), are currently being used by FAA and contractors to support ongoing 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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

In order to achieve this and other capacity metrics, the FAA is undertaking a considerable investment in NextGen. NextGen is a wide-ranging transformation of the air transportation system. Numerous cost-benefit and engineering trade studies are required to support this massive 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 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, 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 2015 – Performance Output Goals***

- Delivery of new SWAC executable software incorporating additional weather forecast products to better represent capacity uncertainty.
- Delivery of new SWAC executable software incorporating a controller workload model to better represent en route sector capacity.
- Delivery of new SWAC executable software incorporating advanced surface capabilities (sequencing, runway assignment, configuration management, etc).
- Delivery of new ADSIM+ executable software incorporating arrival/departure fix balancing function.

- Delivery of new ADSIM+ executable software incorporating improvements to Standard Instrument Departure (SID) and Standard Terminal Arrival Route (STAR) procedure representation.

***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

## **F, Dynamic Capital Planning, M47.01-01**

### **Program Description**

Dynamic Capital Planning supports FAA acquisition programs by:

- Tracking NAS Plan schedules for all Capital Programs;
- Determining and validating quantitative and qualitative economic value and internal benefits for capital programs;
- Comparing financial performance to approved baselines for all major programs;
- Tracking field implementation status of all NAS programs by site; and
- Capitalizing NAS Plan installed equipment which includes final 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 – Maintain 90 percent of major system investments within 10 percent variance of current baseline total budget at completion. (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 corrective actions can be implemented.

***Program Plans FY 2015-2019 – Performance Output Goals***

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

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

### **Program Description**

The Unified Contracting System (UCS) Program will unify the management of FAA procurement processes under one system that improves efficiency, reduces costs, standardizes work products, and eliminates redundant and paper-based processes. UCS will be an electronic and secure internet-based system that incorporates a contract lifecycle management system to automate contract formulation and execution (planning, pre-award, award, administration/post-award, and close-out). UCS will use a sophisticated Graphical User Interface (GUI) based toolset, which will allow future acquisitions process changes to be implemented by the FAA, with minimal external support. This automated system 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 encompass some or all aspects of the following functionality:

- Automate manual procurement processes;

- Interface with the FAA's financial system, Oracle 12i, 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 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

UCS will implement cost effective initiatives by consolidating the supporting information and actions taken as part of FAA's procurement process under one system. 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 reporting on status, 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 legacy (costly) FAA procurement funds obligation and commitment system (PRISM).

#### ***Program Plans FY 2015 – Performance Output Goals***

- Achieve IOC for Automated Procurement Process (APP) version 1.0.
- Achieve IOC for Contract Writing module.

#### ***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.

**Program Plans FY 2019 – Performance Output Goals**

- Achieve IOC for Automated Procurement Process (APP) version 5.0. (Prior Year Funds)

**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) (previously titled “Safety Analysis Tool”) 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 not currently available 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. The 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.

At its core, OARS will be a centralized platform for ATO data distribution, fusion from multiple locations, and warehousing. It will be an integrated suite of inter-connected 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 is planned for FY 2014. Initial Investment Decision (IID) is planned for FY 2015 (January 2015). The Final Investment Decision (FID) is planned in FY 2016 (January 2016).

**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 operational errors after the fact are not enough. 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 2015 – Performance Output Goals***

- Achieve a JRC Initial Investment Decision.

### ***Program Plans FY 2016 – Performance Output Goals***

- Achieve a JRC Final Investment Decision in FY 2016. (Prior year funding)

### ***Program Plans FY 2017-2019 – Performance Output Goals***

- None.

## **I, Next Generation Surveillance & Weather Radar Capability (NSWRC), S14.01-01**

### **Program Description**

The Next Generation Surveillance and Weather Radar Capability (NSWRC) will provide a cost-effective replacement for legacy primary terminal surveillance and weather radars. The FAA currently operates several models of Airport Surveillance Radars (ASR) and the Terminal Doppler Weather Radars (TDWR) for terminal aircraft surveillance and weather detection. The technology of the majority of these systems is over 20 years old and in some cases over 40 years old, and most of these systems have exceeded their service life. Ongoing technology refresh and Service Life Extension Programs (SLEPs) may keep these radars operating in the near-term; however, as the demands of the NAS increase it is becoming increasingly clear that the present radars will not be capable of delivering the required functionality in the future.

Shortfalls that will be addressed by the NSWRC include:

- Limited ability to detect and track Unmanned Aircraft Vehicles (UAV) and other non-cooperative aircraft,
- Reduced ability to detect and track aircraft and weather in the presence of ground clutter, such as wind farm interference,
- Insufficient temporal and spatial resolution of weather data to meet NextGen weather requirements,
- Inability to independently determine aircraft altitude for terminal surveillance,
- Increasing Operations and Maintenance (O&M) costs caused by more frequent mechanical failures across multiple radar types and models,
- Inability to collect weather data that falls into radar coverage gaps,
- Inability to effectively discriminate between different types of low speed airborne targets (aircraft, birds, balloons, hang gliders, etc.), and
- Inability to effectively discriminate between different types of precipitation (rain, ice, sleet, hail, etc.).

This program plans to acquire and deploy approximately 230 FAA operational radar systems with a 5-7 year development period and a 15 year deployment period that will be managed by establishing multi-segmented program baselines.

NSWRC completed the Concept Requirements Definition Readiness (CRDR) in December 2012; and is on track for an Investment Analysis Readiness Decision (IARD) by December 30, 2014; Initial Investment Decision (IID) by 2016; and Final Investment Decision (FID) by 2017.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

Significant cost avoidance will be realized by NSWRC by assuming the mission of the 381 legacy radar systems and reducing the extensive overlapping coverage of those legacy radars. This could reduce the segment of radars needed for terminal surveillance from the current total of 281 to a predicted 230 systems. In addition, a common NSWRC platform will consolidate four separate life-cycle support infrastructure capabilities into one common second level engineering, depot and training capability reducing life-cycle support costs.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Achieve Investment Analysis Readiness Decision (IARD).

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

## **X, Strategic Initiatives Analysis and Validation, M08.48-01**

### **Program Description**

Strategic Initiatives Analysis and Validation will develop concepts and plans for future capital investment activities necessary to accomplish the Agency Strategic initiatives. The Agency has developed 4 strategic initiatives for accomplishment in the 2014-2018 timeframe. These initiatives are:

- Make Aviation Safer and Smarter
- Deliver Benefits through Technology and Infrastructure
- Enhance Global Leadership
- Empower and Innovate with the FAA's people

A series of sub-initiatives and activities have been developed to support the accomplishment of the initiatives. This program will perform the analysis to identify shortfalls by doing a gap analysis of current capabilities versus long term vision of the initiative. The program will develop priorities, costs, and implementation strategies for proposed solutions.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

Strategic Initiatives Analysis and Validation supports cost efficiency initiatives by determining the most cost effective capital investment strategies and solutions to support Agency Strategic Initiatives. Validation of activities and costs prior to implementation will avoid unforeseen and unnecessary costs.

#### ***Program Plans FY 2015-2016 – Performance Output Goals***

- None.

#### ***Program Plans FY 2017-2019 – Performance Output Goals***

- Complete report on prior year accomplishment of activities.
- Develop an approved program plan for activities in the current year.

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

**FY 2015 Request \$1.0M**

**FY 2015 Request \$12.0M**

**System Support Laboratory Sustained Support, F14.00-00**

**Program Description**

The William J. Hughes Technical Center (WJHTC) System Support Laboratory line item sustains the facilities and supporting infrastructure necessary for research, development, test, and evaluation of NAS and NextGen systems. The WJHTC provides the FAA's centralized set of laboratories that 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 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.

The Improvement of the System Support Laboratory Program includes upgrading and enhancing electrical and electronic equipment to allow testing of new or modified systems and reconfiguration of laboratory space to support 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 for new equipment testing and support.

Laboratory Sustainment:

The FAA's centralized set of laboratories located at the WJHTC provide the infrastructure for research, development, testing, and field support to FAA's CIP programs. These laboratories provide around the clock operational support to En Route, Terminal, and other ATC facilities fielded throughout the nation. It is necessary to sustain these laboratory systems in configurations and capabilities that match field sites that currently exist or are planned for the future. This activity provides for the ongoing sustainment of the WJHTC NAS and NextGen laboratories.

Laboratory Modernization:

The FAA's centralized set of laboratories located at the WJHTC provide the infrastructure for research, development, testing, and field support to FAA's CIP programs. It is necessary to upgrade and improve the supporting laboratory infrastructure and equipment to provide a laboratory platform capable of supporting FAA programs. This activity provides for the modernization of the laboratory infrastructure. The Laboratory Master Plan, developed in 2010, identified over 150 improvement areas. The Laboratory Services Division's Quality

Management 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, some future improvement projects may be implemented sooner because an opportunity existed that would save the government money.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 2015 – Performance Output Goals***

##### Laboratory Sustainment:

- 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 or higher (meets or exceeds customer requirements).
- Address 75% of the Corrective and Preventive Action Requests identified in the surveillance audits for FY 2015.

##### Laboratory Modernization:

- Initiate at least 75% of the Laboratory Infrastructure improvements targeted for FY 2015. Laboratory Modernization include projects such as ongoing panel board replacements, Computer Air Conditioner (CAC) replacements, raised floor upgrades, laboratory lighting upgrades, laboratory signage replacements, Uninterrupted Power Supply (UPS) power monitoring system phase 2 and other infrastructure projects to be determined by laboratory system decommissioning and installations.

#### ***Program Plans FY 2016 – Performance Output Goals***

##### Laboratory Sustainment:

- 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 or higher (meets or exceeds customer requirements).
- Address 75% of the Corrective and Preventive Action Requests identified in the surveillance audits for FY 2016.

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#### ***Program Plans FY 2017 – Performance Output Goals***

##### Laboratory Sustainment:

- Complete independent external surveillance audits of the Laboratory Services Division Quality Management procedures and processes.
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Laboratory Modernization:

- Initiate at least 75% of the Laboratory Infrastructure improvements targeted for FY 2017. Laboratory Modernization include projects such as ongoing panel board replacements, CAC replacements, raised floor upgrades and other infrastructure projects to be determined by laboratory system decommissioning and installations.

***Program Plans FY 2018 – Performance Output Goals***

Laboratory Sustainment:

- 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 or higher (meets or exceeds customer requirements).
- Address 75% of the Corrective and Preventive Action Request identified in the surveillance audits for FY 2018.

Laboratory Modernization:

- Initiate at least 75% of the Laboratory Infrastructure improvements targeted for FY 2018. Laboratory Modernization include projects such as ongoing panel board replacements, CAC replacements, raised floor upgrades and other infrastructure projects to be determined by laboratory system decommissioning and installations.

***Program Plans FY 2019 – Performance Output Goals***

Laboratory Sustainment:

- 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 or higher (meets or exceeds customer requirements).
- Address 75% of the Corrective and Preventive Action Requests identified in the surveillance audits for FY 2019.

Laboratory Modernization:

- Initiate at least 75% of the Laboratory Infrastructure improvements targeted for FY 2019. Laboratory Modernization include projects such as ongoing panel board replacements, CAC replacements, raised floor upgrades and other infrastructure projects to be determined by laboratory system decommissioning and installations.

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**1A04, WILLIAM J. HUGHES TECHNICAL CENTER INFRASTRUCTURE SUSTAINMENT**

**FY 2015 Request \$12.2M**

**William J. Hughes Technical Center Building and 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 about \$243.3 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), the Business Continuity Plan backups, and the Enterprise Data Centers. In addition to these operational systems at WJHTC, the Technical Center must provide 24x7 support for 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 (ERAM, STARS, ATOP).

The WJHTC developed a 20 year facility master plan for infrastructure sustainment, which was completed in July of 2008. 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 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 2015 – Performance Output Goals***

Execute the following Center Facility System Improvements (Year 3 of 20 year plan):

- Complete Building 316 Roof Replacement.
- Award Contract for Replacement of Aerial Distribution Switches 1 and 2.
- Complete Design for Building 316 Electrical Substation Replacements.
- Award Contract for Buildings 300 & 301 Fire Detection/Annunciation System Upgrades (Phase 2).
- Award Contract for Building 316 Chiller Replacements (Two Chillers).
- Complete Mechanical Upgrades to Building 300.
- Complete Upgrade Electrical Systems in Building 300 (Part 2).
- Complete Designs for Buildings 211 & 303 Roof Replacements.

#### ***Program Plans FY 2016 – Performance Output Goals***

Execute the following Center Facility System Improvements (Year 4 of 20 year plan):

- Complete Replacement of Aerial Distribution Switches 1 and 2
- Complete 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).
- Complete Buildings 211 and 303 Roof Replacements.
- Complete Technical Support Space Utilization Strategy.
- Complete Design for Building 300 Mechanical Equipment Replacements.
- Complete Design for Life Safety Improvements to five Facilities.

#### ***Program Plans FY 2017 – Performance Output Goals***

Execute the following Center Facility System Improvements (Year 5 of 20 year plan):

- Complete Building 316 Electrical Substation Replacements (Phase 2 of 2).
- Complete Design for Central Utilities Plant Chiller Replacements (Nos. 2 & 3).
- Complete Design for Buildings 303 and 316 Chilled Water Systems Interconnection.

- Complete Design for the Replacement of the Central Utilities Plant Electrical Switchgear.
- Complete Life Safety Improvements to five Facilities.

***Program Plans FY 2018 – Performance Output Goals***

Execute the following Center Facility System Improvements (Year 6 of 20 year plan):

- Complete Building 300 Mechanical Equipment Replacements (Phase 3 of 4).
- Award Contract for Main Electrical Substation Upgrades (Switchgear Enclosure).
- Complete Central Utilities Plant Chiller (No. 2 of 3) Replacement.
- Award Contract for Replacement of the Central Utilities Plant Electrical Switchgear.
- Complete Mechanical and Electrical Improvements to Building 208.
- Award Contract for Center Wide Building Automation System Upgrade /Expansion.

***Program Plans FY 2019 – Performance Output Goals***

Execute the following Center Facility System Improvements (Year 7 of 20 year plan):

- Complete Central Utilities Plant Chiller (No. 3 of 3) Replacement.
- Complete Buildings 303 & 316 Chilled Water System Interconnection.
- Complete Main Electrical Substation Upgrades (Switchgear Enclosure).
- Complete Replacement of the Central Utilities Plant Electrical Switchgear.
- Complete Center Wide Building Automation System Upgrade/Expansion.
- Complete Design for Primary Electrical Feeder Replacement to Building 316.
- Award Contract for Design of Overhead Electrical Distribution System Replacement.
- Award Contract for Design of Water Distribution System Improvements.
- Complete Design for Building 316 Fire Detection/Annunciation System Upgrades.
- Complete Refurbish Elevators in Buildings 300, 301 and 316 (Phase 1).

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**1A05, NEXTGEN – SEPARATION MANAGEMENT PORTFOLIO**

**FY 2015 Request \$13.0M**

- A, 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
- X, Wake Turbulence Re-Categorization, G06M.02-02
- X, Oceanic Tactical Trajectory Management, G01A.02-02
- X, NextGen Oceanic Capabilities, G01A.01-07
- X, Separation Automation System Engineering, G01A.01-06

**A, ADS-B In Applications – Flight Interval Management, G01S.02-01**

**Program Description**

The program will develop ADS-B In Applications for 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.

Interval Management (IM) consists of a set of ground (GIM) and flight deck (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 Flight Interval Management (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 reduced need for downstream path-lengthening, and consistent, low variance spacing between paired aircraft that improves arrival capacity. FIM is also expected to reduce ATC instructions and workload without an unacceptable increase in flight crew workload.

This program will develop Minimum Operational Performance Standards (MOPS) and operational requirements for Interval Management – Spacing Arrivals & Approach, and Cruise. This activity will include requirements development, prototype avionics, standards development, and flight demonstrations. These capabilities will be implemented 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, and the ADS-B NAS Wide Implementation – Future Segments CIP, G02S.01-02, supports the implementation activities for FY 2017 and beyond. The program is planning an Investment Analysis Readiness Decision (IARD) for the first set of ADS-B In applications in Q4 FY 2014, and a Final Investment Decision (FID) in Q3 FY 2016. Follow on investment decisions include an IID for advanced ADS-B In Interval Management applications (involving new air-to-air separation standards) in Q2 FY 2017 (NAS EA Architecture Decision Point (DP) 885) and an FID in Q3 FY 2018 (DP 883).

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

Improved interval management will optimize spacing resulting in maximum utilization of system capacity. It is anticipated that by reducing the inter-arrival spacing, utilization of system capacity may be increased and will result in fewer delays and more optimal routing for aircraft. The full benefits case is part of the analysis.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Develop joint Surveillance and Broadcast Services (SBS) Automation Interval Management Requirements document.
- Complete MOPS v1 document.
- Develop MOPS v2 document.
- Complete ConUse with ERAM, TBFM and TAMR Programs.
- Complete System Specification Document (SSD).
- Develop model and build prototype automation software for TBFM and ERAM (for use in FY 2017 Joint FAA-NASA Flight Test).
- Develop Advanced Interval Management ConOps for future IM applications.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Complete a Delta System Specification Document (SSD).
- Equip aircraft with MOPS v1 functionality (in preparation for FY 2017 Joint FAA-NASA Flight Test).
- Continue development of MOPS v2 document.
- Complete all documents and checklist items necessary for Final Investment Decision (DP 884) including: Requirements document, Business Case, Implementation Strategy and Planning Document, Acquisition Program Baseline.
- Complete Advanced Interval Management ConOps for future IM applications.
- Develop Advanced Interval Management Requirements Document for future IM applications.

***Program Plans FY 2017 – Performance Output Goals***

- Conduct Joint FAA-NASA Flight Test to validate MOPS v1 functionality, prototype automation functionality, and Interval Management procedures.
- Continue development of MOPS v2 document.
- Complete all documents and checklist items and necessary for Initial Investment Decision (DP 885) for Advanced Interval Management.
- Complete Advanced Interval Management Initial Requirements Document for future IM applications.

***Program Plans FY 2018 – Performance Output Goals***

- Complete Advanced Interval Management Final Program Requirements Document.
- Complete all documents and checklist items necessary for Final Investment Decision (DP 883) including: Requirements document, Business Case, Implementation Strategy and Planning Document, Acquisition Program Baseline.
- Complete MOPS v2 document.

***Program Plans FY 2019 – Performance Output Goals***

- None.

## **B, Modern Procedures, G01A.01-01**

### **Program Description**

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

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 (i.e. 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.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

Enhancements to Air Traffic Control (ATC) automation will allow controllers to make fuller use of available airspace by identifying complications along the aircraft's planned flight path and facilitating modification of the current trajectory. Trajectory Based Operations (TBO) requires this capability to increase airspace capacity and provide more efficient routes and altitudes to accommodate demand.

***Program Plans FY 2015 – Performance Output Goals***

- Implement Airborne Re-Route (ABRR) by completing the operational checkout of software application and achieving IOC at Key Site.
- Installation and checkout of ABRR Software at remaining 19 ARTCCs.

***Program Plans FY 2016 – Performance Output Goals***

- Complete Kinetic Vertical Modeling (KVM) Phase-3 prototyping “Hybrid Model Complete”.
- Complete follow-up study for complex Turn Modeling.
- Complete study of runway assignment data and availability into ERAM.
- Complete analysis of Unmanned Aircraft Systems (UAS) impact on ERAM.
- Develop integration prototype for National Special Activity Airspace Project (NSAAP) services.
- Conduct an initial operational evaluation for Automaton-Assisted Controller-to-Controller Coordination (i.e. Conditional Handoff, Point Outs, and Approval Requests).
- Complete examination of overtake/in-trail algorithm.
- 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 concepts for Reduced Controller Coordination for Strategic Resolution Maneuver Implementation document.

***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 related artifacts for future ERAM enhancements.

***Program Plans FY 2019 – 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 are the enablers of Performance-Based Navigation (PBN) and Automatic Dependent Surveillance – Broadcast (ADS-B) services that, in turn, enable Trajectory-Based Operations, area navigation (RNAV), Required Navigation Performance (RNP), and other NextGen improvements. National Policy (PPD-21//NSPD-39) requires the FAA to provide a resilient backup in the event of a GPS interference event or outage to maintain safety and security and preclude significant economic impact. NextGen APNT, will provide a means for users to seamlessly continue RNAV and RNP operations to a safe landing. It also will support critical Air Traffic Management (ATM) services during periods when GPS services are unavailable.

The FAA currently relies on existing legacy systems for GPS alternative navigation. Existing systems, are the Very High Frequency Omnidirectional Range (VOR), Distance Measuring Equipment (DME) and Tactical Air Navigation (TACAN), but these systems do not fully support RNAV and RNP or Trajectory Based Operations. The

NextGen APNT program is exploring the full range of alternatives to provide the NAS with a GPS independent backup solution to support PBN.

The APNT program is conducting paper analysis, for a new technology concept, to identify technical and operational alternatives based on a concept of operations that will ensure that the services it provides will be equivalent or near-equivalent to that provided by GPS. The process will select the best alternative as part of the Initial Investment Decision (IID) in 2016. A Final Investment Decision (FID) is planned in 2017, followed by a procurement package and a contract award in 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**

This program supports maintaining operational availability of the NAS by ensuring PNT services remain available during GPS outages. 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 controllers will all benefit from the availability of APNT services. Specifically, pilots will have access to an accurate and reliable source for aircraft position, navigation, and timing services during GPS outage. This will avoid inefficiencies for the pilot by eliminating an operational transition from performance-based to conventional VHF Omni-directional Range (VOR) based navigation. Furthermore, aircraft dispatchers will preserve the ability to continue to schedule operations and to choose preferred trajectories during a GPS outage. Controllers in conjunction with automation improvements will be able to manage separation services and continue performance-based operations during the loss of GPS.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Prepare Preliminary Program Requirements document (pPR).
- Prepare Enterprise Architecture products.
- Prepare initial Safety Assessment documentation.
- Prepare initial Investment Analysis Plan.
- Prepare initial integrated logistics support plan.
- Prepare range of alternatives.
- Award contract for prototype DME.
- Award contract for prototype Ground Based Transmitter (GBT).
- Award a contract to conduct site surveys (2 sites: DME and GBT).
- Award contract for avionics prototypes.
- Achieve Investment Analysis Readiness Decision (IARD), with limited prototyping.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Develop final Investment Analysis Plan.
- Define Initial Business Case.
- Develop Initial Program Requirements document (iPR).
- Complete comparative Safety Assessment.
- Develop initial Implementation Strategy & Planning Document.
- Develop and test prototype DME.
- Develop and test prototype GBT.
- Develop and test avionics prototypes.
- Conduct site surveys (2 sites: DME and GBT).
- Initiate development of a draft Minimum Operation Performance Standard (MOPS).
- Initiate development of a draft Minimum Aviation System Performance Standards (MASPS).
- Achieve Initial Investment Decision (IID), with limited prototyping.

***Program Plans FY 2017 – Performance Output Goals***

- Complete Business Case Analysis Report
- Finalize Enterprise Architecture products.
- Develop Finale program requirements document.
- Finalize Risk Assessment and potential mitigations.
- Finalize acquisition program baseline.
- Finalize Implementation Strategy and Planning Document.
- Conduct prototype verification and validation testing for selected alternative.
- Conduct prototype verification and validation testing for avionics.
- Complete Minimum Operational Performance Standards (MOPS).
- Complete Minimum Aviation System Performance Standards (MASPS).
- Achieve Final Investment Decision (FID), with limited prototyping.

***Program Plans FY 2018 – Performance Output Goals***

- Develop Baseline Specifications.
- Develop Statement of Work.
- Develop Procurement Plan.
- Develop Screen Information Request (SIR).
- Complete Avionics Minimum Operations Performance Standards (MOPS).
- Complete Minimum Aviation System Performance Standards (MASPS).
- Complete Market Analysis.
- Complete Screen Information Request.
- Complete Request for Proposal.

***Program Plans FY 2019 – Performance Output Goals***

- Complete Contract Award.
- Complete Preliminary Design Review.
- Complete Test and Evaluation Plan.
- Complete Design Qualification Testing.

## **X, 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 changed, and new aircraft designs (A-380, B787, B747-8, very light jets, unmanned aircraft systems) have been introduced into the NAS. The approximately 20 year old wake separation standards provide safe separation of aircraft from each other's wakes, but they 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 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. By 2020, the final phase of the program will have developed 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; which 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 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 has occurred over the last approximately 20 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. In FY 2014, the second phase of this program will develop a wake separation minimum matrix of approximately 100 aircraft type pairs (covering over 99% of all aircraft types operating in the world) for use by controllers and associated decision support tools in providing more capacity efficient static wake separations of aircraft flying into and out of our airports. These standards and supporting benefit and safety cases will then be provided to ICAO by the end of CY 2014. 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 58,166, 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 which results from increased runway throughput capacity. The end goal of the program is to increase the 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 in Core airport runway throughput capacity. The first operational use of the 6 Category standards occurred in November 2012 at the Memphis International Airport (MEM), in September 2013 at the Louisville International Airport (SDF) and in March 2014 at the Cincinnati/Northern Kentucky International Airport. 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. The increased capacity is achieved by reduction in many of the in-trail separation distances of aircraft that are currently required. The implementation of the Leader/Follower Pair-Wise Static wake separations will allow an additional 4-7% increase in a Core airport's runway throughput capacity.

### ***Program Plans FY 2015 – Performance Output Goals***

- None.

***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.
- Initiate software and adaptation changes for FAA automation platforms to enable them to support the use of 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.

## **X, Oceanic Tactical Trajectory Management, G01A.02-02**

### **Program Description**

The Oceanic Tactical Trajectory Management (OTTM) program addresses current performance gaps in the areas of capacity, productivity, efficiency, safety, and environmental impacts in the oceanic environment. The OTTM mid-term concept 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 (AOC) and Air Navigation Service Provider (ANSP) oceanic capabilities, as well as evolving technologies (e.g., System-Wide Information Management (SWIM)) to develop these potential concepts. These oceanic capabilities involve 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 operational improvement (104102) Interactive Planning Using 4D Trajectory Information in the Oceanic Environment.

OTTM enhanced automation capabilities are:

#### SWIM Interface

This capability allows the oceanic automation system to be SWIM compliant and share (publishing and subscribing) relevant flight information using the Flight Information Exchange Model (FIXM) global exchange model to better manage ATC operations within a particular sector. It will allow the oceanic automation system to receive FIXM, Weather Information Exchange Model (WXXM), and Aeronautical Information Exchange Model (AIXM)

information. Data will be mapped to the FIXM standard and will include data elements necessary to potentially benefit future oceanic operations.

#### Enhanced Conflict Probe for Oceanic Automation Airspace Surveillance

The oceanic automation system initiates a conflict probe to determine impacts on other aircraft under oceanic control after receipt of a position report and prior to issuing a clearance or coordinating route and altitude changes. However, the oceanic conflict probe does not provide alerts to the controller for aircraft in radar or ADS-B surveillance airspace. This capability will provide a conflict probe to oceanic controllers using radar separation standards within surveillance airspace (e.g., radar or ADS-B Out coverage). With this enhancement to the conflict probe, the oceanic controller will be able to more efficiently and more safely manage traffic in current Anchorage radar airspace, and airspace in more dense traffic environments, such as transition sectors and offshore facilities where radar coverage is more prevalent.

#### User Trajectory Planning in Pre-Oceanic Phase

Pre-oceanic trajectory coordination enables interactive flight plan collaboration between airspace users and the FAA in which the airspace user informs the FAA of his intended 4D oceanic trajectory and receives feedback prior to the flight's entry into oceanic airspace (whether pre-departure or in-flight) whether that trajectory can be approved or needs to be modified. A flexible, web-based interface for collaboration between the FAA automation and the flight planner would allow most airspace users (with sophisticated and less-sophisticated flight planning capabilities) to participate. This capability will allow maximizing the performance of the aircraft and optimizing the use of the airspace. Trajectory coordination capabilities include: Traffic Congestion Depiction, Flight Specific Likelihood Feedback, Pre-Oceanic Coordination Planner, Re-Profile Alert, and Controller 4D Trajectory Insight. 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.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

With increased system precision and enhanced automation, aircraft can more closely fly routes that 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 problems, and as a result, fewer diversions from the preferred routing. Reduced separation standards will also result in increased 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 2015 – Performance Output Goals***

- None.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Conduct modeling and simulation and report results for 4-D Stochastic Trajectory Model.
- Develop Functional Analysis for:
  - Traffic Congestion Depiction;
  - Flight Specific Likelihood Feedback;
  - Pre-Oceanic Coordination Planner; and
  - Re-Profile Alert.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Develop Functional Analysis for:
  - Controller 4D Trajectory Insight.
  - UAS Integration.

- Conduct modeling and simulation and report results for:
  - Traffic Congestion Depiction;
  - Flight Specific Likelihood Feedback;
  - Pre-Oceanic Coordination Planner; and
  - Re-Profile Alert.

***Program Plans FY 2018 – Performance Output Goals***

- Conduct modeling and simulation and report results for Controller 4D Trajectory Insight.
- Complete tech transfer and documentation for:
  - Traffic Congestion Depiction;
  - Flight Specific Likelihood Feedback;
  - Pre-Oceanic Coordination Planner; and
  - Re-Profile Alert.

***Program Plans FY 2019 – Performance Output Goals***

- Complete documentation for Controller 4D Trajectory Insight. (Prior year funding)

## **X, NextGen Oceanic Capabilities, G01A.01-07**

### **Program Description**

The NextGen Oceanic 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 closer to their optimal (or preferred) 4D trajectories while in oceanic airspace.

NextGen Oceanic Capabilities will handle a wide-range of oceanic aircraft equipage, Airline Operations Center (AOC) capabilities, and Air Navigation Service Provider (ANSP) capabilities, as well as using evolving technologies (e.g., 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 control will allow more airspace users to collaborate with air traffic management to obtain their desired routes. Optimized flight trajectories result in savings of time, fuel, and emissions.

This program will provide the following operational improvements:

- Flexible entry time for oceanic tracks;
- Aircraft-specific traffic flow management allowing for optimization of flight trajectories;
- Improved management of flows at merge points;
- Improved Air Traffic Management (ATM) by integrating weather information into decision support tools; and
- Providing decision support tools for the controllers, resulting in improved efficiency and increased safety.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

With increased system precision and enhanced automation, aircraft can more closely fly routes that 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 diversions from the preferred routing. Reduced separation standards

will also result in increased 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 2015 – Performance Output Goals***

- None.

***Program Plans FY 2016 – Performance Output Goals***

- Achieve Final Investment Decision.

***Program Plans FY 2017-2019 – Performance Output Goals***

- Output goals dependent on Final Investment decision.

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

### **Program Description**

This program will refine and validate NextGen automation for Oceanic, Enroute and Terminal, and it will address Surface separation NextGen concepts for improving the efficiency of traffic flow in the terminal area. It will reduce the risks inherent with introducing new technology and operational procedures using System Engineering analysis that examines the integrated use of 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) will assess or validate the impact of new technology and operational procedures on the NAS infrastructure and determine the needed changes throughout the product development lifecycle for NextGen Separation Automation systems. This project will create specific products to support the investment decision supporting 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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

This project will refine the definition of proposed concepts and validate them as viable necessary additions to the NAS. The continuous growth of aircraft air and ground movement is projected to exceed the capacity of the system, causing serious delays and gridlock. The air traffic controller (ATC) automation capabilities will assist controllers in maintaining safe aircraft separation while optimizing use of airspace system capacity. The main focus of this project will result in the safe and efficient use of airspace and airports.

***Program Plans FY 2015-2016 – Performance Output Goals***

- None.

***Program Plans FY 2017 – Performance Output Goals***

- 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)
  - Chief Financial Officer (CFO) Package

***Program Plans FY 2018 – Performance Output Goals***

- Develop the following products in support of the Final Investment Decision (FID):
  - Final Program Requirements documentation
  - Enterprise Architecture documentation
  - Business Case documentation
  - Implementation Strategy and Planning Document (ISPD)
  - Acquisition Program Baseline (Execution Plan)

***Program Plans FY 2019 – Performance Output Goals***

- Milestones will be developed at FID.

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

**FY 2015 Request \$38.8M**

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

**A, Terminal Flight Data Manager (TFDM), G06A.03-01**

**Program Description**

The Terminal Flight Data Manager (TFDM) program is an acquisition program that delivers NextGen decision support capabilities to tower air traffic controllers and FAA traffic managers with 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 (airspace around an airport and airport surface data) and to improve access to information necessary for the safe and efficient control of air traffic. 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 the airport operations. The decision support capabilities will also provide more efficient and safe airport operations, in particular management of airport surface traffic sequencing and scheduling. TFDM will automate the manual flight data processes to enable enhanced data sharing between the Tower ATC and the En Route ATC, Approach Control ATC, Traffic Flow Management (TFM), and Flight/Airline Operations domains.

Early implementation of TFDM will be comprised of the following:

- 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 SWIM;
- Sustainment of the Philadelphia (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
- Sustainment of the Electronic Flight Strip Transfer System (EFSTS) at 77 sites.

Initial deployment of TFDM will be comprised of the following Core 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 automatic surface surveillance data;
- TFDM scheduler/sequencer, including integration of Traffic Flow Management System (TFMS)/TBFM and Surface Collaborative Decision Making (S-CDM) implementation;
- Enhanced data exchange with flight operators and other airport stakeholders.

A key component of TFDM Core 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 facility, between Air Traffic Control facilities and between 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 Core 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 June 2014. Final Investment Decision date 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 2 – Maintain an average daily capacity for Core airports of 58,166, 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 Air Traffic Control coordination and decision making to facilitate more efficient operations and increased airport capacity. The capabilities provided by TFDM will provide multiple NAS benefits, such as reduced surface delay, taxi time and fuel burn (with improved operational and environmental performance); better performance and airport capacity utilization during severe weather and other off-nominal conditions; improved usability and situational awareness and enhanced safety.

#### ***Program Plans FY 2015 – Performance Output Goals***

- AEFS operational in CLE and LAS.
- EFSTS Tech Refresh (Parts) Procurement.
- Conduct Final Investment Decision for TFDM.

#### ***Program Plans FY 2016 – Performance Output Goals***

- S-CDM Data Elements Enhancement implemented via TFMS.
- AEFS operational in SFO.
- Start implementation of EFSTS.
- Complete contract award for TFDM Core.
- Conduct System Requirements Review (SRR).
- Conduct Preliminary Design Review (PDR).

#### ***Program Plans FY 2017 – Performance Output Goals***

- Conduct Critical Design Review (CDR).
- Begin incremental software and hardware development of TFDM Core system.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Initial deployment of Electronic Flight Data capability.
- Complete hardware unit testing and incremental software development testing of TFDM Core.
- Begin System Integration and Government Acceptance Testing of TFDM Core.

**Program Plans FY 2019 – Performance Output Goals**

- Complete TFDM System Government Acceptance (GA) Test.
- Conduct Operational Test program of TFDM.
- Complete TFDM Core Key Site installation and checkout.

**System Implementation Schedule**

	2010	2015	2020
<b>Terminal Flight Data Manager (TFDM)</b> Core Capability: First site IOC: 2020 -- Last site IOC: TBD			<b>TFDM</b>

**X, Surface Tactical Flow, G02A.01-01**

**Program Description**

The Surface Tactical Flow (STF) program is focused on the development of 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 complete development on near-term STBO capabilities for:

- Providing recommendations to optimize airport surface resources;
- Maximizing runway throughput by sequencing and spacing aircraft and managing queues for departing and arriving aircraft when demand for surface resources exceeds capacity;
- Exchanging operational surface data among stakeholders; and
- Developing a surface schedule that meets surface constraints and traffic management, arrival and departure constraints through collaboration with air traffic managers and flight operators.

The STBO concept is expected to be implemented as a set of decision support tools deployed on the Terminal Flight Data Manager (TFDM) automation system.

**Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 58,166, 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 2015 – Performance Output Goals***

- None.

### ***Program Plans FY 2016 – Performance Output Goals***

- Complete a simulation of Airport and Runway and Configuration Management (ARCM) configuration decision support tool.
- Complete an assessment of Post TFDM Surface shortfalls.
- Complete an initial benefits analysis for ARCM capabilities.

### ***Program Plans FY 2017 – Performance Output Goals***

- Conduct a simulation of ARCM Decision Support Tool in a multiple airport environment.
- Refine ARCM Concept of Use.
- Complete the initial research of remaining surface shortfalls.

### ***Program Plans FY 2018 – Performance Output Goals***

- Complete a simulation and analysis of a Time-Based Taxi Route Generation tool.
- Complete a technical transfer of mature capabilities to the Program Management Organization, deliverables include:
  - Preliminary Program Requirements
  - Functional Analysis
  - Updated Benefits Analysis
  - Prototype Software
  - Simulation and Evaluation Reports

### ***Program Plans FY 2019 – Performance Output Goals***

- Complete a Human-in-the-Loop evaluation of Time-Based Taxi Route Generation Tool.
- Develop field evaluation plan for Time-Based taxi routing.

## **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 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 58,166, 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 2015-2017 – Performance Output Goals***

- None.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Develop Human-in-the-Loop (HITL) evaluation plan for Surface Conformance Monitoring.
- 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***

- Complete HITL evaluation of Surface Conformance Monitoring.
- Complete HITL evaluation of Surface Conformance Monitoring integrating NASA Integrated Surface Management with Flight Deck.

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## **1A07, NEXTGEN – ON DEMAND NAS PORTFOLIO**

### **FY 2015 Request \$6.0M**

- A, Flight Object, G05A.02-03
- B, International Harmonization Demonstration, G08M.01-01
- X, Common Status & Structure Data, G05A.02-01
- X, Advanced Methods, G05A.02-02
- X, Collaborative Information Management (CIM), G05M.02-01
- X, Flight Object Exchange Services (FOXS), G05A.02-08
- X, Dynamic Airspace, G05A.04-01
- 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 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 Flight Object work program will be composed of two major components:

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

#### Development of FIXM Standard:

The FIXM Standard will be updated on an annual basis (FIXM V2.0 was released in 2013). 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, ICAO (International Civil Aviation Organization) and IATA (International Air Transport Association).

#### Flight Object Operational Analysis:

The operational analysis work 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 58,166, 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 2015 – Performance Output Goals***

Development of FIXM Standard:

- Develop final FIXM v4.0 artifacts.
- Develop draft FIXM v5.0 artifacts.

Flight Object Operational Analysis:

- Identify capabilities which should be supported by FIXM v5.0.
- Develop operational scenarios to define the operational context for FIXM v4.0.
- Verify that FIXM v4.0 artifact accurately reflects the operational needs.

***Program Plans FY 2016 – Performance Output Goals***

Development of FIXM Standard:

- Develop final FIXM v5.0 artifacts.
- Develop draft FIXM v6.0 artifacts.

Flight Object Operational Analysis:

- Identify capabilities which should be supported by FIXM v6.0.
- Develop operational scenarios to define the operational context for FIXM v5.0.
- Verify that FIXM v5.0 artifact accurately reflects the operational needs.

***Program Plans FY 2017 – Performance Output Goals***

Development of FIXM Standard:

- Develop final FIXM v6.0 artifacts.
- Develop draft FIXM v7.0 artifacts.

Flight Object Operational Analysis:

- Identify capabilities which should be supported by FIXM v7.0.
- Develop operational scenarios to define the operational context for FIXM v6.0.
- Verify that FIXM v6.0 artifact accurately reflects the operational needs.

***Program Plans FY 2018 – Performance Output Goals***

Development of FIXM Standard:

- Develop final FIXM v7.0 artifacts.
- Develop draft FIXM v8.0 artifacts.

Flight Object Operational Analysis:

- Identify capabilities which should be supported by FIXM v8.0.
- Develop operational scenarios to define the operational context for FIXM v7.0.
- Verify that FIXM v7.0 artifact accurately reflects the operational needs.

***Program Plans FY 2019 – Performance Output Goals***

Development of FIXM Standard:

- Develop final FIXM v8.0 artifacts.
- Develop draft FIXM v9.0 artifacts.

Flight Object Operational Analysis:

- Identify capabilities which should be supported by FIXM v9.0.
- Develop operational scenarios to define the operational context for FIXM v8.0.
- Verify that FIXM v8.0 artifact accurately reflects the operational needs.

**B, International Harmonization Demonstration, G08M.01-01**

**Program Description**

The Mini-Global demonstration will support the goals of International Air Traffic Interoperability (IATI) through validation of the Flight Object concept and the use of the Flight Information Exchange Model (FIXM) standard. The FIXM is a data interchange format for sharing information about flights throughout their lifecycle. FIXM is part of a family of technology independent, harmonized and interoperable information exchange models designed to

cover the information needs of Air Traffic Management. The demonstration will show how ANSPs and flight operators, in both the Pacific and Atlantic regions, can leverage the FIXM standard as a means for sharing common flight information elements.

Mini Global demonstration activities will foster a future implementation of a seamless, global Air Traffic Management (ATM) system that will enable flight operators to meet their planned times of departure and arrival and adhere to their preferred flight profiles with minimum constraints and without compromising agreed levels of safety. Fundamental to this is a global seamless operations and integration of systems. An integrated global ATM system will improve the handling and transfer of operational aeronautical information and enable aircraft operators to conduct flights in accordance with preferred trajectories, dynamically adjusted, in the most optimum and cost-efficient manner.

Activities include the establishment and demonstration of the Mini Global “Cloud” infrastructure - Enterprise Messaging Services (EMS), using SWIM/Service Oriented Architecture (SOA) technologies. The demonstration project will identify global policies, protocols, security, and business sensitivity requirements, mediate between diverse EMSs, and provide an infrastructure for future applications/services to benefit Global ATM.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

Sharing common information elements (Flight Object and FIXM) will improve the accuracy and availability of flight information updates, the consistency of flight planning in different ATM systems and ANSP domains, and the transition of flights between these domains, and phases of flight (e.g. departure, en-route, arrival.). This improvement will address the FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 58,166, or higher, arrivals and departures.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Conduct demonstration to focus on the Mini Global “Cloud” infrastructure, the connectivity and data sharing between multiple Enterprise Messaging Services (EMS), initial applications for ATM enhancements, and assess global ATM interoperability/harmonization options for future adoption.
- Complete a post-demonstration analysis.
- Provide standards and governance recommendations to the Flight Object Working Group on Flight Information Exchange Model (FIXM) 3.0.
- Provide recommendation to System Wide Information Management (SWIM) Program Office to include efficiency, scalability, governance, performance and Enterprise Messaging Service (EMS) connectivity.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

## **X, Common Status & Structure Data, G05A.02-01**

### **Program Description**

The Common Status and Structure 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. 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 SAA, airport configuration, static constraints, and NOTAMs affecting the NAS to support NextGen capabilities.

Key elements of the Common Status and Structure program include:

- The Aeronautical Common Services (ACS) platform, which will be used to ingest data from the authoritative databases, process and combine data from these multiple sources, and distribute the data via the 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. This enterprise level approach will enable delivery of consistent, timely, and authoritative data across the various user communities;
- 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 (AI) visualization/mapping, relational filtering (e.g. airspace affected by a given NOTAM, Letter of Agreement (LOA) constraints affecting a given geographic location, and SAA schedule deconfliction services); and
- Using the status 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 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

Common Status and Structure Data (CSSD) provides support for the information, systems and tools necessary to implement comprehensive NAS safety and capacity 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 and new airspace changes affect current and future NAS capacity.

Identifying the requirements and benefits of integrated flight planning and briefing (including flight constraint information) will lead to better flight planning and arrival/departure capacity plans by supporting preflight, during flight and post-operational aeronautical information for exchange and use by NAS automation systems. The resulting efficiency gains will enable the FAA to maximize use of NAS capacity.

An integrated set of data services delivering both static and dynamic data through well-defined exchange mechanisms across the NAS will enable users to more easily consume and visualize the NAS status. This synthesis of the various data using standard models and ubiquitous availability in the cloud will deliver a greater degree of shared situational awareness as data can be integrated, compared, and evaluated using additional constraints and the assurance that data are related in clearly defined ways. Thus, enhanced business intelligence capabilities and a comprehensive NAS data enterprise service infrastructure along with new benchmarking and forecasting capabilities will enable the FAA to intelligently manage the NAS resources to optimize capacity in the face of changing conditions.

### ***Program Plans FY 2015 – Performance Output Goals***

- None.

***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 and ingest static aeronautical information including airspace definitions, airport configurations, schedules, and other constraints such as miles in trail restrictions, boundary crossing data, via the Aeronautical Common Services.
- Conduct IARD for AIM Modernization future Segment 3. Deliverables include:
  - Functional Analysis
  - Investment Analysis Plan

***Program Plans FY 2017 – Performance Output Goals***

- Develop level of integration of the AI in NAS automation and interface requirements documents to support development of interfaces and data flow with decision support tools and other automation using AIM information, for example, ERAM or TFDM. Specifically this effort will support acquisition engineering for those programs within the On-Demand NAS Information Portfolio in the Bravo timeframe (FY2016-FY2020).
- Conduct IID for AIM Modernization future Segment 3. Deliverables include:
  - Initial Program Requirements
  - Business Case Analysis Report (BCAR)
  - Enterprise Architecture Artifacts
  - Implementation Strategy and Planning Document (ISPD)
  - Chief Financial Officer (CFO) Package
- 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), Letter of Agreement 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 2018 – Performance Output Goals***

- Conduct Concept and Requirements Definition Readiness Decision for AIM Modernization future Segment 4. Deliverables include:
  - Concept and Requirements Definition (CRD) Plan
  - Concept of Operations
  - Shortfall Analysis
- Conduct Final Investment Decision (FID) for AIM Modernization future Segment 3. Deliverables include:
  - Final Program Requirements
  - BCAR
  - ISPD
  - Enterprise Architecture Artifacts
  - Communications Plan

***Program Plans FY 2019 – Performance Output Goals***

- Conduct IARD for AIM Modernization future Segment 4. Deliverables include:
  - Preliminary Program Requirements
  - Functional Analysis
  - Investment Analysis Plan
  - Enterprise Architecture Artifacts

**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 which will increase airport capacity and sector throughput, and will 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.

Advanced Methods will identify automation system and procedural enhancements to address strategic TFM shortfalls in the following enhancement areas:

- Constraint Prediction, Monitoring and Alerting;
- Operational Response Development; and
- Post-Operational Analysis and Training.

The capabilities defined by this program will be implemented in a future TFMS updates.

### **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 58,166, 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 increase airport capacity and sector throughput, and reduce sector delays.

#### ***Program Plans FY 2015 – Performance Output Goals***

- None.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Update concept engineering plan and conduct concept engineering activities to develop the following products:
  - Preliminary Capability Functional Analysis for individual capabilities under Constraint Prediction, Monitoring and Alerting; Operational Response Development; and Post-Operational Analysis and Training;
  - Preliminary Capability Requirements for individual capabilities under Constraint Prediction, Monitoring and Alerting; Operational Response Development; and Post-Operational Analysis and Training;
  - Concept Validation Activities – Prototyping/Evaluations/HITLs/Reports for individual capabilities under Constraint Prediction, Monitoring and Alerting; Operational Response Development; and Post-Operational Analysis and Training; and
  - Updated Capability CONOPS.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Conduct concept engineering activities to develop the following products:
  - Updated Capability Functional Analysis for individual capabilities under Constraint Prediction, Monitoring and Alerting; Operational Response Development; and Post-Operational Analysis and Training;
  - Updated Capability Requirements for individual capabilities under Constraint Prediction, Monitoring and Alerting; Operational Response Development; and Post-Operational Analysis and Training;
  - Quantitative Capability Benefits 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.

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

**Program Description**

Collaborative Information Management (CIM) 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 System Oriented Architectures (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 58,166, 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 2015 – Performance Output Goals***

- None.

***Program Plans FY 2016 – Performance Output Goals***

- Develop a behavior analysis model/toolset to evaluate NAS service behavior to develop baseline for CIM.

***Program Plans FY 2017 – Performance Output Goals***

- Evaluate cyber threat scenarios related to air domain system vulnerabilities and report findings.

***Program Plans FY 2018 – Performance Output Goals***

- Prepare 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.

## **X, 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. 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 richer 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 58,166, 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 NAS capacity.

#### ***Program Plans FY 2015 – Performance Output Goals***

- None.

#### ***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 Final Investment Decision (FID):
  - Final Program Requirements
  - BCAR
  - ISPD
  - Enterprise Architecture Artifacts
  - Communication Plan

***Program Plans FY 2019 – Performance Output Goals***

- Initiate FOXS implementation.

## **X, 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 to dynamically deactivate restrictions on travel through designated areas. The Airspace Resource Management System (ARMS) will implement these tools for reconfiguring sectors and controlling the reconfiguration of the NextGen networked communications infrastructure and flight data distribution in response to operational requirements.

It is expected that 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 transfer of airspace from adjacent areas within a facility and airspace from adjacent facilities when that would improve efficiency of operations, especially when faced with major constraints such as weather. The capability also supports a robust business continuity capability.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

Dynamic Airspace and ARMS 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 2015-2016 – Performance Output Goals***

- None.

***Program Plans FY 2017 – Performance Output Goals***

- Prepare case study of radio coverage and implementation analysis.
- Develop a preliminary shortfall analysis.

***Program Plans FY 2018 – Performance Output Goals***

- Develop an initial Concept of Operations.
- Conduct concept validation activities, such as a human-in-the-loop simulation.
- Develop initial operational requirements.
- Prepare documentation of voice system reconfiguration requirements
- Prepare operational study evaluating processes for moving sector boundaries and airspace configurations.
- Develop documentation for information loading of new airspace frequency plan into ERAM.

***Program Plans FY 2019 – Performance Output Goals***

- Prepare operational study evaluating automation processes for moving sector boundaries and airspace configurations dynamically.
- Update documentation for information loading of new airspace frequency plan into ERAM.
- Develop documentation of adaptation requirements for surveillance, flight plan posting, etc.
- Develop operational requirements for implementing Dynamic Spectrum coverage for communication.

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

### **Program Description**

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

Key benefits from ARMS include the following:

- Reduced air traffic controller constrained airspace workload while addressing weather and Special Use Airspace (SUA).
- Air traffic managers will have more flexibility to reconfigure airspace to address convective weather and meet 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.*

### **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 2015-2018 – Performance Output Goals***

- None.

***Program Plans FY 2019 – Performance Output Goals***

- Complete documentation in preparation for Investment Analysis Readiness Decision:
  - Shortfall Analysis;
  - Concept of Operations;
  - Functional analysis;
  - NAS EA artifacts;
  - Safety analysis; and
  - Preliminary requirements.

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**1A08, NEXTGEN – ENVIRONMENT PORTFOLIO**

**FY 2015 Request \$2.5M**

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

**Program Description**

The environmental and energy development efforts under this program will lead to assessments of NextGen solutions to reduce emissions, fuel burn, and noise. This effort will focus on explorations, demonstrations, and development of methods to integrate environmental impact mitigation and energy efficiency options within the NextGen infrastructure. It will also explore ways to adapt the NAS infrastructure to fully exploit the benefits of these environmental mitigation and energy efficiency options.

NextGen environmental goals are to reduce system wide aviation environmental impacts in absolute terms notwithstanding the growth of aviation. The NextGen Five Pillar Environmental Approach contains several options to mitigate environmental impacts of aviation: operational procedures; aircraft and engine technologies; alternative fuels, Air Traffic Management improvements and efficiencies, environmental policies and standards; and improved tools for environmental analysis. These all enable an increase in capacity while reducing environmental impacts.

There are two environmental projects under this program.

Environmental Management System Framework:

Solutions to achieve NextGen environmental goals must consider the effect of aviation noise and emissions on human health and welfare. The Environmental Management System (EMS) provides a framework to manage, mitigate and verify progress towards achieving the environmental goals. The EMS will employ well-developed and demonstrated environmental impacts metrics. The EMS approach will allow for the systematic examination of advanced options for noise, fuel burn, and emissions reduction to support sustainable growth in demand and mobility. Approaches will be developed and analyses conducted to track progress towards meeting emissions, noise and fuel burn efficiency goals.

Advanced Noise and Emission Reduction:

Implementation of advanced aircraft (both engine and airframe) technologies, and improved environmental and energy efficient operational procedures are keys to reductions in significant environmental impacts while improving system energy efficiency. Policy options, environmental standards and market based measures also provide mitigation that will help meet environmental and energy efficiency goals. This program will focus on assessing the impacts of mitigation actions and provide guidance on potential adaptations needed in order to maximize benefits from the mitigation actions. This program interfaces with the CLEEN (Continuous Lower Energy, Emissions and Noise) technologies program being pursued under the NextGen Environment and Energy Research and Development 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 – Improve NAS energy efficiency by 16% as measured relative to the base year of FY 2001 (revenue ton per kilometer).*

## **Relationship to Performance Metrics**

This program supports the FAA Strategic Priority for Delivering Benefits through Technology and Infrastructure with an outcome of the US aviation sector being a model for sustainable growth. Progress and success of this program will be measured against the performance metric to improve NAS-wide energy efficiency by at least 2% per year. This program supports accelerated maturation of air traffic management and adoption of CLEEN aircraft technologies through testing, demonstration and benefit assessment. In addition, it focuses on exploration of energy efficient and environmentally favorable operational procedures. Both of these advances lead to improved energy efficiency which will be managed and tracked via the Environmental Management System. This program accelerates securing qualification of commercial alternative fuels through testing and demonstration as well as analysis of aviation environmental standards on NAS-wide operational environmental performance.

### ***Program Plans FY 2015 – Performance Output Goals***

#### Environmental Management System (EMS) Framework:

- Submit a report on development of the initial operational version of NextGen EMS framework.

#### Advanced Noise and Emissions Reduction:

- Develop a report on demonstration of FMS/ATM Integration for Trajectory Optimization.
- Update report on assessments of NAS-wide environmental benefits of new aircraft technologies including those from the CLEEN program.
- Develop a report on assessments of environmentally and energy efficient gate-to-gate operational procedures.
- Develop a report on assessments of NAS-wide impacts of environmental standards and policy measures.

### ***Program Plans FY 2016 – Performance Output Goals***

#### Environmental Management System (EMS) Framework:

- Develop report evaluating progress towards meeting NextGen environmental goals that identifies performance gaps and mitigation solution needs.
- Submit a report on enhancements to Aviation Environmental Design Tool (AEDT) terminal area capabilities.
- Submit a report on integration of NextGen simulation models and data with AEDT software version 2b.

#### Advanced Noise and Emission Reduction:

- Submit a report on assessments of operational procedures and ATM-related technologies that could reduce noise, emissions, and fuel burn.

### ***Program Plans FY 2017 – Performance Output Goals***

#### Environmental Management System (EMS) Framework:

- Submit a report with details on refinements to NextGen EMS framework.
- Update report evaluating progress towards meeting NextGen environmental goals that identifies performance gaps and mitigation solution needs.
- Report on further enhancements to the AEDT and other aviation environmental tools.
- Integrate NextGen simulation models and data with enhanced version of AEDT and other aviation environmental tools.

#### Advanced Noise and Emission Reduction:

- Submit a report on assessments and simulations of operational procedures and ATM-related technologies that could reduce noise, emissions, and fuel burn.

### ***Program Plans FY 2018 – Performance Output Goals***

#### Environmental Management System (EMS) Framework:

- Update report on progress made towards meeting FAA's environmental and energy goals using updated processes and tools along with details on potential performance gaps between forecast performance and goals.
- Submit a report on enhancements to AEDT and other aviation environmental tools to better integrate NextGen simulation models and data.

#### Advanced Noise and Emission Reduction:

- Submit a report on assessments, simulations, and demonstrations of operational procedures and ATM-related technologies that could reduce noise, emissions, and fuel burn.

***Program Plans FY 2019 – Performance Output Goals***

**Environmental Management System (EMS) Framework:**

- Submit a report with details on progress made towards meeting FAA’s aviation environmental and energy goals using updated information on growth scenarios and technology improvements, alternative fuel penetration, operational procedures, and policy measures.
- Submit a report on development of environmental assessment capabilities that are integrated with NAS design tools, simulation models and performance monitoring systems.

**Advanced Noise and Emission Reduction:**

- Submit a report on assessments, simulations, and demonstrations of operational procedures and ATM-related technologies that could reduce noise, emissions, and fuel burn.

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**1A09, NEXTGEN – IMPROVED MULTIPLE RUNWAY OPERATIONS PORTFOLIO**

**FY 2015 Request \$3.5M**

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

**A, Closely Spaced Parallel Runway Operations, G06N.01-02**

**Program Description**

Closely Spaced Parallel Operations (CSPO) are simultaneous approaches 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 (HUR) 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 (when there is a stagger between aircraft) along the parallel final approach course 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 stagger 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 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 initiative will enhance procedures that allow dependent operations to closely spaced parallel runways or converging approaches to runways greater than 700 feet apart, as well as supporting independent operations to parallel runways between 2500 feet and 4300 feet. Furthermore, CSPO will identify potential alternatives for meeting functional requirements such as the application of existing and new technologies to current standards, reevaluation of the applicability of the blunder model assumptions and the use of the model on risk assessments, the application of emerging NextGen technologies to current standards, and the development of new standards to facilitate NextGen applications.

The research funded by 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 58,166, or higher, arrivals and departures.*

## **Relationship to Performance Metric**

CSPO research is focused on finding safe ways to recover lost capacity induced 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 arrival rates regardless of weather conditions (IMC vs VMC). It is expected IMC arrival rates will be close to VMC rates. Some airports may increase arrival rates by as much as 6 to 12 operations per hour, though benefits will vary based on local operations and procedures.

### ***Program Plans FY 2015 – Performance Output Goals***

- Complete site-specific evaluation report for candidate site with the goal of performing fast-time simulations and collecting data via three data collection events (aircraft flight simulator, lab and on-site).
- Complete enhancements and upgrades to the Modeling and Simulation Tool Suite.
- Support the implementation of standards for dependent approaches with reduced dependent stagger (less than 1.5 NM).
- Support the implementation of standards for dual SIIA with an offset (2.5 to 3.0 degrees) for runways at least 3000 feet apart
- Perform analysis of Paired Approach (PA) Algorithm feasibility Initial Operating Capability (IOC).
- Complete analysis of the use of HUR surveillance to enable a reduction in current runway spacing.
- Complete analysis of the use of ADS-B with FUSION for use with independent approaches with lower minima, and provide corresponding White Paper.
- Conduct fast time simulations to assess the capabilities of the PA to CAT I procedure.
- Finalize Simplified Aircraft-Based Paired Approach (SAPA) Adjacent Landing Alerting System Algorithm for PA to CAT II/III minima.
- Validate PA to CAT I PA ADS-B Guidance Display for CAT I Minima (Phase I) and provide a report.

### ***Program Plans FY 2016 – Performance Output Goals***

- Complete enhancements to the CSPO blunder model.
- Perform Human-in-the-Loop (HITL) simulations using Simplified Aircraft-Based Paired Approach (SAPA) algorithm developed for Paired Approaches to CAT II/III minima.
- Complete HUR Studies with Final Report.
- Complete enhancement and upgrades to the Modeling and Simulation Tool Suite.
- Evaluate PA Algorithm Feasibility IOC and provide report.
- Perform additional FastTime Simulation for PA to CAT I Minima.
- Perform HITL simulations using Adjacent Landing Alerting System algorithm developed for PA to CAT II/III minima plus perform FastTime Simulation for Analysis and provide Memo.
- Complete FUSION software emulation and provide a technical report.
- Support the implementation of new standards for triple approaches and approaches utilizing High Update Rate surveillance.

### ***Program Plans FY 2017 – Performance Output Goals***

- Conduct HITL simulations of the PA to CAT II/III concept.
- Finalize analysis of PA to CAT I minima and provide Technical Report.
- Support the implementation of PA to CAT I approach minima at applicable airports (e.g. Safety Risk Management Panel, safety reviews and publishing orders).
- Conduct analysis of the concept for PA to CAT II/III approach minima.
- Continue FUSION Technical report and supply a status memo.

***Program Plans FY 2018 – Performance Output Goals***

- Finalize analysis of the concept for PA to CAT II/III approach minima and provide Technical Report.
- Support the implementation of PA to CAT II/III approach minima at applicable airports (e.g. SRMP, safety reviews and publishing orders) and provide a Technical Report.
- Complete the Fusion Technical Report and supply a status memo.

***Program Plans FY 2019 – Performance Output Goals***

- Support the implementation of PA to CAT II/III approach minima at applicable airports (e.g. safety reviews and publishing orders).

## **B, Wake Turbulence Mitigation for Arrivals (WTMA), G06A.01-02**

### **Program Description**

This program will evaluate air traffic control wake separation decision support tool capabilities and associated prototypes as possible enablers to safely meet the predicted NextGen demand for capacity to handle additional flights in the nation's air transportation system. If the capabilities demonstrated by the prototypes are evaluated to be beneficial and are incorporated into the terminal automation systems, more flights can be accommodated by existing airport runways and in the existing airspace due to safely reducing the required wake mitigation separations between aircraft. This program is taking the results of technology research and development and new wake separation concept modeling and simulation efforts and evaluating concept feasibility prototypes for flight safety and impact on the NAS capability for meeting the demand for more flights.

Evaluation of the Wake Turbulence Mitigation for Arrivals (WTMA) capabilities will continue and requirements for implementation will be developed. The WTMA procedures would be used by controllers in reducing wake separations imposed on aircraft following behind Boeing 757 or Heavy wake category aircraft when landing on an airport's set of closely spaced parallel runways (CSPR) (runways less than 2500 feet apart).

This project will complete an adaptation of the Advanced Terminal Proximity Alert (ATPA) decision support tool to provide controller's a visual display of the required wake mitigation minimum separations to be applied during WTMA-Procedural (WTMA-P) operations. WTMA-Procedural (WTMA-P) allows reduced wake separations to be applied during instrument landing operations at airports that meet certain CSPR layout criteria. Application of ATPA is not required for WTMA-P, but the design of ATPA must be consistent with WTMA-P procedure change. ATPA is considered an enabling capability for WTMA-System (WTMA-S).

The WTMA capabilities, when implemented, will provide an economic boost to the nation's aviation system by restoring part of the airport landing capacity lost when an airport has to change its operation from visual approach operations to instrument approach operations and apply its attendant required wake mitigation separation minima between landing aircraft. High level analyses have indicated that the current air traffic control wake mitigation separations process, aided by technology, can be more capacity efficient while at the same time remain safe. It is expected that the project's WTMA evaluation and requirements development products will allow a rapid integration of the WTMA capability into the NextGen era FAA automation platforms.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

The procedures and technology evaluated by this project will reduce the gap between an airport's visual operations landing capacity and its instrument operations landing capacity. The WTMA-P (Procedural) air traffic control wake mitigation procedures when approved and implemented, will allow controllers at several closely spaced parallel runways (CSPR) airports to use diagonal dependent wake separations during instrument approach operations to the

airport's CSPR in all wind conditions. The farther term (2019 – 2020) decision support tool capability WTMA-S (System) will use crosswind information similar to that of the Wake Turbulence Mitigation for Departures (WTMD) air traffic control decision support tool, to enable use of the WTMA air traffic control procedure at many other airports that use their CSPR for landing operations. Use of the WTMA air traffic control wake mitigation procedure, when weather conditions allow, is estimated to increase an airports CSPR arrival throughput capacity by 8 to 10 more CSPR arrivals (depending on fleet mix) per hour above what the airports can currently achieve during instrument operating conditions. The WTMA incremental arrival throughput capacity improvement can be achieved without any changes to the aircraft fleet's equipage and has a compounding beneficial flight delay reduction effect when weather conditions would otherwise have more severely cut an airport's capacity to accept flights on its CSPR.

***Program Plans FY 2015 – Performance Output Goals***

- Conduct airport specific analyses for application of WTMA-P at two additional locations.
- Develop WTMA-P ATC procedures and training packages for the two airports.
- Validate TAMR ATPA phase 2 adapted software for use at the TRACONS of the two additional airports.

***Program Plans FY 2016 – Performance Output Goals***

- Develop and validate WTMA-S requirements via prototyping.

***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.

***Program Plans FY 2018-2019 – Performance Output Goals***

- None.

## **X, Ground Based Augmentation System, 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 is a cost effective alternative to Instrument Landing Systems (ILS) for Category II/III operations because a single device can serve an entire airport versus multiple ILS facilities (one at each runway end). GBAS will eliminate the need to install ILS localizers that provide horizontal 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 FAA to 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 (GBAS Approach Service Type C (GAST-C)) services.

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. However, GBAS is dependent on GPS signals, so it cannot be utilized as the sole means for approaches and navigation. Backup systems will 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 are being tested at Newark. A GBAS that allows Category III landings has been developed and 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 project 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. The Department of Defense (DoD) also plans to implement GBAS Technology in their Joint Precision Approach and Landing System (JPALS) 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 (ACY) will continue to be used as an interim platform to validate Category III requirements under this project. 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 Radio Frequency Interference (RFI) issues that were identified in the implementation of a non-Fed LAAS (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 to identify standards for alternative systems using dual frequency and multi-constellation implementation options.

### **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 58,166, 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 2015 – Performance Output Goals***

- None.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Perform initial System Design Approval (SDA) for GBAS Cat III Approach Service Type D (GAST-D) system.
- Perform review of technical performance of Cat III prototype using FAA avionics and ground system prototypes.
- Perform validation of ICAO Standards And Recommended Practices (SARPS) for the baseline set of GAST-D and multi constellation/dual frequency requirements.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Complete GBAS SDA for GAST-D.

#### ***Program Plans FY 2018-2019 – Performance Output Goals***

- None.

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

### **Program Description**

The ESSC program will develop an approach to low-cost service improvement capability for non-towered airports. As an adjunct to the expansion of ADS-B service, the FAA will develop the necessary changes to the controller

equipment to support the benefits of improving access to smaller airports. Improving access in nearly all weather conditions by adding a surveillance capability to these small airports will not only eliminate delays due to one-in and one-out operations at those airports but also provide economic opportunity for these communities. This effort expands the existing Colorado demonstration for improved low altitude surveillance by adding surveillance down to the airport surface and adds capability to the controller workstation to support these non-towered airports. It will also investigate cheaper and less terrain restricted alternatives for providing wide area mutilation.

The FAA will use its authority to enter into cost recovery mechanisms for this enhanced service through state, municipal, or 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

ESSC will provide surface surveillance approved for operational use, future technologies, standards and procedures to accommodate the demand in small community airport services. ESSC will improve Instrument Flight Rules (IFR) throughput in low visibility and night conditions to be comparable with capacity in Visual Flight Rules (VFR), and ESSC will allow the FAA to cost effectively expand its service to meet capacity demand. ESSC will also allow for delivering aviation services when a local air traffic control facility is experiencing a limited duration loss of service by allowing a contingency facility to provide those services. This will allow improved access to the small community airports.

#### ***Program Plans FY 2015-2017 – Performance Output Goals***

- None.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Perform ESSC requirements development.
- Perform ESSC concept exploration.

#### ***Program Plans FY 2019 – Performance Output Goals***

- Complete initial requirements document for ESSC.
- Complete initial concept of operations (CONOPS) document for ESSC.

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## **1A10, NEXTGEN – NAS INFRASTRUCTURE PORTFOLIO**

### **FY 2015 Request \$13.5M**

- A, Weather Observation Improvements, G04W.02-01
- B, Weather Forecast Improvements, G04W.03-01
- C, Surface/Tower/Terminal Systems Engineering, G06A.02-01
- D, NextGen Navigation Engineering, G06N.01-03
- E, New ATM Requirements, G01M.02-02
- X, Information Management, G05M.03-01

### **A, Weather Observation Improvements, G04W.02-01**

#### **Program Description**

This program will manage the evolution of the existing aviation weather observation sensor networks to one that provides the optimal quantity and quality of ground, air, and space based sensors. A consistent and effective

aviation weather sensor network is fundamental to NextGen. Of primary focus is the surface weather sensor network in the Terminal environment. A comprehensive list of 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 58,166, 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 supports the optimal selection of aircraft routes and precise spacing for arriving and departing aircraft. The increased accuracy of forecasts and improved observations will enable the capability to provide individual trajectory-based profiles, which optimize the usage of available airspace

#### ***Program Plans FY 2015 – Performance Output Goals***

- Complete Request for Information (RFI) for second winter season Concept Maturity Technology Demonstration (CMTD).
- Update Winter Weather Work Package Evaluation Plan.
- Conduct second season CMTD of meteorological and operational performance assessment of winter weather equipment and algorithms.
- Develop NAS interface design for enhanced winter weather capability.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Complete and deliver second winter season CMTD report.
- Deliver technical requirements specification for automated winter weather capability.
- Complete RFI/Request for Quote for prototype of NAS Interface for automated winter weather.
- Deliver final automated winter weather algorithm and code package.
- Conduct CMTD for NAS automated winter weather interface package.
- Deliver CMTD report on performance of NAS Interface for Automated Winter Weather.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Update weather observations shortfall analysis and stakeholder prioritization.
- Identify and assess market technologies applicable to next useful segment.
- Initiate System Engineering activities for next useful segment (e.g. terminal-area adverse winds) .

#### ***Program Plans FY 2018 – Performance Output Goals***

- Deliver Weather Observation Improvements Risk Mitigation Plan for next useful segment.
- Deliver NextGen Surface Observing Capability (NSOC) CMTD Plan for next useful segment.
- Initiate CMTD for next useful segment.

***Program Plans FY 2019 – Performance Output Goals***

- Deliver initial CMTD results and analysis to key stakeholders and users.
- Produce initial algorithms and design documents.

**B, Weather Forecast Improvements, G04W.03-01**

**Program Description**

The Weather Forecast Improvements (WFI) program addresses the need to improve weather prediction and how to make better use of weather information in the future NAS. Sophisticated National Weather Service (NWS) forecast models will be integrated into models that forecast weather impacts for aviation purposes. In today's NAS, traffic managers and users must mentally interpret weather conditions and the potential impact of weather on ATC decisions. WFI will improve the accuracy of aviation weather information, to include the automated objective indication of the constraints placed on the NAS, and incorporate this data into collaborative and dynamic decision-making. WFI will:

- Enable the integration of aviation weather information into collaborative and dynamic decision-making;
- Implement advanced aviation weather forecasting models to determine effects on traffic forecasts;
- Develop and apply metrics to evaluate how effective weather improvements can be in increasing use of NAS capacity;
- Develop policies and guidance necessary for the allocation of roles and responsibilities in providing and using weather information to meet FAA requirements and U.S. commitments to ICAO;
- Develop a process for quality control and standardization of aviation weather products; and
- Develop ICAO-compliant Quality Management System (QMS).

Specifically, work elements under RWI-WFI includes:

- Metrics – Weather Delay Mitigation – Core airport weather impact study is an objective data-driven analysis of how various weather phenomena impact airport operations and will determine how to discriminate between “unavoidable” weather impacts and opportunities for mitigation of “avoidable” weather delays;
- Metrics – Weather Post-Analysis Capability – Provides ATMs rapid, objective assessment of prior-day Traffic Management Initiatives (TMIs) imposed due to weather and isolate similar events from historical data archives to compare them to the targeted event to evaluate “What-If” simulation scenarios;
- Quality Management System – The QMS provides a methodology to ensure aviation weather products and services meet specified requirements and standards, improvements are made when these requirements are not met, and each process has documentation and traceability;
- International – Provides support to develop ICAO Annex 3 Meteorological Services, which are consistent with the Standards and Recommended Practices (SARPs) for the production and dissemination of meteorological information to support international air navigation; and
- ATM Weather Integration – This needs/dependency assessment will yield a coordinated strategy for 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.

**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 58,166, or higher, arrivals and departures.*

## **Relationship to Performance Metric**

Weather Forecast Improvements tailors aviation weather data for integration into decision support tools for collaborative and dynamic NAS decision making. It enhances capacity by making fuller use of aviation 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 aviation weather observations and forecasts enables the capability to provide individual trajectory-based profiles, which optimize the usage of available airspace.

### ***Program Plans FY 2015 – Performance Output Goals***

- Quality Management System:
  - Complete transition plan of an ICAO compliant QMS process to an FAA service organization.
- International:
  - Complete annual US position on ICAO draft Amendment 77 of Annex 3.
  - Complete annual ICAO Manual on Meteorological Support for ATM.

### ***Program Plans FY 2016 – Performance Output Goals***

- Metrics – Weather Delay Mitigation:
  - Complete report on annual unavoidable weather-related impact.
  - Complete study to identify highest impacts by airport for crosswinds, wind compression and winter weather.
  - Complete No-weather delay baseline annual update.
- Metrics – Weather Post-Analysis Capability (Wx-PAC):
  - Complete Wx-PAC Requirements Definition Plan.
  - Develop Draft Solution ConOps for Weather - Post Analysis Capability (Wx-Pac).
- Quality Management System:
  - Finalize transition package.
- International:
  - Complete annual US position on ICAO draft Amendment 77 of Annex 3.
  - Complete annual ICAO Manual on Meteorological Support for ATM.
- ATM Weather Integration:
  - Complete Draft Preliminary Weather Integration Roadmap.
  - Complete Final Weather Integration Roadmap.
  - Complete draft post-Bravo user direct and indirect weather needs analysis.

### ***Program Plans FY 2017 – Performance Output Goals***

- Metrics – Weather Delay Mitigation:
  - Complete no-weather baseline annual rebase-lining.
  - Complete initial report on Concept Maturity and Technical Development of Delay Mitigation Mechanisms.
- Weather – Post Analysis Capability:
  - Complete Final Shortfall Analysis for Wx PAC capability.
  - Complete Draft Solution ConOps for Wx PAC capability.
- International:
  - In coordination with EURO CONTROL, complete development of reports and presentations (e.g., position papers, guidance material) to ICAO.
- ATM Weather Integration:
  - Complete final post-Bravo (beyond 2020) Users’ Direct and Indirect Weather Needs Analysis.
  - Complete post- Bravo (beyond 2020) Gap Analysis & Shortfall Mitigation Plan.

### ***Program Plans FY 2018 – Performance Output Goals***

- Weather – Post Analysis Capability:
  - Complete Final Solution ConOps for Wx PAC capability.
  - Complete Preliminary Requirements ConOps for Wx PAC capability.
- International:
  - In coordination with EURO CONTROL, complete development of reports and presentations (e.g., position papers, guidance material) to ICAO.

- ATM Weather Integration:
  - Complete initial evaluation document of weather translation techniques for future Collaborative Air Traffic Management Technologies (CATM-T), Time Based Flow Management (TBFM), and Surface Trajectory-Based Operations (STBO) work packages.

***Program Plans FY 2019 – Performance Output Goals***

- Weather – Post Analysis Capability:
  - Complete requirements documentation for Wx-PAC capability.
- International:
  - In coordination with EURO CONTROL, complete development of reports and presentations (e.g., position papers, guidance material) to ICAO.
- ATM Weather Integration:
  - Complete final evaluation document of weather translation techniques for future CATMT, TBFM, and STBO work packages.

**C, 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 the risks inherent with introducing new technology and operational procedures using systems engineering analysis that examines the integrated use of techniques and equipment necessary to achieve these efficiencies. System engineering will consider the impact on the NAS architecture and the needed changes throughout the product development lifecycle for terminal systems. This program will create specific products for use by the Terminal Services organization as they develop the final system configuration.

The Surface/Tower/Terminal Systems Engineering program will identify issues relative to the proposed TRACON automation capabilities as part of a Safety Risk Management activity. Concept engineering activities include analysis, evaluation, and assessments to develop and mature concepts for changes to Terminal / TRACON automation as well as identifying procedure changes needed to support automation change within the TRACON domain. The Terminal Work Package 1 primary areas of focus 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 activities conducted in support of Terminal Work Package 1 development will reduce technical risk, quantify benefits, support alternatives development, and identify safety concerns.

## **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 58,166, or higher, arrivals and departures.*

## **Relationship to Performance Metric**

The Surface/Tower/Terminal Systems Engineering project supports more efficient use of capacity by analyzing and evaluating concepts that support more efficient transfer of flight information including movement constraints to interconnected systems, facilities, controllers, pilots, and airport operators. This project will develop capabilities that will enable the Terminal domain to more efficiently balance arrivals, departures, and surface operations. The Terminal domain will be better able to sufficiently share or exchange data within the Terminal domain, with other NAS domains, and NAS stakeholders that are involved in air traffic management decision making.

### ***Program Plans FY 2015 – Performance Output Goals***

- Conduct terminal concept engineering and validation activities - results documented in architecture activity models.
- Conduct prioritization process using operational input to select the list of problems to carry forward into Investment Analysis.
- Achieve Investment Analysis Readiness Decision for the Terminal WP1 program.
- Update the Terminal WP1 program requirements document.
- Develop initial business case for the Terminal WP1 program.
- Develop initial implementation strategy and planning documents for Terminal WP1.
- Develop a plan for the Terminal WP1 program to go to final investment analysis.
- Achieve Initial Investment Decision for the Terminal WP1 program.

### ***Program Plans FY 2016 – Performance Output Goals***

- Develop and document benefits and cost models for the Terminal WP1 program.
- Develop final Terminal WP1 program requirements document.
- Develop final business case for the Terminal WP1 program.
- Develop final implementation strategy and planning document for the Terminal WP1 program.
- Update enterprise architecture products and amendments.
- Achieve Final Investment Decision for the Terminal WP1 program.
- Conduct terminal concept engineering and requirements definitions for future Terminal WPs.

### ***Program Plans FY 2017 – Performance Output Goals***

- Refine the overall strategic plan for the Terminal domain in terms of out-year capabilities, including activity and process models to develop operational value.
- Complete concept engineering and requirements definition of future Terminal WPs.
- Begin to develop follow on service analysis to define the need for future TFDm capabilities.

### ***Program Plans FY 2018 – Performance Output Goals***

- Complete concept engineering and requirements definition of future TFDm enhancements.
- Conduct Service/Domain Enhancements requirements prioritization.

### ***Program Plans FY 2019 – Performance Output Goals***

- Conduct terminal concept engineering and validation activities including a shortfall analysis, CONOPs documentation, and operational scenarios, and document results in formal activity models.
- Conduct concept validation activities, such as operational scenario walkthroughs with subject matter experts and human-in-the-loop simulations with the results of these efforts documented in updated 'concepts of use' documents.

## **D, NextGen Navigation Engineering, G06N.01-03**

### **Program Description**

This program supports the NextGen goal to increase capacity of the NAS by determining that navigation requirements and any potential issues with allowing broader use of advanced capabilities are identified and resolved. It will evaluate how to increase and improve the use of Area Navigation (RNAV) using Distance Measuring Equipment (DME) in the terminal domain. It supports the Flight Standards efforts to further reduce the minimums necessary to allow landings than those currently used for low visibility operations. As advanced avionics technology moves forward, the requirement changes needed to ground-based navigation and lighting systems and visual technology in the aircraft must be identified to take advantage of reduced visibility landings.

There are two activities in NextGen Navigation Engineering: Terminal RNAV DME-DME and NextGen Navigation Support – Enhanced Low Visibility Operations (ELVO) Phase III.

#### Terminal RNAV DME-DME:

This activity supports terminal RNAV through the use of DME-DME (use of 2 or more distance measuring navigational aids) down to 2000 feet Above Ground Level (AGL) and potentially to the Final Approach Fix (FAF), 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 and IRU. This work investigates the requirements and potential airspace changes for using DMEs not collocated with a Very High Frequency Omnidirectional Range (VOR) system. The NextGen goal of implementing NAS-wide Performance-Based Navigation (PBN) will require changes to the existing DME infrastructure and this activity will assess the needed changes.

#### NextGen Navigation Support – ELVO Phase III:

This activity supports requirements analysis for low visibility operations for landing 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 below 1200 feet visibility will require the use of additional advanced avionics such as the Enhance Vision/Enhanced Flight Vision System (EV/EFVS), Heads Up Display (HUD), and Combined Vision System that incorporate other emerging technologies such as Synthetic Vision System or Head Down Display. When operations are allowed below 1200 foot visibility, the operation must 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 III and it will conduct Acquisition Management System (AMS) pre-implementation activities.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

This program supports the average daily capacity performance metric by enabling:

- A greater number of users to utilize Performance Based Navigation; and
- An increased number of landing and departures during low visibility conditions.

#### ***Program Plans FY 2015 – Performance Output Goals***

##### Terminal RNAV DME-DME:

- Complete initial DME capacity study to address critical DME issues associated with PBN implementation.
- Complete coordination of FAA Order 9840.1 to reflect findings of DME testing and analysis.
- Complete shortfall analysis for Terminal DME.

NextGen Navigation Support – ELVO Phase III:

- Complete analysis to identify changing requirements for navigational aids based on advanced avionics and systems.
- Complete planning for LVO/SMGCS demonstration at a NAS airport.
- Complete the ELVO Phase III Concept Requirements Definition (CRD) Plan.

***Program Plans FY 2016 – Performance Output Goals***

Terminal RNAV DME-DME:

- 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.

NextGen Navigation Support – ELVO Phase III:

- Complete draft report on requirements for lower minimas and EFVS operation.
- Complete LVO/SMGCS demonstration at one NAS airport.
- Complete shortfall analysis to support ELVO Phase III.
- Complete draft report on NextGen planned implementation for LVO/SMGCS – including identifying current navigation capabilities.

***Program Plans FY 2017 – Performance Output Goals***

Terminal RNAV DME-DME:

- Develop plan for integration of non-collocated DME into NAS Operations.

NextGen Navigation Support – ELVO Phase III:

- Complete pretest of moving map at a Part 139 LVO/SMGCS airport with Geographic Information System (GIS) survey airport data.
- Complete initial report on NextGen planned implementation for LVO/SMGCS – including identifying current navigation capabilities.

***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 III:

- 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 III:

- Complete final LVO/SMGCS compliance plan.
- Complete update to report on NextGen planned implementation for LVO/SMGCS – including identifying current navigation capabilities.

## **E, New 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. It includes:

- identifying technical challenges;

- evaluating cost models;
- developing technology approaches and proposed solutions; and
- performing concept demonstration including modeling and prototyping.

The overall activity includes four major areas:

- Multifunction Phased-Array Antenna Maturation;
- Engineering Studies – Technology Assessment;
- Multifunction Radar data processing and control definition; and
- Concept and Requirements Definition.

The outcome of this body of work will result in an initial Antenna and Radar electronics specification. The information gained through this effort will 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 DoD, NWS, 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 versioning exchange standards, and conformance monitoring techniques. The goal is to develop a strategy to ensure NAS systems adherence to established standards and protocols. 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 is necessary to coordinate information standards work and achieve global harmonization of standards and protocols, especially as they relate to engagement with Open Geospatial Consortium (OGC) and harmonization with ICAO standards.

#### Future Collision Avoidance System (Future CAS):

Airborne Collision Avoidance System X (ACAS X) is being developed to meet future collision avoidance requirements. This activity will complement the work planned under the ACAS X program [M54.01-01] to include new user classes such as Unmanned Aircraft Systems (UAS) (Xu) and General Aviation (Xp). This activity will conduct research to develop requirements for these new classes of users to ensure future 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 appropriate readiness for operational use in the NAS. Weather Transition will manage appropriate activities to include the: (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) or 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.

## 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 58,166, 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 2015 – Performance Output Goals***

#### New Radar Requirements (Surveillance & Weather):

- Develop high level requirements document for the Multifunction Phased Array Radar (MPAR).
- Complete update to MPAR Cost Model.

#### Enterprise Information Protocol & Exchange Standards:

- Identify the shortfalls in moving from data sharing to a network environment including information protocol and exchange standards and evaluation techniques, criteria for managing standards, and conformance monitoring techniques and policies to ensure compliance.
- Develop and implement required capabilities and governance.
- Develop strategy to ensure NAS systems maintain compliance with developed standards and protocols.

### ***Program Plans FY 2016 – Performance Output Goals***

#### New Radar Requirements (Surveillance & Weather):

- Complete update of high level requirements document for MPAR.
- Complete update of the MPAR Risk Assessment Plan.
- Complete update to MPAR Cost Model.

#### Enterprise Information Protocol and Exchange:

- Collect and standardize baseline versions of exchange models.
- Develop enterprise solution 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:

- Develop engineering study translating weather state information into impacts on individual aircraft / flights / trajectories.
- Validate weather information requirements document as part of integrated controller tools.

#### Synchronization of Air/Ground Procedures:

- Develop initial document for two-way communications procedures between FMS and ground systems.

#### Advanced Air/Ground Communications:

- Document the development and test of L-Band communications standards with international community.
- Document the development of Satellite-based Push-to-Talk communications standards with international community.

### ***Program Plans FY 2017 – Performance Output Goals***

#### Enterprise Information Protocol and Exchange Standards:

- Maintain and update information protocols and exchange standards.

#### Future CAS:

- Prepare report that develops and validates collision avoidance interoperability performance criteria for general aviation.
- Prepare report on ACAS Xp proof of concept to inform ongoing RTCA SC-228 standards development activities.

Weather Transition:

- Prepare report that evaluates algorithms for integrating weather into decision support tools using translated weather products.
- Conduct assessment of mature research for transition to NWS.
- Perform analysis of weather related operational services.

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 to validate air/ground procedure synchronization.

Advanced Air/Ground Communications:

- Develop Test Plan for Satellite based Push-to-Talk communications standards with international community.
- Conduct tests of Satellite-based Push-to-Talk communications standards with international community.

***Program Plans FY 2018 – Performance Output Goals***

Enterprise Information Protocol and Exchange Standards:

- Maintain and update information protocols and exchange standards.

Future CAS:

- Publish the ACAS-Xp standard including hybrid ACAS to reduce spectrum clutter.

Weather Transition:

- Evaluate additional algorithms for integrating weather into decision support tools using translated weather products.
- Conduct assessment of mature research for transition to National Weather Service (NWS).
- Perform analysis of weather related operational services.

Synchronization of Air/Ground Procedures:

- Document trials results and provides recommendation.

Advanced Air/Ground Communications:

- Conduct safety analysis of Satellite-based Push-to-Talk communications standards.
- Conduct tests of the new communications standards with international community.
- Conduct safety analysis of new communications standards.

***Program Plans FY 2019 – Performance Output Goals***

Enterprise Information Protocol and Exchange Standards:

- Maintain and update information protocols and exchange standards.

Weather Transition:

- Evaluate additional algorithms for integrating weather into decision support tools using translated weather products.
- Conduct assessment of mature research for transition to NWS.
- Perform analysis of weather related operational services.

Advanced Air/Ground Communications:

- Develop standards for advance air-ground communications evolving technologies.
- Conduct tests of the new communications standards with international community.
- Conduct safety analysis of new communications standards.

## **X, Information Management, G05M.03-01**

### **Program Description**

Recent experience in sharing surface data information with users in the new service-oriented architecture approach, coupled with proliferation of data repositories to perform post-analysis, highlighted the need to move from data sharing to full information management. This includes allocating information service by type and amount needed based on a business case analysis, establishing performance requirements for the delivery of the information and monitoring performance, and establishing the governance of how and when the information is provided. Improvements to information management approaches are necessary to ensure the efficient use of FTI and SWIM as

conduits of information. The EO 13642 and cloud first mandates also require improvements to the information management infrastructure of the NAS.

The research on Information Management will identify the shortfalls in moving from data sharing to a network environment including: authoritative operational data stores, governance and evaluation techniques, and performance monitoring techniques and policies to ensure compliance. After this analysis and preliminary engineering design is complete, the activities will shift to development and implementation of the required capabilities and governance.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

The goal is to ensure that in the transformation to NextGen, the necessary and required information sharing to improve situational awareness are provided with guaranteed performance. Implementation of Information Management will allow information to be shared at a level of service that will enable the NAS to more efficiently manage NAS resources to optimize capacity in the system. Achieving capacity goals requires increased sharing of data with guaranteed delivery and performance. To assure this delivery is cost effective, the agency needs to migrate from data sharing to full-scale data management using SWIM as a component.

#### ***Program Plans FY 2015 – Performance Output Goals***

- None.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Develop policies for Information Management Governance.
- Develop initial Implementation Strategy Plan for Information Management baseline capability.
- Perform preliminary engineering work to identify alternatives and migration of research products for analyst's use.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Complete report on performance monitoring methods to ensure delivery of agreed service performance.
- Identify appropriate big data approaches for improving efficiency of service.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Complete analysis and deliver report on availability of additional data for extended user community.
- Complete strategic plans for long-term enhancements of Information Management baseline capabilities to support user community and align with NextGen roadmap.

#### ***Program Plans FY 2019 – Performance Output Goals***

- Deliver update to the Information Management Governance.
- Complete analysis and deliver report on additional value added services for enhanced analytical capabilities.
- Deliver report on initial coordination with key organizations to ensure compliance of Information Management Governance.

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## **1A11, NEXTGEN – SUPPORT PORTFOLIO AT WJHTC**

**FY 2015 Request \$13.0M**

### **NextGen Laboratories at WJHTC, 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 assessment of demonstrations to evaluate 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 located at WJHTC and provides the facility, personnel and computing infrastructure to support the development, refinement and validation of NextGen from concept definition, to requirements maturity, to integration of NAS capabilities across the various NAS domains.

#### Florida NextGen Test Bed (FTB):

The FTB is located at Embry Riddle Aeronautical University in Daytona Beach and provides a robust 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

## **Relationship to Performance Metric**

The integration, development, and operational analysis capability provides the support services, and software and hardware required to enhance and sustain the NIEC to conduct early proof of concept studies, rapid prototyping, validate and mature concepts, reduce risks, and improve operational performance across all NextGen Portfolios. With the collocation of NIEC and the William J. Hughes Technical Center laboratories, each NextGen program need not establish and maintain separate laboratory facilities resulting in reduced costs. It enables the FAA to evaluate concepts and programs that span more than one domain of the NAS and integrate NextGen solutions into the NAS.

The FTB provides a platform for new 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 equipment 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 2015 – Performance Output Goals***

#### **NIEC:**

- The NIEC facility will maintain a minimum of 80% up-time for customer availability.
- Identify and install NIEC upgrades and enhancements to support NextGen research, concepts and technology, human-in-the-loop simulations for portfolios, and proof of concept demonstrations.
- Integrate the Traffic Flow Management (TFM) Auxiliary Platform into the NIEC.
- Integrate Traffic Management Advisor and Traffic-Based Flow Management (TBFM) data feeds with Distributed Environment for Simulation, Rapid Engineering, and Experimentation (DESIREE) and Target Generation Facility (TGF) at the NIEC laboratory.

#### **FTB:**

- Develop architecture and plan to incorporate in-air communication capability for the exchange of information between ground systems and en-route aircraft to facilitate demonstration concepts. Establish Airline Operation Center (AOC) flight planning, filing, and monitoring capabilities to augment airline operations capabilities.
- Establish connectivity to Department of Defense (DoD) Defense Research and Engineering Network (DREN) to support inter-agency research activities.
- Develop plan for FY 2016 FTB technology refresh.

#### **NextGen Operational Assessment – Performance:**

- Enhance operational performance model to support NextGen Operational Assessment.
- Publish an updated NextGen Business Case document.
- Evaluate the operational performance impacts of NextGen technologies and procedures and publish an annual report.
- Develop document assessing data requirements for display on the web NPS.
- Maintain and update the NSIP to aid the planning and deployment of NextGen portfolio in the mid-term timeframe.

### ***Program Plans FY 2016 – Performance Output Goals***

#### **NIEC:**

- The NIEC facility will maintain a minimum of 80% up-time for customer availability.
- Identify and install NIEC upgrades and enhancements to support NextGen research, concepts and technology, human-in-the-loop simulations for portfolios, and proof of concept demonstrations.

FTB:

- Perform technology refresh of FTB systems and network equipment to support upcoming NextGen concepts and maintain reliability, improve performance, and ensure compatibility with current-day Commercial of the Shelf (COTS) systems.
- Provide additional demonstration scenario development, validation, and analysis tools to facilitate NextGen Test Bed demonstrations.
- Provide in-air communication capability for the exchange of information between ground systems and en-route aircraft to facilitate demonstration concepts.

NextGen Operational Assessment – Performance:

- 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.
- Maintain and update the NSIP to aid the planning and deployment of NextGen portfolio in the mid-term timeframe.

***Program Plans FY 2017-2019 – Performance Output Goals***

NIEC:

- The NIEC facility will maintain a minimum of 80% up-time for customer availability.
- Identify and install NIEC upgrades and enhancements to support NextGen research, concepts and technology, human-in-the-loop simulations for portfolios, and proof of concept demonstrations.

FTB:

- Expand telecommunication infrastructure with increased bandwidth and data services to support additional live data streams to the FTB.
- Develop plan for FY 2020 FTB technology refresh.
- Identify and install upgrades and enhancements to support NextGen proof of concept demonstrations.

NextGen Operational Assessment – Performance:

- Enhance Safety Model to support NextGen Operational Assessments.
- Publish an updated NextGen Business Case document.
- 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.
- Maintain and update the NSIP to aid the planning and deployment of NextGen portfolio in the mid-term timeframe.

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**1A12, NEXTGEN – PERFORMANCE BASED NAVIGATION & METROPLEX PORTFOLIO**

**FY 2015 Request \$25.5M**

- A, NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP), G05N.01-01
- B, NextGen Performance Based Navigation (PBN) – NAV Lean, G05N.01-02
- C, 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 – Metroplex RNAV/Required Navigation Performance (RNP) will develop procedures at Metroplexes to improve airspace efficiency. The Airspace Optimization Group will begin integrated 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 would:

- Examine use of additional transition access/egress points not tied to ground-based navigation aids;
- Develop and implement arrival and departure procedures concurrently;
- Incorporate the process for optimizing procedures;
- Decouple conflicting operations to and from primary and secondary/satellite airports serviced by the same complex terminal airspace; and
- 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.

#### Optimization of Airspace and Procedures in the Metroplex:

Airspace redesign and procedure development will target specific Metroplex areas that have been designated as high priority using criteria established by FAA with input from RTCA, using quantitative and qualitative metrics. The current program plan will address 13 Metroplexes. These can be unique metropolitan locations (e.g. North Texas with Dallas/Fort-Worth (DFW), Dallas Love Field Airport (DAL), and other regional airports) or consolidated Metroplex locations (e.g. Central and Southern Florida Metroplexes (Orlando (MCO), Miami (MIA), Tampa (TPA), Palm Beach (PBI), Fort Lauderdale (FLL) and other regional airports) which can be addressed as a single project to take advantage of overlapping airspace. This approach began in FY 2010 and will be completed at the selected locations by FY 2018. Study Team results guide the design and implementation of those procedures that have the highest benefits. Design and Evaluation Team efforts include analyses and simulations, assessment of alternatives, and modeling of projected airspace and procedures benefits. These efforts include:

- Study and Scoping: Identify issues and propose potential solutions through facility and industry interface meetings.
- Design and Procedure Development: Create the detailed Integrated Airspace and Procedure designs.
- Evaluation: Complete all necessary operational modeling, Safety Management System (SMS) analyses, and environmental reviews. It is conducted by the Design and Evaluation team after design and procedure development.
- Pre-Implementation: Complete Metroplex design package preparation, criteria evaluation, training plans, Safety Risk Management Documentation (SRMD) and publication preparation documentation.
- Post Evaluation: Complete Metroplex documentation reviews, lessons learned, and process improvement activities. It includes reviews of the airspace and procedure changes to determine if they have delivered the desired benefits while minimizing other impacts. Modifications or refinements may be made to the design process to better achieve desired benefits or address unforeseen impacts.

#### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 5 – 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 performance based navigation in Metroplex airspace will allow more efficient use of the airspace and increases in arrival and departure flows.

***Program Plans FY 2015 – Performance Output Goals***

**Optimization of Airspace and Procedures in the Metroplex:**

- Complete analysis and studies, through established Optimization of Airspace and Procedures in the Metroplexes (OAPM) Study Team processes, at four Metroplex locations (e.g., Chicago, Memphis, Cleveland/Detroit and Boston) focusing on expedited integrated PBN procedure development coupled with airspace design to optimize benefits.
- Based on the output of the earlier analysis and study stage, begin OAPM design work at four Metroplex locations (e.g., Memphis, Cleveland/Detroit, Chicago and Boston).
- Begin OAPM pre-implementation/evaluation activities at four Metroplex locations (e.g., South/Central Florida, Chicago, Cleveland/Detroit and Phoenix).
- Establish standardized databases, software and data formats in support of the Navigation Procedures Implementation Plan (NAV Lean) initiative, which will accelerate Metroplex projects and NextGen by improving efficiency and production time for all Instrument Flight Procedures (IFPs).

***Program Plans FY 2016 – Performance Output Goals***

**Optimization of Airspace and Procedures in the Metroplex:**

- Complete Metroplex design work at three Metroplex locations (e.g., South/Central Florida, Boston and Memphis).
- Complete Metroplex pre-implementation evaluation activities at three Metroplex locations (e.g., Southern California, Phoenix and Cleveland/Detroit).
- Begin Post Evaluation activities at three Metroplex locations (e.g., Southern California, Phoenix and Cleveland/Detroit)
- Complete Post Evaluation activities at two Metroplex locations specifically for benefits analysis and metric analysis. (e.g., Charlotte and Atlanta)
- Begin Metroplex documentation reviews at two Metroplex locations (e.g., Charlotte and Atlanta)
- Complete Metroplex documentation reviews, lessons learned and potential redesign based on benefits analysis, and process improvement activities at two Metroplex locations. (e.g., DC, Northern California).

***Program Plans FY 2017 – Performance Output Goals***

**Optimization of Airspace and Procedures in the Metroplex:**

- Complete the Evaluation of four Metroplex projects.
- Complete Post Evaluation activities at one Metroplex project specifically for benefits analysis and metric analysis.
- Complete Metroplex documentation reviews, lessons learned and evaluate potential redesign based on benefits analysis, and process improvement activities for three Metroplex projects.

***Program Plans FY 2018 – Performance Output Goals***

**Optimization of Airspace and Procedures in the Metroplex:**

- Complete Post Evaluation activities for four Metroplex projects specifically for benefits analysis and metric analysis.
- Complete Metroplex documentation reviews, lessons learned and evaluate potential redesign based on benefits analysis, and process improvement activities for one Metroplex project.

***Program Plans FY 2019 – Performance Output Goals***

**Optimization of Airspace and Procedures in the Metroplex:**

- Complete Metroplex documentation reviews, lessons learned and evaluate potential redesign based on benefits analysis, and process improvement activities for four Metroplex projects.

**B, NextGen Performance Based Navigation (PBN) – NAV Lean, G05N.01-02**

**Program Description**

The Navigation Procedures Implementation Plan (NAV Lean) was published in June 2011, in response to the Navigation (NAV) Procedures Project Final Report, dated September 2010, containing 21 recommendations to

streamline the Instrument Flight Procedures (IFP) development process. This program will facilitate implementation of the recommendations to include a streamlined version of the current core process for developing instrument flight procedures (including request, design and development, approval, implementation, and maintenance). It will also clarify the role of auxiliary processes, such as Safety Management System (SMS), environmental, and operational approval. The process will be better managed by having all IFP requests submitted through an authorized Web-based portal established as the official entry point into a system for processing, tracking, and managing the IFP development life cycle.

NAV Lean will allow participants in the process to obtain up-to-date information concerning an IFP status, exchange information with other system users, and will provide an archive function and audit trail. This system will also serve as a gateway to the consolidated databases required for IFP design and development, applicable publications, and forms and templates. Consolidation and standardization of the databases will provide improved data integrity and improved process management. Use of this system will facilitate early screening of requests to ensure they are complete and have been assigned a priority, and it will provide transparency for users. It will also ensure that safety, airspace, operational approval, and environmental aspects are all considered early in the process. Use of this common portal will also facilitate the early recognition of potential requirements for new or modified criteria.

NAV Lean Implementation of the future IFP process is expected to significantly reduce the average time required to implement IFPs and will position the FAA to meet the increased demand for instrument flight procedures that are the cornerstone for NextGen. Achieving this optimal future process and all of its benefits will require full implementation of all recommendations.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

Nav Lean improved processes will result in better managed IFP requests which have been submitted through an authorized web-based portal established as the single entry point into a system for requesting, processing, tracking, and managing the IFP development life cycle. At least a 40% improvement in processing time is estimated and this high quality procedure development will enhance NextGen efforts.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Migrate National Airspace System Resource (NASR) functionality into AirNav 2.0.
- Complete implementation of a secured technical solution for authentication and access point for external users.
- Complete system development, testing, integration and implementation of Airports, Points and Holding, Enroute, Departures, and Approaches Authoritative Sources.
- Complete Web based Request and Access Portal Testing and Implementation, including Stakeholder and User Training.
- Standardize software and data formats that allow auto-population/extraction of data to produce, populate, and edit documents that are accessible to all parties for review.
- Develop, implement, and ensure standards to electronically communicate, transfer, and integrate data among tools.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

## **C, Concept Development for Integrated NAS Design & Procedure Planning, G05A.02-04**

### **Program Description**

The Integrated National Airspace Design and Procedure Planning program is currently conducting PBN Initiatives safety analyses to allow for the future NAS-wide implementation of Established-on-RNP Instrument Approach Procedures (IAPs). Established-on- Required Navigation Performance (RNP) (EoR) will allow air traffic controllers to clear aircraft on an RNP approach with a turn to final without providing standard radar separation between aircraft that are established on approaches to parallel runways. 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 capacity via reduced standard separation.

The program supports RTCA Task Force 5 recommendations and integrates industry and agency efforts to maximize utility of aircraft performance capabilities, Standard Terminal Arrivals (STARs) and Optimum Profile Descents (OPDs). The primary focus of the program is to conduct design, safety analysis and implementation of various EoR IAPs in an effort to provide shorter, repeatable and stabilized paths to runway for RNP aircraft.

Facilitating the EoR concept of operation from a key developmental site to a NAS-wide Document Changes Proposals (DCP) is a major undertaking effort 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 Safety Risk Management Process (SRMP) and specific waivers that will allow experimental EoR flight trials to be conducted. From the experimental operations/flight trials, additional data will be collected to support final safety and benefits analyses. 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 58,166, 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 thereby increasing capacity.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Initiate modeling and safety analysis of two new RNP approach standards.
- Support the implementation of one RNP approach standard.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Complete safety analysis of two RNP approach standards.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Initiate modeling and safety analysis of one new RNP approach standard.
- Support the implementation of one RNP approach standard.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Complete safety analysis of one RNP approach standard.
- Support the implementation of one RNP approach standard.

***Program Plans FY 2019 – Performance Output Goals***

- Initiate modeling and safety analysis of one new RNP approach standard.
- Support the implementation of one RNP approach standard.

## **ACTIVITY 2: AIR TRAFFIC CONTROL FACILITIES AND EQUIPMENT**

### **A: En Route Programs**

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#### **2A01, EN ROUTE AUTOMATION MODERNIZATION (ERAM)**

**FY 2015 Request \$10.5M**

#### **En Route Automation Modernization (ERAM), A01.10-01**

##### **Program Description**

ERAM replaces hardware and software for the En Route automation system at all 20 ARTCCs and at the Technical Center. The baseline ERAM program (A01.10-01) has four segments: Enhanced Backup Surveillance (EBUS), En Route Information Display System (ERIDS), ERAM Release 1, and ERAM Releases 2 and 3. The first segment, EBUS was completed during FY 2006. The second, ERIDS, was completed in FY 2008. ERAM Release 1 replaced the current Host Computer System with a new automation system that expands the Host's capability so the new system can handle additional airspace capacity, and improve efficiency and safety. From a functionality standpoint, Release 1, as originally planned, was intended to contain the capabilities and performance required to achieve acceptable operational suitability and effectiveness. ERAM Release 2 was a planned maintenance software release containing backlog Problem Report fixes. ERAM Release 2 also allowed the program office to incorporate a substantial amount of core functionality improvements, as articulated in the Office of Management and Budget (OMB) improvement plan and reflected as part of the Joint Resource Council (JRC) re-baselining in June 2011. Release 3 incorporates NextGen transformational program infrastructure into ERAM including interfaces with Automatic Dependent Surveillance – Broadcast (ADS-B), Pre-Departure Re-Route, and addresses International Civil Aviation Organization (ICAO) 2012 requirements.

Releases 1-3 were originally planned to be completed in FY 2011. However, there were challenges that were encountered once operational testing of the software at the key sites began in June 2009. These included the discovery of problems with interfaces with other facilities and other systems due to the limitations of the testing environments at the William J. Hughes Technical Center and at the contractor's facility. These test sites were not being fully representative of the actual complex operational environment at field facilities. Additionally, there were problems with some interfaces that are only needed during the transition from legacy to ERAM but are not needed once ERAM is fully operational. Also, additional familiarization time was needed because ERAM does some processing differently than Host. These challenges resulted in delaying the implementation of ERAM through FY 2014 and requiring additional acquisition funding in FY 2011 – FY 2014 of approximately \$330M. As many of the required fixes were already developed in Release 2, the program decided to use Release 2 for the waterfall deployment of ERAM. The Salt Lake City (ZLC) key site has been successfully operating on ERAM Release 2 in a continuous Operational Suitability Demonstration (OSD) phase since October 19, 2010 and the Seattle (ZSE) site since December 28, 2010. Independent Operational Assessment (IOA) was conducted at both the Salt Lake City and Seattle key sites and an In-Service Decision was approved on March 29, 2011 with an Action Plan to address hazards documented through the IOA process. The core functionality improvements necessary to mitigate the identified hazards were implemented in 3 build phases as part of Release 2 completion. The IOA re-assessment against the identified hazards was completed in December 2011 and confirmed that the high hazards had been successfully mitigated to sufficient levels to continue with the waterfall deployment. Both Salt Lake City and Seattle sites obtained Operational Readiness Date (ORD) on March 23, 2012 and April 23, 2012 respectively. Additionally, Seattle achieved ORD on Release 3 on August 20, 2012. Release 3 has been used as the waterfall release throughout FY 2013 as the ERAM deployment continued and additional sites achieved operational milestones on ERAM.

The ERAM deployment, however, was significantly impacted by sequestration during FY 2013. FAA decided to focus support only on sites which had achieved continuous operations on ERAM, so no additional site milestones were achieved from April through August 2013. The unavailability of operational resources from the sites necessary to test and deploy ERAM releases resulted in a delay and an increase in the budget (\$41.7M) to complete the deployment of ERAM. The remainder of the waterfall was re-planned and the 3 remaining sites are now planned to achieve IOC by the end of FY 2014 with the last site ORD planned to be achieved by the end of the second quarter of FY 2015 (March 2015).

As of September 2013, 17 of the 20 ARTCC sites have achieved IOC on ERAM with the most recent being the Fort Worth ARTCC on September 14, 2013. Additionally, 11 of the 20 sites have achieved ORD on ERAM with the most recent being the Oakland ARTCC on September 24, 2013.

**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 58,166, or higher, arrivals and departures.*

**Relationship to Performance Metric**

ERAM contributes to the Performance Metric for maintaining average daily airport capacity by increasing the number of flight plans that can be stored to 65,536 (versus the current 2,600); providing flexibility in airspace configuration; and extending the radar coverage in all En Route Centers by increasing the number of radar feeds from 24 to a maximum of 64. ERAM also provides better flight planning data, integrates additional surveillance data which facilitates controllers’ ability to optimize the airspace, provides more dynamic routing and situational awareness of the airspace, and quicker updates of critical aircraft information. Additionally, improved access to flight conditions and meteorological information provided by ERAM allow controllers to access this information more quickly and efficiently and to integrate it more readily into the decision making processes, reducing controller workload. In addition to the baseline improvements, ERAM provides the infrastructure to realize improved navigation, communications, and surveillance benefits of NextGen which drive efficiency enhancements and will allow the FAA to handle the anticipated growth and complexity of the NAS.

**Program Plans FY 2015 – Performance Output Goals**

- Complete ERAM deployment achieving last site ORD by March 2015.

**Program Plans FY 2016-2019 – Performance Output Goals**

- None.

**System Implementation Schedule**



**2A02, NEXTGEN – EN ROUTE AUTOMATION MODERNIZATION (ERAM) – SYSTEM ENHANCEMENTS AND TECHNOLOGY REFRESH**

**FY 2015 Request \$45.2M**

- A, ERAM System Enhancements and Technology Refresh, G01A.01-05 / X, ERAM System Enhancements Future Segment, G01A.01-08
- B, ERAM Sector Enhancements, G01A.01-04

## **A, ERAM System Enhancements and Technology Refresh, G01A.01-05 / X, 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 accommodate changes in international standards for data exchange, and it will improve the overall functionality and improve the usability of the controller workstation. The technology refresh segment will replace components of the controller workstation that are becoming obsolete. Work in this program will take place between 2013 and 2016. The Sector Enhancements program, which is addressed in a separate CIP write up – G01A.01-04, will upgrade the controller workstation to allow better coordination between the tactical (R-side) and strategic (D-side) controllers. Finally, the ERAM System Enhancements Future Segment – G01A.01-08 – will continue the work done in the ERAM System Enhancements and Technology Refresh program.

#### ERAM System Enhancement and Technology Refresh (G01A.01-05):

The legacy ERAM program will complete the waterfall deployment of the core ERAM program with all the planned baseline functionality. The ERAM System Enhancements will provide capabilities above and beyond that core ERAM functionality. The Final Investment Decision for ERAM System Enhancements and Technology Refresh was made in September 2013, and it baselined requirements for funding for the years FY 2013 – FY 2016 with activities completing in FY 2017.

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

- 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.

The Technology Refresh portion of the ERAM System Enhancements & Technology Refresh program will replace many of the ERAM components, which were procured in 2006, and are approaching and/or at their projected end-of-life. The FY 2013 – FY 2015 Technology Refresh consists of the following:

- AIX 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.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Metric**

The ERAM System Enhancement Refresh and Technology Refresh effort will provide for efficient, cost effective, ERAM updates following the last site Operational Readiness Date (ORD) 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 2015 – Performance Output Goals***

System Enhancements and Technology Refresh (G01A.01-05):

- Complete development, test and deployment of first release of enhancements.
- Complete system engineering of second release of enhancements.
- Begin development of second release of enhancements.
- Complete procurement and test of Technology Refresh equipment.
- Complete deployment of Technology Refresh equipment.

ERAM System Enhancement Future Segment (G01A.01-08):

- None.

***Program Plans FY 2016 – Performance Output Goals***

System Enhancements and Technology Refresh (G01A.01-05):

- Complete development of second release of enhancements.
- Complete test and deployment of second release of enhancements.
- Begin development of third release of enhancements.

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 release of enhancements. (Prior year funds)
- Complete test and deployment of third release of enhancements. (Prior year funds)

ERAM System Enhancement Future Segment (G01A.01-08):

- Develop supporting documents for an investment decision to baseline program.

***Program Plans FY 2018-2019 – Performance Output Goals***

System Enhancements and Technology Refresh (G01A.01-05):

- None.

ERAM System Enhancement Future Segment (G01A.01-08):

- Develop supporting documents for an investment decision to baseline program.

## **B, 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 lack the requisite accuracy, consistency, and usability needed during high demand scenarios which results 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.

An Investment Analysis Readiness Decision is planned for FY 2014 and the Final Investment Decision is planned for FY 2015. Prime contractor system engineering, software development, and implementation activities are planned to begin in 2016 and complete in 2020.

### **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 58,166, or higher, arrivals and departures.*

## Relationship to Performance Metric

The ERAM Sector Enhancements program will improve trajectory modeling, enhance conflict probe processing, 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 associated with NextGen.

### *Program Plans FY 2015 – Performance Output Goals*

- Complete ERAM Sector Enhancements Business Case development and obtain Final Investment Decision.
- Prepare and release request for proposal for ERAM contract modification.

### *Program Plans FY 2016 – Performance Output Goals*

- Award ERAM contract modification for Sector Enhancements.
- Initiate first block of ERAM Sector Enhancements software design.

### *Program Plans FY 2017 – Performance Output Goals*

- Complete first block of ERAM Sector Enhancements software design
- Conduct Software Design Review for first block of ERAM Sector Enhancements
- Complete first block of Sector Enhancements software development, integration, and test.
- Initiate second block of ERAM Sector Enhancements software design.

### *Program Plans FY 2018 – Performance Output Goals*

- Complete second block of ERAM Sector Enhancements software design
- Conduct Software Design Review for second block of ERAM Sector Enhancements
- Complete second block of Sector Enhancements software development, integration, and test.
- Initiate third block of ERAM Sector Enhancements software design

### *Program Plans FY 2019 – Performance Output Goals*

- Complete third block of ERAM Sector Enhancements software design
- Conduct Software Design Review for third block of ERAM Sector Enhancements
- Complete third block of Sector Enhancements software development, integration, and test.
- Initiate fourth block of ERAM Sector Enhancements software design.

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## **2A03, EN ROUTE COMMUNICATIONS GATEWAY (ECG)**

**FY 2015 Request \$6.6M**

### **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 ARTCC's. The ECG is fully operational at the ARTCC's.

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.

Technology Refresh:

Based on input from ECG OA, STEP, and the evolving operational needs of the NAS, the ECG Technology Refresh activity plans, procures, and deploys ECG hardware or software components to maintain a high level of system availability. The items refreshed can be for EOL, EOS, or performance issues as well as modifications to increase capacity, and 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 19, 2013.

***Program Plans FY 2015 – Performance Output Goals***

Performance Monitoring:

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

Technology Refresh:

- Complete development phase of Interface Processor, Magma Chassis and Intelligent Communication Adapter Card hardware upgrade.
- Begin formal test phase of Interface Processor, Magma Chassis and Intelligent Communication Adapter Card hardware upgrade.
- Develop plan for Design and Development of RAPPI Tech Refresh.

***Program Plans FY 2016 – Performance Output Goals***

Performance Monitoring:

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

Technology Refresh:

- 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***

Performance Monitoring:

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

Technology Refresh:

- Deliver Interface Processor, Magna Chassis and Intelligent Communication Adapter Card hardware upgrade to key site and begin national deployment.

***Program Plans FY 2018 – Performance Output Goals***

Performance Monitoring:

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

Technology Refresh:

- Complete technology refresh activities recommended in the prior year ECG STEP.

***Program Plans FY 2019 – Performance Output Goals***

Performance Monitoring:

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

Technology Refresh:

- Complete technology refresh activities recommended in the prior year ECG STEP.

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**2A04, NEXT GENERATION WEATHER RADAR (NEXRAD)**

**FY 2015 Request \$7.1M**

**NEXRAD – Service Life Extension Program (SLEP) Phase 1, W02.02-02**

**Program Description**

NEXRAD SLEP is a 9-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.

Currently there are 160 NEXRAD systems operated jointly by the Tri-Agency partners – the National Weather Service (NWS), the FAA, and the Department of Defense. NWS is the lead agency for the NEXRAD program. FAA independently owns 12 of these systems located in Alaska (7), Hawaii (4) and Puerto Rico (1).

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 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 will require technology refresh beginning 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 2015 – Performance Output Goals**

- Conduct Signal Processor Deployment Readiness Review.

**Program Plans FY 2016 – Performance Output Goals**

- Complete first replacement/refurbishment at first site. (APB milestone)

**Program Plans FY 2017 – Performance Output Goals**

- Deliver Upgraded Icing algorithm to Radar Operations Center (ROC).
- Complete last Signal Processor replacement.

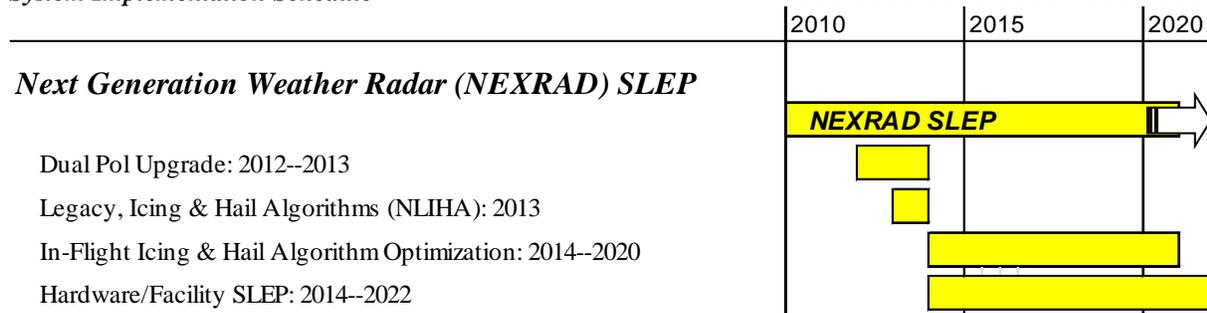
**Program Plans FY 2018 – Performance Output Goals**

- Complete first Pedestal refurbishment.

**Program Plans FY 2019 – Performance Output Goals**

- Complete 6<sup>th</sup> pedestal refurbishment.

**System Implementation Schedule**



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## **2A05, ARTCC BUILDING IMPROVEMENTS/PLANT IMPROVEMENTS**

**FY 2015 Request \$63.7M**

### **ARTCC Modernization, F06.01-00**

#### **Program Description**

The Air Route Traffic Control Center (ARTCC) Modernization and Expansion program supports en route air traffic operations and service-level availability by providing life cycle management of the physical plant infrastructure at the 21 ARTCCs and 2 Center Radar Approach Control (CERAP) facilities. These structures were built in the 1960's and expanded several times since then. As of FY 2013 there was a \$95.8 million facility backlog which includes all building systems such as HVAC Components, all piping, plumbing, control systems, and both exterior and interior of the building. This backlog increases the risk of outages and may result in increased maintenance costs. This program modernizes and sustains these buildings to meet air traffic service requirements and to reduce the backlog. Each year, several major renovation projects and numerous smaller sustain projects are funded. This program is one of the 12 programs included in FAA's NAS Sustainment 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**

The ARTCC Modernization and Expansion 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. In FY 2006 there were eight ruptures of aged pipes, one of which required draping plastic sheets over controller consoles to maintain operations. In addition, the chiller plants for air conditioning are currently approaching and/or are past their life expectancies. 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 2015 – Performance Output Goals***

- Fund and Award Construction Contract for Control Wing Basement/Major Mechanical projects at the Boston and Albuquerque ARTCCs.
- Fund and Award Construction Contract for Building Automation Controls System Replacement projects at the Albuquerque and Houston ARTCCs.
- Fund and Award Design Contract for Control Wing Basement/Major Mechanical at Washington, Los Angeles, Atlanta, Salt Lake, Cleveland, Oakland and Seattle ARTCCs.
- Fund and Award Design Contract for Building Automation Controls System Replacement at Cleveland, Kansas City, Oakland, Indianapolis, and Anchorage ARTCCs.
- Fund and Award Construction Contract for Administration Wing Seismic Remediation Upgrades at Anchorage ARTCC.
- Fund and Award Construction Contract for M-1 Room Build Out Phase II for Miami ARTCC.
- Provide funding for all ARTCCs and CERAPs for mission critical failure mode mitigation and miscellaneous sustainment needs.
- Conduct facility condition assessments to update the national Facility Condition Assessment database for three sites and paper upgrades for all other ARTCCs and CERAPs.

***Program Plans FY 2016 – Performance Output Goals***

- Fund and Award Contract for Control Wing Basement/Major Mechanical projects at the Oakland, Cleveland, and Kansas City ARTCCs.
- Fund and Award Contract for Building Automation Controls System Replacement projects at Boston and Anchorage ARTCCs.
- Provide funding to all ARTCCs and CERAPs for mission critical failure mode mitigation and miscellaneous sustainment needs.
- Conduct facility condition assessments to update the national Facility Condition Assessment database for three or four sites and paper upgrades for all other ARTCCs and CERAPs.

***Program Plans FY 2017 – Performance Output Goals***

- Fund and Award Contract for Control Wing Basement/Major Mechanical projects at the Washington, Salt Lake City and Atlanta ARTCCs.
- Fund and Award Contract for Control Wing Basement/Major Mechanical Design Cost for project at the Denver ARTCC.
- Fund and Award Contract for Building Automation Controls System Replacement projects at the Cleveland, Kansas City, Indianapolis and Oakland ARTCCs.
- Fund and Award Contract for Building Automation Controls Systems Replacement Design at Washington, Los Angeles, Atlanta, Minneapolis ARTCCs and Guam CERAP.
- Provide funding to all ARTCCs and CERAPs for mission critical failure mode mitigation and miscellaneous sustainment needs.
- Conduct facility condition assessments to update the national Facility Condition Assessment database for three or four sites and paper upgrades for all other ARTCCs and CERAPs.

***Program Plans FY 2018 – Performance Output Goals***

- Fund and Award Contract for Control Wing Basement/Major Mechanical projects at the Los Angeles and Seattle ARTCCs.
- Fund and Award Contract for the Chillers Replacement Project at Guam CERAP.
- Fund and Award Contract for Building Automation Controls System Replacement projects at the Washington, Los Angeles, Atlanta, Salt Lake City and Minneapolis, Seattle ARTCCs and Guam CERAP.
- Provide funding to all ARTCCs and CERAPs for mission critical failure mode mitigation and miscellaneous sustainment needs.
- Conduct facility condition assessments to update the national Facility Condition Assessment database for three or four sites and paper upgrades for all other ARTCCs and CERAPs.

***Program Plans FY 2019 – Performance Output Goals***

- Fund and Award Contract for Control Wing Basement/Major Mechanical project at Denver ARTCC.
- Provide funding to all ARTCCs and CERAPs for mission critical failure mode mitigation and miscellaneous sustainment needs.
- Conduct facility condition assessments to update the national Facility Condition Assessment database for three or four sites and paper upgrades for all other ARTCCs and CERAPs.

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**2A06, AIR TRAFFIC MANAGEMENT (ATM) – TRAFFIC FLOW MANAGEMENT (TFM)**

**FY 2015 Request \$5.7M**

**TFM Infrastructure – Technology Refresh, A05.01-12 / TFM Infrastructure –  
Field/Remote Site Technology Refresh, A05.01-13**

**Program Description**

The Traffic Flow Management (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 partner countries.

**TFM Infrastructure – Technology Refresh (A05.01-12):**

TFM Infrastructure – Technology Refresh (FY 2011-2015), was approved by the FAA JRC on March 29, 2011. This segment provides a replace-in-kind technology refresh of the central data processing hardware for the TFM System (TFMS). The program replaces the hardware used by the TFM Processing Center (TPC) (also called TFMS Core), the TFM application National Traffic Management Log (NTML), located at the William J. Hughes Technology Center (WJHTC), the TFMS backup system located at the Disaster Recovery Center (DRC), and the prime contractor site. Last replaced in 2006, the hardware used in the system is no longer produced, and it doesn't have the capacity to support future processing needs. The hardware must be replaced to avoid obsolescence, system performance degradation and impact to other programs.

The baselined TFMS Technology Refresh segment has three elements:

- Spares: Procurement of Spares for the TFM TPC is a primary risk mitigation effort so that the TFMS will be fully functional until the technology refresh is completed in 2015. The current TFMS hardware is no longer produced. This mitigation effort will minimize outages due to equipment failure and will minimize the impact to development of Collaborative Air Traffic Management Technologies (CATMT) capabilities in Work Package 2 and Work Package 3.
- Phase 1: The technology refresh of NTML. The activities include engineering analysis, procurement, test and installation of the NTML replacement hardware. The current NTML equipment is no longer produced and no longer supported. The NTML is a TFM application that logs actions the Traffic Managers take to mitigate congestion and demand and it shares this information with other FAA Traffic Management facilities for better situation awareness, collaboration and decision support.
- Phase 2: Perform technology refresh of TFM Processing Center, also called the TFMS Core. The activities include: engineering analysis, procurement, test and installation of replacement hardware.

**TFM Infrastructure – Field /Remote Site Technology Refresh (A05.01-13):**

TFM Infrastructure Field/Remote Site Technology Refresh will replace 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 ATC facilities around the country including TMUs at En Route Centers, Terminal Radar Facilities, Control Towers, and Airline Operation Centers (AOCs). The program achieved FID in June 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.*

**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 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. Keeping the TFMS fully mission capable also serves as an enabling function for the NextGen CATMT WP 2 & 3 effort, as they both reside and operate on TFMS.

**Program Plans FY 2015 – Performance Output Goals**

TFM Infrastructure – Technology Refresh (A05.01-12):

- Phase 2 – Complete system test, installation and final deployments of TFM Production Center (also called TFMS Core) replacement hardware of the operational, test, development and back-up strings located at WJHTC, Disaster Recovery Center (DRC), and prime contractor site.
- Phase 2 – TFMS Core operational - In Service Decision on replacement hardware, September 2015. (APB Milestone)

TFM Infrastructure – Field /Remote Site Technology Refresh (A05.01-13):

- Conduct engineering analyses for spare equipment requirements.

**Program Plans FY 2016 – Performance Output Goals**

TFM Infrastructure – Technology Refresh (A05.01-12):

- None, program complete in 2015.

TFM Infrastructure – Field /Remote Site Technology Refresh (A05.01-13):

- None.

**Program Plans FY 2017-2019 – Performance Output Goals**

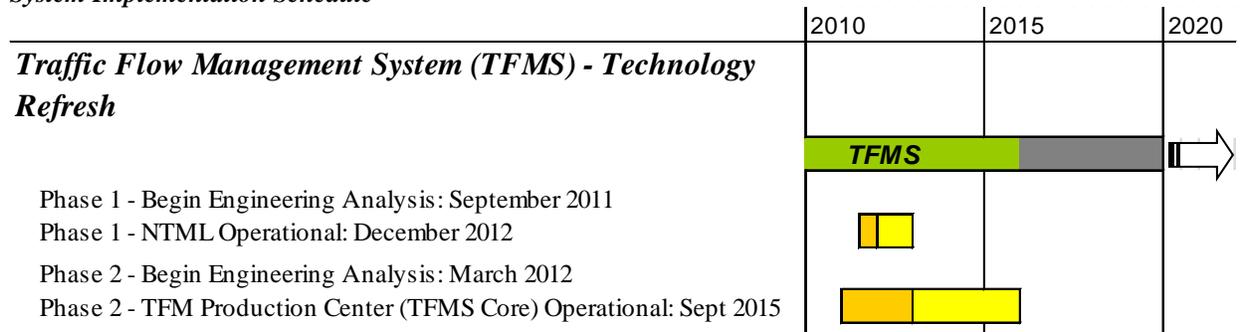
TFM Infrastructure – Technology Refresh (A05.01-12):

- None.

TFM Infrastructure – Field /Remote Site Technology Refresh (A05.01-13):

- Milestones will be developed at FID.

**System Implementation Schedule**



**2A07, AIR/GROUND COMMUNICATIONS INFRASTRUCTURE**

**FY 2015 Request \$3.9M**

**Communications Facilities Enhancement – Expansion, C06.01-00 / Communications Facilities Enhancement – Air/Ground Communications RFI Elimination – Technology Refresh, C06.03-01**

**Program Description**

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 aircraft when there are gaps in coverage or new routes are adopted. It also provides various upgrades to RCF's, including building and tower grounding, lightning protection, and replacing the cables from the equipment to antennas whenever necessary to improve radio equipment performance. Air/Ground Communications RFI Elimination Technology Refresh will provide equipment and support to detect and resolve radio frequency interference with FAA communications.

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

The Air-to-Ground (A/G) Communications Infrastructure expansion program enhances operational efficiency and effectiveness by establishing, replacing and upgrading radio equipment. This radio equipment is installed at remote sites that allow communications between pilots and controllers when an aircraft is beyond normal direct transmission range of the radios in the air traffic facility. The program also renovates buildings that house this equipment and improves site conditions and access for these remote radio sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

The 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 Radio Communication Facilities (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 900 RX Multicouplers used in the NAS; however, many of these units were purchased locally, are not supply supportable 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 and are not depot supported. 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**

CFE projects reduce the number of outages by replacing aging and increasingly unreliable communications equipment with modern equipment. In addition, the CFE projects improve and provide upgrades needed at A/G Communication sites and facilities to sustain reliable operation.

***Program Plans FY 2015 – Performance Output Goals***

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

- Establish/Replace/Upgrade 3 CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- Procure and deliver 110 Receiver Multicoupler units to FAA Depot.

***Program Plans FY 2016 – Performance Output Goals***

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

- Establish/Replace/Upgrade four CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- None.

***Program Plans FY 2017 – Performance Output Goals***

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

- Establish/Replace/Upgrade four CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- None.

***Program Plans FY 2018 – Performance Output Goals***

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

- Establish/Replace/Upgrade four CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- None.

***Program Plans FY 2019 – Performance Output Goals***

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

- Establish/Replace/Upgrade four CFE sites.

Communications Facilities Enhancement – RFI Elimination – Technology Refresh (C06.03-01):

- None.

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**2A08, AIR TRAFFIC CONTROL EN ROUTE RADAR FACILITIES IMPROVEMENTS**

**FY 2015 Request \$5.1M**

**Long Range Radar Improvements – Infrastructure Upgrades/Sustain, S04.02-03**

**Program Description**

The Long Range Radar (LRR) Infrastructure Upgrades/Sustain Program modernizes and upgrades the radar facilities that provide aircraft position information to FAA En Route 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 are installed in facilities constructed in the 1950's and 60'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 in turn cause delay to aircraft departures and arrivals.

The scope of work of the LRR Infrastructure Upgrades includes:

- Replacement of engine generators,
- Replacement of uninterruptible power supply (UPS) to support the new Common Air Route Surveillance Radar (CARSR) installation,
- Upgrade of existing lightning protection, grounding, bonding, and shielding (LPGBS) 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 lightings and walkways,
- Abatement of hazardous materials such as asbestos contaminated materials (ACM), lead based paint, mold
- Refurbishment of Heating, Ventilation, and Air Conditioning (HVAC), cooling fans, duct works, elevators, wiring and lighting systems, and walkways,
- 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 one of the 12 programs included in FAA's NAS Sustainment 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

The LRR program supports the FAA's Strategic Priority, Deliver Benefits through Technology and Infrastructure by providing renovation of existing FAA-owned surveillance facilities and structures serving the NAS. The NAS requires reliable and continuous operation of surveillance equipment. Repairs, improvements, and modernization to 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 2015 – Performance Output Goals*

- Complete upgrades of critical infrastructure systems at 18 ARSRs including UPS, LPGBS, and HVAC systems (actuals may vary based upon validation and priority for the year).
- Complete sustaining improvements to existing facility infrastructures at 20 ARSR, Fixed Position Surveillance (FPS), and ATCBI-6 facilities including; roof replacements, asbestos abatement, water intrusion, safety improvements power panel retrofits, road repairs, plumbing repair, and HVAC control upgrades (actuals may vary based upon validation and priority for the year).

### *Program Plans FY 2016-2019 – Performance Output Goals*

- None.

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## **2A09, VOICE SWITCHING CONTROL SYSTEM (VSCS)**

**FY 2015 Request \$13.8M**

### **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. These large switches handle communication connections for 70 to 210 active air traffic control workstations at each en route center.

### 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 (ARTCCs). 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 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. Additional upgrades will be completed to ensure that the VSCS continues to provide reliable voice communications, which can support future en route operations.

VSCS Technology Refresh Phases 1 and 2 included funding for Work Station Upgrades, VSCS Display Module Replacement (VDMR), VSCS Integrated Test Suite (VITS) Replacement, Maintenance Test Set Replacements – Functional At Speed Tester (MTSR-F), Power Supply upgrades, VSCS Training and Backup Switch (VTABS) Test

Controller Replacement (VTCR), as well as some Programming Language for Microcomputers (PLM) to C software code conversion.

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), LAN Transceiver retrofits (approximately 5,000), 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 maintain operational availability of the National Airspace System 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. VSCS Technology Refresh Phase 3 is required to maintain both the operational availability of the VSCS/VTABS switches and to maintain the ability of the VSCS Depot to support site requisitions.

***Program Plans FY 2015 – Performance Output Goals***

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

- G/G node reduction: Excess nodes removed from three additional ARTCCs.
- FOTT power supply replacement: Complete system and key site testing.

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

- None.

***Program Plans FY 2016 – Performance Output Goals***

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

- FOTT power supply retrofits 50% complete.
- Ground to Ground Node Reduction complete. (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):

- FOTT power supply retrofits 100% complete. (APB Milestone)
- VSCS Local Area Network Transceiver Retrofit completed. (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):

- A/G PLM to C software conversion: Complete deployments to all sites.(APB milestone)

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

- None.

**Program Plans FY 2019 – Performance Output Goals**

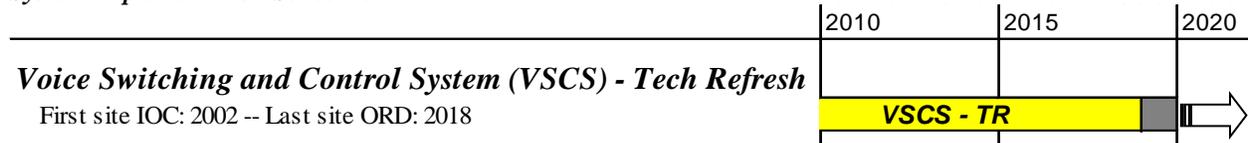
VSCS – Technology Refresh – Phase 3 (C01.02-04):

- None.

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

- Complete quarterly VSCS \ VTABS System Technology Evolution Process database update needed for Diminishing Manufacturing Sources and Material Shortages (DMSMS) analysis.
- Award contract to recover, replace or upgrade TBD components identified in the DMSMS analysis.

**System Implementation Schedule**



**2A10, OCEANIC AUTOMATION SYSTEM (OAS)**

**FY 2015 Request \$3.5M**

**Advanced Technologies and Oceanic Procedures (ATOP), A10.03-00**

**Program Description**

The ATOP program replaced oceanic air traffic control systems, and associated with the replacement updated procedures and modernized the Oakland, New York, and Anchorage ARTCCs, which house these oceanic automation systems. 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.

A technology refresh for the automation system was completed in second quarter FY 2010 for all three operational sites and the system installed at the William J, Hughes Technical Center (WJHTC). This technology refresh increased system performance, capacity, and usability, and made improvements to software functionality. Additional safety and efficiency enhancements identified by stakeholder and validated by FAA requirements management group will be delivered through FY 2016 by planned software modifications to the ATOP Ocean21 system. These modifications will address needed functionality changes to support airspace expansion initiatives, address Agency-required system infrastructure changes (e.g., X.25 to IP communication protocol interface upgrades), and support FAA and International Civil Aviation Organization (ICAO) mandated system changes.

The ATOP Program Office is preparing for an Acquisition Management System (AMS) Investment Analysis Readiness Decision (IARD) in FY 2015 and a Final Investment Decision (FID) in FY 2016 to enable the Oceanic air traffic system to continue to be enhanced through 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 3 – Achieve a NAS on-time arrival rate of 88 percent at Core airports.*

**Relationship to Performance Metric**

ATOP allows properly equipped aircraft (i.e., ADS-C, Controller-Pilot Data Link Communications (CPDLC), Required Navigation Performance-4 nm (RNP-4)) and qualified aircrews to operate using reduced oceanic separation criteria. This enables more aircraft to fly optimal routes and reduce aircraft flight time (and increase fuel and payload efficiency) during oceanic legs of their flights. Reduced lateral (side-to-side) separation provides space for additional routes between current locations or new direct markets. Reduced longitudinal (nose-to-tail) separation provides more opportunities to add flights without delays (e.g., climbs, descents, reroutes, or speed penalties). By reducing the potential for delays (i.e., increasing the number of available routes, increasing airspace capacity,

enhancing the interfacility coordination of air traffic, reducing flight times, etc.), ATOP facilitates an increase in the on-time performance of scheduled air carriers.

**Program Plans FY 2015 – Performance Output Goals**

- Deliver software enhancements in the operational release to address operational problems and system improvements to all three Oceanic sites in November 2014. The enhancements implemented will include two technical operations and three air traffic NAS Change Proposals (NCPs).
- Deliver software enhancements in the operational release to address operational problems and system improvements to all three Oceanic sites in April and September 2015. Enhancements will include changes needed for the ATOP system to support NextGen ADS-C Climb and Decent and ADS-B In-Trail Procedures (ITP) capabilities.

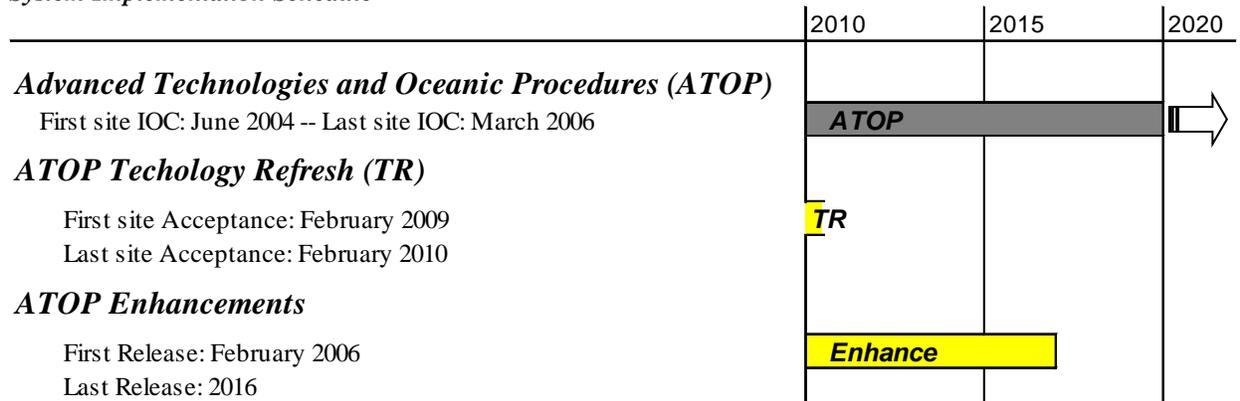
**Program Plans FY 2016 – Performance Output Goals**

- Deliver software enhancements in the operational release to address operational problems and system improvements to all three Oceanic sites in February 2016. (Prior year funds)

**Program Plans FY 2017-2019 – Performance Output Goals**

- None.

**System Implementation Schedule**



**2A11, NEXT GENERATION VERY HIGH FREQUENCY AIR/GROUND COMMUNICATIONS SYSTEM (NEXCOM)**

**FY 2015 Request \$40.0M**

**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 radio frequency spectrum available 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. In addition, replacement of these radios improves A/G radio equipment maintainability and reliability, and enhances A/G information security and communications control. Segment 1a of the NEXCOM program finished replacing all en route radios (30,000) with Multimode Digital Radios (MDRs) in FY 2013.

The NEXCOM Segment 2 program began replacing radios at terminal and flight services in FY 2009 with completion scheduled in FY 2027. Ultimately 31,000 radios will be deployed into the NAS under the NEXCOM Segment 2 Program. Segment 2 is separated into two phases. Phase 1 has JRC approval from 2011 to 2018.

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

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 17,000 radios will be replaced in Phase 1. The new VHF radios can emulate the existing 25 kHz voice mode protocol for channel separation, or they can operate in the more efficient 8.33 kHz voice mode currently used in Europe. The 8.33 kHz voice-only mode divides the current bandwidth for one channel into three channels and this increase in the number of channels recovers the spectrum needed for a stand-alone data communications system (i.e., Datacom program). To support the NextGen NAS Voice systems (NVS) program, Voice over Internet Protocol (VoIP) will be integrated into Segment 2, Phase 1 VHF and UHF radios.

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

NEXCOM Segment 2, Phase 2 completes terminal and flight services facility radio modernizations that began under NEXCOM Segment 2, Phase 1. All terminal and flight services facilities will be completed with new radios during Phase 2 (FY2019 to FY2027). A total of 14,000 radios will be replaced during Phase 2.

**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 2015 – Performance Output Goals***

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

- Deploy 2,700 new Terminal Air Traffic Control Radios.
- Achieve first site initial operational capability for Segment 2 Phase 1, Oct 2014. (APB milestone)

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

- None.

***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.

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.
- Deploy 300 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.
- Achieve IOC at 450 sites. (APB milestone)
- Deploy 300 Emergency Transceivers.

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

- None.

**Program Plans FY 2019 – Performance Output Goals**

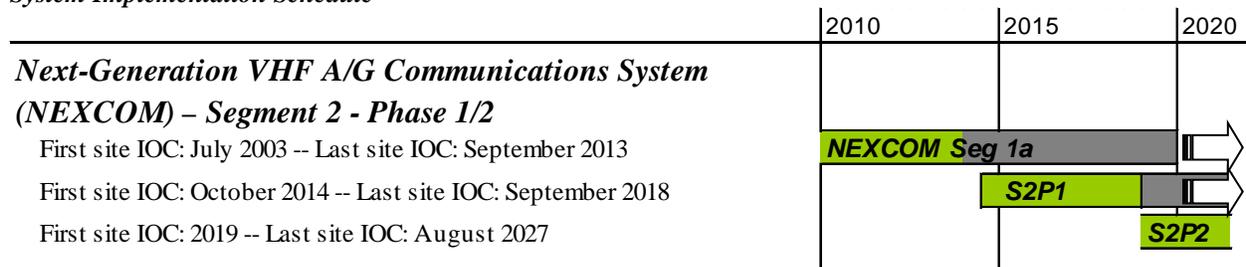
NEXCOM – Segment 2 – Phase 1 of 2 (C21.02-01):

- None.

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

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

**System Implementation Schedule**



**2A12, NEXTGEN – SYSTEM-WIDE INFORMATION MANAGEMENT (SWIM)**

**FY 2015 Request \$60.3M**

- A, System Wide Information Management (SWIM) – Segment 1, G05C.01-01 / X, System Wide Information Management (SWIM) – Segment 1 - Technology Refresh, G05C.01-05
- B, System Wide Information Management (SWIM) – Segment 2A, G05C.01-04 / X, System Wide Information Management (SWIM) – Segment 2B, G05C.01-08
- C, System Wide Information Management (SWIM) – Common Support Services Weather (CSS-Wx), G05C.01-06

**A, System Wide Information Management (SWIM) – Segment 1, G05C.01-01 / 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 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 (G05C.01-01):**

SWIM is being developed in segments. In SWIM Segment 1, nine SWIM capabilities are being implemented with SWIM-provided governance, standards, and software to support development of reusable SOA services. Segment 1 results in SOA services deployed to all ARTCCs, 39 TRACONS, the Air Traffic Control System Command Center, the William J. Hughes Technical Center (WJHTC), and NAS Enterprise Management Centers (NEMCs). The Segment 1 capabilities are as follows:

- Aeronautical Information Management (AIM) Special Use Airspace (SUA) Automated Data Exchange;
- Integrated Terminal Weather System (ITWS) Data Publication;
- Corridor Integrated Weather System (CIWS) Data Publication;
- Weather Message Switching Center Replacement (WMSCR) Pilot Report (PIREP) Data Publication;
- Reroute Data Exchange;
- SWIM Terminal Data Distribution System (STDDS);
- Traffic Flow Management (TFM) Flow Data Publication;
- Runway Visual Range (RVR) Data Publication; and
- Flight Data Publication Service (FDPS).

In FY 2011, ITWS and CIWS capabilities became operational and AIM SUA Data Exchange achieved an Initial Operating Capability (IOC). In FY 2012, WMSCR became operational and STDDS achieved an IOC.

**SWIM – Segment 1 - Technology Refresh (G05C.01-05):**

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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

**Relationship to Performance Metric**

SWIM will reduce the number and types of unique interfaces, reduce redundancy of information, better facilitate information-sharing, improve predictability and operational decision-making, and reduce the cost of service. The improved coordination that SWIM will provide will allow for the transition from tactical conflict management of air traffic to strategic trajectory-based operations. In addition, SWIM will provide the foundation for greatly enhanced information exchange and sharing outside the FAA.

***Program Plans FY 2015 – Performance Output Goals***

**SWIM – Segment 1 (G05C.01-01):**

- Begin operating on Flow Information Publication. (APB milestone)
- Begin operating on Flight Data Publication. (APB milestone)
- Complete Implementation – SWIM Tool Kits. (APB milestone)

**SWIM – Segment 1 - Technology Refresh (G05C.01-05):**

- None.

***Program Plans FY 2016-2018 – Performance Output Goals***

SWIM – Segment 1 (G05C.01-01):

- None.

SWIM – Segment 1 - Technology Refresh (G05C.01-05):

- None.

***Program Plans FY 2019 – Performance Output Goals***

SWIM – Segment 1 (G05C.01-01):

- None.

SWIM – Segment 1 - Technology Refresh (G05C.01-05):

- Complete Technology Refresh for NAS Service Registry/Repository.

**B, System Wide Information Management (SWIM) – Segment 2A, G05C.01-04 / X, 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 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 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 will result 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 Management (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 Flight Data Publication Service (FDPS) – makes flight and airspace data independent of HOST/Air Traffic Management Data Distribution System (HADDSS) 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 September 2014.

**Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

**Relationship to Performance Metric**

SWIM will reduce the number and types of unique interfaces, reduce redundancy of information, better facilitate information-sharing, improve predictability and operational decision-making, and reduce the cost of service. The improved coordination that SWIM will provide will allow for the transition from tactical conflict management of air traffic to strategic trajectory-based operations. In addition, SWIM will provide the foundation for greatly enhanced information exchange and sharing outside the FAA.

***Program Plans FY 2015 – Performance Output Goals***

SWIM Segment 2A (G05C.01-04):

- Complete Phase 3 NEMS demand assessment and associated deployment of new NEMS Nodes. (APB milestone)
- Complete NEMS Security Services Capability development and deployment. (APB milestone)
- Complete NEMS Service Management (availability and performance) Capability development and deployment.
- Complete SOA suitability assessments for NAS programs entering the FAA investment analysis process in 2015.

SWIM Segment 2B (G05C.01-08):

- None.

***Program Plans FY 2016 – Performance Output Goals***

SWIM Segment 2A (G05C.01-04):

- Complete Phase 4 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), Terminal Flight Data Manager (TFDM), 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 – 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 process in 2017.
- Additional output goals will be established at FID.

***Program Plans FY 2018 – 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 process in 2018.
- Additional output goals will be established at FID.

***Program Plans FY 2019 – 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 process in 2019.
- Additional output goals will be established at FID.

## **C, 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 instance of a 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 the NextGen. CSS-Wx will filter weather information by location and time. Consumers of the information published by CSS-Wx will include air traffic controllers, traffic managers, commercial aviation, general aviation, and the flying public. CSS-Wx will also make weather information available for integration into NextGen's enhanced decision support tools (DSTs). CSS-Wx will be the FAA's single provider of aviation weather data, consolidating several legacy weather dissemination systems. CSS-Wx will also be scalable to facilitate the addition of new users and new systems. The system is scheduled to achieve Initial Operating Capability (IOC) in FY 2017.

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 to provide only the specific data requested by a user (e.g., 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 make improved weather products 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 for input into collaborative decision-making.

The program is targeted for a Final Investment Decision (FID) in September 2014 (originally scheduled for first quarter of FY 2015). FID for CSS-Wx is scheduled to occur with FID for NWP.

**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 58,166, 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 2015 – Performance Output Goals**

- Complete Prime Contractor’s requirements review for CSS-Wx.
- Complete Preliminary Design Review (PDR) for CSS-Wx.

**Program Plans FY 2016 – Performance Output Goals**

- Complete Critical Design Review (CDR) for CSS-Wx.

**Program Plans FY 2017 – Performance Output Goals**

- Complete CSS-Wx Verification and Test Readiness Reviews.
- Complete System Acceptance Test.
- Complete Operational Testing (OT) for CSS-Wx.
- Achieve Key Site IOC for CSS-Wx.

**Program Plans FY 2018 – Performance Output Goals**

- Complete Independent Operational Assessment.
- Achieve In-Service Decision.
- Achieve CSS-Wx Operational Readiness Demonstration (ORD) at deployed sites (number of sites determined at FID).

**Program Plans FY 2019 – Performance Output Goals**

- Achieve CSS-Wx ORD at deployed sites (number of sites determined at FID).

**System Implementation Schedule**



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## **2A13, NEXTGEN – AUTOMATIC DEPENDENT SURVEILLANCE - BROADCAST (ADS-B) NAS WIDE IMPLEMENTATION**

**FY 2015 Request \$247.2M**

- A, ADS-B NAS Wide Implementation – Baseline Services & Applications (Service Volume), G02S.03-01
- X, ADS-B NAS Wide Implementation – Future Segments, G02S.01-02

### **A, ADS-B NAS Wide Implementation – Baseline Services & Applications (Service Volume), G02S.03-01**

#### **Program Description**

ADS-B is an advanced surveillance technology that provides highly accurate and more comprehensive surveillance information. ADS-B is the cornerstone technology for the 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), HOST, and Advanced Technologies and Oceanic Procedures (ATOP).

In addition to the ground-based ADS-B receiver, 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 program provides for continuing ADS-B baseline services and applications. The deployment utilizes performance based service fees for ADS-B infrastructure owned and operated by the prime contractor. It also continues implementation of baseline applications: 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.

Also included in this activity is the Colorado WAM project which is operating a Multilateration surveillance service capability. The traditional surveillance coverage provided by existing ground based radar does not allow coverage below 9,000 feet due to the mountainous terrain. The lack of surveillance forced controllers to use procedural separation standards for the Instrument Flight Rules (IFR) arriving/departing aircraft. To provide this surveillance service, receivers / transmitters were placed at multiple locations on the surface to determine the location of aircraft by triangulating the transponder signals broadcast by the radar beacon and Mode S avionics. The aircraft location information is provided to the automation system at Denver ARTCC to allow controllers to provide separation services at the four Colorado airports (Durango, Gunnison, Montrose and Telluride). The increased accuracy of this

surveillance technique safely expands the capacity of these airports to allow additional aircraft operations during instrument landing conditions.

#### Gulf Expansion:

Three additional ADS-B radio stations will be provided in Mexico which will provide coverage for all of the Gulf of Mexico (GOMEX). A Memorandum of Agreement (MOA) was signed between United States and Mexico on May 22, 2012. The MOA includes 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.

Three additional ADS-B radio stations in Mexico will provide coverage over all of the Gulf of Mexico air traffic routes extending from Houston ARTCC into Mexico. Airlines will use the routes transitioning from North to South, or South to North, and the primary area of expanded coverage is the far south of the US Flight Information Region (FIR). This will allow for reduced separation resulting in greater airspace capacity.

#### 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.*

### **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 an increase in capacity and will result in fewer delays and more optimal routing for aircraft. The efficiency benefits include reductions in weather deviations, reduced cancellations resulting from increased access to some Alaskan villages during reduced weather conditions, additional controller automation, and additional aircraft to aircraft applications. 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.

The Surveillance and Broadcast Services (SBS) baseline surveillance service includes ADS-B coverage for the U.S. portion of the Gulf of Mexico. 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, thereby allowing reduced separation for both sides of the border and enabling 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.

In Trail Procedures will enable more frequent approval of flight level requests between properly equipped aircraft using a reduced separation standard in Oceanic Airspace, improving flight efficiency.

#### ***Program Plans FY 2015 – Performance Output Goals***

##### Baseline Services and Applications:

- Provide service at 306 service volumes within specified requirements.
- Achieve Terminal ATC Separation Services IOC at 61st Site.
- Complete 40 aircraft upgrades under Boeing/Rockwell Collins/United Agreement.
- Deploy GIM-S NAS wide.
- Achieve IOC at one Airport Surface Surveillance Capability (ASSC) site.
- Complete site preparation and construction at second ASSC site.
- Pay performance based subscription charges on time.

- Provide WAM surveillance services of 99.996% availability supporting air traffic operations for the three Colorado airports.

Gulf Expansion:

- First radio station construction complete.

In Trail Procedures:

- ATOP ITP modifications completed.

***Program Plans FY 2016 – Performance Output Goals***

Baseline Services and Applications:

- Provide service at 306 service volumes within specified requirements.
- Install Surface Advisory Services at five ASSC sites.
- Achieve IOC at three ASSC sites.
- Pay performance based subscription charges on time.
- Provide WAM surveillance services of 99.996% availability supporting air traffic operations for the three Colorado airports.

Gulf Expansion:

- Remaining radio station construction complete
- Expanded GOMEX services operational at Houston – September 2016. (APB milestone)

In Trail Procedures:

- ATOP Oceanic ITP operational at Oakland Center.

***Program Plans FY 2017 – Performance Output Goals***

Baseline Services and Applications:

- Provide service at 306 service volumes within specified requirements.
- Install Surface Advisory Services at two ASSC sites.
- Achieve IOC at three ASSC sites.
- Pay performance based subscription charges on time.
- Provide WAM surveillance services of 99.996% availability supporting air traffic operations for the three Colorado airports.

Gulf Expansion:

- Pay performance based subscription charges on time.

In Trail Procedures:

- ATOP Oceanic ITP operational at New York and Anchorage Centers.

***Program Plans FY 2018 – Performance Output Goals***

Baseline Services and Applications:

- Provide service at 306 service volumes within specified requirements.
- Pay performance based subscription charges on time.
- Provide WAM surveillance services of 99.996% availability supporting air traffic operations for the three Colorado airports.
- Achieve IOC at two ASSC sites.

Gulf Expansion:

- Pay performance based subscription charges on time.

In Trail Procedures:

- None.

***Program Plans FY 2019 – Performance Output Goals***

Baseline Services and Applications:

- Provide service at 306 service volumes within specified requirements.
- Pay performance based subscription charges on time.
- Provide WAM surveillance services of 99.996% availability supporting air traffic operations for the three Colorado airports.

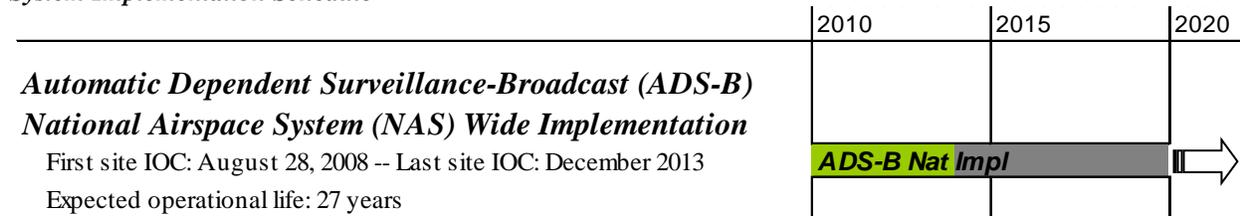
Gulf Expansion:

- Pay performance based subscription charges on time.

In Trail Procedures:

- None.

**System Implementation Schedule**



**X, ADS-B NAS Wide Implementation – Future Segments, G02S.01-02**

**Program Description**

The program will develop and implement ADS-B In Applications. Information is sent to aircraft using ADS-B In, which shows all aircraft in the area, including those not equipped with ADS-B technology, via a cockpit display. This improves flight safety by enhancing pilot situational awareness and providing advisories so pilots can determine airborne and airport surface hazards.

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 define 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, and the strategy was published October 2012.

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. These final investment decisions will encompass the work activities and milestones for the Future Segments of the SBS program.

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 and this CIP, G02S.01-02, supports the implementation activities from FY 2017 and beyond. The program is planning an Investment Analysis Readiness Decision (IARD) for the first set of ADS-B In applications in Q4 FY 2014, and a Final Investment Decision (FID) in Q3 FY 2016. Follow on investment decisions include an IID for Advanced ADS-B In applications in Q2 FY 2017 (Decision Point (DP) 885) and an FID in Q3 FY 2018 (DP 883).

**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.*

**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 an increase in capacity and will result in fewer delays and more optimal routing for aircraft. The efficiency benefits include reductions in weather deviations, reduced cancellations resulting from increased access to some Alaskan villages during reduced weather conditions, additional controller automation, and additional aircraft to aircraft applications.

***Program Plans FY 2015-2016 – Performance Output Goals***

- None.

***Program Plans FY 2017 – Performance Output Goals***

- Complete vendor Specifications (ERAM, TBFM, and TAMR).
- Complete Preliminary Design Review with automation vendors.
- Complete Critical Design Review with automation vendors.
- Begin software development with ERAM automation vendor.

***Program Plans FY 2018 – Performance Output Goals***

- Continue software development with ERAM automation vendor
- Begin software development with TAMR automation vendor.

***Program Plans FY 2019 – Performance Output Goals***

- Complete software development with ERAM automation vendor.
- Continue software development with TAMR automation vendor
- Begin software development with TBFM automation vendor.
- Complete Final ERAM Verification Requirements Traceability Matrix.
- Begin Avionics Certification.

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**2A14, WINDSHEAR DETECTION SERVICE (WDS)**

**FY 2015 Request \$4.3M**

- 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 currently deployed in the NAS. The program will address obsolescence of the legacy systems Weather Systems Processor (WSP), Low Level Wind Shear Alert System (LLWAS) and Wind Measuring Equipment (WME). The program will sustain existing service levels by upgrading components of existing systems to mitigate safety hazards and to resolve obsolescence/supportability issues of the 34 WSP, 60 WME, and 50 LLWAS systems currently 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 2015 – Performance Output Goals***

- Complete the design and development of Weather Systems Processor (WSP) Radar Video Processor (RVP) and award the Production Contract.
- Complete the design and development of 1<sup>st</sup> Article for the Key Site Test of Wind Measuring Equipment (WME) Upgrade.
- Complete Deployment of 40 Low Level Wind Shear Alerting System (LLWAS) Ultra High Frequency (UHF) Radios.

***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***

- First WME site upgrade complete (1 of 62, 2%). (APB milestone)
- Install WSP site upgrade at 19 sites (20 of 34, 59%).
- Install WME site upgrade at 30 sites (31 of 62, 50%).

***Program Plans FY 2018 – Performance Output Goals***

- Last WME site upgrade complete (62 of 62, 100%). (APB milestone)
- Last WSP site upgrade complete (34 of 34, 100%). (APB milestone)

***Program Plans FY 2019 – Performance Output Goals***

- None.

## **X, Juneau Airport Wind System (JAWS) – Technology Refresh, W10.01-02**

### **Program Description**

The 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. The 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.

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 first technology refresh of 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.

### **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 2015-2018 – Performance Output Goals***

- None.

***Program Plans FY 2019 – Performance Output Goals***

- Achieve Initial Analysis Readiness Decision.
- Begin Final Investment Analysis.

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**2A15, NEXTGEN – COLLABORATIVE AIR TRAFFIC MANAGEMENT PORTFOLIO**

**FY 2015 Request \$13.5M**

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

**A, Collaborative Air Traffic Management Technologies (CATMT) – Work Package 3, G05A.05-02 / X, 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 (TMU) 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 which result in significant benefits to passengers and airlines. TFM benefits the airlines, general aviation, U.S. Department of Defense (DoD), U.S. Department of Homeland Security, industry, and partner countries.

CATMT Work Package 3 (G05A.05-02):

CATMT Work Package 3 (WP3) provides enhancements to the TFM from FY 2011 to 2015. The FAA baseline for WP 3 includes the following capability enhancements:

- TFM Remote Site Re-engineering (TRS-R) – Modernizes the software (SW) infrastructure, backbone of the TFM decision support tool suite used by Traffic Managers in the field:
  - Phase 1 – Consolidates three software base 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 to one modernized suite. This is the first and fundamental step for future mid-term CATMT capabilities as well as 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 SWIM as the medium for information exchanges between the TFM system and external systems to receive Special Use Airspace (SUA) 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 2016 through 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.

CATMT WP4 Final Investment Decision (FID) is planned for 3<sup>rd</sup> 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.*

**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 2015 – Performance Output Goals***

CATMT WP3 (G05A.05-02):

- Complete deployment of CIX. (APB milestone)
- Complete detailed design review of 2nd increment of TRS-R Phase 2.

CATMT Work Package 4 (G05A.05-03):

- None.

***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 Final Investment Decision and contract award, begin design and development of CATMT Work Package 4.
- Pending JRC Final Investment Decision, award contract for the TFMS/CATMT WP4.

***Program Plans FY 2017-2019 – Performance Output Goals***

CATMT WP3 (G05A.05-02):

- None.

CATMT WP4 (G05A.05-03):

- Pending JRC Final Investment Decision and contract award, continue design, development and deployment of CATMT Work Package 4.

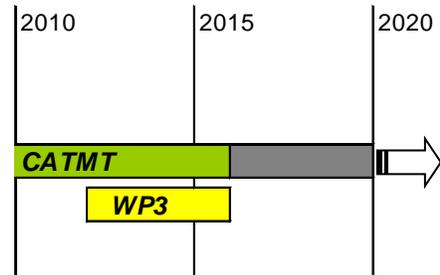
### System Implementation Schedule

#### **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: 2015

WP4 - Pending final investment decision



### **B, Strategic Flow Management Application, G05A.01-01**

#### **Program Description**

Strategic Flow Management Application (SFMA) program will develop concepts, requirements and investment decision documentation to enhance Airborne Re-Route (ABRR) capabilities. ABRR has been developed and will be deployed by 2015 to the ATCSCC's. Future ABRR capabilities will identify and formulate of complex reroutes in TFMS and communicate these complex reroutes from Airline Operations Centers/Flight Operations Centers to TFMS, then through ERAM to the aircraft via Data Communications. This program will also develop risk mitigation strategies and assess possible changes in work behavior due to emerging technologies and 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 58,166, 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 concept provides controllers, pilots, and flight operators with more choices when negotiating dynamic reroutes for active aircraft.

#### **Program Plans FY 2015 – Performance Output Goals**

- Develop Concept of Use document.
- Update Operational Sequence Diagrams.
- Conduct functional analysis and develop report.
- Develop operational requirements document.
- Develop Operational Impact document.
- Develop Human in the Loop (HITL) Plan.
- Update functional analysis and requirements documents using results of HITL to validate concepts.

#### **Program Plans FY 2016 – Performance Output Goals**

- Prepare business case artifacts, to include projected costs and benefits.
- Prepare NAS enterprise artifacts.
- Prepare operational safety documentation.

***Program Plans FY 2017 – Performance Output Goals***

- Update business case artifacts, to include projected costs and benefits.
- Update NAS enterprise artifacts.
- Update operational safety documentation.

***Program Plans FY 2018 – Performance Output Goals***

- Achieve FID.
- Develop shortfall analysis report for the use of advanced flow management and reroute operations, leveraging Airborne Reroute Execution (ABRR) and data comm-enabled complex clearances.
- Develop initial CONOPs and operational scenarios documents.

***Program Plans FY 2019 – Performance Output Goals***

- Update functional analysis and requirements documents using results of HITL to validate advanced flow management and reroute operations concepts.
- Assess interoperability of advanced flow management and reroute operations concept with existing and planned traffic flow management capabilities.
- Update CONOPs and develop initial functional analysis document.

## **C, Strategic Flow Management Engineering Enhancement, G05A.01-02**

### **Program Description**

The Strategic Flow Management Engineering Enhancement program develops concepts to address operational Traffic Flow Management (TFM) shortfalls and prepares analysis and documentation supporting FID. Implementation will be accomplished by the TFMS program. This program will also develop TFM enhancements for future work packages.

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 made more efficient through establishing strategic methods for mitigating delay and capacity issues. These strategic plans may provide predictability as well as a resource to base future decisions. The systems and capabilities that are used for TFM today do not provide an adequate foundation for future enhancements.

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 do not come together to formulate a dynamic, complete view of the operation or to provide optimal support to operational decision-making. Many of the functions performed by Traffic Managers require manual assimilation of data from various sources. Similarly, limited modeling capabilities necessitate mental integration and projection of data into the future. The potential impact of some traffic management initiatives is not known until the initiative is implemented. Traffic Managers do their best to estimate the impact by gathering data and applying their experience of how the initiative has performed in the past. Not only are these processes cognitively demanding and workload-intensive, they also make the effectiveness of the 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 earlier and to make better decisions. Better modeling capabilities will allow them to assess the effectiveness and potential impact of their decisions before they are implemented.

In 2016, the program will begin development of the next set, or package, of TFM 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 58,166, or higher, arrivals and departures.*

## Relationship to Performance Metric

Implementation of the capabilities in CATMT WP4 (and future TFM enhancements) 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 resource capacity.

### *Program Plans FY 2015 – Performance Output Goals*

- Complete development of documents to support the CATMT WP4 FID.
- Complete contract technical and cost proposal evaluations.

### *Program Plans FY 2016 – Performance Output Goals*

- Complete gap analysis document to determine operational, functional and performance gaps associated with TFM after WP4.
- Complete priority ranking document of gaps for next set of TFM enhancements (post WP4).

### *Program Plans FY 2017 – Performance Output Goals*

- Develop Initial Shortfalls Analysis Report and Concepts and Requirements Document (CRD) Plan.
- Achieve Concept Requirements Development Readiness (CRDR).

### *Program Plans FY 2018 – Performance Output Goals*

- Develop necessary documentation to support IARD.
- Achieve IARD.

### *Program Plans FY 2019 – Performance Output Goals*

- Complete Initial Investment Decision (IID). Deliverables include:
  - Initial Program Requirements
  - Business Case Analysis Report (BCAR)
  - Enterprise Architecture Artifacts
  - Implementation Strategy and Planning Document (ISPD)
  - Chief Financial Officer (CFO) Package

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## **2A16, NEXTGEN – TIME BASED FLOW MANAGEMENT (TBFM) PORTFOLIO**

**FY 2015 Request \$21.0M**

### **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 evolution of the TMA Program. This system uses Time Based Metering (TBM) software to optimize the capacity in the NAS. TBFM will improve upon TMA and directly address NextGen Portfolios.

TBFM Work Packages 3 and 4 will modernize and enhance the existing TBFM system. TBFM is a vital part of the NAS and enhances air traffic operations, by reducing delays and increasing efficiency of airline operations. TBFM is an automation system currently available that enables the use of time-based metering to optimize the flow of aircraft as they approach and depart congested airspace and airports. TBFM has been field-tested over the past 10 years and is already installed in the 20 Air Route Traffic Control Centers (ARTCC) and adapted for most of the major airports served by those centers.

TBFM Work Package 3 (G02A.01-06):

TBFM Work Package 3 is a follow-on phase of TBFM WP2 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; expansion of the Integrated Departure/Arrival Capability (IDAC) to additional locations; and making TBFM more flexible to accommodate reroute operations during adverse weather conditions. The design, development and deployment of these concepts will occur during the 2015-2019 timeframe. These enhancements support the current NextGen Operational Improvements including:

- ***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 TMA system (IDAC).
- ***Point-in-Space Metering (104120)*** – Provides the flexibility to enable alternate, Predefined Meter Points (PDMP) in en route airspace, which will help to support metering during reroute operations when nominal meter points are not available or useable due to weather or changes to traffic flows. Also adds path stretching to advisories to enable meter times to be met more efficiently and more accurately.
- ***Time Based Metering Using RNAV and RNP Route Assignments (104123)*** – Provides users with more efficient and consistent arrival and departure routings and fuel-efficient operations. Metering automation will manage the flow of aircraft to meter fixes, thus permitting efficient use of runways and airspace.
- ***Time-Based Metering in the Terminal Environment (104128)*** – Supports a time-based sequencing and spacing capability in the terminal environment by providing TBFM runway and sequence assignment information to terminal automation for display to controllers.

Final Investment Decision for Work Package 3 is planned for December 2014.

TBFM Technology Refresh (G02A.01-07):

TBFM Technology Refresh will replace the equipment that was deployed in 2013 with new equipment in the FY 2018-2019 time frame. The current equipment will begin to reach its end of life and 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 Final Investment Decision to replace this hardware.

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; replacing aged equipment with new modern equipment; providing NAS user preferences including preferred runway, arrival sequence or slot swapping; and integrating strategic and tactical scheduling to reduce delays for departures.

### **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 58,166, or higher, arrivals and departures.*

### **Relationship to Performance Target**

TBFM will expand time based metering solutions across 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 TMA has provided an average of 3-5% increase in throughput at the airports where it is installed.

***Program Plans FY 2015 – Performance Output Goals***

**TBFM Work Package 3 (G02A.01-06):**

- Complete all documents necessary for Final Investment Decision including:
  - Requirements document
  - Business Case
  - Implementation Strategy and Planning Document
  - Acquisition Program Baseline
- Achieve Final Investment Decision.
- Award Work Package 3 enhancements/work to approved vendor.
- Complete following documents for Terminal Sequencing and Spacing (TSS) capability:
  - Implementation plan
  - Specification Documentation

**TBFM Technology Refresh (G02A.01-07):**

- Complete the following products in support of the Investment Analysis Readiness Decision (IARD):
  - Preliminary Program Requirements (pPR) documentation
  - Quantified Shortfall Analysis report
  - Enterprise Architecture documentation

**TBFM Work Package 4 (G02A.01-08):**

- None.

***Program Plans FY 2016 – Performance Output Goals***

**TBFM Work Package 3 (G02A.01-06):**

- Complete preliminary software review for TSS.
- 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 (IARD):
  - Preliminary alternatives analysis report
  - Initial Investment Analysis Plan (IAP)

**TBFM Work Package 4 (G02A.01-08):**

- None.

***Program Plans FY 2017 – Performance Output Goals***

**TBFM Work Package 3 (G02A.01-06):**

- Outputs to be defined at FID

**TBFM Technology Refresh (G02A.01-07):**

- Complete documentation for FID to include:
  - Requirements document
  - Business Case
  - Implementation Strategy and Planning Document
  - Acquisition Program Baseline.
- Achieve FID.
- Award contract.

**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 established at FID.

**TBFM Technology Refresh (G02A.01-07):**

- Outputs to be established 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
  - Quantified Shortfall Analysis report
  - Enterprise Architecture documentation

***Program Plans FY 2019 – Performance Output Goals***

TBFM Work Package 3 (G02A.01-06):

- Outputs to be established at FID.

TBFM Technology Refresh (G02A.01-07):

- Outputs to be established at FID.

TBFM Work Package 4 (G02A.01-08):

- Complete all documents necessary for Final Investment Decision including:
  - Requirements document
  - Business Case
  - Implementation Strategy and Planning Document
  - Acquisition Program Baseline
- Award contract.

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**2A17, NEXTGEN – NEXT GENERATION WEATHER PROCESSOR (NWP)**

**FY 2015 Request \$23.3M**

**Weather Forecast Improvements – NextGen Weather Processor (NWP), Work Package 1, G04W.03-02**

**Program Description**

The goal of the NextGen Weather Processor (NWP) program is to establish a common weather processing platform that will functionally replace the legacy FAA weather processor systems and host new capabilities. As input, NWP will use information from the FAA and National Oceanic and Atmospheric Administration (NOAA) radar and sensors and NOAA forecast models. NWP will use sophisticated algorithms to create aviation-specific current and predicted weather information. NWP will create value-added weather information that will be available in the Common Support Services-Weather (CSS-Wx) system. It will perform weather translation, which will enable the use of weather information by automated decision-support tools (DSTs). NWP will also provide aviation safety related windshear products. The NWP will aid in reducing the rising operating and maintenance costs by integrating the functions of the following systems over its lifecycle:

- Corridor Integrated Weather System (CIWS): Provides 0 - 2 hour aviation weather information to the Traffic Flow Management System (TFMS) and associated users;
- 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 is targeted for September 2014. FID for CSS-Wx is scheduled to occur with FID for NWP.

### Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 6 – Improve throughput at Core airports during adverse weather by 14 percent by 2018. (FAA Business Planning Metric)*

### Relationship to Performance Metric

NWP produces improved weather radar mosaics and predictions for integration into decision support tools for collaborative and dynamic NAS decision making. It enhances capacity 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. Initial estimates of airline and passenger cost savings (including fuel costs, downstream connection delays for passengers, etc.) attributed to these advanced en route weather applications exceed \$290M per year. The effect of NWP capabilities will be to tactically and strategically decrease avoidable aircraft delays, diversions, and cancellations.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Complete NWP WP1 Prime Contractors requirements review.
- Complete NWP WP1 Preliminary Design Review (PDR).

#### ***Program Plans FY 2016 – Performance Output Goals***

- Complete Critical Design Review (CDR) for NWP WP1.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Complete NWP WP1 Verification and Test Readiness Reviews.
- Complete NWP WP1 Factory Acceptance Test (FAT).
- Complete NWP WP1 Operational Testing (OT).

#### ***Program Plans FY 2018 – Performance Output Goals***

- Achieve NWP WP1 Key Site Initial Operational Capability (IOC).
- Complete NWP WP1 Independent Operational Assessment (IOA).
- Achieve NWP WP1 In-Service Decision.
- Achieve NWP WP1 Operational Readiness Demonstration (ORD) at deployed sites (number of sites determined at FID).

#### ***Program Plans FY 2019 – Performance Output Goals***

- Achieve NWP WP1 ORD at deployed sites (number of sites determined at FID).

### System Implementation Schedule



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## **2A18, AIRBORNE COLLISION AVOIDANCE SYSTEM X (ACAS X)**

**FY 2015 Request \$12.0M**

### **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 2015 – Performance Output Goals**

- Freeze design for Surveillance and Tracking Module (STM) and Threat Resolution Monitor for ACAS Xa. (Execution milestone)
- Complete ACAS Xa and Xo Full Flight Test of Prototypes. (Execution milestone)

***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. (Execution milestone)

***Program Plans FY 2018 – Performance Output Goals***

- RTCA publish MOPS. (Execution milestone)

***Program Plans FY 2019 – Performance Output Goals***

- Complete operational evaluation of ACAS X (Limited Implementation Program with Commercial Airlines on Host Aircraft). (Execution milestone)

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**2A19, NEXTGEN – DATA COMMUNICATION IN SUPPORT OF NEXTGEN**

**FY 2015 Request \$147.3M**

**Data Communications – Segment 1 Phase 1, G01C.01-05 / Data Communications – Segment 1 Phase 2, G01C.01-06 / X, Data Communications – ATN Gateway, G01C.01-08**

**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 Air Traffic Control (ATC) clearances, instructions, traffic flow management, flight crew requests and reports. Data Comm is critical to the success of NextGen operations, enabling efficiencies not possible using the current voice system by providing NAS infrastructure enhancements to support NextGen operational improvements.

Data Comm will enhance NAS operations through:

- Reduced impact of ground delay programs, airport reconfigurations, convective weather, congestion, and other causes;
- Reduced communication errors;
- Improved controller and pilot efficiency through automated information exchange;
- Enabled NextGen services (e.g., enhanced re-routes, trajectory operations); and
- Increased 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 2 phases. Future Segment 2 will further build upon the Departure Clearance and En Route services by supporting the delivery of services to enable the transfer of complex clearances and more advanced NextGen operations not possible using voice communications, such as four-dimensional trajectories, optimized profile descents, and advanced flight interval management. Data Comm will also implement an Aeronautical Telecommunications Network (ATN) compliant ground system to support the advanced avionics required for NextGen services. ATN is an internetwork architecture that allows ground/ground, air/ground, and avionic data subnetworks to interoperate by adopting common interface services and protocols.

**Data Communications – Segment 1 Phase 1 (G01C.01-05):**

In Segment 1 Phase 1 (S1P1), the Data Comm program will deliver Departure Clearances (DCL) to 57 towers 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 Segment 1 Phase 1 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 the interoperability of aircraft avionics and ATC automation;
- 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

#### Data Communications – Segment 1 Phase 2 (G01C.01-06):

Segment 1 Phase 2 (S1P2) will leverage the S1P1 infrastructure to deliver services to the En Route domain. En Route services will include airborne reroutes, controller and pilot initiated downlinks, altitude and altimeter settings, tailored arrivals, issuing crossing restrictions, holding restrictions and will automate routine communications such as advisory messages, beacon codes, and transfer of communications and initial check-in. 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. As Data Comm becomes fully operational, the majority of pilot-controller exchanges will be handled by Data Comm for appropriately equipped users. A Final Investment Decision for S1P2 is planned for FY 2015.

The major elements of the Segment 1 Phase 2 implementation are:

- TDLS software enhancements to provide additional services to Tower controllers;
- ERAM software enhancements for En Route Controller-Pilot Data Link Communications (CPDLC) applications;
- DCNS expanded coverage and capacity; and
- Continuation of the Avionics Equipage Initiative strategy implemented in S1P1.

A 4D Trajectory Demonstration will be conducted to provide analysis of feasibility of advanced trajectory management in NextGen timeframes. The demonstration will show the benefits of a limited Data Comm ATN Baseline 2 to support future Data Comm investment for ground and flight deck.

#### 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 addition of ATN will support the implementation of more advanced NextGen services such as advanced Trajectory Based Operations (TBO), advanced flight interval management, optimized profile descents, and dynamic Required Navigation Performance (RNP). This will also provide the infrastructure to support advanced capabilities and additional research and development in the 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.

## **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 58,166, 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 enhance airspace throughput, flight times, and other efficiencies 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 will make better use of available NAS resources such as airspace and airports. This improvement will occur for routine operations and be even more critical during system disruptions such as weather. Data Communications is a key transformational program under NextGen that will enable advanced capabilities, such as Trajectory Based Operations, Optimized Profile Descents, Advanced Flight Interval Management, Enhanced Surface Movement, and Dynamic RNP. Data Communication will also reduce operational errors, enhancing the safety and efficiency of the NAS.

### ***Program Plans FY 2015 – Performance Output Goals***

#### **Data Communications – Segment 1 Phase 1 (G01C.01-05):**

- DCNS Build 2 delivered at WJHTC.
- Complete integration and testing of the subsystems to deliver Data Comm Services.

#### **Data Communications – Segment 1 Phase 2 (G01C.01-06):**

- Achieve FID for En Route Services.
- System Requirements and Design Technical Interchange Meetings for En Route Services.
- 4-D Trajectory Demo:
  - Develop demonstration requirements and procedures.
  - Development of demonstration scenarios for evaluation.

#### **Data Communications – ATN Gateway (G01C.01-08):**

- None.

### ***Program Plans FY 2016 – Performance Output Goals***

#### **Data Communications – Segment 1 Phase 1 (G01C.01-05):**

- Complete Operational Test & Evaluation (OT&E). (APB Milestone)
- Initial Operational Capability (IOC) for Tower Services. (APB Milestone)

#### **Data Communications – Segment 1 Phase 2 (G01C.01-06):**

- Complete system requirements and design effort.
- 4-D Trajectory Demo:
  - Conduct demonstration evaluation.
  - Complete initial report and evaluation analysis report.
  - Complete a post-demonstration analysis.

#### **Data Communications – ATN Gateway (G01C.01-08):**

- None.

### ***Program Plans FY 2017 – Performance Output Goals***

#### **Data Communications – Segment 1 Phase 1 (G01C.01-05):**

- Data Comm In-Service Decision (ISD). (APB Milestone)
- Key Site Operational Readiness Decision (ORD). (APB Milestone)

#### **Data Communications – Segment 1 Phase 2 (G01C.01-06):**

- Complete software development for En Route Services.

#### **Data Communications – ATN Gateway (G01C.01-08):**

- Begin Final Investment Analysis of ATN ground system.

***Program Plans FY 2018 – Performance Output Goals***

Data Communications – Segment 1 Phase 1 (G01C.01-05):

- Data Comm directives development and validation for Air Traffic and Tech Ops.

Data Communications – Segment 1 Phase 2 (G01C.01-06):

- Complete developmental testing.
- Additional milestones will be developed at FID.

Data Communications – ATN Gateway (G01C.01-08):

- Continue Final Investment Analysis.

***Program Plans FY 2019 – Performance Output Goals***

Data Communications – Segment 1 Phase 1 (G01C.01-05):

- Complete deployment of DCL Services.
- Achieve Final Operating Capability (FOC).

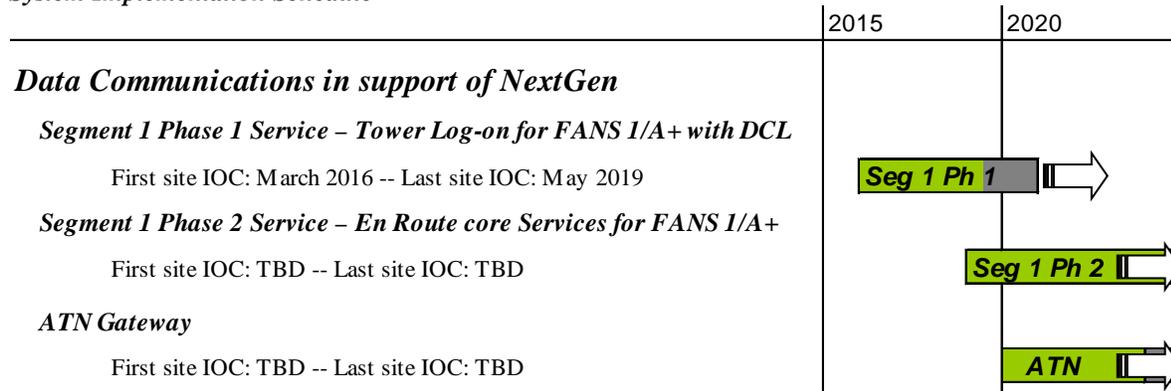
Data Communications – Segment 1 Phase 2 (G01C.01-06):

- Complete Operational Testing.
- Additional milestones will be developed at FID.

Data Communications – ATN Gateway (G01C.01-08):

- Achieve FID.

***System Implementation Schedule***



**B: Terminal Programs**

**2B01, AIRPORT SURFACE DETECTION EQUIPMENT - MODEL X (ASDE-X)**

**FY 2015 Request \$5.4M**

**ASDE-X – Technology Refresh & Disposition, S09.01-01**

**Program Description**

The FAA rebaseline decision in 2005 includes the ASDE-X Technology Refresh program that 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.

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. Three of the five potential projects identified in the study were approved.

The following three 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 at 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.

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 2015 – Performance Output Goals***

- Complete installation of the ASDE-X Technology Refresh processor solution at two of the 35 airports.

#### ***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.

#### ***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.

#### ***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)

**Program Plans FY 2019 – Performance Output Goals**

- None.

**System Implementation Schedule**

	2010	2015	2020
<b>Airport Surface Detection Equipment – Model X (ASDE-X)</b>			
First ORD October 2003 -- Last ORD: July 2011	ASDE-X		
First Site Delivery: January 2015 -- Last Site Delivery: August 2018		ASDE-X TR	

**2B02, TERMINAL DOPPLER WEATHER RADAR (TDWR) – PROVIDE  
FY 2015 Request \$1.9M**

**Terminal Doppler Weather Radar (TDWR) – Service Life Extension Program (SLEP) –  
Phase 2, W03.03-02**

**Program Description**

The primary mission of the TDWR is to enhance the safety of air travel through timely detection and reporting of hazardous weather conditions including wind-shear events, microburst, gust fronts, and thunderstorms in and near an airport’s terminal approach and departure zones. TDWRs are installed at higher-density airports with high occurrences of thunderstorms, and provide controllers current information on severe weather so that they can issue warnings to pilots. There have been no wind shear accidents at any TDWR-protected airport since its TDWR was commissioned. TDWRs are operational at 46 airports. TDWR weather data is transmitted to FAA automation systems and to 34 National Weather Service forecast offices.

The TDWR is an important component of the FAA and National Weather Service (NWS) weather information, alerting and forecasting family of monitoring and predicting systems. The current system has been in service since 1994 and is facing serious obsolescence issues and must be updated.

TDWR SLEP Phase 2 will address TDWR components not addressed in Phase 1 that have deteriorated due to aging, and have become obsolete or unsupported. An investment analysis/business case will be prepared which includes the Diminishing Manufacturing Sources and Material Shortages (DMSMS) study. This effort will review:

- Logistics supportability,
- Reliability, Maintainability, and Availability (RMA) analysis,
- Site conditions to check the integrity of radar equipment, facilities/shelters and grounding systems, and
- A cost-benefit analysis in preparation for the Investment Analysis Readiness Decision (IARD).

Final Investment Decision is planned in the 4<sup>th</sup> quarter of 2015.

**Alignment of Program to FAA Strategic Priority and Performance Metric**

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

**Relationship to Performance Metric**

The TDWR's required inherent availability (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 2015 – Performance Output Goals***

- Complete Final Program Requirements document.
- Complete Final Business Case.
- Complete Final Implementation Strategy and Planning Document.
- Update Enterprise Architecture Products and Amendments.
- Achieve Initial Investment Decision.

***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

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**2B03, STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS) (TAMR PHASE 1)**

**FY 2015 Request \$50.7M**

**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 (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 our TRACON facilities and airport traffic control towers. Air traffic controllers use the STARS automation and displays 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 baseline and the 5 sites deployed by the TAMR Phase 2 program are complete, and these STARS are in the hardware technology refresh life cycle phase. The technology refresh program provides updated high-resolution 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 is necessary to address 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 providing security modifications to the software baseline.

STARS – Technology Refresh Future Phases (A04.01-03):

The STARS Technology Refresh Future Phases program will continue to address the technology refresh updates needed to sustain the STARS system and support NextGen enhancements. The FAA began a program in 2012 to install STARS at 108 additional locations. Beginning in FY 2019, this new program will be responsible for technology refresh of all STARS sites. Technology refresh is necessary to address obsolescence and security gaps.

**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**

During FY 2011 and through March 2012, STARS had 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 2015 – Performance Output Goals***

**STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):**

- Procure processors for upgrades from G1 to G4 configuration at three operational sites.
- Procure flat panel displays for upgrades at three 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 2016 – Performance Output Goals***

**STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):**

- Procure processors for upgrades from G1 to G4 configuration at 12 additional 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 additional 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 seven additional operational sites.
- Procure flat panel displays for upgrades at seven 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<sup>th</sup> site (26 of 48). (APB milestone)

**STARS – Technology Refresh Future Phases (A04.01-03):**

- None.

***Program Plans FY 2019 – Performance Output Goals***

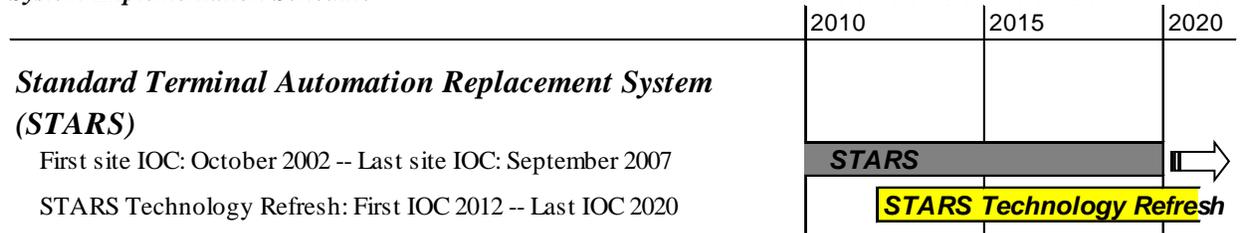
**STARS – Technology Refresh (TAMR Phase 1) (A04.01-01):**

- Complete IOC at 39<sup>th</sup> site. (APB milestone) (Prior year funding)

**STARS – Technology Refresh Future Phases (A04.01-03):**

- Procure processors for upgrades from G1 to G4 configuration at seven additional operational sites.
- Procure flat panel displays for upgrades at seven operational sites.
- Implement mandatory software security and safety enhancements, new functionality and upgrades needed for enhanced performance and capacity in the support of NextGen initiatives.

**System Implementation Schedule**



**2B04, TERMINAL AUTOMATION MODERNIZATION/ REPLACEMENT PROGRAM (TAMR PHASE 3)**

**FY 2015 Request \$136.2M**

- A, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1, A04.07-01
- B, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 2, A04.07-02

**A, Terminal Automation Modernization – Replacement (TAMR) – Phase 3, Segment 1, A04.07-01**

**Program Description**

The TAMR program employs a three-phased approach to modernizing the air traffic control systems that controllers use to control traffic approaching or leaving the nation's major airports. The first phase of the program – TAMR Phase 1 – replaced the automated radar processing and display systems at TRACON facilities, and their associated airport traffic control towers. Phase 1 deployed Standard Terminal Automation Replacement System (STARS) to 47 sites. TAMR Phase 2 involved the replacement of automation systems at five additional TRACONs and the modernization of 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 segments to better address short-term versus long-term 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) IIIIE sites. TAMR Phase 3 Segment 2 will address the remaining 97 Automated Radar Terminal System (ARTS) sites. On December 21, 2011, the JRC approved the Final Investment Decision for Segment 1.

TAMR Phase 3 Segment 1 will replace 11 existing CARTS IIIIE facilities with STARS hardware and software components. In particular, TAMR Phase 3 Segment 1 will:

- Begin convergence to a single Terminal Automation hardware and software platform by replacing the IIIIE facility with STARS at Dallas (D10) by 2013.
- Replace remaining 10 IIIIE facilities with STARS by 2017 to complete the convergence of the IIIIE'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 provides the FAA with a strategy to support ADS-B requirements and continue with the FAA's original plan for terminal convergence to one automation platform originally established under the Standard Terminal Automation Replacement System (STARS) contract. Once executed, terminal convergence will eliminate a redundant need to sustain both STARS and Common Automated Radar Terminal System (CARTS) and eliminate the need to continue with redundant software development activities.

### Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 2 – Maintain an average daily capacity for Core airports of 58,166, 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 provides a platform to modernize the 11 IIIIE facilities in alignment with near-term NextGen requirements such as support for ADS-B.

#### *Program Plans FY 2015 – Performance Output Goals*

- Complete ORD at Dallas (D10) on second software build, May 2015. (APB milestone)
- Complete STARS equipment installation at two additional sites.
- Purchase STARS hardware for last three sites.
- Complete Initial Operating Capability (IOC) at 5<sup>th</sup> site. (APB milestone)

#### *Program Plans FY 2016 – Performance Output Goals*

- Complete IOC at 8<sup>th</sup> site, July 2016. (Prior year funds)
- Complete IOC at 9<sup>th</sup> site, August 2016. (Prior year funds)

#### *Program Plans FY 2017 – Performance Output Goals*

- Complete IOC at 10<sup>th</sup> site, October 2016. (Prior year funds)
- Complete last IOC. (APB milestone) (Prior year funds)

#### *Program Plans FY 2018 – Performance Output Goals*

- Complete ORD at 11<sup>th</sup> site, October 2017. (APB milestone) (Prior year funds)

#### *Program Plans FY 2019 – Performance Output Goals*

- None.

### *System Implementation Schedule*



- JRC Decision – Authorization to Proceed – December 2010.
- Final Investment Decision for Segment 1 – December 2011.
- Contract Definitization – May 2012.

## **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 airport traffic control towers. Phase 1 deployed Standard Terminal Automation Replacement System (STARS) to 47 sites. TAMR Phase 2 involved the replacement of automation systems at five additional TRACONs and the

modernization of 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.

This approach for TAMR Phase 3 Segment 2 provides the FAA with a strategy to support ADS-B requirements and continue with the FAA's original plan for terminal convergence to one automation platform originally established under the STARS contract. Once executed, terminal convergence will eliminate a redundant need to sustain both STARS and Common Automated Radar Terminal System (CARTS) and eliminate the need to continue with 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 58,166, 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 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 2015 – Performance Output Goals***

- Achieve IOC at five additional sites.
- Complete site preparation at 10 additional sites.
- Complete installation of hardware at 12 additional sites.
- Procure 30 additional systems (22 operational and 8 support).

#### ***Program Plans FY 2016 – Performance Output Goals***

- Procure 26 operational systems.
- Deliver 42 additional systems (36 operational and 6 support).
- Complete IOC at 12<sup>th</sup> ARTS IIE site. (APB milestone)

#### ***Program Plans FY 2017 – Performance Output Goals***

- Procure 26 operational systems.
- Deliver 13 additional operational systems.
- Complete IOC at 34<sup>th</sup> ARTS IIE site. (APB milestone)

#### ***Program Plans FY 2018 – Performance Output Goals***

- Deliver 27 additional systems (26 operational and 1 support).
- Complete IOC at 65<sup>th</sup> ARTS IIE site. (APB milestone)
- Procure 11 systems (10 operational and 1 support).

**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)

**System Implementation Schedule**



Final Investment Decision for Segment 2 was approved September 2012.

**2B05, TERMINAL AUTOMATION PROGRAM**

**FY 2015 Request \$1.6M**

**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 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 (TRACON, 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) COTS and modified COTS equipment. The FDIO system is mainly comprised of computers, servers, monitors, keyboards, printers, and circuit cards that are commercially available. The program is based on a 5 year replacement cycle for the various components in order to maintain system operational availability. Individual components are procured and replaced as they reach their end of life.

**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 COTS 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 2015 – 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.

**Program Plans FY 2016 – 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.

**Program Plans FY 2017 – 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.

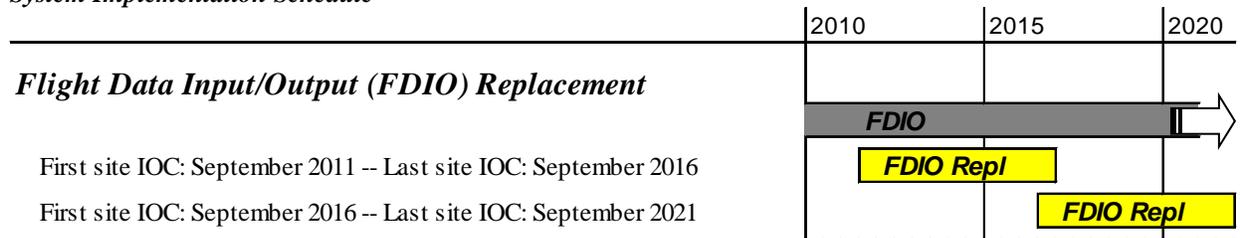
**Program Plans FY 2018 – Performance Output Goals**

- 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.

**Program Plans FY 2019 – 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**



**2B06, TERMINAL AIR TRAFFIC CONTROL FACILITIES - REPLACE**

**FY 2015 Request \$29.8M**

**ATCT/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 Air Traffic Control Tower (ATCT) and Terminal Radar Approach Control (TRACON) facilities and replaces 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 (i.e., helicopter positions, Visual Flight Rule traffic advisories, runway monitors, etc.). 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 one of the 12 programs included in FAA’s NAS Sustainment Strategy.

The Capital Programming Guide (contained in OMB Circular A-11) requires full funding for useful segments of a project. For this program, projects are funded in five useful segments and are scheduled based on Agency’s priorities. The five segments are: Advance Requirements and Other Direct Costs; Facility Design; Construction Award; Equipment and Utilities Installation; and Disposition, Demolition, and Decommissioning. 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.

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 that list of facilities in most dire need.

At this time, the FAA is committed to completing a facility replacement for New York TRACON (N90). The facility's FY 2013 condition index was at 84.8 percent, characterized as poor condition, with \$5.93M 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 planning stages of re-planning this investment, but the out-year funding tentatively supports the schedule below and assumes that the N90 replacement will cost roughly half as much as 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 2015 – Performance Output Goals***

- Initiate equipment procurement at two sites (Tucson, AZ and West Palm Beach, FL).
- Initiate Disposition planning activities at three sites (San Francisco, CA Houston, TX and Cleveland, OH).
- Conduct land market survey, initiate land environmental assessment and evaluation, and develop New York TRACON replacement project requirements.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Award construction contracts at two sites (Charlotte, NC and Sacramento, CA).
- Initiate Disposition activities at two sites (West Palm Beach, FL and Las Vegas, NV).

#### ***Program Plans FY 2017-2019 – Performance Output Goals***

- Award construction contracts at three sites.
- Complete procurement and installation at three sites.
- Complete Disposition, Demolition and Decommissioning at three sites.

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## **2B07, ATCT/TERMINAL RADAR APPROACH CONTROL (TRACON) FACILITIES - IMPROVE FY 2015 Request \$45.0M**

### **ATCT/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/Repair of building envelop components (e.g., siding, roof, windows, fascia's, eaves, gutters, downspouts, soffits, 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, renovation of interior finishes, 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 (e.g., doors, carpets, floor and ceiling tiles, stairs, handrails, catwalks, and reconfiguration of Administrative areas).

ATCT/TRACON facilities have also had to 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 one of the 12 programs included in FAA's NAS Sustainment 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**

The ATCT/TRACON Modernization program upgrades and improves facilities to support the NAS. This program will enable facilities to meet current operational, environmental, seismic and safety needs more economically than replacing or relocating the entire facility. This effort will result in a smooth and orderly transition of new equipment into FAA terminal facilities, minimizing disruption of the operating system. This program will 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 minimize 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 2011, FCI ranged from 74 percent to 100 percent for towers and TRACONs.

### ***Program Plans FY 2015-2019 – 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.

**2B08, TERMINAL VOICE SWITCH REPLACEMENT (TVSR)**

**FY 2015 Request \$2.0M**

**Voice Switches – Terminal Voice Switch Replacement (TVSR) II, C05.02-00**

**Program Description**

The ongoing TVSR program involves replacing the aging, obsolete voice switches in ATCTs and TRACONs. Voice switches enable air traffic controllers to select lines to communicate with pilots as well as other air traffic control facilities. The TVSR program 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 of maintain 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 2015 – Performance Output Goals**

- Complete recovery of available legacy assets as needed per Integrated Logistics Support Plan.
- Maintain TVSR contract vehicles needed to procure terminal voice switches for new terminal facilities.

**Program Plans FY 2016-2019 – Performance Output Goals**

- None.

**System Implementation Schedule**

	2010	2015	2020
<b><i>Small-Tower Voice Switches (STVS), Enhanced Terminal Voice Switches (ETVS), Rapid Deployment Voice Switches (RDVS) model IIA, Voice Switch Bypass Systems (VSBP), and Interim Voice Switch Replacement (IVSR).</i></b>			
First site IOC: 1994 (2006) -- Last site ORD: TBD	<b>STVS/ETVS/RDVS/VSBP/IVSR</b> 		

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## **2B09, NAS FACILITIES OSHA AND ENVIRONMENTAL STANDARDS COMPLIANCE**

**FY 2015 Request \$43.5M**

### **NAS Facilities OSHA & Environmental Standards Compliance, F13.03-00**

#### **Program Description**

Implement an Environmental and Occupation Safety and Health Program that ensures the health and safety of all FAA employees by complying with Federal, state, and local regulations and bargaining unit agreements. This program is one of the 12 programs included in FAA's NAS Sustainment Strategy.

#### 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 agreements with employees. Environment and Occupational Safety & Health (EOSH) Services is the lead organization charged with 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 program's scope of responsibility has been expanded from ATO only to all organizations of the FAA.

#### 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 318 of the 377 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 Goal, Outcome, and Performance Metric**

- *FAA Strategic Goal 2 – Workplace of Choice.*
- *FAA Outcome 2 – FAA is widely recognized as a workplace of choice.*
- *FAA Performance Metric 1 – The FAA is rated in the top 25 percent of places to work in the federal government by employees.*

#### **Relationship to Performance Metric**

The NAS Facilities OSHA and Environmental Standards Compliance program supports the FAA's Strategic Goal of Workplace of Choice by continuing to improve 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. For example, the FAA ensures that 100% of all staffed and at least 95% of all unstaffed workplaces listed in the Workplace Inspection Tool (WIT) are inspected annually as required by FAA policy and Federal regulations.

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. Workplace hazards are recorded in the FAA Workplace Inspection Tool (WIT) database, along with a risk assessment and an estimated cost to correct each individual hazard. The Hazard Abatement Program then tracks the identified hazards until they are

completely abated. As of FY 2012 the FAA WIT is tracking 123,368 individually identified workplace hazards, of which 118,497 (96.0%) have been completely abated.

***Program Plans FY 2015 – Performance Output Goals***

**OSHA & Environmental Standards Compliance:**

- Upgrade 800 fall protection systems.
- Ensure 90% of employees eligible under the FAA Hearing Conservation Program (HCP) are identified and enrolled, and 80% of the enrolled employees obtain applicable audiometric medical surveillance and HCP training annually.
- Provide first aid/CPR training to 2000 Air Traffic System Specialists (ATSSs) and volunteer responders.
- Provide fall protection training to 1800 employees.
- Conduct nine Arc Flash Hazard Analyses at large facilities.
- Conduct a total of 30 Arc Flash Assessments at small facilities.
- Conduct OSH program evaluations at six field locations and all headquarters organizations.
- Assist other FAA LOBs with administering the OSH program evaluation process and expand the evaluations to include the facility and regional level of each LOB.
- Provide ATO Environmental Management System General Awareness training to all ATO employees.
- Complete annual inspections for 100% of all staffed and at least 95% of all unstaffed FAA workplaces, as listed in the FAA Workplace Inspection Tool (FAA WIT) database, and as required by FAA Policy and Federal Regulation by the end of FY 2015.
- File compliant abatement plans for 100% of all open workplace safety inspection findings within thirty days of their identification as required by FAA Policy and Federal Regulation by end of FY 2015.
- Develop a comprehensive agency-wide occupational medical surveillance program.
- Develop, maintain, and provide hazard specific and general awareness safety training to all new FAA employees and managers.
- Accomplish the prior years unfunded EOSH training requirements.
- Develop best practices documentation for employee safety protection.

**Tower Fire Life Safety:**

- Initiate approximately 20 ATCT upgrades.
- Complete a minimum of 10 ATCT fire life safety upgrades (complex and costly systems).

***Program Plans FY 2016 – Performance Output Goals***

**OSHA & Environmental Standards Compliance:**

- Upgrade 500 fall protection systems.
- Ensure all appropriate occupational medical surveillance coverage and appropriate occupational medical recordkeeping is provided to 50% of all employees who are required under regulations to have one or more medical surveillance activities.
- Provide all necessary emergency response and personal protective equipment to equip FAA personnel newly assigned for aircraft accident investigations and to update equipment as necessary for currently assigned personnel.
- Conduct radon testing at all FAA housing.
- Provide first aid/CPR training to 2000 ATSSs and volunteer responders.
- Provide fall protection training to 1300 employees.
- Conduct four Arc-flash analyses at large facilities.
- Conduct OSH evaluations 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 Workplace Inspection Tool (FAA WIT) database, are inspected as required by FAA Policy and Federal Regulation.
- File compliant abatement plans for 100% of all open workplace safety inspection findings within thirty days of their identification.
- Provide safety awareness training to all new FAA personnel.

**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.
- Ensure all appropriate occupational medical surveillance coverage and appropriate occupational medical recordkeeping is provided to 60% of all employees who are required under regulations to have one or more medical surveillance activities.
- Provide all necessary emergency response and personal protective equipment to equip FAA personnel newly assigned for aircraft accident investigations and to update equipment as necessary for currently assigned personnel.
- Conduct radon testing at 25% of staffed location establishments.
- Provide fall protection training to 1000 employees.
- Provide first aid/CPR training to 2000 ATSSs and volunteer responders.
- Conduct four Arc-flash analyses at large facilities.
- Conduct OSH evaluations 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 Workplace Inspection Tool (FAA WIT) database.
- File compliant abatement plans for 100% of all open workplace safety inspection findings within thirty days of their identification.
- Provide safety awareness training to all new FAA personnel.

**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.
- Ensure all appropriate occupational medical surveillance coverage and appropriate occupational medical recordkeeping is provided to 70% of all employees who are required under regulations to have one or more medical surveillance activities.
- Provide all necessary emergency response and personal protective equipment to equip FAA personnel newly assigned for aircraft accident investigations and to update equipment as necessary for currently assigned personnel.
- Conduct radon testing at 25% of staffed location establishments.
- Provide first aid/CPR training to 2000 ATSSs and volunteer responders.
- Provide fall protection training to 1400 employees.
- Conduct four Arc-flash analyses at large facilities.
- Conduct OSH evaluations 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 Workplace Inspection Tool (FAA WIT) database.
- File compliant abatement plans for 100% of all open workplace safety inspection findings within thirty days of their identification.
- Provide Safety awareness training to all new FAA personnel.

**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 100 fall protection system.
- Ensure all appropriate occupational medical surveillance coverage and appropriate occupational medical recordkeeping is provided to 80% of all employees who are required under regulations to have one or more medical surveillance activities.
- Provide all necessary emergency response and personal protective equipment to equip FAA personnel newly assigned for aircraft accident investigations and to update equipment as necessary for currently assigned personnel.
- Conduct radon testing at 25% of staffed location establishments.

- Provide first aid/CPR training to 2000 ATSSs and volunteer responders.
- Provide fall protection training to 1000 employees.
- Conduct four Arc-flash analyses at large facilities.
- Conduct OSH evaluations 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 Workplace Inspection Tool (FAA WIT) database.
- File compliant abatement plans for 100% of all open workplace safety inspection findings within thirty days of their.
- Provide safety awareness training to all new FAA personnel.

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**2B10, AIRPORT SURVEILLANCE RADAR (ASR-9) SERVICE LIFE EXTENSION PROGRAM (SLEP)  
FY 2015 Request \$13.6M**

**Terminal Radar (ASR) Program – ASR-9 SLEP, Phase 2, S03.01-09**

**Program Description**

The Airport Surveillance Radar Model 9 (ASR-9) provides aircraft target and weather information to air traffic controllers which reduces delays and improve 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. Air traffic controllers utilize this information to safely and efficiently separate aircraft in the terminal environment. The ASR-9 also provides data to AMASS and ASDE-X to aid in the prevention of accidents resulting from runway incursions.

Without modifications to the ASR-9, the system will continue to experience decreasing reliability and availability over time. The supportability of the ASR-9 system is at risk due to the lack of commercial availability of some components. The ASR-9 was procured in the mid-1980s and fielded between 1989 and 1994. The system is expected to remain operational until 2028; however, the radar systems are becoming difficult to maintain. The system uses hardware and software architectures that are becoming increasingly difficult to procure, and some of which are obsolete, resulting in cannibalization and re-engineering for short term results as a means to repair or refurbish in order to maintain this vital system.

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. The sustainment of the ASR-9 aligns with the NAS Enterprise Architecture Surveillance Roadmap Decision Points, and the Surveillance and Broadcast Services (SBS) / Automatic Dependent Surveillance Broadcast (ADS-B) backup strategy. Based on this strategy, ASR-9 systems will remain in service through 2028.

**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. Extending the service life of the ASR-9 system will reduce outages due to performance deterioration and parts obsolescence. Furthermore, the ASR-9 service life extension will increase equipment and service availability. Without modifications to the ASR-9, the system will continue to experience decreasing reliability and availability over time.

**Program Plans FY 2015 – Performance Output Goals**

- Award contract for Digital Remote Surveillance Communication Interface Processor Replacement (DRSR) Materials in December 2014.
- Complete ARTCC En Route Radar Intelligence Tool Key Site Test Report in September 2015.
- Complete installation at first site in March 2015. (APB milestone)
- Complete Operational Test and Evaluation (OT&E) for all projects in September 2015. (APB milestone)

**Program Plans FY 2016 – Performance Output Goals**

- Complete Installation of Digital Remote Surveillance Communication Interface Processor Replacement at 25% of ASR-9 sites.
- Complete Installation of Transmitter Backplane at 25% of ASR-9 sites.

**Program Plans FY 2017 – Performance Output Goals**

- Complete installation of Digital Remote Surveillance Communication Interface Processor Replacement at 75% of ASR-9 sites.
- Complete installations of Transmitter Backplane at 75% of ASR-9 sites.

**Program Plans FY 2018 – Performance Output Goals**

- Complete installation of DRSR at 100% of ASR-9 sites.
- Complete installation of Transmitter Backplane at 100% of ASR-9 sites.

**Program Plans FY 2019 – Performance Output Goals**

- Installation at last site completed, September 2019. (APB Milestone)

**System Implementation Schedule**

	2010	2015	2020
<b>Airport Surveillance Radar-Model 9 (ASR-9) Service Life Extension Program (SLEP) Phase 2</b>			
First Site Install: 2015 -- Last Site Install: September 2019		<b>ASR-9 SLEP 2</b>	

**2B11, TERMINAL DIGITAL RADAR (ASR-11) TECHNOLOGY REFRESH AND MOBILE AIRPORT SURVEILLANCE RADAR (MASR)**

**FY 2015 Request \$21.1M**

- A, Terminal Radar (ASR) Program – ASR-11 – Technology Refresh, Segment 2, S03.02-05 / X, Terminal Radar (ASR) Program – ASR-11 – Technology Refresh, Segment 3, S03.02-07
- B, Terminal Radar (ASR) Program – ASR-11 – Mobile Airport Surveillance Radar (MASR), S03.02-06

**A, Terminal Radar (ASR) Program – ASR-11 – Technology Refresh, Segment 2, S03.02-05 / X, Terminal Radar (ASR) Program – 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.

ASR-11 Technology Refresh Segment 2 (S03.02-05):

The ASR-11 Technology Refresh Segment 2 is being structured to address the following shortfalls identified in the Segment 2 Shortfall Analysis Report:

- Site Control Data Interface (SCDI) /Operator Maintenance Terminal (OMT) obsolescence
- Uninterruptible Power Supply (UPS) capacitor at end of life expectancy

The objective of the Segment 2 program is to insure continued reliable and cost effective operation of the radar system through its designated lifecycle. The Segment 2 Investment Analysis Readiness Decision (IARD) was approved in November 2012 and the Final Investment Decision (FID) was achieved in December 2013.

ASR-11 Technology Refresh Segment 3 (S03.02-07):

The ASR-11 Technology Refresh Segment 3 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 Investment Analysis Readiness Decision (IARD) is planned for December 2017 and the Final Investment Decision (FID) is planned for December 2018. Future ASR-11 Technology Refreshes are dependent on Next Generation Surveillance Weather Radar Capability (NSWRC), which has a planned FID in December 2017.

**Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

**Relationship to Performance Metric**

The ASR-11 Technology Refresh Segment 2 will continue upgrading the components and functionality of the ASR-11 to reduce operating costs and improve operational efficiency.

***Program Plans FY 2015 – Performance Output Goals***

ASR-11 Technology Refresh Segment 2 (S03.02-05):

- Procure UPS Capacitor Kits for designated sites.
- Conduct SCDI OMT replacement Design Review.
- Procure EOSH label kits for ASR-11.
- Procure and receive two SCDI OMT replacement hardware retrofit kits.

ASR-11 Technology Refresh Segment 3 (S03.02-07):

- None.

***Program Plans FY 2016 – Performance Output Goals***

ASR-11 Technology Refresh Segment 2 (S03.02-05):

- Complete SCDI Development Test.

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 SCDI replacement OT&E.
- Conduct Key site test for SCDI replacement.
- Deliver first site for SCDI replacement.
- Certify first site for operational use for SCDI replacement.
- Achieve In-Service Decision.
- 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):

- Milestones will be developed at FID.

**System Implementation Schedule**

	2010	2015	2020
<b>Airport Surveillance Radar - Model 11 (ASR-11) Technology Refresh - Segment 2</b>			
First site certified for use: December 2016 -- Last site certified for use: April 2020			<b>ASR-11 TR 2</b>

**B, Terminal Radar (ASR) Program – ASR-11 – Mobile Airport Surveillance Radar (MASR), S03.02-06**

**Program Description**

The Mobile Airport Surveillance Radar (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 and will have the performance capabilities of existing systems. The program will be refurbishing two ASR-9 and two MODE S systems and will procure two mobile ASR-11 systems.

The MASR can be deployed quickly within short-duration timeframes and be compatible with all ATCTs, TRACONS, ARTCCs, and their associated automation systems.

The MASR system architecture will support a reusable, service-oriented capability with an emphasis on providing the terminal surveillance service 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.

**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 2015 – Performance Output Goals***

- Procure Mobile ASR-11 System #2.
- Complete Refurbishment of second ASR-9/Mode-S System by March 2015. (APB milestone)
- Complete Mobile ASR-11 System Factory Acceptance Test (FAT) by March 2015. (APB milestone)
- Deliver Mobile ASR-11 System to test and evaluation site by June 2015. (APB milestone)

***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 2018-2019 – Performance Output Goals***

- None.

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**2B12, RUNWAY STATUS LIGHTS (RWSL)**

**FY 2015 Request \$41.7M**

- A, Runway Status Lights (RWSL) – Implementation – Phase 1, S11.01-02
- B, Runway Status Lights (RWSL) – Prototype Sustainment, S11.01-03

**A, Runway Status Lights (RWSL) – Implementation – Phase 1, S11.01-02**

**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 that 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 (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.

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 Airport, Phoenix—Sky Harbor and George Bush International. The FAA plans to have the entire system operational in 2017.

**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 at 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 2015 – Performance Output Goals**

- Start construction at two of 17 operational sites.
- Achieve IOC at two of 17 (71%) operational sites.

**Program Plans FY 2016 – Performance Output Goals**

- Start construction at one of 17 operational sites.
- Complete installation at two of 17 operational sites.
- Achieve IOC at four of 17 (94%) operational sites.

**Program Plans FY 2017 – Performance Output Goals**

- Achieve IOC at one of 17 (100%) operational sites.
- Achieve Operational Readiness date (ORD) at three, including 17<sup>th</sup> and last, operational sites. (APB Milestone)
- Complete Operational Readiness date (ORD) at San Francisco International Airport. (APB Milestone)

**Program Plans FY 2018 – Performance Output Goals**

- Conduct Contract Close-out activities.

**Program Plans FY 2019 – Performance Output Goals**

- None.

**System Implementation Schedule**



**B, Runway Status Lights (RWSL) – Prototype Sustainment, S11.01-03**

**Program Description**

The Runway Status Lights (RWSL) system integrates runway lighting equipment with approach and surface surveillance systems to provide a visual signal to pilots and vehicle operators indicating that 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 (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 to 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 will consider alternative solutions at these sites to provide a direct warning capability to flight crews. The team will plan 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 both 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 at 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 in order to determine how they contribute to the overall performance metrics.

### *Program Plans FY 2015 – Performance Output Goals*

- Operational evaluation of the Prototype Runway Status Lights prototype systems will continue through FY 2015. An Annual Performance Report from each prototype site will be delivered.

### *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.

### *Program Plans FY 2017-2019 – Performance Output Goals*

- None.

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## **2B13, NEXTGEN – NATIONAL AIRSPACE SYSTEM VOICE SYSTEM (NVS)**

**FY 2015 Request \$20.6M**

### **NAS Voice System – Segment 1/2, G03C.01-01**

#### **Program Description**

The NAS Voice System (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 out-going 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 re-sectorization (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 12 different voice switch configurations including Terminal Voice Switches and the Voice Switching and Control System (VSCS). 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 contract was awarded in August 2012, and will be implemented in two segments. This will minimize risk and ensure the new switches will be consistent with agency priorities and constraints. Segment 1 focuses on the demonstration of NextGen capabilities and evaluates production ready systems. Segment 2 will procure production systems that are capable of meeting the requirements of various size facilities. The program will request a Final Investment Decision (FID) in September 2014 that will complete Segment 1 and start Segment 2. The NVS contract addresses both the demonstration and production systems.

**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 58,166, 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 re-sectorization 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 2015 – Performance Output Goals**

- Complete Critical Design Review.
- Order a second article test system.

**Program Plans FY 2016 – Performance Output Goals**

- Complete additional system development needed to conduct Factory Acceptance Test (FAT) on first and second test articles at contractor’s facility.

**Program Plans FY 2017 – Performance Output Goals**

- Complete Factory Acceptance Testing and Functional and Physical Configuration Audits of test systems.
- Deliver first and second article test systems to William J. Hughes Technical Center (WJHTC) and Mike Monroney Aeronautical Center (MMAC).
- Initiate Operational Test and Evaluation (OT&E) of test systems at William J. Hughes Technical Center (WJHTC) and Mike Monroney Aeronautical Center (MMAC).
- Order Key Site Systems.

**Program Plans FY 2018 – Performance Output Goals**

- Complete Operational Test and Evaluation (OT&E) of test systems at William J. Hughes Technical Center (WJHTC) and Mike Monroney Aeronautical Center (MMAC).
- Finalize full-scale training course development.
- Deliver Key Site Systems.

**Program Plans FY 2019 – Performance Output Goals**

- Initiate Key Site testing.
- Complete In-Service Decision (ISD) at Key Site.
- Order additional NAS Systems based on FID.

**System Implementation Schedule**

	2010	2015	2020
<b>NAS Voice System (NVS)</b>			<b>NVS</b>
First site IOC: 2021 -- Last site ORD: TBD			

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**2B14, INTEGRATED DISPLAY SYSTEM (IDS)**

**FY 2015 Request \$16.9M**

**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 to 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 thus increasing efficiency of operations. The FAA began regional procurements in 1990 and currently has 2,230 IDS-4 workstations located at approximately 390 FAA facilities nationwide. Recent obsolescence issues and loss of proprietary software support make it necessary to replace this system to sustain its functionality.

IDS Replacement (A03.05-01):

The IDS Replacement program modernizes the IDS-4 system with current technology at 71 existing IDS-4 networks, including 1,944 IDS-4 workstations, at 256 sites. (Instead of replacing systems at some smaller sites, existing systems at larger sites will be repurposed to the smaller sites.) The prime contract was awarded in May 2010 and design efforts were completed in late 2011. The program was rebaselined in March 2013. Deployment will occur from 2013 to 2017. During 2013, 6 networks were installed.

IDS Replacement – Technology Refresh (A03.05-02):

The IDS-4 will be 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 system components are 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 beyond economic repair rate for motherboards returned to the FAA Logistics Center for repair 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 2015 – Performance Output Goals**

IDS Replacement (A03.05-01):

- Achieve Initial Operating Capability (IOC) at 21 networks by end of FY 2015.

IDS Replacement – Technology Refresh (A03.05-02):

- None.

**Program Plans FY 2016 – Performance Output Goals**

IDS Replacement (A03.05-01):

- Achieve Initial Operating Capability (IOC) at 21 networks by end of FY 2016.

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 7 networks by end of FY 2017.
- 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 2 sites.

**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 69 sites.

**System Implementation Schedule**



**2B15, REMOTE MONITORING AND LOGGING SYSTEM (RMLS)**

**FY 2015 Request \$3.9M**

- A, Remote Monitoring and Logging System (RMLS) – Technology Refresh, M07.04-02
- B, 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 covers future activities required to 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 2020. RMLS Technology Refresh replaces the commercial off the shelf (COTS) logical 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 of NAS components, systems, and services for the NAS as a whole. The RMLS maintenance information is used by the FAA to analyze trends and improve performance, make investment decisions and support budget requests for replacement, relocate, or modify 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 functions as a single system across the FAA's Technical Operations enterprise and 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 2015 – Performance Output Goals***

- Complete deployment of the following at the WJHTC Integration Testing/Operational Testing (IT/OT) and NOCC:
  - Six NLN Database Servers
  - Six Storage Arrays
  - Six Database Switches
  - Three Application Servers
  - Three Windows Management Servers
- Complete deployment of the following at the WJHTC (IT/OT) and POCC:
  - Three Monitor/Message Servers
  - Three NRN Database Servers
  - Three Trace Servers
  - Three Preventive Maintenance Servers
  - Six FTI/OPS Switches
- Complete deployment of the following at the WJHTC (IT/OT) and POCC Security:
  - Three Management Servers
  - Six Load Balancers
  - Three Presentation Servers
  - Perform site preparation

***Program Plans FY 2016 – Performance Output Goals***

- Complete deployment of the following at the POCC, MOCC and NOCC:
  - Six NLN Database Servers
  - Six Storage Arrays
  - Six Database Switches
  - Three Application Servers
  - Nine Management Servers
  
- Complete deployment of the following at the AOCC, MOCC and NOCC:
  - Three Monitor/Message Servers
  - Three NLN Database Servers
  - Three Trace Servers
  - Three Preventive Maintenance Servers
  - Six FTI/OPS Switches
  
- Complete deployment of the following at the AOCC, MOCC and NOCC Security:
  - Three Management Servers
  - Six Load Balancers
  - Three Presentation Servers
  - Prepare three sites

***Program Plans FY 2017 – Performance Output Goals***

- Complete deployment of the following at the Data Repository, Operational Test (OT2) and Oklahoma City (OKC) Training:
  - Six NLN Database Servers
  - Six NRN Database Servers
  - Three NLN Application Servers
  - Three NRN Monitor/Message Servers
  - Nine Windows Management Servers
  - Three System Management Servers
  - Six Storage Arrays
  - Six Database Switches
  - Six Core Switches
  - Six Load Balancers
  - Six CheckPoint Security Firewall Appliances with Intrusion Detection Systems
  - Three High Capacity Tape Library
  
- Complete deployment of the following at Data Repository (DR)/OPS Security:
  - Two Management Servers
  
- Complete deployment of the following at Operational Test, Operational Test 2, OKC Training, Anchorage ARTCC (ZAN), Honolulu (ZHN), Southern California TRACON (SCT), Seattle ARTCC (ZSE), Salt Lake ARTCC (ZLC), Oakland ARTCC (ZOA), and Denver ARTCC (ZDV):
  - 20 Protocol Converter and Software Licenses
  - 30 Protocol Converter Servers
  - 10 Rack Management Servers
  - 10 Keyboard/Video/Mouse (KVM) / Terminal Switches

***Program Plans FY 2018 – Performance Output Goals***

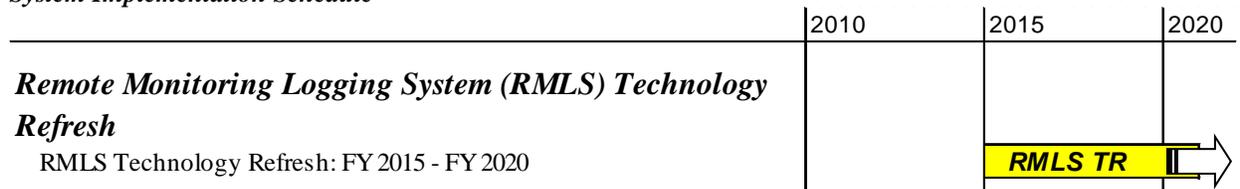
- Complete deployment of the following at the Operational Test, Integration Test, NOCC:
  - Six Core Switches
  - Six Load Balancers
  - 12 CheckPoint Firewall Appliances with Intrusion Detection Systems
  - Three KVM Switches
  - Three Serial Console Switches

- Three Time Servers
- Three System Management Servers
- Complete deployment of the following at Los Angeles ARTCC (ZLA), Jacksonville ARTCC (ZJX), Memphis ARTCC (ZME), Miami ARTCC (ZMA), New York ARTCC (ZNY), ZBW, Atlanta ARTCC (ZTL), and Washington ARTCC (ZDC):
  - 16 Protocol Converter and Software Licenses
  - 24 Protocol Converter Servers
  - Eight Rack Management Servers
  - Eight KVM / Terminal Switches

**Program Plans FY 2019 – Performance Output Goals**

- Complete deployment of the following at the POCC, AOCC, and MOCC:
  - Six Core Switches
  - Six Load Balancers
  - 12 CheckPoint Firewall Appliances with Intrusion Detection Systems
  - Three KVM Switches
  - Three Serial Console Switches
  - Three Servers
  - Three System Management Servers
- Complete deployment of the following at Albuquerque ARTCC (ZAB), Indianapolis ARTCC (ZID), Chicago ARTCC (ZAU), Fort Worth ARTCC (ZFW), Houston ARTCC (ZHU), Minneapolis ARTCC (ZMP), Cleveland ARTCC (ZOB), and Kansas City ARTCC (ZKC):
  - 16 Protocol Converter and Software Licenses
  - 24 Protocol Converter Servers
  - Eight Rack Management Servers
  - Eight KVM / Terminal Switches

**System Implementation Schedule**



**B, Automated Maintenance Management System (AMMS), M07.05-01**

**Program Description**

The Automated Maintenance Management System (AMMS) will provide new functionality and standards of data sharing using updated tools and technology for the interoperability of operations and maintenance information systems. AMMS will provide real time status information and eliminate inefficiencies in access to information provided by navigation, surveillance, communication, safety management, aeronautical information, supply chain management, maintenance, training, and labor resource systems. AMMS will not be implemented as a single system, but as a series of interfaces with existing enterprise services that will be developed and implemented on an individual basis. AMMS will not subsume or replace existing programs. Instead, it will improve information processing and comply with FAA's future vision of a net-centric environment as defined in the NextGen Mid-Term Concept of Operations. AMMS will implement a web services environment to eliminate unnecessary duplication, manual and limited automated 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.

Investment analysis requirements will be completed for Final Investment Decision (FID) planned for 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 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. Currently technicians do not have real time access to information they need to maintain and repair the system which results in longer downtime for repairs. Also the lack of information restricts the ability to proactively resolve issues before an outage occurs. Currently 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 2015 – Performance Output Goals***

- Complete investment analysis documentation.
- Achieve Final Investment Decision.
- Develop interface requirements document for SWIM implementation.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

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## **2B16, MODE S SERVICE LIFE EXTENSION PROGRAM (SLEP)**

### **FY 2015 Request \$8.1M**

- A, Terminal Radar (ASR) Program – Mode S SLEP – Phase 2, S03.01-08
- B, Terminal Radar (ASR) Program – ASR-9 and Mode S SLEP – Phase 3 Planning, S03.01-11

## **A, Terminal Radar (ASR) Program – Mode S SLEP – Phase 2, S03.01-08**

### **Program Description**

The Mode Select (Mode S) SLEP Phase 2 program will implement modifications to the Mode S system to sustain secondary surveillance service through 2028. The Beacon Video Reconstitutor (BVR) will be replaced with more modern components. Four (4) critical Lowest Replaceable Units (LRU) of the Mode S system that process radar data will be redesigned in addition to the depot replenishment of High Gain Open Planar Array (HGOPA), Maintenance Terminals, Keyboard Cathode Ray Tube and Non-Volatile Memory to address obsolescence and supply/support issues. The sustainment of the Mode S system aligns with the NAS Enterprise Architecture (EA), and the Automatic Dependent Surveillance – Broadcast (ADS-B) back-up strategy.

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.

The Mode S is integrated with co-located Airport Surveillance Radar Model 9 (ASR-9) and ASR-8, Air Route Surveillance Radar Models 1 and 2 (ARSR 1 and 2) and Common Air Route Surveillance Radar (CARSR). The Mode S system is capable of providing correlated radar and beacon reports and weather map reports to NAS en route and terminal automation, U.S. Department of Defense (DoD), and other users. Digital aircraft location data is provided in ASR-9 / Common Digitizer (ASR/CD) format to FAA automation systems at TRACON and ARTCC facilities, DoD, and other external organizations.

JRC approved the Final Investment Decision (FID) for the Phase 2 program on June 27, 2012.

### **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**

Providing for the Mode S service life extension modifications reduces the risk of unscheduled outages and ensures the continuation of service capabilities. 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. Without modifications to the Mode S, the system will continue to experience decreasing reliability and availability over time.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Complete Operational Test and Evaluation (OT&E) for all projects in January 2015. (APB milestone)
- Complete BVR installation at first site in March 2015. (APB Milestone)
- Award contract to vendor for procurement of HGOPA Antenna, April 2015.
- Complete Final Development Testing for the BVR, October 2014.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Production of 12 HGOPA 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 and delivery to FAA Logistics Center.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Production of 18 HGOPA and delivery to FAA Logistics Center.

***Program Plans FY 2019 – Performance Output Goals***

- Complete Critical LRU Redesign, Preliminary Design Review in December 2018. (APB Milestone)
- Complete Depot replenishment in September 2019. (APB Milestone)

**B, Terminal Radar (ASR) Program – ASR-9 and Mode S SLEP – Phase 3 Planning, S03.01-11**

**Program Description**

The Airport Surveillance Radar Model 9 (ASR-9) and Mode Select (Mode S) Service Life Extension Program (SLEP) Phase 3 Planning program will perform engineering studies to determine the scope of the ASR-9 and Mode S SLEP Phase 3 activities. The program will also develop prototypes for Data Communications Equipment, Receiver Protector, and four (4) critical Lowest Replaceable Units (LRUs) for evaluation purposes. These and other components of the ASR-9 and Mode S radar systems will not remain supportable through 2028. The purpose of these studies is to determine the extent of re-engineering and system modifications needed.

A Final Investment Decision (FID) for Phase 3 is planned for March 2016. When the FID is achieved, new projects will be established to implement the approved SLEP activities for ASR-9 and Mode S.

**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 and Mode S systems are functioning at an operational availability of 99.4 and 99.3 percent respectively, which is below the FAA performance metric of 99.7 percent. Without modifications to the ASR-9 and Mode S, these systems will continue to experience decreasing reliability and availability over time. Extending the service life of the ASR-9 and Mode S systems will reduce outages due to performance deterioration and parts obsolescence.

***Program Plans FY 2015 – Performance Output Goals***

- Complete investment analysis documents in support of a FID.
- Complete Alternative Analysis Report for ten (10) LRUs.

***Program Plans FY 2016-2019 – Performance Output Goals***

- Output goals will be established at FID.

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**2B17, SURVEILLANCE INTERFACE MODERNIZATION (SIM)**

**FY 2015 Request \$4.0M**

**Surveillance Interface Modernization (SIM), S13.01-01**

**Program Description**

The Surveillance Interface Modernization (SIM) Program will modernize the interfaces between FAA Terminal and En Route surveillance radar, automation, and specific weather systems. 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. SIM accomplishes these goals by improving existing Radar to Automation interfaces, message formats, and information flow to Air Traffic Controllers.

Currently surveillance data is sent using Common Digitizer message format [version 2] (CD2) over point to point serial interfaces. 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 data formats will carry the additional data fields needed by automation to improve tracker, display, and safety logic performance. New formats enable the transmittal of extensive radar data, available at the radar sensor, to the automation platform. The more extensive data transmission includes the distinct 24-bit aircraft address, a time stamp associated with the aircraft position, Mode S data link access to aircraft sensors, and additional positional resolution bits which provide a more accurate determination of an aircraft's location.

Access to additional radar data provides performance enhancements for ATC automation systems, and allows, in the long-term, a more robust support of future operational improvements (OIs), the enhancement of future facilities capabilities, as well as providing improved backup capabilities when ADS-B surveillance becomes a primary resource of aircraft position reporting.

As a result of simplifying the radar data transmission architecture, the distribution of all available radar system data, to both the FAA and external users, will be more effective and efficient, and information security measures can be applied more consistently, resulting in greater flexibility with expandable information flow from the Aircraft, to Radar, and, ultimately, to Automation. The enhanced capabilities resulting from the SIM Program will reduce the maintenance overhead costs of legacy systems, reduce costs for the implementation of future systems, simplify the calculation for fusion of surveillance data into controller displays, add increased range resolution, and enable future capabilities such as Enhanced Mode S Altitude Intent.

An Initial Investment Decision is planned for 4Q FY 2014 and Final Investment Decision 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**

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 legacy systems will be required to provide data distribution other than point-to-point via modern networking techniques and transition to standard interface message formats with higher reporting precision which also provide additional target information to support future operational improvements (OIs). This program will implement a common industry standard communications architecture and format.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Achieve Final Investment Decision.
- Complete Preliminary Design Reviews.
- Contract award for Mode S data converters.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

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## **2B18, VOICE RECORDER REPLACEMENT PROGRAM (VRRP)**

### **FY 2015 Request \$1.0M**

- A, Voice Recorder Replacement Program – NAS Voice Recorder Program (NVRP), C23.02-01
- B, Voice Recorder Replacement Program – New Requirements Safety & Audit, C23.01-01

### **A, Voice Recorder Replacement Program – NAS Voice Recorder Program (NVRP), C23.02-01**

#### **Program Description**

The NAS Voice Recorder Program (NVRP) will replace digital voice recorders to provide enhanced digital voice recording functionality and to maintain operational availability. These new recorders will meet increasing demand for improved access to the data and will add needed capabilities such as increased recording capacity, recording of Voice Over Intranet Protocol (VoIP) telephones, and compatibility with FAA Telecommunications Infrastructure (FTI).

Voice recorders provide the legally accepted recording capability for conversations between air traffic controllers, pilots, and ground-based air traffic facilities. These recordings are used in the investigation of accidents and incidents and in the routine evaluation of ATC operations. These recorders are used in all Air Traffic Control (ATC) domains. As the voice recorder technology and voice recorder requirements have evolved, earlier digital voice recorders are experiencing obsolescence and supportability issues. Currently there are 465 recorders in service. Recorders have a 10 year operational life. The current model of voice recorders will begin to reach end of life starting in 2017.

A final investment decision is planned for 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**

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 important in reducing fatalities by helping to determine causes of accident and incidents and to implement corrective actions.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Complete initial draft requirements document.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

### **B, Voice Recorder Replacement Program – New Requirements Safety & Audit, C23.01-01**

#### **Program Description**

Voice Recorder Replacement Program – New Requirements Safety and Audit will provide the capability for improved remote voice recorder access. Voice recorders provide the legally accepted recording capability for

conversations between air traffic controllers, pilots and ground-based air traffic facilities in all ATC domains. Voice recordings are used in the investigation of accidents and incidents and routine evaluation of ATC operations.

New and updated FAA Safety orders are creating additional requirements for reporting that are dependent on access to voice data stored on the Digital Audio Legal Recorder (DALR) systems throughout the NAS. These orders contain provisions that require safety related data, including recorded voice be captured regularly and analyzed for trends or hazards. The analyses are used to change NAS systems or procedures to reduce or eliminate risks that potentially have a safety impact.

These new requirements include:

- New capability for remote access and download – Traffic Analysis and Review Program (TARP) / Comprehensive Electronic Data Analysis and Reporting (CEDAR);
- Unique data transfer requirements for the NTSB; and
- Ability to accommodate increased number of users.

In FY 2015, additional Safety & Audit requirements will be developed utilizing the centralized remote access capability installed in FY 2014.

### **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 upgrade to the DALR system will provide a system that will comply with the Safety Management System (SMS) and the associated new / updated FAA Safety orders. This will support efforts to reduce air carrier fatalities.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Complete initial draft requirements document for additional Safety & Audit requirements.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

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## **2B19, PRECISION RUNWAY MONITOR ALTERNATE (PRMA)**

**FY 2015 Request \$1.0M**

### **Precision Runway Monitor (PRM) – Replacement (PRMR), S08.01-02**

#### **Program Description**

The purpose of the Precision Runway Monitor Replacement (PRMR) program is to replace the PRM systems now in use at San Francisco International Airport (SFO) and Hartsfield-Jackson Atlanta International Airport (ATL). The FAA is currently re-evaluating the need for PRM when using triple simultaneous approaches for closely spaced parallel runways, such as at ATL. The FAA Flight Standards organization is reassessing the required runway separation requirements which may result in eliminating the need for PRM at ATL. In this case, the PRM at SFO would be sustained and not replaced. If the reassessment determines that PRM is required, then the program office will complete the investment analysis process and begin procurement activities for replacement of the systems at ATL and SFO. Due to the delay for reassessment, Final Investment Decision for the program has been rescheduled for December 2015.

PRM is a high update-rate surveillance radar specifically designed for use during inclement weather and reduced visibility conditions. PRM monitors closely-spaced-parallel-approaches (CSPA) in order to sustain or increase use

of capacity, as measured by an Airport's Arrival Rate (AAR), during Instrument Meteorological Conditions (IMC) and Marginal Visual Meteorological Conditions. During IMC, air traffic separation standards require greater distance between aircraft approaching closely spaced runways, thus reducing the AAR below the number an airport is capable of accepting each hour during good visibility conditions. The system also incorporates alert algorithms to predict and warn controllers of aircraft deviations from their nominal approach course. A PRM system must be used to conduct independent simultaneous instrument approaches to side-by-side runways spaced less than 3600 feet apart for dual approaches and 5000 feet apart for triple approaches. Without the PRM technology, airports would be required to conduct dependent simultaneous approaches, significantly reducing the AAR/capacity. Independent operations require only side by side separation and do not require lead to follower separation that is required with dependent operations. At ATL, PRM increases airport departure capacity during IMC, and at SFO PRM increases arrival rates by up to 17% during Marginal Visual Meteorological Conditions.

At present, there are two different PRM configurations deployed within the NAS: PRM Electronic Scan Radar (PRM-E), the original PRM system developed by Allied Signal/Raytheon Company, and the newer PRM Alternate (PRM-A) system, a Saab Sensis Corporation product, that uses the Airport Surface Detection Equipment, Model X (ASDE-X) multilateration (MLAT) technology to provide aircraft location to controller displays. The PRM-E systems are currently deployed at five airports throughout the NAS; SFO, ATL, Cleveland Hopkins International Airport (CLE), Lambert-St. Louis International Airport (STL) and Philadelphia International Airport (PHL). The current PRM-E systems were installed and commissioned between 1999 and 2007. The PRM-A is a single site system, installed and commissioned at Detroit's Metro Wayne County Airport (DTW) in June 2009.

PRM-E, first installed in 1999, is experiencing increased parts obsolescence and other support issues. Repair times have increased significantly, to in some cases in excess of 26 weeks, due to a limited availability of critical spare parts, and a diminishing number of companies interested in manufacturing spare parts.

Due to changing airport conditions, and a subsequent reduction in traffic volume, there is no longer a need for PRM service at CLE, PHL and STL. These airports are able to maintain an acceptable AAR level during IMC without the use of the PRM-E. Therefore, the PRM-E systems at CLE, STL and PHL will be decommissioned and returned to the FAA Logistics Center (FAALC) for use as spare parts to support the SFO and ATL PRM systems until these two systems are replaced by the PRMR. The plan to decommission these systems is being developed.

The PRMR program received Joint Resource Council (JRC) initial investment decision (IID) approval on September 26, 2012.

### **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 PRM replacement solution will ensure the continued operation of PRM service and allow the most efficient use of airport capacity at ATL and SFO. The selected solution will resolve the obsolescence and supportability issues, thus improving overall system maintainability, reliability and availability.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Develop the following products in support of investment analysis activities:
  - Program Implementation Plan.
  - Final Requirements Document.
  - Final Business Case.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

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**2B20, INTEGRATED TERMINAL WEATHER SYSTEM (ITWS) TECHNOLOGY REFRESH**  
**FY 2015 Request \$4.4M**

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**ITWS – Technology Refresh & Disposition, W07.01-02**

**Program Description**

The Integrated Terminal Weather System (ITWS) provides air traffic managers with graphic, full-color displays of essential weather information at major U.S. airports. ITWS integrates weather data from a number of sources and provides a single, easily used and understood display of support 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 prototype during FY 2014 and FY 2015 allowing technology refresh to begin in FY 2016 and be completed in FY 2018. 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 unsupported 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 2015 – Performance Output Goals***

- Develop ITWS Technology Refresh Hardware and Software prototype.

***Program Plans FY 2016 – Performance Output Goals***

- Complete ITWS Technology Refresh deployment and associated activities at three ITWS sites (9% complete).

***Program Plans FY 2017 – Performance Output Goals***

- Complete ITWS Technology Refresh deployment and associated activities at 14 ITWS sites (50% complete).

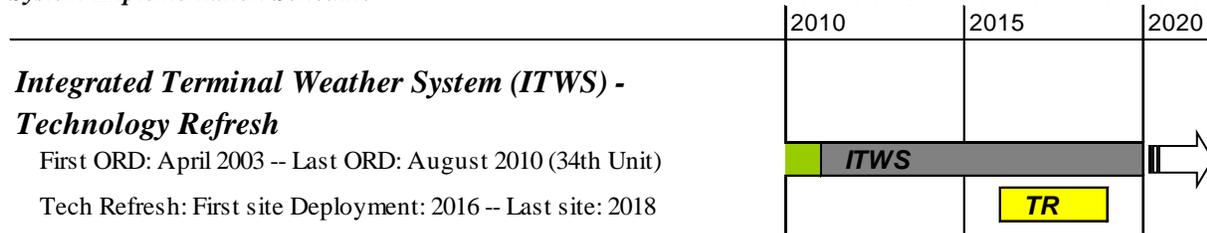
***Program Plans FY 2018 – Performance Output Goals***

- Complete ITWS Technology Refresh deployment and associated activities at 17 ITWS sites (100% complete).

***Program Plans FY 2019 – Performance Output Goals***

- None.

**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: 2016 -- Last site: 2018

**C: Flight Service Programs**

**2C01, AVIATION SURFACE WEATHER OBSERVATION SYSTEM**

**FY 2015 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 unsupported equipment experiencing increasing failure rates. Continued failures of weather sensing equipment will result in a loss of ASWON services and subsequent inability to maintain current operational availability levels of 99.7%.

**Program Plans FY 2015 – Performance Output Goals**

- Install AWSS Technology Refresh mods at 20 additional sites (21 of 44, 48%).
- Install AWOS Technology Refresh mods at 40 additional sites (65 of 187, 35%).
- Install DASI Technology Refresh mods at key site (1 of 180).
- Install F-420 Technology Refresh mods at key site (1 of 210).

**Program Plans FY 2016 – Performance Output Goals**

- Install AWSS Technology Refresh at 23 remaining sites (44 of 44, 100%). (APB milestone)
- Install AWOS Technology Refresh mods at 50 additional sites (115 of 187, 61%).
- Install DASI Technology Refresh mods at 40 additional sites (41 of 180, 23%).
- Install F-420 Technology Refresh mods at 30 additional sites (31 of 210, 15%).
- Begin ASOS Software Operational Test and Evaluation (OT&E) at key site.

**Program Plans FY 2017 – Performance Output Goals**

- Install AWOS Technology Refresh at remaining 72 sites (187 of 187, 100%). (APB milestone)
- Install DASI Technology Refresh mod at 40 sites (81 of 180, 45%).
- Install F-420 Technology Refresh mods at 40 sites (81 of 210, 40%).
- Install ASOS Technology Refresh mods at 50 sites (50 of 517, 10%).

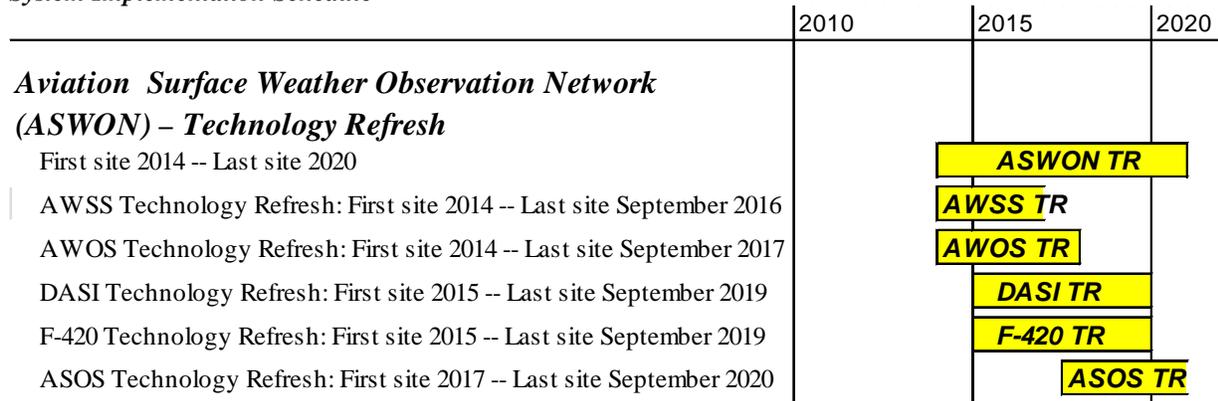
**Program Plans FY 2018 – Performance Output Goals**

- Install DASI Technology Refresh mods at 40 additional sites (121 of 180, 67%).
- Install F-420 Technology Refresh mods at 60 additional sites (141 of 210, 67%).
- Install ASOS Technology Refresh mods at 150 additional sites (201 of 571, 35%).

**Program Plans FY 2019 – Performance Output Goals**

- Complete DASI Technology Refresh. (APB milestone)
- Complete F-420 Technology Refresh, (APB milestone)
- Install ASOS Technology Refresh mods at 150 additional sites (351 of 571, 62%).

**System Implementation Schedule**



**2C02, FUTURE FLIGHT SERVICES PROGRAM (FFSP)**

**FY 2015 Request \$1.0M**

**Future Flight Services Program, A34.01-01**

**Program Description**

The goal of this program is to continue the accurate and consistent delivery of flight service information to the general aviation (GA) community, while ensuring safe and efficient flight operations. This program will also reduce

the overall cost associated with delivering flight services, while increasing the efficiency of delivery. Through stakeholder engagement, community outreach, and working with industry partners, this program will analyze the delivery of existing services and develop requirements necessary to acquire and implement new techniques for service delivery that meet programs goals and objectives.

Flight services are currently being provided to the GA community by multiple platforms. These services are provided within the Continental U.S., Puerto Rico, Alaska, and Hawaii, and include:

- pilot weather briefings;
- flight planning services;
- coordination of Visual Flight Rules (VFR) flight plans;
- orientation services to lost aircraft;
- weather broadcasts delivered on the radio frequencies of selected Navigational Aids (NAVAIDs),
- issuance of Notices to Airman (NOTAMs); and
- Search and Rescue (SAR) coordination.

Flight services in the lower 48 states are being provided by contractor personnel, 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) in Alaska.

This program supports the transition to a new AFSS 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. IID is planned in FY 2015 and 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 (SAR) response.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Develop the following products in support of Investment Analysis (IA) activities for the new AFSS contract:
  - Develop/Release Market Survey
  - Develop Initial Program Requirements Document
  - Develop Final Program Requirements Document
- Achieve an IID.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Develop the remaining IA products for the new AFSS contract:
  - Develop Independent Government Cost Estimate (IGCE);
  - Develop CFO Package
  - Develop Request For Proposal (RFP)/Screening Information Request (SIR) for the new AFSS contract.

***Program Plans FY 2017 – Performance Output Goals***

- Achieve a FID.
- Award new AFSS contract.

***Program Plans FY 2018-2019 – Performance Output Goals***

- Milestones will be developed at FID based on pending contract transition.

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**2C03, ALASKA FLIGHT SERVICE FACILITY MODERNIZATION (AFSFM)**

**FY 2015 Request \$2.8M**

**Alaska Flight Service Facility Modernization (AFSFM), F05.04-02**

**Program Description**

The Alaska Flight Service Facility Modernization (AFSFM) program modernizes or replaces the Flight Service facilities in Alaska to ensure the security and sustainment of Flight Services, and develop the infrastructure for continuity of operations. Over 1/3 of the 17 Alaska Flight Service 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 standards.

In coordination with Alaska Technical Operations and the Western Service Center, plans are developed to maintain and sustain Alaskan Flight Services 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 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 2015 – Performance Output Goals***

These actions may be superseded if a higher priority need is entered into the CWP prior to their beginning:

- Replace and upgrade the interior and exterior lighting at the Fairbanks AFSS.
- Decommission the old Gulkana FSS building.
- Decommission the old Kotzebue FSS buildings.
- Complete Roof Replacement at Ketchikan FSS.
- Refurbish the equipment rooms, break rooms, pilot briefing rooms, and rest rooms at the Ketchikan, Deadhorse FSS, Kotzebue FSS, and Nome FSS facilities.

***Program Plans FY 2016 – 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 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 Heating, Ventilation, and Air Conditioning (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 Heating, Ventilation, and Air Conditioning (HVAC) system at Deadhorse FSS.

***Program Plans FY 2019 – Performance Output Goals***

These actions may be superseded if a higher priority need is entered into the CWP prior to their beginning:

- Complete roof replacement at Nome FSS.
- Complete roof replacement at Kotzebue FSS.
- Complete refurbishment of the Heating, Ventilation, and Air Conditioning (HVAC) system at Nome FSS.

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**2C04, WEATHER CAMERA PROGRAM**

**FY 2015 Request \$0.2M**

**Weather Camera Program – Future Segments, M08.31-02**

**Program Description**

The Weather Camera Program sustains the operational Weather Cameras which are installed at airports and strategic en route locations to provide pilots, dispatchers and flight service station specialists with real-time video weather information in Alaska. 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 maintenance and restoral activities, maintains and operates system servers, software, and networks, and provides continued system automated monitoring, trouble ticket management and tracking, and operations reporting processes. 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 provides the renovation of structures that house the camera systems and provides upgrades to the poor performing sites. These sites must be refurbished periodically due to age and outdated equipment as well as 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 in-flight interruptions. 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 2015 – Performance Output Goals***

- Replace the Camera System Central Server at the Anchorage Regional Operations Center (ROC).
- Replace legacy and failing cameras/routers at five sites.

### ***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.

## D: Landing and Navigation Aids Programs

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### 2D01, VHF OMNIDIRECTIONAL RADIO RANGE (VOR) WITH DISTANCE MEASURING EQUIPMENT (DME)

**FY 2015 Request \$8.3M**

- A, Very High Frequency Omni-Directional Range (VOR) Collocated with Tactical Air Navigation (VORTAC), N06.00-00
- B, 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 converts VOR and VORTAC facilities to improve NAS efficiency and capacity. VOR, Tactical Air Navigation (TACAN) and VORTAC (combination VOR and TACAN) systems 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 they are 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 beyond their estimated service life. It is projected that within 10-15 years all existing VORTAC systems will be beyond their estimated service life.

There are over 1,000 VORTACs or VORs with 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.

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 restrictions due to encroachment of obstacles that block the transmission of VOR electronic signals. These restrictions are having a serious impact on both en-route and arrival and departure procedures. The main natural encroachment comes from the growth of vegetation, mostly trees, which are located outside the area controlled by FAA, but are now tall enough to cause electromagnetic interference. Many manmade obstacles cause the same electromagnetic interference, examples are the construction of tall buildings, new industrial parks with their high concentration of metal buildings, transmission lines, radio/TV/cell towers and most recently, wind farms. Dopplerizing a VOR eliminates most of these restrictions.

##### **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% in the short term.

***Program Plans FY 2015 – Performance Output Goals***

- Procure five DVOR Doppler Antenna Kits.
- Procure two DVOR electronic kits.
- Complete one on-going DVOR project.
- Complete analysis to determine the feasibility of redesigning the Line Replaceable Units (LRU) for the current VOR.

***Program Plans FY 2016 – Performance Output Goals***

- Procure five DVOR Doppler Antenna Kits.
- Procure two DVOR electronic kits.
- Complete one on-going DVOR project.

***Program Plans FY 2017 – Performance Output Goals***

- Procure five DVOR Doppler Antenna Kits.
- Procure two DVOR electronic kits.
- Complete one on-going DVOR project.

***Program Plans FY 2018 – Performance Output Goals***

- Procure five DVOR Doppler Antenna Kits.
- Procure two DVOR electronic kits.
- Complete one on-going DVOR project.

***Program Plans FY 2019 – Performance Output Goals***

- Procure 10 DVOR Doppler Antenna Kits.
- Procure 10 DVOR electronic kits.
- Complete two on-going DVOR projects.
- Initiate one new DVOR project.

**B, VOR – Minimum Operating Network (MON) Implementation Program, N06.01-01**

**Program Description**

In order to provide navigation services that more efficiently meet the goals of the NextGen, a transition from the use of VHF Omni-directional Range (VOR) defined route structures as the primary means of navigation to that of Performance-Based Navigation (PBN), using Area Navigation (RNAV) and Required Navigation Performance (RNP), supporting satellite navigation (SATNAV), is necessary. The current process for defining airways, routes, and developing procedures using VORs will transition to a more efficient development of routes that provide improved accuracy, availability, integrity, and continuity to support PBN. This transition strategy is described in the Federal Register Notice, which was briefed at the October 31, 2011 NextGen Management Board and approved for public release in December 2011.

The VOR Minimum Operational Network (MON) implementation program will prepare the analyses, documentation and implementation plan for downsizing the VOR network to the minimum required as a backup navigation system for VOR equipped aircraft. It would allow these aircraft to navigate and/or land safely under IFR in the event of an unplanned Global Positioning System (GPS) outage; however, the planned backup capability will be less robust than the current VOR network. Sufficient facilities will be retained so that navigation and landing can be accomplished without the necessity of using radar vectors, thus reducing the reliance on air traffic controllers, who may incur a high workload when dealing with the effects of a GPS outage. This program will transition the legacy network of approximately 967 VORs to a MON of approximately 500 VORs by 2025. Downsizing the VOR network to the minimum required for a backup navigation system provides an opportunity for cost avoidance and savings.

The program is currently in the Acquisition Management System process. Investment Analysis Readiness Decision (IARD) was approved in March 2014. The program is scheduled for Final Investment Decision (FID) in March 2015.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 5 – 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 use of GPS for aircraft navigation has increasingly reduced the need for ground based navigation aids for most domestic en route and terminal flights under instrument flight rules. Many aviation users no longer use Very High Frequency (VHF) Omni Ranges (VORs) for normal navigation and could potentially rely on using augmented GPS as a primary source. However, the risk of outages of GPS and other GNSS systems is well known, both from scheduled interference (e.g., Department of Defense [DoD] testing and exercises) or unscheduled events. Accordingly, the FAA is planning to maintain a backup navigation capability to provide service in case of a GPS outage.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Achieve Final Investment Decision.
- Additional activities and output goals will be dependent on FID.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

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## **2D02, INSTRUMENT LANDING SYSTEMS (ILS) – ESTABLISH**

**FY 2015 Request \$7.0M**

### **Instrument Landing Systems (ILS), N03.01-00**

#### **Program Description**

This program replaces older ILS equipment. The ILS provides the pilot with both vertical and horizontal guidance information allowing aircraft to land in weather conditions that would otherwise be prohibited. The ILS also enables airports to meet increasing traffic demands. The ILS includes three components, a localizer which gives lateral guidance to the runway centerline, a glide slope to give vertical guidance and marker beacons. 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 directly receive ILS signals to automatically guide the plane to a landing.

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).

- 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

Approximately 1,200 runway ends are equipped with an ILS in the U.S. Of these, approximately 125 are more than 25 years old and may be replaced, because they have exceeded their expected service life and their original 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. In FY 2024 more than 700 ILS currently deployed will exceed their service life.

### **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 58,166, 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 2015 – Performance Output Goals***

- Procure five ILS systems and ancillary equipment.
- Complete approximately five ILS replacement projects.
- Attain Service for two ILS projects.
- Develop plans to initiate approximately three new sustain ILS replacement projects.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Procure five ILS systems and ancillary equipment.
- Complete approximately five ILS replacement projects.
- Attain Service for two ILS projects.
- Develop plans to initiate approximately three new sustain ILS replacement projects.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Procure five ILS systems and ancillary equipment.
- Complete approximately five ILS replacement projects.
- Attain Service for two ILS projects.
- Develop plans to initiate approximately three new sustain ILS replacement projects.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Procure five Instrument Landing Systems.
- Install Instrument Landing Systems at five locations.

#### ***Program Plans FY 2019 – Performance Output Goals***

- Procure eight ILS systems and ancillary equipment.
- Complete approximately seven ILS replacement projects.
- Attain Service for two ILS projects.
- Develop plans to initiate approximately five new sustain ILS replacement projects.

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## **2D03, WIDE AREA AUGMENTATION SYSTEM (WAAS) FOR GPS**

**FY 2015 Request \$103.6M**

### **Wide Area Augmentation System (WAAS), N12.01-00**

#### **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.

WAAS became operational July 10, 2003. Following commissioning, WAAS began the Full Localizer Performance with Vertical guidance (LPV) segment (Phase II) which involved development, modernization, technology refresh and enhancement of WAAS. This program enhanced WAAS by extending availability of LPV over the entire CONUS and Alaska.

WAAS is currently in Phase III of the program, which allows Full LPV-200 Performance (precision approach guidance to within 200 feet vertically of the runway). Phase IV, Dual Frequency Operations, will begin 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 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.

In FY 2014, the WAAS program will seek a final investment decision for Phase IV, Dual Frequency Operations. 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). L5 can be used by civilian receivers and provides improved accuracy for civil users of GPS. Users who equip with new dual frequency (L1/L5) avionics will be able to process inputs from both GPS frequencies to internally calculate ionospheric corrections providing a more robust LPV-200 signal. The expectation is that users will equip with dual frequency (L1/L5) avionics when the upgraded system is operational. For those users who do not upgrade their avionics, WAAS will continue to support single frequency users during Phase IV.

The program funds the following activities:

- GEO Satellites: Satellite leases for the existing GEO #3, GEO #4, and Gap Filler GEO, as well as the development of the satellite payloads and ground infrastructure for the 5<sup>th</sup> and 6<sup>th</sup> leased GEOs which will

replace two of the existing satellite leases. There will be a continuing need for replacement GEOs throughout the WAAS lifecycle to ensure the current and future WAAS signal in space remains available. WAAS requires a minimum of three GEO satellites to meet performance requirements;

- **Technology Refresh:** Ongoing technology refresh to include integration of a new WAAS reference station G-III receiver, integration of a new safety computer, upgrades to the terrestrial communication system (TCS) and development and fielding of new processors;
- **NAS Implementation:** Supports the following activities: 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;
- **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); and
- **Program Management/Technical Support:** Technical assistance contracts to support program management, planning, software and hardware development, software and safety assurance, finance, acquisition, system performance assessment, logistics, training, test and evaluation, reliability-maintainability-availability (RMA) analysis, quality assurance (QA), human factors (HF), earned-value management (EVM), security, safety engineering and specialty engineering.

### **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 at over 3,889 runway ends (as of January 9, 2014).

#### ***Program Plans FY 2015 – Performance Output Goals***

##### GEO Satellites:

- Provide funding for three WAAS geostationary satellite leases.
- Complete GEO 5 Radio Frequency Uplink and Ground Uplink Station (GUS) development.

##### Technology Refresh:

- Implement Processor Upgrades for Dual Frequency Operation.
- Complete Telecommunications Upgrade.
- Complete fielding of 50% of Third Generation Reference receiver (G-III) fielding.

##### NAS Implementation:

- Develop and publish 100 WAAS LPV/LP approach procedures.

##### Technology Evolution:

- Establish Message Format for Dual-Frequency Multi-Constellation Definition Document.
- Complete Preliminary Draft of Dual-Frequency SBAS Minimum Operational Performance Standards (MOPS).
- Establish requirements for Scintillation to improve overall system performance.

***Program Plans FY 2016 – Performance Output Goals***

GEO Satellites:

- Provide funding for three WAAS geostationary satellite leases.
- Complete GEO 5 satellite launch and in-orbit test.
- Complete GEO 6 GUS development.

Technology Refresh:

- Develop and complete GEO 5 Signal Generator Subsystem (SGS) installation.
- Complete GEO 5 SGS fielding and deployment.
- Complete GEO 6 SGS Development.
- Complete processor/Operating System/Compiler upgrades.
- Complete Telecommunications Upgrade and all cutovers.
- Complete Telecommunications services for GEO 5 GUS sites.
- Complete Third Generation Reference receiver (G-III) fielding.

NAS Implementation:

- Develop, evaluate and publish remaining WAAS LPV/LP approach procedures out of 5,218 qualified runways in the NAS that can support a WAAS approach.

Technology Evolution:

- Develop prototype ARAIM concepts for evaluation.
- Develop draft MOPS for Dual-Frequency/Multi-constellation WAAS.
- Develop preliminary requirements to support MOPS development for ARAIM.
- Conduct an Initial Galileo Signal Assessment for potential inclusion into WAAS.

***Program Plans FY 2017 – Performance Output Goals***

GEO Satellites:

- Provide funding for three WAAS geostationary satellite leases with funding for additional GEO for part of FY due to fielding overlap (Field new GEO before decommissioning legacy GEO).
- Complete GEO 6 integration and testing.

Technology Refresh:

- Complete new G-III signal data processing.
- Field new Safety Computer at WAAS Master Station (WMS).
- Develop and complete GEO 6 SGS installation.
- Integrate GEO 5 into Operational WAAS.

NAS Implementation:

- None.

Technology Evolution:

- Conduct initial evaluation of Prototype Dual Frequency Algorithms.
- Conduct testing of ARAIM system elements.
- Establish draft MOPS for ARAIM.

***Program Plans FY 2018 – Performance Output Goals***

GEO Satellites:

- Provide funding for three WAAS geostationary satellite leases with funding for additional GEO for part of FY due to fielding overlap (Field new GEO before decommissioning legacy GEO).

Technology Refresh:

- Deploy software update to Safety Computers at WMS sites.

NAS Implementation:

- None.

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.

***Program Plans FY 2019 – Performance Output Goals***

GEO Satellites:

- Provide funding for three WAAS geostationary satellite leases.
- Establish contract for GEO 7.

Technology Refresh:

- Integrate GEO 6 into Operational WAAS.

NAS Implementation:

- None.

Technology Evolution:

- Establish government/industry partnerships to support initial development and evaluation of dual-frequency MOPS.

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**2D04, RUNWAY VISUAL RANGE (RVR) & ENHANCED LOW VISIBILITY OPERATIONS (ELVO) PROGRAM**

**FY 2015 Request \$6.0M**

- A, Runway Visual Range (RVR) – Replacement/Establishment, N08.02-00
- B, Enhanced Low Visibility Operations (ELVO), N08.03-01

**A, Runway Visual Range (RVR) – Replacement/Establishment, N08.02-00**

**Program Description**

The Runway Visual Range (RVR) program replaces older RVR equipment with PC-Based RVR equipment. RVR provides pilots and air traffic controllers with a measurement of the visibility at key points along a runway. 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 and Category II/III conditions. 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 low-impact-resistant structures that break away if hit by aircraft during take-off or landing. Replacement decisions are prioritized based on the level of activity at the airport, equipment age and life-cycle issues, such as: Reliability, Availability and Maintainability. 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 2015 – Performance Output Goals***

- Install RVR systems at 14 locations.

***Program Plans FY 2016 – Performance Output Goals***

- Procure eight RVR systems.
- Install RVR systems at eight locations.

***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.
- Initiate RVR projects at eight locations.

**B, Enhanced Low Visibility Operations (ELVO), 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 I 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 them 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.

<b>Enhanced Low Visibility Operations (ELVO) – Lower RVR Minimums</b>			
<b>Flight Operation</b>	<b>Minimums</b>	<b>Decision Height (DH) / Decision Altitude (DA)</b>	<b>Required Avionics</b>
<b>CAT I</b>	1800RVR	200 ft DA	Flight Director; or Head-Up Display (HUD); or Autopilot
<b>Special Authorization (SA) CAT I</b>	1400RVR	150 ft DH	HUD
<b>SA CAT II</b>	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 58,166, 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 2015 – Performance Output Goals***

- Initiate execution schedule in FAA Corporate Work Plan (CWP) for new low visibility services at a minimum of three locations.
- Obtain full operational capability for low visibility services at two sites.

#### ***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 four 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)

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**2D05, APPROACH LIGHTING SYSTEM IMPROVEMENT PROGRAM (ALSIP)**

**FY 2015 Request \$3.0M**

**Visual Nav aids – ALSIP Continuation, N04.03-00**

**Program Description**

The Approach Lighting System Improvement Program (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 with lightweight and low-impact resistant structures that collapse or break apart upon impact. The entire approach lighting system is replaced when existing non-frangible structures are replaced. 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 with reference to the glideslope, roll guidance, and horizontal references for Category I Precision Approaches. Runway Alignment Indicator Lights provides visual information to pilots on runway alignment.

There currently exists a backlog of 30 MALSR and 1 ALSF-2 systems that do not meet the frangible requirements. Current estimates project that it will take approximately 20 years to address this backlog. The FAA utilizes targets of opportunity wherever possible such as coordinating with airport sponsor projects. This coordination effort allows for the FAA to provide the required lighting aids sooner in conjunction with the airport's implementation activities, which has reduced the installation cost to the Agency as well as begin addressing some of the backlog.

**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 ALSIP replaces rigid approach lighting structures with lightweight and low-impact resistant structures that collapse or break apart upon impact. This reduces damage to aircraft that inadvertently descend below the minimum recommended altitudes and risk striking these structures during departure or landing. Reducing the impact and damage aircraft sustain when striking these lightweight and low-impact resistant structures diminishes the probability of fatal accidents if these structures are hit.

**Program Plans FY 2015 – Performance Output Goals**

- Procure approximately four MALSR systems and ancillary equipment.
- Replace a MALSR at approximately one location.

**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 MALSRS systems and ancillary equipment.
- Replace a MALSRS at approximately one location.

***Program Plans FY 2019 – Performance Output Goals***

- Procure approximately four MALSRS systems and ancillary equipment.
- Replace MALSRS at approximately two locations.

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**2D06, DISTANCE MEASURING EQUIPMENT (DME)**

**FY 2015 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 state-of-the-art DME systems to support Commercial Aviation Safety Team (CAST) requirements, renovation of DMEs that have exceeded their 20 year service life expectancy, replacement of ILS middle markers, critical new DME requirements, and RNP requirements.

To support the Commercial Aviation Safety Team (CAST) recommendations, the DME program is procuring and installing DME systems at 90 recommended sites. These systems will support the reduction of controlled-flight-into-terrain (CFIT) accidents at the most vulnerable locations in the NAS. There are 451 identified CAST DME sites. However, the FAA recommends that DME be installed at 177 of those locations; as of 2012, 91 DMEs have been installed. These 91 locations provide navigational information for 80 percent of all operations.

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/control over the vertical descent profile thus reducing CFIT risks.

**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 58,166, 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 state-of-the-art DME is 300% greater than that of the existing DME systems. Implementation of both these factors has 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%
- Improving reliability by 300%
- Increasing availability by 130%
- Reducing maintenance cost
- 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 2015 – Performance Output Goals***

- Procure 25 DME systems.
- Complete project initiation documentation for 25 DME installations.
- Attain availability for 25 establish/sustainment DME projects.

***Program Plans FY 2016 – Performance Output Goals***

- Procure 25 DME systems.
- Complete project initiation documentation for 25 DME installations.
- Attain availability for 25 establish/sustainment DME projects.

***Program Plans FY 2017 – Performance Output Goals***

- Procure 25 DME systems.
- Complete project initiation documentation for 25 DME installations.
- Attain availability for 25 establish/sustainment DME projects.

***Program Plans FY 2018 – Performance Output Goals***

- Procure 25 DME systems.
- Complete project initiation documentation for 25 DME installations.
- Attain availability for 25 establish/sustainment DME projects.

***Program Plans FY 2019 – Performance Output Goals***

- Procure 35 DME systems.
- Complete project initiation documentation for 35 DME installations.
- Attain service availability for 35 establish/sustainment DME projects.

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**2D07, VISUAL NAVAIDS - ESTABLISH/EXPAND**

**FY 2015 Request \$2.0M**

**Visual Navaids – 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. 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 implementation of PAPI systems satisfies Commercial Aviation Safety Team (CAST) recommendations and air carrier requirements for Land and Hold Short Operations (LAHSO).

- The FAA plans to implement the 170 highest priority CAST PAPI installations. This number would cover 80% of commercial airline operations. (25 of those 170 remain to be done.)
- LAHSO is an air traffic control tool used to increase airport capacity by allowing simultaneous approaches on intersecting runways. Vertical guidance is required for air carrier operations on the hold short runway. This is satisfied with a visual glide slope indicator (PAPI or existing VASI).

## 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 2015 – Performance Output Goals*

- Install CAST PAPI systems at 17 locations.

### *Program Plans FY 2016 – Performance Output Goals*

- Procure seven PAPI systems.
- Install CAST PAPI systems at seven locations.

### *Program Plans FY 2017 – Performance Output Goals*

- Procure seven PAPI systems.
- Install CAST PAPI systems at seven locations.

### *Program Plans FY 2018 – Performance Output Goals*

- Procure seven PAPI systems.
- Install CAST PAPI systems at seven locations.

### *Program Plans FY 2019 – Performance Output Goals*

- Procure seven PAPI systems.
- Install CAST PAPI systems at seven locations.

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## **2D08, INSTRUMENT FLIGHT PROCEDURES AUTOMATION (IFPA)**

**FY 2015 Request \$2.4M**

### **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.

FAA's Aeronautical 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. 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.

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 mostly manual process. As part of the development of the new IFPA tools, integration of systems is being accomplished between the Aeronautical 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.

IFPA – Technology Refresh, Segment 1 (A14.02-02):

In November 2010, the IFPA Technology Refresh Segment 1 cost and schedule baseline was approved by the Joint Resources Council (JRC). Beginning in FY 2012, the legacy APTS workflow software will be replaced with new in-house developed business process workflow software. The acquisition was originally planned as Commercial Off the Shelf (COTS), but a suitable commercial solution was not available so a non-COTS solution will be implemented. The APTS system will be renamed to AeroNav Products Workflow System and will be built in 3 phases. Phase 1 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 military workflow requirements. Phase 3 will provide a new management productivity suite of tools. Beginning in FY 2013, the IPDS software tool will be upgraded for COTS architecture changes, including conversion for the Windows-7 operating system. Technology Refresh of the IFPA server infrastructure began in FY 2013 and continues into FY 2014.

IFPA – Technology Refresh, Segment 2 (A14.02-03):

A study will begin 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

The IFPA system ensures continued progress toward increasing instrument flight procedures development and maintenance productivity. 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, while maintaining ISO-9000 compliance.

#### ***Program Plans FY 2015 – Performance Output Goals***

IFPA – Technology Refresh, Segment 1 (A14.02-02):

- Complete APTS upgrades with BPM Workflow Software Replacement Phase 2.

IFPA – Technology Refresh, Segment 2 (A14.02-03):

- None.

#### ***Program Plans FY 2016 – Performance Output Goals***

IFPA – Technology Refresh, Segment 1 (A14.02-02):

- Complete APTS upgrades with BPM Workflow Software Replacement Phase 3.
- Complete IPDS COTS Software Technology Refresh – Phase 2.

IFPA – Technology Refresh, Segment 2 (A14.02-03):

- None.

**Program Plans FY 2017-2019 – Performance Output Goals**

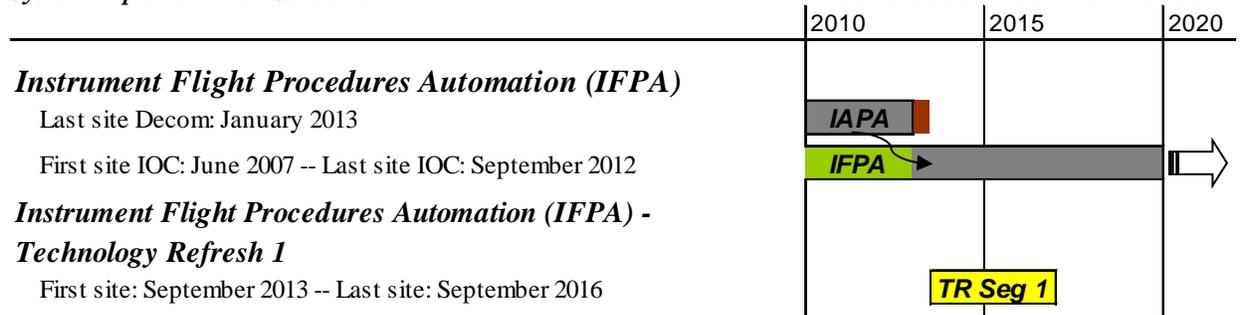
**IFPA – Technology Refresh, Segment 1 (A14.02-02):**

- 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**



**2D09, NAVIGATION AND LANDING AIDS – SERVICE LIFE EXTENSION PROGRAM (SLEP)**

**FY 2015 Request \$3.0M**

**Nav aids – Sustain, Replace, Relocate, N04.04-00**

**Program Description**

This program renovates or replaces airport approach lighting systems at sites where there is a high risk for failure of these systems and where failure would result in denying use of the primary precision approach. The approach lighting systems include:

- Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) for Category I approaches,
- High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) for Category II/III approaches, and
- Runway End Identifier Lights (REIL).

This program also replaces or renovates Instrument Landing Systems (ILS) at non-Core Airports, which are more likely to have the older systems with the least redundancy. ILS components include electronic devices such as localizers, glide slopes and marker beacons. In some cases ILS's (Mark 1F) removed from Core Airports are reinstalled at lower activity airports to replace existing Mark 1D and Mark 1E ILS.

This program includes various other efforts that are related to the replacement of supporting structures and other components of navigation equipment, such as: replace guide wires that support a light station, replace cable between light stations, replace aluminum light towers, replace DME antenna pedestal, convert antenna arrays, re-cable localizer antenna, equipment relocate, replace glideslope wooden tower, replace localizer antenna platform, repair pier with navigation or lighting equipment, undertake new technology initiatives, and provide engineering and technical services support.

Service life extension for some ALSF-2 (CAT II/III systems) is accomplished by replacing the constant current regulators, installing an improved monitoring system and replacing electrical cables 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 MALSRS green threshold and white steady burning lights with LED lights.

### **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 2015 – Performance Output Goals***

- Procurement and installation of approximately three ALSF-2 Runway Replacement Lamp Monitoring System (RLMS) sets.
- Complete Runway End Identifier Lights (REIL) replacement projects at approximately 10 locations.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Procurement and installation of approximately three ALSF-2 Runway Replacement Lamp Monitoring System (RLMS) sets.
- Complete Runway End Identifier Lights (REIL) replacement projects at approximately 10 locations.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Procurement and installation of approximately three ALSF-2 Runway Replacement Lamp Monitoring System (RLMS) sets.
- Complete Runway End Identifier Lights (REIL) replacement projects at approximately 10 locations.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Renovate or replace ILS at approximately two Non-Core Airport locations.
- Initiate replacement MALSRS projects at approximately 2 locations.
- Procure three ALSF-2 Runway Lamp Monitoring System Kits.
- Replace the Runway End Identifier Lights at 10 locations.
- Install the ALSF-2 Runway Lamp Monitoring System Kits at three locations.

#### ***Program Plans FY 2019 – Performance Output Goals***

- Renovate or replace ILS at approximately four Non-Core Airport locations.
- Initiate replacement MALSRS projects at 2 locations.
- Procure six ALSF-2 Runway Lamp Monitoring System Kits.
- Replace the Runway End Identifier Lights at 10 locations.
- Install the ALSF-2 Runway Lamp Monitoring System Kits at three locations.

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**2D10, VASI REPLACEMENT – REPLACE WITH PRECISION APPROACH PATH INDICATOR**  
**FY 2015 Request \$5.0M**

**Visual Nav aids – 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 runway ends. This will be completed in fiscal year 2018 when all of the remaining systems have been replaced. 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.*

**Relationship to Performance Metric**

Air traffic controllers use certain procedures such as Land and Hold Short Operations (LAHSO) to increase airport capacity and prevent aircraft delays. 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 2015 – 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 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.

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**2D11, GLOBAL POSITIONING SYSTEM (GPS) CIVIL REQUIREMENTS**

**FY 2015 Request \$27.0M**

**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. In FY 2015, the work required to implement Civil Signal Monitoring is expected to consist of system design and development activities and program management. 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) 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 2015 – Performance Output Goals***

- Provide funding to the Air Force GPS Directorate to implement the core 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 2016 – Performance Output Goals***

- Provide funding to the Air Force GPS Directorate to implement the core 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 to complete funding of the core 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 2018-2019 – Performance Output Goals***

- None.

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**2D12, RUNWAY SAFETY AREAS – NAVIGATION MITIGATION**  
**FY 2015 Request \$35.0M**

**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 Areas (RSA). The RSA must be free of all objects that are 3 inches above 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.

The 2006 DOT Appropriations (PL-109-115) required Part 139 certificated airports to comply with the current RSA airport design standards prior to December 31, 2015. In accordance with PL-109-115, the FAA must report on the agency’s progress toward RSA improvements.

The FAA has identified 1,430 RSA needs of varying size and complexity that must be addressed at various airport locations. The projects would improve non-compliant FAA-owned equipment in the RSAs. Initial funding to start the projects will be provided each fiscal year, while completion funding will typically be provided the following fiscal year.

**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 initiative 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.

FAA-owned equipment that are not moved or made frangible can pose a considerable safety risk to aircraft and passengers when struck during an overrun. For example, in June 1975 a Boeing 727 crashed into several non-frangible approach lighting systems (ALS) towers while attempting to land at John F. Kennedy Airport in New York. Of the 124 persons aboard, 113 died of injuries received in the crash.

***Program Plans FY 2015 – Performance Output Goals***

- Complete 75 F&E-funded RSA improvements.
- Provide funding and procure 20 systems for RSA improvements.

***Program Plans FY 2016 – Performance Output Goals***

- Complete 75 F&E-funded RSA improvements.

***Program Plans FY 2017 – Performance Output Goals***

- Complete 75 F&E-funded RSA improvements.

***Program Plans FY 2018 – Performance Output Goals***

- Complete 24 F&E-funded RSA improvements.

***Program Plans FY 2019 – Performance Output Goals***

- None.

## **E: Other ATC Facilities Programs**

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### **2E01, FUEL STORAGE TANK REPLACEMENT AND MANAGEMENT**

**FY 2015 Request \$15.5M**

#### **Fuel Storage Tank Replacement and 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 FST Program active inventory includes over 3,600 systems and 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.

Implementation costs are based on a 20 year system service lifecycle. An average of 180 FST system replacements is required annually to sustain NAS operational integrity. System components have differing lifecycles so component sustainment requirements continue during full system replacement 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 one of the 12 programs included in FAA's NAS Sustainment 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**

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 2015 – Performance Output Goals***

- Implement ARTCC fuel system upgrade at four sites; Denver Center (ZDV), Salt Lake Center (ZLC), Oakland Center (ZOA) and Jacksonville Center (ZJX).
- Implement fuel system modernization at two TRACON sites; Omaha TRACON and Elgin TRACON.
- Implement fuel system replacements at four island critical facilities: Guam (two facilities), Saipan (one facility) and San Juan (one facility).
- Implement fuel system replacements at 14 GNAS facilities to be determined by prioritization scheme.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Implement TRACON fuel system modernization at eight sites; Honolulu Combined Facility (HCF), Potomac TRACON (PCT), Atlanta TRACON (A80), Merrimack TRACON (A90), Florence TRACON (FLO), Miami TRACON (MIAZ), Huntsville TRACON (HSVZ) and Westbury NY (QHM).
- Implement fuel system replacements at eight ARSR facilities to be prioritized based on field reporting.
- Implement fuel system replacements at six CORE ATCT facilities, six CORE ASR facilities and four GNAS facilities to be determined by prioritization scheme.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Implement TRACON fuel system upgrades at nine sites; Orlando FL (F11), Falmouth MA (FMH), Pensacola FL (P31), Belleview NE (R90), Houston TX (I90), Weldon Springs MO (T75), Boise ID (BOIZ), Longview TX (GGGZ) and Sioux City IA (SUXZ).
- Implement fuel system replacements at 12 ARSR facilities to be prioritized based on field reporting.
- Implement fuel system replacements at 10 CORE ATCT facilities, 10 CORE ASR facilities and 20 CORE supporting GNAS facilities to be determined by prioritization scheme.

***Program Plans FY 2018 – Performance Output Goals***

- Implement TRACON fuel system upgrades at six sites; Edwards AFB CA (EDW), Sacramento CA (NCT), Portland OR (PDX), San-Diego CA (SCT), Seattle WA (SEA) and Anchorage AK (ANCZ).
- Implement fuel system replacements at 12 ARSR facilities to be prioritized based on field reporting.
- Implement fuel system replacements at seven CORE ATCT facilities, seven CORE ASR facilities, 14 CORE supporting GNAS facilities and 44 GNAS facilities to be determined by prioritization scheme.

***Program Plans FY 2019 – Performance Output Goals***

- Implement TRACON fuel system upgrades at six sites to be prioritized based on field reporting.
- Implement fuel system replacements at 12 ARSR facilities to be prioritized based on field reporting.
- Implement fuel system replacements at seven CORE ATCT facilities, seven CORE ASR facilities, 14 CORE supporting GNAS facilities and 30 GNAS facilities to be determined by prioritization scheme.

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**2E02, UNSTAFFED INFRASTRUCTURE SUSTAINMENT**

**FY 2015 Request \$32.3M**

**FAA Buildings and Equipment Sustain Support – Unstaffed Infrastructure Sustainment, F12.00-00**

**Program Description**

The Unstaffed Infrastructure Sustainment (UIS) Program modernizes NAS structures and supporting electrical, plumbing and heating/air conditioning equipment to ensure reliable delivery of Air Traffic Control services. There are approximately 28,000 unstaffed facilities within the NAS. The UIS Program is requesting an Acquisition Program Baseline. The Investment Analysis Readiness Decision (IARD) was achieved September 2012. Approval for the Final Investment Decision (FID) was received June 2013. This program is one of the 12 programs included in FAA's NAS Sustainment Strategy.

This program includes major replacement and/or upgrading of real property and structures which do not have staff permanently assigned to them. Examples of projects are:

- Major property upgrades including: access roads, grounds, security fencing, storm water controls, parking lots, helicopter landing pads, marine structures (such as docks), security gates, lighting, and walkways;
- Replacement or modernization of FAA infrastructure including: buildings, shelters, roofs, sheds, fuel tanks (heating only), plumbing, heating, ventilating and air conditioning (HVAC) equipment, alarms, and lighting. NAS communication, surveillance, navigation and weather services equipment is currently housed in these unstaffed facilities. The anticipated service life for most of this infrastructure is 25 years, and according to the Facility Service and Equipment Profile (FSEP) database, over 50 percent (50%) of the FAA's current unstaffed infrastructure will exceed its service life within the next five years. The FAA infrastructure portfolio has the added complication that several facilities are located at remote sites, which require more frequent renovation and because of their location need unique logistical solutions;
- Replacement or renovation of NAS supporting structures for antennas and other communications, surveillance, navigation and weather equipment;
- Life Safety: addressing significant and unacceptable occupational safety and health risks (i.e., electrical hazards, fall protection, and physical hazards associated with deteriorated infrastructure) which have been identified at over 50 FAA facilities. These hazards place the safety of FAA employees conducting maintenance at these facilities at risk and can result in NAS disruptions.

Initial portfolio analysis has revealed that many unstaffed facilities:

- 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., temperature, excessive corrosion, other).
- 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.
- Have structures supporting air-ground communications and navigation and landing aids that have been weakened due to environmental factors (e.g., broadcast towers).

### **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 providing renovation or replacement of 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 will result in NAS equipment failures directly reducing capacity of the NAS. A few of the many examples of infrastructure failures that resulted in direct impacts to the NAS include: a roof leak taking the Idaho Falls (IDA) VOR off line for 7 hours and 15 minutes; roof leaks at the Andrews (ADW) VOR causing 280 hours in outages; and Pawnee City (PWE) VOR being off-line for 369 days due to failure of the roof. The Wilkes-Barre, PA MALSR has been out of service since February 21, 2013 due to the poor condition of the towers and catwalk that support the lights and flashers.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Complete 120 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- By 9/30/2015, establish FY 2016 prioritization plan for deferred maintenance and safety related deficiencies and coordinate with EOSH Service to ensure compliance requirements are addressed.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Complete 120 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- By 9/30/2016, establish FY 2017 prioritization plan for deferred maintenance and safety related deficiencies and coordinate with EOSH Service to ensure compliance requirements are addressed.

#### ***Program Plans FY 2017 – Performance Output Goals***

- Complete 120 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- By 9/30/2017, establish FY 2018 prioritization plan for deferred maintenance and safety related deficiencies and coordinate with EOSH Service to ensure compliance requirements are addressed.

#### ***Program Plans FY 2018 – Performance Output Goals***

- Complete 150 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- By 9/30/2018, establish FY 2019 prioritization plan for deferred maintenance and safety related deficiencies and coordinate with EOSH Service to ensure compliance requirements are addressed.

#### ***Program Plans FY 2019 – Performance Output Goals***

- Complete 150 unstaffed infrastructure projects located in all three service areas for Communication, Navigation, Surveillance, and Support Services.
- By 9/30/2019, establish FY 2020 prioritization plan for deferred maintenance and safety related deficiencies and coordinate with EOSH Service to ensure compliance requirements are addressed.

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## **2E03, AIRCRAFT RELATED EQUIPMENT PROGRAM**

### **FY 2015 Request \$9.0M**

- A, Aircraft Related Equipment (ARE) Program, M12.00-00
- X, Airbus Simulator Purchase - Advanced Fly-By-Wire Simulator – Additional Technology Refresh Projects, M12.01-04

### **A, Aircraft Related Equipment (ARE) Program, M12.00-00**

#### **Program Description**

The Aircraft Related Equipment 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 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 (Automatic Flight Inspection System (AFIS) and NextGen Automatic Flight Inspection system (NAFIS)). The Aircraft Related Equipment (ARE) program updates the FAA's FI aircraft fleet with systems required for inspecting, certifying, modernizing and sustaining the NAS and evolving NextGen requirements. These aircraft must not only be able to perform flight inspection but also be equipped with modern avionics necessary to operate in the evolving NAS environment.

The FI aircraft fleet is composed of 32 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 as well.

The new equipment provides the capability for flight validation & inspection of:

- WAAS/LPV/LP approaches;
- Required Navigation performance (RNP)/ Special Aircraft and Aircrew Authorization Required (SAAR);
- Area Navigation (RNAV) Standard Instrument departures (SIDs)/Standard Terminal Approach Routes (STARs);
- Distance Measuring Equipment (DME/DME) and GPS routes;
- Automatic Dependent Surveillance – Broadcast (ADS-B);
- Wide Area Multi-lateration (WAM); and
- GLS - GPS Landing System.

The ARE program is grouped into three activities:

#### Aircraft Modernization:

Projects support avionics technology refresh and new/changing regulatory requirements for operating aircraft in domestic and international airspace.

#### Flight Inspection System Sustainment:

Projects support mission equipment technology refresh and new/changing regulatory requirements necessary to continue flight inspection of legacy NAS systems.

#### Flight Inspection System Modernization:

Projects support new mission equipment requirements and new/changing regulatory requirements necessary to provide flight inspection of Performance Based Navigation and implementation of evolving NextGen systems.

## **Alignment of Program to FAA Strategic Priority and Performance Metric**

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

## **Relationship to Performance Metric**

The FAA sustains system availability by ensuring the accuracy of navigational aid electronic signals, as well as validating and certifying the approach/departure flight procedures and terminal routes at all airports within the NAS and at military facilities world-wide. To do this the fleet of FI aircraft must be modernized and updated to be compatible with the latest equipment and procedures. By constantly checking electronic aids for navigation and landing, and the associated procedures, availability is maintained. As the data below shows, the checks identify discrepancies that are fixed before they cause delays and diversions of aircraft.

In FY 2011 through FY 2012, a total of 31,849 flight inspections were conducted of existing ground based navigational aids and existing Instrument Flight Procedures (IFPs) and 1,988 had reportable discrepancies. This equates to 6.2% of published IFPs and associated ground based navigational aids requiring further attention. In addition, 7,162 IFPs required flight inspection in order to publish a new or amended flight procedure. The results of those flight inspections required 808 IFPs to be adjusted or found to be unsatisfactory. Of the new or amended IFPs, 11.3% required correction and thereby avoided potentially unsafe IFPs from being published.

### ***Program Plans FY 2015 – Performance Output Goals***

#### Aircraft Modernization:

- Publish a Flight Inspection Aircraft Fleet (Future Plan) study.
- Acquire and/or install:
  - Pro Line 21 avionics suite on four BE-300 aircraft and one CL-600 series aircraft.
  - Integrated Flight Information System (IFIS) on one prototype aircraft. IFIS is an enhancement to the avionics suite.
  - Equipment to establish wireless connectivity on one prototype aircraft.
- Establish multi-year schedules for the IFIS and wireless connectivity projects for the fleet.

#### Flight Inspection System Sustainment:

- Execute interim updates:
  - Automated Flight Inspection System (AFIS).
  - NAFIS Phase I for deployed aircraft.
- Deploy Flight Operations Management System (FOMS) integrated with airborne systems.

#### Flight Inspection System Modernization:

- Complete or deploy:
  - NAFIS FIAPA software Block I development and integration (part of NAFIS Phase II).
  - NAFIS Phase I on four Beech 300 aircraft.
  - NAFIS Phase II on two CL-600 series aircraft.

### ***Program Plans FY 2016 – Performance Output Goals***

#### Aircraft Modernization:

- Acquire and/or install:
  - Pro Line 21 avionics suite on five BE-300 aircraft and three CL-600 series aircraft.
  - Integrated Flight Information System (IFIS) based on the multi-year schedule established in FY 2015.
  - Equipment to establish wireless connectivity based on the multi-year schedule established in FY 2015.
- Update the outyear fleet installation schedules as needed for the IFIS and wireless connectivity projects.

#### Flight Inspection System Sustainment:

- Begin or execute interim updates:
  - Automated Flight Inspection System (AFIS) and complete AFIS sustainment.
  - NAFIS Phase I for deployed aircraft and complete fleet deployment.
  - NAFIS Phase II 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.
  - NAFIS Phase II Development, including FIAPA software Block II development and integration.

***Program Plans FY 2017 – Performance Output Goals***

Aircraft Modernization:

- Acquire and/or install:
  - Pro Line 21 avionics suite on two CL-600 series aircraft and complete the project for the fleet.
  - Integrated Flight Information System (IFIS) based on the multi-year schedule updated in FY 2016.
  - Equipment to establish wireless connectivity based on the multi-year schedule updated in FY 2016.
- Update the outyear fleet installation schedules as needed for the IFIS and wireless connectivity projects.

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) based on the multi-year schedule updated in FY 2017.
  - Equipment to establish wireless connectivity based on the multi-year schedule updated in FY 2017 and complete the project for the fleet.
- Update the outyear fleet installation schedule as needed for the IFIS project.

Flight Inspection System Sustainment:

- Execute NAFIS interim updates for deployed aircraft.
- Begin NAFIS sustainment updates after full aircraft deployment.

Flight Inspection System Modernization:

- Deploy NAFIS Phase II on two BE-300 aircraft.
- Complete NAFIS aircraft deployments.

***Program Plans FY 2019 – Performance Output Goals***

Aircraft Modernization:

- Acquire and/or install the Integrated Flight Information System (IFIS) based on the multi-year schedule updated in FY 2018 and complete the project for the fleet.
- Establish a schedule for the fleet to upgrade the Global Positioning System (GPS) antennas to include the L5 band.

Flight Inspection System Sustainment:

- Execute NAFIS updates for the fleet.

**X, Airbus Simulator Purchase - Advanced Fly-By-Wire Simulator – Additional Technology Refresh Projects, M12.01-04**

**Program Description**

Advanced Fly-By-Wire (FBW) Simulator Additional Technology Refresh will upgrade specific components in the Airbus simulator. The FAA is responsible for the development, analysis and introduction into the NAS of new concepts and technologies for aircraft navigation and instrument flight operations. The FAA Flight Technologies and Procedures Division (AFS-400) establishes and governs policies, criteria and standards by which terminal and en route flight procedures are established and maintained. AFS-400 is also responsible for approving special instrument approach procedures and requests for waivers of standards.

The FAA acquired an Airbus 330/340 (A330/340) convertible 6-axis full flight aircraft simulator that replicates the performance and handling characteristics of a wide-body aircraft with two jet engines (A330) or four jet engines (A340), which are commercial transport aircraft with electronic FBW flight control technologies. The A330/340 simulator with side-stick control complements the narrow-body Boeing 737-800 Next Generation simulator during vital research and development projects and realistic high fidelity operational evaluation activities. Such activities include Closely Spaced Parallel Operations (CSPO), Required Navigation Performance (RNP), and Human-in-the-Loop (HITL) pilot/controller/aircraft terminal operations performance during introduction of new NextGen technology initiatives. This simulator supports NAS NextGen modernization and development initiatives such as future FAA and National Transportation Safety Board (NTSB) safety initiatives.

A FID is planned in FY 2015 which will define the specific components in the Airbus 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 A330/340 simulator improves air safety by providing the FAA with the capability to conduct NextGen operational evaluation programs on the impact of introducing new technologies and advanced systems integration within the NAS. On-going and future research and development projects will provide regulators with analysis data to ensure safe implementation of new technologies while increasing capacity within the NAS. It will also improve safety by assisting accident investigators and other inspectors and analysts with replication of mishap incident and trend data that may provide input into procedure and/or equipment modifications. The simulator's high fidelity capability and operational realism along with the ability to quickly modify operational procedures for evaluation will provide enhanced aircraft performance and HITL data for safety analyses across all flight segments.

#### ***Program Plans FY 2015 – Performance Output Goals***

- None.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Milestones will be developed at FID.

#### ***Program Plans FY 2017-2019 – Performance Output Goals***

- None.

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## **2E04, AIRPORT CABLE LOOP SYSTEMS – SUSTAINED SUPPORT**

**FY 2015 Request \$5.0M**

### **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. 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. 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. 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).

### **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 during that specific time period. The number of associated delays has decreased an average of 3% annually since that time. For the FY 2014/2015 sites identified to have corrective action taken, 163 of the delays will be mitigated from having a reoccurrence.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Complete electronics installation at Miami, FL Airport (MIA).
- Complete Fiber Optic Transmission Systems installation at Cleveland (CLE).
- Develop plan for advanced engineering, construction activities, and Fiber Optic Transmission Systems equipment installations for Anchorage (ANC) and Oakland (OAK).
- Perform construction and electronics activities at John F Kennedy (JFK) in New York.
- Perform electronics installation at Denver (DEN).

#### ***Program Plans FY 2016 – Performance Output Goals***

- Complete reconfiguration and electronics installation activities at San Francisco (SFO).
- Complete engineering package at Ft Lauderdale, FL Airport (FLL).
- Develop plan for two additional airports. The FY 2014 planning activities will confirm the sites.
- Perform construction and electronics activities at John F Kennedy (JFK) in New York.
- Perform electronics installation at Denver (DEN).

#### ***Program Plans FY 2017 – Performance Output Goals***

- Complete construction at Ft Lauderdale, FL Airport (FLL).
- Develop plan for two additional airports. The FY 2015 planning activities will confirm the sites.
- Perform construction and electronics activities at John F Kennedy (JFK) in New York.
- Perform electronics installation at Denver (DEN).

#### ***Program Plans FY 2018 – Performance Output Goals***

- Complete electronics installation at Ft Lauderdale, FL Airport (FLL).
- Complete electronics and construction installation at John F Kennedy (JFK) in New York.
- Complete electronics installation at Denver (DEN).
- Develop plan for three additional airports one of which will be a core airport.

#### ***Program Plans FY 2019 – Performance Output Goals***

- Complete construction activities at one airport determined by the Air/Ground Integrated Requirements Team in FY 2014.
- Develop plan for two additional airports, one of which will be a core airport determined in FY 2017.

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## **2E05, ALASKAN SATELLITE TELECOMMUNICATION INFRASTRUCTURE (ASTI)**

**FY 2015 Request \$11.4M**

### **Alaskan Satellite Telecommunication Infrastructure (ASTI), C17.02-01**

#### **Program Description**

The Alaskan Satellite Telecommunication Infrastructure (ASTI) program (formerly named Alaskan NAS Interfacility Communications System (ANICS)) will upgrade the FAA owned and operated communications network (using satellite transmissions of data) that provides 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).

ASTI uses primary and alternate satellites that meet FAA Order 6000.36 specifications to provide system circuit diversity and redundancy. The Alaskan Satellite Telecommunications Infrastructure (ASTI) program was initiated to modernize the legacy ANICS network. The ASTI Modernization Contract was awarded in August 2011.

Existing system availability has fallen below required availability and continues to decline. Outages are increasing in both number and duration. Many system components have either reached the end of their useful life or are no longer supportable. In addition, the arctic climate degrades the ground equipment due to cold cycling, corrosion and wind damage. Recently, aggressive technical service efforts have been required to maintain overall system availability and reliability. Conditions have led to a loss of performance capability and increased frequency and cost of maintenance. Much of the Network Management and Control System (NMCS) equipment has reached its capacity as the number of ASTI sites has risen to the current 64 sites. In addition, the NMCS does not provide the level of security assurance that current Federal standards demand.

The ASTI Program will restore system availability through this Modernization program. It will achieve this objective by awarding contracts to acquire and provide Commercial off-the-Shelf (COTS) 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).

#### **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 FAA's Strategic Priority of Deliver Benefits through Technology and Infrastructure and the metric for maintaining operational availability of the National Airspace System (NAS) at 99.7 percent. 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 2015 – Performance Output Goals**

- Complete Installation at 37th site. (APB milestone)

**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 2018-2019 – Performance Output Goals**

- None.

**System Implementation Schedule**



**2E06, FACILITIES DECOMMISSIONING**

**FY 2015 Request \$5.7M**

**Decommissioning – Real Property Disposition, F26.01-01**

**Program Description**

The Decommissioning – Real Property Disposition Program works with other FAA programs to identify and plan for the timely disposition of real property. After other programs decommission a system, this program is solely responsible for real property disposal for all FAA NAS sites. The program accomplishes this with a proactive approach in cross-program collaboration and by providing specific insight and expertise to facilitate the disposition of decommissioned or excess real property assets. This approach for disposal of facilities is nationally prioritized to meet current, future, and evolving operational needs. The implementation of NextGen, changes in airspace design and decommissioning of sites that are no longer needed to support NAS operations increases the need for the disposal of excess properties.

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 (FTI) service,
- Some locations of ground based navigation systems (i.e. VOR, NDB and ILS (CAT I)) 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 Decommissioning – Real Property Disposition Program coordinates, plans, and implements actions necessary to facilitate disposition of real property infrastructure and site restorations, when required, of all decommissioned facilities. The four services provided by the Decommissioning Program are as follows:

- Identifying, verifying, and scheduling the disposition and needed site restoration of decommissioned facilities,

- 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 Decommissioning Program serves a critical role in the removal of these facilities from the FAA's inventory and the subsequent reduction of Operations and Maintenance (O&M) costs, lease costs (where applicable), and associated liabilities. This program is one of the 12 programs included in FAA's NAS Sustainment Strategy.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

This program directly supports improving 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 2015 – Performance Output Goals***

- Complete approximately 125 Real Property Disposal Projects, approximately 42 per Service Area. These projects include, but are not limited to, Visual Aids, Navigational Aids (NDB, DF, ILS, etc), Radio Communications sites including Towers (RCO, RTR, etc). This will include disposal of Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Complete approximately 75 Real Property Disposal Projects, approximately 25 per Service Area. These projects include, but are not limited to, Visual Aids Navigational Aids (NDB, DF, ILS, etc), Radio Communications sites including Towers (RCO, RTR, etc). This will include disposal of Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.
- Dispose of eight Very-High Omni-directional Radio (VOR) sites

#### ***Program Plans FY 2017 – Performance Output Goals***

- Complete approximately 75 Real Property Disposal Projects, approximately 25 per Service Area. These projects include, but are not limited to, Visual Aids Navigational Aids (NDB, DF, ILS, etc), Radio Communications sites including Towers (RCO, RTR, etc). This will include disposal of Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.
- Dispose of eight 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 include, but are not limited to, Visual Aids Navigational Aids (NDB, DF, ILS, etc), Radio Communications sites including Towers (RCO, RTR, etc). This will include disposal of Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.
- Dispose of 22 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 include, but are not limited to, Visual Aids Navigational Aids (NDB, DF, ILS, etc), Radio Communications sites including Towers (RCO, RTR, etc). This will include disposal of Radio Communications Link Repeater (RCLR) /Radio Communications Link Terminal (RCLT) Tower sites.

- Dispose of 22 Very-High Omni-directional Radio (VOR) sites.

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## **2E07, ELECTRICAL POWER SYSTEMS – SUSTAIN/SUPPORT**

**FY 2015 Request \$102.0M**

### **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 protect sensitive electronic equipment from 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 one of the 12 programs included in FAA's NAS Sustainment Strategy.

#### Power Systems Sustained Support (PS3) (F11.01-01):

PS3 sustains the following components and services:

- **NAS Batteries:** Large scale battery complexes serve as backup power sources for key NAS electronic installations at en route, terminal, and General National Airspace System (GNAS) facilities. These batteries provide power for a limited time during major power system disruptions and maintain the function of key systems. The PS3 program sustains Air Route Traffic Control Centers (ARTCC) Critical and Essential Power System (ACEPS) and GNAS battery installations with periodic 5- to 7-year replacements 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 currently sustains PCS/UPS systems with an expected useful life of 20 years. The PCS/UPS inventory requires replacement due to reliability and supportability issues attributable to age.
- **Direct Current Backup System (DC BUS):** A DC BUS stores power in batteries, providing a low cost, short term power source at facilities with a limited number of equipment. System availability is increased by preventing commercial power outages from disrupting air traffic operations for up to several hours. The PS3 sustains DC BUS with 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, 2 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 replaces, sustains and optimizes elements to minimize 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 provide backup power (and are the primary source of power at some remote locations) for essential NAS electronic systems at GNAS facilities 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 which are replaced by the Engine-Generator, PCS/UPS, and NAS Battery sustainment activities.
- **PS3 Program Management and System Engineering:** This activity provides program management and power systems engineering for design and management of electrical power systems in the NAS. 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, and addresses establishing and administering test facilities and developing procedures for enhanced system designs.
- **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 Cell. PS3 sustains AES installations connected to NAS equipment.
- **Environmental Remote Monitoring System (ERMS):** ERMS provides the interface of power systems (EG's, DC Bus, PCS/UPS) to the remote monitoring system to provide power system status to the Operations Control Centers. The status information provides FAA with real time data on the status of the systems which allows response to system related issues.

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 airport capacity 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. PS3 supports the NAS operational availability of 99.7%.

***Program Plans FY 2015 – 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 (19 Sets).
- DC BUS Systems (24 Sets).
- ACEPS (3 Sets).
- LPGBS elements (5 Sets).
- ELD Replacements (9 Sets).
- Engine Generators Replacement (99 Sets).

- CPDS (3 Sets).
- PS3 Program Management and System Engineering (9 Sets).
- AES (8 Sets).

Power Systems Sustained Support (PS3) – Future Segments (F11.01-02):

- None.

***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 (120 Sets).
- PCS / UPS (24 Sets).
- DC BUS Systems (38 Sets).
- ACEPS (1 Sets).
- LPGBS elements (15 Sets).
- ELD Replacements (7 Sets).
- Engine Generators Replacement (69 Sets).
- CPDS (6 Sets).
- PS3 Program Management and System Engineering (10 Sets).
- AES (6 Sets).
- ERMS (3 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 (120 Sets).
- PCS / UPS (24 Sets).
- DC BUS Systems (38 Sets).
- ACEPS (1 Sets).
- LPGBS elements (15 Sets).
- ELD Replacements (7 Sets).
- Engine Generators Replacement (69 Sets).
- CPDS (6 Sets).
- PS3 Program Management and System Engineering (10 Sets).
- AES (6 Sets).
- ERMS (3 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 (152 Sets).
- PCS / UPS (30 Sets).
- DC BUS Systems (48 Sets).
- ACEPS (2 Sets).
- LPGBS elements (19 Sets).
- ELD Replacements (9 Sets).
- Engine Generators Replacement (88 Sets).
- CPDS (7 Sets).

- PS3 Program Management and System Engineering (12 Sets).
- AES (8 Sets).
- ERMS (5 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 (180 Sets).
- PCS / UPS (35 Sets).
- DC BUS Systems (57 Sets).
- ACEPS (2 Sets).
- LPGBS elements (23 Sets).
- ELD Replacements (11 Sets).
- Engine Generators Replacement (104 Sets).
- CPDS (9 Sets).
- PS3 Program Management and System Engineering (14 Sets).
- AES (7 Sets).
- ERMS (5 Sets).

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**2E08, ENERGY MANAGEMENT AND COMPLIANCE (EMC)**

**FY 2015 Request \$1.0M**

**Energy Cost Savings – Energy Management and Compliance, F13.04-02**

**Program Description**

The Energy Management and Compliance (EMC) Program will be a new capability that will centrally orchestrate cost-effective reductions of energy and water use at ATO facilities. This will be 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 will not only reduce operational costs to the ATO but also increase reliability of the NAS by reducing the likelihood of facility outages and disruptions. The EMC Program will promote 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 one of the 12 programs included in FAA’s NAS Sustainment Strategy.

The EMC Program will also contribute 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
- FY 2013 DOT/FAA Strategic Sustainability Performance Plan (SSPP) Goals 1, 2, and 4.

The strategy for the EMC Program is to address projects and initiatives that are cost-effective and provide the most benefits to the ATO. The EMC Program intends to focus on five specific capability areas:

1. **Improving monitoring of ATO energy performance** including engineering, designing, planning and testing a cost-effective approach for installing advanced electric meters to comply with the provisions of 42 U.S. Code Section 8253.

2. **Implementing energy and water efficiency projects** at targeted sites to improve ATO performance including infrastructure improvements with the greatest cost to benefit ratios and shortest payback periods.
3. **Increasing the number of high performance sustainable buildings** in ATO's portfolio by implementing targeted infrastructure improvements at selected large staffed facilities in compliance with Executive Order mandates.
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.

Final Investment Decision (FID) approval was received 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 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 2015 – Performance Output Goals***

- Install 14 advanced electric meters at select facilities.
- Perform energy and water improvements at three facilities.
- Complete the design for energy and water improvements at seven facilities.
- Complete the design for High Performance Sustainable Building (HPSB) upgrades at one facility.
- Provide the required 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 2016 – Performance Output Goals***

- Install 23 advanced electric meters at select facilities.
- Install five advanced gas meters at select facilities.
- Perform energy and water improvements at seven facilities.
- Perform HPSB upgrades at one facility.
- Complete the design for energy and water improvements at 13 facilities.
- Complete the design for HPSB upgrades at two facilities.
- Provide the required 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 one advanced electric meter at a select facility.
- Perform energy and water improvements at 13 facilities.
- Perform HPSB upgrades at two facilities.
- Complete the design for energy and water improvements at 12 facilities.
- Complete the design for HPSB upgrades at two facilities.
- Provide the required 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 eight advanced electric meters at select facilities.
- Perform energy and water improvements at 12 facilities.
- Perform HPSB upgrades at two facilities.
- Complete the design for energy and water improvements at 14 facilities.
- Complete the design for HPSB upgrades at one facility.
- Provide the required 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 14 facilities.
- Perform HPSB upgrades at one facility.
- Complete the design for energy and water improvements at 12 facilities.
- Complete the design for HPSB upgrades at one facility.
- Provide the required annual reports on progress against legislative and executive order mandates to the Department of Energy (DOE) and the Office of Management and Budget (OMB).

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**2E09X, INDEPENDENT OPERATIONAL TEST AND EVALUATION**

**FY 2015 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. 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 2015-2019 – Performance Output Goals***

- A specific list of programs that will have an IOA performed will be finalized at the beginning of each fiscal year.

## **ACTIVITY 3: NON-AIR TRAFFIC CONTROL FACILITIES AND EQUIPMENT**

### **A: Support Equipment**

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#### **3A01, HAZARDOUS MATERIALS MANAGEMENT**

**FY 2015 Request \$22.0M**

#### **Environmental Cleanup / 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 identified approximately 743 contaminated sites at approximately 150 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 one of the 12 programs included in FAA's NAS Sustainment Strategy.

Annually in September the Environmental Site Cleanup Report (ESCR) is published. This document contains current and expected future cleanup activities for the 720 contaminated sites mentioned above. An estimate of out year Environmental Remediation (ER) Liabilities is also included in this report. The current (FY 2013) ER Liability is estimated at approximately \$454M un-inflated, and with contingency and inflation the ER Liability is estimated at approximately \$821M. We continue to make good progress toward remediating sites. Approximately 5% of the existing sites 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. In the FY 2013 ESCR, the total number of identified sites decreased from 743 to 681.

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, 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.

## Alignment of Program to FAA Strategic Priority and Performance Metric

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 2015-2019 – Performance Output Goals*

- Complete activities at five percent (5%) of the total sites listed in the Environmental Site Cleanup Report, resulting in no further resources being needed to be applied to these sites.

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## **3A02, AVIATION SAFETY ANALYSIS SYSTEM (ASAS)**

**FY 2015 Request \$11.9M**

### **Regulation and Certification for Infrastructure System Safety (RCISS) – Segment 2, A17.01-02 / X, Regulation and Certification for Infrastructure System Safety (RCISS) – Segment 3, A17.01-03**

## Program Description

RCISS is an existing technology refreshment 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. All 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. Improving the rate of data transfer 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 personnel computers and peripherals);
- telecommunications services;
- application servers and data storage devices (hosting national AVS safety applications); and
- COTS Software licenses.

The program will also procure contractor support services to provide specialized technical expertise in modernizing and maintaining the RCISS enterprise infrastructure. 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.

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 FY 2015 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 RCISS program provides the infrastructure to support the workforce's need for information on the safety record of an airline, and the actions required to meet regulations and directives. This new infrastructure will dramatically enhance the capability of the workforce to complete assignments while conducting work in the field. Having this information allows the safety inspectors to determine if the airline is complying with good safety practices, which is essential to FAA's role in preventing accidents. 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 2015 – 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 (MOB) Deployment 8 for annual technology refresh of safety workforce mobile toolkits. (APB Milestone)
- Complete Contract Award - Enterprise Data Center (EDC) Deployment 8 for annual technology refresh of Enterprise Data Center centralized data storage and processing equipment. (APB Milestone)
- Complete contract award for annual technology refresh of Enterprise Data Center disaster recovery servers and storage area network equipment.
- Complete RCISS Segment 3 Final Investment Decision.

RCISS Segment 3 (A17.01-03):

- None.

***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 (MOB) 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):

- None.

***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.
- Complete Disaster Recovery Deployment 10 contract award for annual technology refresh of disaster recovery 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.
- Complete Disaster Recovery Deployment 11 contract award for annual technology refresh of disaster recovery equipment.

***Program Plans FY 2019 – Performance Output Goals***

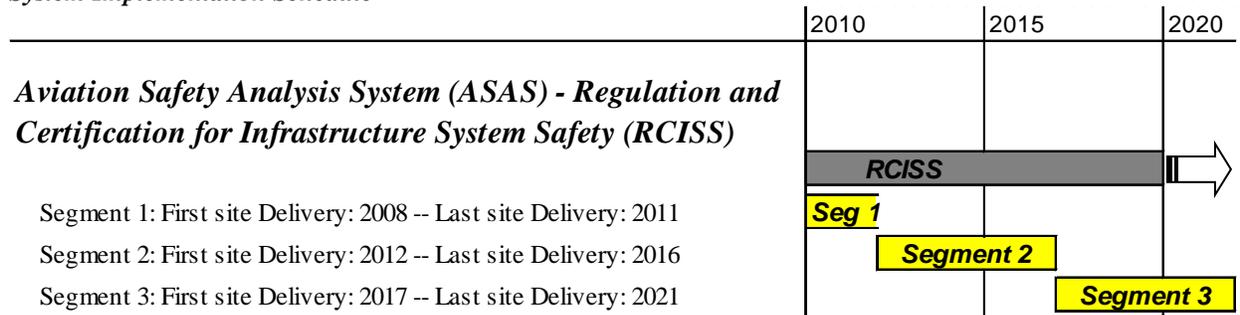
**RCISS Segment 2 (A17.01-02):**

- 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.
- Complete Disaster Recovery Deployment 12 contract award for annual technology refresh of disaster recovery equipment.

***System Implementation Schedule***



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### **3A03, LOGISTICS SUPPORT SYSTEM AND FACILITIES (LSSF)**

**FY 2015 Request \$8.0M**

#### **Logistics Center Support System (LCSS) – Segment 2, M21.04-01 / X, Logistics Center Support System (LCSS) – Technology Refresh, M21.04-02**

##### **Program Description**

The Logistics Center Support System (LCSS) is a mission support IT procurement to re-engineer and automate the FAA's logistics management processes. The program modernizes the FAA's supply chain management and replaces the 20-year old Logistics Inventory System (LIS) in support of the Next Generation of air traffic control (NextGen) environment.

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 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. 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. The current system that is used to manage these functions is the LIS.

LCSS is replacing LIS which is an agency developed legacy mainframe application that lacks the capability and flexibility to accommodate the near term or future long-term supply support needs necessary to maintain the NAS. LIS is built using Natural and COBOL languages and was deployed in 1990. Over the last two decades, over 39,000 changes have been implemented in LIS. Its archaic architecture lacks the scalability to support the increased performance requirements projected by the NAS architecture.

##### Logistics Center Support System (LCSS) – Segment 2 (M21.04-01):

The program was baselined in 2012 and final operational capability was planned for 2014. Due to delays in the development effort, final operational capability is expected in 2016. A baseline change was approved in April 2014.

##### Logistics Center Support System (LCSS) – Technology Refresh (M21.04-02):

This program will replace LCSS hardware that was purchased in 2010 which will have reached its end-of-life five-year cycle and will be eligible for replacement. The program plans for technology refresh will be reevaluated after the LCSS Segment 2 program is rebaselined in 2014.

##### **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 in a centralized and automated manner enabling the agency to:

1. Provide the right part, at the right time, to the right place. The metric for this is Issue Effectiveness. Target goal is 85% effectiveness, where issue effectiveness is the shipment of an item in stock within 24 hours of the order or, in the case of a direct ship item, completed processing of the order with the vendor within 24 hours.
2. Provide NAS components and parts that are not defective. Metric: Confirm defective products. Target goal is no more than 10.8 defects per 1,000 issues.
3. Provide services that meet or exceed customer expectations. Metric: Customer satisfaction surveys. Target goal is 86% customer satisfaction.

4. Deliver parts and services on-time and defect-free reducing potential air traffic system outages and avoiding the cost of duplicate shipping and handling.

**Program Plans FY 2015 – Performance Output Goals**

Logistics Center Support System (LCSS) – Segment 2 (M21.04-01):

- Achieve Initial Operational Capability.

Logistics Center Support System (LCSS) – Technology Refresh (M21.04-02):

- None.

**Program Plans FY 2016 – Performance Output Goals**

Logistics Center Support System (LCSS) – Segment 2 (M21.04-01):

- Achieve Final Operational Capability.
- Decommission legacy Logistics Inventory System (LIS).

Logistics Center Support System (LCSS) – Technology Refresh (M21.04-02):

- None.

**Program Plans FY 2017 – Performance Output Goals**

Logistics Center Support System (LCSS) – Segment 2 (M21.04-01):

- None.

Logistics Center Support System (LCSS) – Technology Refresh (M21.04-02):

- Complete replace/upgrade of development and production hardware Phase 1.

**Program Plans FY 2018 – Performance Output Goals**

Logistics Center Support System (LCSS) – Segment 2 (M21.04-01):

- None.

Logistics Center Support System (LCSS) – Technology Refresh (M21.04-02):

- None.

**Program Plans FY 2019 – Performance Output Goals**

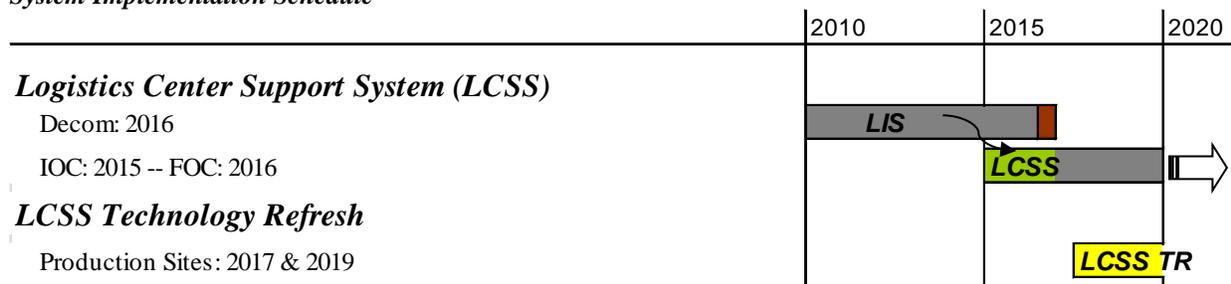
Logistics Center Support System (LCSS) – Segment 2 (M21.04-01):

- None.

Logistics Center Support System (LCSS) – Technology Refresh (M21.04-02):

- Replace/upgrade development and production hardware Phase 2.

**System Implementation Schedule**



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### **3A04, NATIONAL AIRSPACE SYSTEM (NAS) RECOVERY COMMUNICATIONS (RCOM)**

**FY 2015 Request \$12.0M**

#### **Command and Control Communications (C3), C18.00-00**

##### **Program Description**

The RCOM program supports the FAA emergency Command and Control Communications (C3) system that gives FAA the capability to directly manage and operate the NAS during local, regional and national emergencies when normal common-carrier communications are interrupted. C3 provides and enhances a variety of fixed-position, portable, and transportable emergency communications systems that support crisis management. These C3 systems enable the FAA and other Federal agencies to exchange classified and unclassified communications to protect national security. The RCOM program also supports the Washington Operations Center Complex and modernizes several FAA “continuity of operations” sites, which ensures FAA executives have command and communications during times of crisis. C3 capabilities and related systems include 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 C3 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 Federal Emergency Management Agency continuity readiness levels by 5 percent. (FAA Business Planning Metric)*

##### **Relationship to Performance Metric**

The RCOM program contributes to the Make Aviation Safer and Smarter priority by ensuring that the FAA’s C3 structure 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 2015 – Performance Output Goals***

- Procure and install VHF/FM equipment for Salt Lake City District.
- Relocate EOF site due to expiring lease.
- Improve EON security and the offline availability of EON Geographical Information Systems (GIS) applications.
- Perform vehicle upgrades and quarterly testing for CST.
- Develop transition plan from analog based Secure Telephone Equipment to VOIP based secure telephone.
- Complete technical refresh of network printers, copiers, facsimiles, shredders and conference system.
- Develop fixed satellite phone replacement plan.

##### ***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.
- Complete facility modernization at Washington Operations Center Complex (WOCC), Emergency Operating Facility (EOF), and PAF.
- 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 Colombia District.
- Create GIS applications for use on cellular phones and tablets.
- Complete facility modernization at WOCC, EOF, and PAF.
- 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 HW/SW.
- Complete facility modernization at WOCC, EOF, and PAF.
- Replace CST Emergency Response Vehicle.
- Complete technical refresh of secure facsimile equipment.
- Complete technical refresh of Storage Area Network and network switches.

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**3A05, FACILITY SECURITY RISK MANAGEMENT**

**FY 2015 Request \$14.3M**

**Facility and Infrastructure Security Program – 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.

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. Of the 1075 facilities, 423 facilities still require upgrades to read Personal Identity Verification (PIV) access cards. This objective 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. FSRM activities to increase/improve physical security enable the FAA to comply with:

- U.S. Department of Justice Report #381 Vulnerability Assessment of Federal Facilities
- The Airport Security Improvement Act of 2000 (Title 49 USC § 44903. Air Transportation Security)
- Homeland Security Presidential Directive 7, Critical Infrastructure Identification, Prioritization, and Protection
- Homeland Security Presidential Directive 12, Policy for a Common Identification Standard for Federal Employees and Contractors
- FAA Order 1600.69, Facility Security Management Program, as revised.

Both the DOT IG and GAO continue to track our progress in meeting these requirements. As a result operational availability is maintained because enhanced security prevents loss of NAS service.

### *Program Plans FY 2015 – Performance Output Goals*

- Complete installation of security upgrades at Mike Monroney Aeronautical Center.
- Complete design of security upgrades at Tech Center.
- Complete design work at Eastern, Northwest Mountain, and Western Pacific Regional offices.
- Complete PIV access control retro-fit (75 sites).

### *Program Plans FY 2016 – Performance Output Goals*

- Complete installation of X-ray machines (30 sites) by September 1, 2016.
- Complete PIV access control retro-fit (75 sites).

### *Program Plans FY 2017 – Performance Output Goals*

- Complete PIV access control retro-fit (205 sites).

### *Program Plans FY 2018 – Performance Output Goals*

- Complete perimeter hardening at 12 Security Level 3 and Security Level 4 facilities.

### *Program Plans FY 2019 – Performance Output Goals*

- Complete perimeter hardening at 12 Security Level 3 and Security Level 4 facilities.

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## **3A06, INFORMATION SECURITY**

**FY 2015 Request \$12.0M**

### **Information Systems Security, M31.00-00**

## **Program Description**

The FAA must ensure the integrity and availability of all its critical information systems, networks, and administrative systems under conditions of increased cyber terrorism and malicious activities by hackers and other unauthorized personnel. In the Homeland Security Presidential Directive/HSPD 7, FAA was directed to protect and ensure the integrity, confidentiality, and availability of all National Airspace Information Systems as well as federal information. Under the Federal Information Security Management Act (FISMA) of 2002, FAA must identify and

provide information security protection equal to the risk and magnitude of the harm resulting 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 Systems Security (ISS) program is a partnership between the FAA Chief Information Officer (CIO) organization and FAA lines of business and staff offices (LOBs/SOs) with a focus on protecting our information technology (IT) infrastructure. The Cyber Security Management Center (CSMC) provides the following services:

- IT and Information Systems Security (ISS) awareness and training;
- IT development;
- Enterprise architecture;
- Policy, standards, and requirements;
- Program evaluations; and
- System certification and compliance.

This comprehensive Cyber Security effort offers information security awareness training for the agency's key ISS personnel, development and evaluation of policies and standards, formulation of system requirements, certification of systems and ensures their compliance with federal regulations, protection of FAA's computer enterprise, and response to computer security incidents. The CSMC is the operational branch of the FAA ISS Program. It is comprised of facilities, technologies, as well as FAA and contract personnel working as a unified entity to provide extremely effective, enterprise-focused cyber security services to its clients. The CSMC is a 24x7x365 day operation supporting the entire FAA and the Department of Transportation (DOT). In executing the CSMC mission of cyber security for the FAA, the CSMC is the central reporting point for all cyber incidents occurring within the FAA and DOT. Along these lines, the CSMC also represents the entire DOT as the single source provider of the cyber "big picture" when reporting to the Department of Homeland Security (DHS).

The office of the Chief Information Officer (AIO's) takes a comprehensive, proactive approach to preventing and isolating intrusions in the agency's computer networks. This cyber defense strategy involves hardening of the individual system and network elements, isolating those elements and backing up those elements to avoid services disruptions.

Advanced Persistent Threat 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 sophisticated cyber attacks. The Advanced Persistent Threat events are one type of event the team at CSMC detects, analyzes and responds to daily in defense of the FAA systems. In addition to the Advanced Persistent Threat 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 to 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 – Utilize Continuous Diagnostics and Mitigation (CDM) capabilities to continuously enhance our ability to prevent, deter, detect, and respond to cyber attacks against the FAA's infrastructure for 95% of non-NAS IP-based systems and pilot CDM capabilities on a NAS IP-based system.*

### **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 the nation's efforts to safeguard homeland security, in particular the aviation infrastructure and industry.

***Program Plans FY 2015 – 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, including the NAS.
- Implement solutions and services to achieve Continuous Diagnostics and Mitigation (CDM) goals of managing access to hardware and software.
- Evaluate and deploy at least one new technology to combat Advanced Persistent Threat (APT).
- Deploy Full Packet Capture capability through Flexible Analysis System (FAS) at two new strategic network points.
- Implement routine vulnerability and FDCC/USGCB scanning of 70% of mission support networks.
- Evaluate three new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.
- Install wireless technologies that monitor for wireless network threats and vulnerabilities in selected locations determined at the beginning of the fiscal year.
- Conduct software code vulnerability security analysis on 80 legacy and development agency systems.
- Conduct at least four Webinar/ training sessions on software assurance to FAA employees and contractors.
- Develop architecture and engineering efforts for alternative solutions to secure new FAA systems.

***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, including the NAS.
- Implement solutions and services to achieve Continuous Diagnostics and Mitigation (CDM) goals of preparing for and responding to incidents and contingencies.
- Evaluate and deploy at least one new technology to combat Advanced Persistent Threat (APT).
- Deploy Full Packet Capture capability through Flexible Analysis System (FAS) at two new strategic network points.
- Implement routine vulnerability and FDCC/USGCB scanning of 80% of mission support networks.
- Evaluate three new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.
- Conduct software code vulnerability security analysis on 100 legacy and development agency systems.
- Conduct at least five Webinar/ training sessions on software assurance to FAA employees and contractors.
- Develop architecture and engineering efforts for alternative solutions to secure new FAA systems.

***Program Plans FY 2017 – 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, including the NAS.
- Implement solutions and services to achieve Continuous Diagnostics and Mitigation (CDM) goals of security lifecycle management including design and build in security and operate, monitor and improve capabilities.
- Evaluate and deploy at least one new technology to combat Advanced Persistent Threat (APT).
- Deploy Full Packet Capture capability through Flexible Analysis System (FAS) at two new strategic network points.
- Implement routine vulnerability and FDCC/USGCB scanning of 90% of mission support networks.
- Evaluate three new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.
- Conduct software code vulnerability security analysis on 120 legacy and development agency systems.
- Conduct at least six Webinar/ training sessions on software assurance to FAA employees and contractors.
- 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 Continuous Diagnostics and Mitigation (CDM) endpoint integrity goals of managing: hardware, software, configuration settings and known vulnerabilities, including the NAS.
- Evaluate and deploy at least two new technologies to combat Advanced Persistent Threat (APT).
- Deploy Full Packet Capture capability through Flexible Analysis System (FAS) at two new strategic network points.

- Implement vulnerability and FDCC/USGCB scanning in support of continuous monitoring of 99% of mission support networks.
- Evaluate three 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 development agency systems.
- Conduct at least six Webinar/ training sessions on software assurance to FAA employees and contractors.
- Develop architecture and engineering efforts for alternative solutions to secure new FAA systems.

***Program Plans FY 2019 – 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, including the NAS.
- Evaluate and deploy at least two new technologies to combat Advanced Persistent Threat (APT).
- Deploy Full Packet Capture capability through Flexible Analysis System (FAS) at two new strategic network points.
- Implement vulnerability and FDCC/USGCB scanning in support of continuous monitoring of 99% of mission support networks.
- Evaluate three new technologies to address complex and rapidly changing cyber threats and vulnerabilities to include wireless technologies.
- Have completed software code vulnerability security analysis on 200 legacy and development agency systems.
- Conduct at least six Webinar/ training sessions on software assurance to FAA employees and contractors.
- Develop architecture and engineering efforts for alternative solutions to secure new FAA systems.

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**3A07, SYSTEM APPROACH FOR SAFETY OVERSIGHT (SASO)**

**FY 2015 Request \$22.5M**

**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 FAA’s Flight Standards (AFS) safety oversight and inspection processes by implementing the International Civil Aviation Organization (ICAO) Safety Management System (SMS). To implement SMS within AFS, four components are being developed; Safety Assurance System (SAS), Safety Risk Management (SRM), Safety Policy (SPO) and Safety Promotion (SPR).

Safety Assurance System (SAS) – The SAS supports a new proactive systems safety approach that will significantly improve the FAA’s ability to identify and address hazards and safety risks before they result in accidents. Existing information systems and tools will be examined to determine their ability to support systems safety oriented oversight and redundant applications will be consolidated. Obsolete and unsuitable systems will be removed and replaced with an integrated suite of databases and analysis tools that coincide with the new SMS-based processes. The new systems, analysis and decision support tools will consistently provide accurate, critical information needed to make timely safety decisions, and the newly engineered oversight processes will emphasize the use of this data by the FAA when making critical decisions. Finally, 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 survey 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 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 – 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 and procedures to facilitate the development of plans and procedures to meet FAA, Office of Aviation Safety (AVS) and AFS safety objectives, and 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 – SASO Safety Promotion initiatives include five primary activities:

- Development of a positive safety culture within AVS, AFS and certificated and non-certificated entities;
- Communication of ongoing SMS efforts and outputs to all employees;
- Establishment of personnel competency requirements for SMS activities;
- Capturing knowledge of safety issues and incorporating it into the air transportation system; and
- Updating product/service provider SMS requirements.

SASO is divided into three phases. SASO Phase I was 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 for the major air carriers as defined by Title 14, Code of Federal Regulations (CFR) Part 121. It also demonstrated the benefits of system safety to AFS and the aviation community. SASO Phase II further develops and implements the SAS concept for other CFR Parts pertaining to aviation. SASO Phase II is divided into two segments: Alpha and Beta.

SASO Phase II Alpha (A25.02-01):

SASO Phase II Alpha is the first segment and covers the years FY 2010 through FY 2016. In this segment, the AFS SAS Pilot Project is further developed and implemented and adds functionality to support AFS oversight of Title 14 CFR Parts 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 has been completed and changes are being incorporated into the SAS. Also, changes to the testing and implementation strategies have been instituted to help mitigate further program risk. As a result, the SAS development and deployment will be delayed by approximately twenty eight months and the original completion of this phase is projected to slide from FY 2013 to FY 2016. The first SAS Key Site initial operational capability (IOC) is planned for Q3 FY 2014 and the first SAS Production IOC by Q4 FY 2014. Full deployment of the SAS to approximately 131 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 is the second segment and covers the period from FY 2014 through FY 2019. A Final Investment Decision (FID) for Phase II Beta is planned for 1st quarter FY 2015. During this phase, SAS functionality is further developed to accommodate the remaining Title 14 CFR Parts regulated by AFS. These include, but are not limited to, other air operators, Pilot Schools and Training Centers, Aviation Maintenance Technical Schools, other certificated operations such as helicopter external load, and agriculture/crop dusting. Additionally, the remaining three components of the SMS (safety risk management, safety policy, and safety promotion) will be developed and implemented during this phase.

**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 so they can improve their enforcement of safety regulations and continue to protect America’s flying public.

#### Program Plans FY 2015 – Performance Output Goals

##### SASO Phase II Alpha (A25.02-01):

- Complete installation, training and IOC at 52 of 131 sites by March 30, 2015 (39% complete).
- Complete installation, training and IOC at 100 of 131 sites by September 30, 2015 (76% complete).

##### SASO Phase II Beta (A25.02-02):

- Achieve Final Investment Decision Q1 FY 2015
- Conduct SAS Business Process Reengineering.
- Conduct SAS Phase II Beta Preliminary Design Review.
- Conduct Safety Risk Management (SRM) Preliminary Design Review.
- Conduct Safety Promotion (SPR) Preliminary Design Review.
- Conduct Safety Policy (SPO) Preliminary Design Review.
- Deliver SRM, SPR, SPO business processes documentation.

#### 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):

- Milestones will be developed at FID.

#### Program Plans FY 2017-2019 – Performance Output Goals

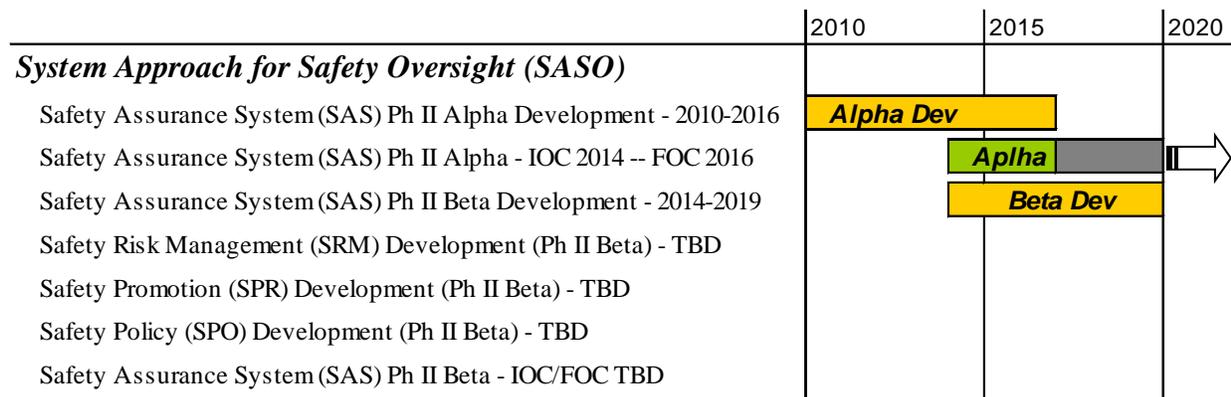
##### SASO Phase II Alpha (A25.02-01):

- None.

##### SASO Phase II Beta (A25.02-02):

- Milestones will be developed at FID.

#### System Implementation Schedule



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### **3A08, AVIATION SAFETY KNOWLEDGE MANAGEMENT ENVIRONMENT (ASKME)**

**FY 2015 Request \$10.2M**

#### **Aviation Safety Knowledge Management Environment (ASKME) – Segment 2, A26.01-01**

##### **Program Description**

ASKME is a suite of information technology (IT) tools 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 the Office of Aviation Safety through deployment of 18 integrated business solutions (18 projects) between Fiscal Year 2008 and Fiscal Year 2017. Segment 1 covers fiscal years FY 2008 – FY 2012 and Segment 2 covers fiscal years FY 2013 – FY 2017. ASKME, Segment 2, obtained its baseline decision on September 21, 2011 from the FAA Joint Resources Council.

ASKME projects will provide electronic storage and retrieval of 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 easily. ASKME will provide a comprehensive automated system and electronic tools for capturing key safety related data resulting from rulemaking and policy development, airworthiness directives, design certification, production/ manufacturing certification and airworthiness certification. This will help inspectors in approving new operating certificates, and insuring that design or modification of aircraft meet aircraft safety conditions; and in designee management, evaluation and audit, external inquiries, enforcement, continued operational safety management, and international coordination.

Segment 2 IT Application Deliverables Include:

- Electronic File Service (EFS) – Production Support and Historical Scanning
- Work Tracking Software – Budget Management (WTS-BMgmt)
- Airworthiness Directives Development (ADD)
- Airworthiness Certifications (4 related applications):
  - Standard Airworthiness Certifications (StdAC)
  - Special Airworthiness Certifications (SpclAC)
  - Special Flight Authorizations (SFA)
  - Certification of Imported/Exported Products (CI/EP)
- 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 Aircraft Certification Service (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 2015 – Performance Output Goals***

- Finalize documented detailed System Specification Requirements Compliance and Enforcement Actions (CEA)
- Complete design, development, test, and implementation phases Airworthiness Directives Development (ADD).
- Complete scanning of 25% of historical documents for Electronic File System (EFS).

***Program Plans FY 2016 – Performance Output Goals***

- Complete design, development, test, and implementation phases Standard Airworthiness Certifications (StdAC), Special Airworthiness Certifications (SpclAC), Special Flight Authorizations (SFA), Certification of Imported/Exported Products (CI/EP) and Compliance and Enforcement Actions (CEA).
- Complete scanning of 25% of historical documents for Electronic File System (EFS).

***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.

***Program Plans FY 2018-2019 – Performance Output Goals***

- None.

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**3A09, NEXTGEN – SYSTEM SAFETY MANAGEMENT PORTFOLIO**

**FY 2015 Request \$18.7M**

- A, Aviation Safety Information Analysis and Sharing (ASIAS), G07A.02-01
- B, Systems Safety Management Transformation, 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 for both existing and future systems 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 safety levels demanded by the public, it will be necessary to address shortcomings in the current aviation system by:

- Replacing inadequate, informal communication with prompt and comprehensive exchanges of aviation safety information;
- Coordinating and sharing the resources required to maximize the effectiveness of tool development and issue analysis; and
- Establishing a collaborative approach to identifying and mitigating system safety issues posing the highest risks.

ASIAS supports these objectives by aggregating and sharing data among ASIAS participants in order to more clearly understand precursors to accidents. ASIAS aggregates disparate aviation safety data sources in a central repository, increasing its potential value for analysis-based insight and providing insights that would not be available if data is not shared. ASIAS also has advanced safety analytical capabilities and performs analyses that would not be available to individual participants performing similar analyses.

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:

1. Research to develop ASIAS capabilities that build upon and extend existing capabilities for managing and processing aviation safety and performance data;
2. The development of tools that convert both textual and numeric data into information; and
3. The creation of visualization capabilities that aid causal/contributing factor analyses and risk assessment.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

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

### **Relationship to Performance Metric**

ASIAS is a vital component needed to support FAA's Strategic Priority to Make Aviation Safer and Smarter. Safety insights from ASIAS analyses are communicated to the ASIAS participants and, as authorized by the ASIAS Executive Board (AEB), to others in the aviation community. Participants will leverage insight to identify risk-reducing alternatives or changes to operations or processes. Implemented changes will prevent would-be accidents. 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 2015 – Performance Output Goals***

- Develop improved data analysis tools that leverage the fusion of voluntarily submitted text based safety reports from both FAA and ASIAS participants with digital flight data and FAA surveillance data.
- Develop an expanded set of ASIAS analytical capabilities to support analysis of deployed NextGen Operational Improvements (OIs).
- Continue development of an initial set of NextGen known-risk monitoring metrics.
- Expand the ASIAS data set to include ATC Voice and Surveillance and Broadcast Services (SBS) data.
- Develop a voice data analytical capability to include a query interface for voice data and an automated safety issue classification model using voice-to-text conversion capability.
- Evolve ASIAS Information Technology (IT) architecture (e.g. cloud computing) to improve computational efficiency to support FAA and ASIAS participant analysis needs.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Develop standards for Rotorcraft flight data sharing and requirements for tools to analyze Rotorcraft data.
- Deploy a GA ASIAS in which directed studies, known-risk monitoring and information sharing among GA operators can be conducted for issues specific to the GA community.
- Expand ASIAS analytical capabilities to include the storage, retrieval, and analysis of ATC voice archives; demonstrate the application of these capabilities through one of the ASIAS Directed Studies.
- Deploy automated capabilities to alert on non-typical flight and system behavior using fused digital and textual data.

***Program Plans FY 2017 – Performance Output Goals***

- Through the ASIAs Portal, enable full 3-D visualization of selected safety events using aggregate fused data for ASIAs participants use in their internal analysis.
- Align Directed Studies and analytical techniques with NextGen system changes (e.g., ATM procedures, airspace redesign) and community changes (e.g., fleet changes, avionics).
- Expand ASIAs studies beyond those affecting commercial aviation in the NAS through assessment of issues that impact multiple segments of the aviation community (e.g. interaction of GA and commercial aviation) as well as targeted studies for specific communities such as rotorcraft or GA fixed wing.
- Develop automated capabilities to alert 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.
- Complete the transition of ASIAs to a cloud-based architecture for data storage and analytical capabilities, and provide access to other organizations to conduct their own analyses in a cloud based environment.
- Expand ASIAs studies to include risks identified by unsupervised exploratory (atypicality) analysis performed on databases consisting of fused proprietary and publicly available data.
- Complete integration of ASIAs with other NextGen portfolios through establishment of appropriate requirements-driven safety metrics and monitoring strategies to demonstrate safety performance.

***Program Plans FY 2019 – Performance Output Goals***

- Develop capability to monitor and assess data quality for ASIAs participants' Safety Reporting Programs.
- Expand 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.
- Investigate predictive analytics (updatable models) to support (near) real-time and historical analysis of safety risks.

## **B, Systems Safety Management Transformation, G07M.02-01**

### **Program Description**

This program conducts research to develop a comprehensive and proactive approach to aviation safety especially as it relates to the implementation of NextGen. This research enables safety assessments of proposed NextGen concepts, algorithms, and technologies and provides system knowledge to understand economic, implementation, operational and performance impacts (with respect to safety) of NextGen system alternatives. This project supports the development and implementation of integrated safety management systems across the air transportation system to ensure that the safety risk throughout the system is managed to an acceptable level. The Integrated Safety Assessment Model (ISAM), a national level System Safety Assessment model that proactively identifies emerging risks associated with NextGen capabilities, will be exercised to evaluate annual and future risks. Mechanisms to define and support integrated risk-based approaches to safety and safety oversight will be described analytically and reflected within the ISAM model, and parameters will be identified in order for FAA to monitor operational safety and determine the safety implications of operational changes (primarily NextGen related) to the air transportation system. The activities included in the Systems Safety Management Transformation program include:

Airport and Terminal Risk Baseline and Forecast:

An Airport and Terminal area risk baseline 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. Using the airport and terminal area baseline, risk forecasts within the ISAM will also be periodically re-calculated by incorporating the results of the airport and terminal risk baseline outputs.

Integrated Safety Assessment Model (ISAM) Baseline and Forecast:

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 a report on annual metrics and featuring the potential impact of NextGen initiatives on current and future safety baselines for all aspects of the NAS. The ISAM will also be extended to cover world-wide accident rates, and to cover incident data. This will be accomplished via a coordinated effort with Eurocontrol in the research supporting the Single European Sky Air Traffic Management Research (SESAR) program.

#### Hazard Information Integration:

Hazard Risk Tracking system safety data will be incorporated into the risk baseline analysis in ISAM. Harmonized taxonomies will be provided to all ISAM users and standard baseline assessments will be provided as end-products to Safety Risk Management (SRM) practitioners. This effort starts 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 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 2015 – Performance Output Goals***

##### Airport and Terminal Risk Baseline and Forecast:

- Develop prototype system baseline risk software for airports and terminal areas without sophisticated surveillance (ASDE-X sites).
- Develop prototype system risk forecast software for airports and terminal areas without sophisticated surveillance (ASDE-X sites).
- Test the prototype baseline and forecast software at the top 100 US airports with and without sophisticated surveillance.
- Deliver trend analysis software for risk estimates for top 100 US airports with data requirements for trend validation.

##### Integrated Safety Assessment Model Baseline and Forecast:

- Develop baseline event sequence diagrams and probabilistic risk-based calculations for 30 accident scenarios relevant to aviation safety calibrated to US historical data as well as additional accident scenarios relevant to Unmanned Aerial Vehicle (UAV) activity.
- Implement fault-trees associated with primary failure modes relevant to the 30 accident scenarios in a web-based environment.
- Customize risk-based reports for scenarios relevant to the FAA Lines of Business.
- Develop ASIAs data interchange protocol and report that provides a model-based risk assessment of an airport surface safety risk.
- Integrate international risk baselines (and a comparison report) through a cooperative research activity with SESAR.
- Deliver a preliminary peer-review report on FAA/Eurocontrol data exchange on ISAM and SESAR Accident Incident Model for system risk baselines.

- Deliver model-based risk calculation software deployed in web-based environment extended to include new vehicles (UAV).
- Produce precursor data tracking requirements document including data requirements for UAV modeling.
- Conduct annual NAS-wide risk impact assessment for implementation of NextGen using ISAM model and expert assessments.
- Provide results of expert-judgment assessment of NextGen safety impacts on operational scenarios.
- Deliver a peer review coordination report: ISAM results of NextGen and SESAR impacts (FAA/Eurocontrol cooperative effort).
- Conduct test of Standardized hazard taxonomy and associated Event Sequence Diagram and Fault Tree associations.

***Program Plans FY 2016 – Performance Output Goals***

Integrated Safety Assessment Model Baseline and Forecast:

- Produce a precursor data tracking requirements document.
- 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:

- Develop near real-time risk baseline function for commercial airports including real or model-based data for locations not served by ASDE-X.
- Implement system risk forecasting capability in a test-environment for all commercial NAS locations (top 35 airports and facility areas).

Integrated Safety Assessment Model Risk Baseline and Forecast:

- Produce monthly NAS-wide risk metrics and reports (system baselines and operational impacts of NextGen changes).
- Produce monthly NAS-wide risk forecasts, trend modeling and reporting, evaluation of SESAR and NextGen operational improvements.

***Program Plans FY 2018 – 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.

***Program Plans FY 2019 – Performance Output Goals***

Airport and Terminal Risk Baseline and Forecast:

- Implement near real time location specific risk baseline capability (35 locations).
- Implement near real time location specific risk forecasts capability (35 locations).

Integrated Safety Assessment Model Risk Baseline and Forecast:

- Produce monthly NAS-wide risk metrics and report including system baselines and trends.
- Produce monthly NAS-wide risk forecasts, trend modeling and reporting.

Hazard Risk Tracking System:

- Implement inclusion of hazards and operational requirements from an AOC into hazard risk tracking system.

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## **3A10, NATIONAL TEST EQUIPMENT PROGRAM**

**FY 2015 Request \$2.0M**

### **National Test Equipment Program, M17.01-01**

#### **Program Description**

The National Test Equipment Program manages the modernization, distribution, and maintenance of test, measurement, and diagnostic equipment required to perform preventive and corrective maintenance in support of new and legacy NAS systems. Test equipment is crucial to communication, automation, surveillance, power, navigation, and weather platforms that must be maintained within specific tolerances. Failure to achieve certification of critical NAS systems at an FAA facility (due to poor performing test equipment) could result in flight delays.

Analysis conducted during the Service Analysis and Concept and Requirements Definition (CRD) phases indicates that between 19%-25% of the 77,000 pieces of Test Equipment (TE) require replacement, with an estimated cost of approximately \$320M. Some existing test equipment is more than 30 years old and spare parts for this old equipment are no longer manufactured, so it must be replaced. Replacement of the current analog test equipment must be forward compatible with the advanced digital technology being deployed through NextGen. Current requirements reflect a critical need for Transmission, Communication Service Monitors, Signal Generators, and Oscilloscopes. In addition, the National Test Equipment Program will improve the safety of certain procedures because technology enhancements reduce the need to perform certain functions, such as climbing high towers by allowing test systems to collect necessary data from ground level.

The National Test Equipment Program achieved Final Investment Decision (FID) was approved in June 2013. These milestones have been incorporated on the FAA's Enterprise Architecture (EA) Roadmap for Facilities. The programs spend plan addresses the test equipment shortfall identified at the agency's Core 30 airports.

#### **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**

Poor performing test equipment impacts the mean-time of restoration between outages. When test equipment is functioning at an optimal performance, it provides a return on investment through greater efficiencies in maintaining the NAS. Representative systems that are impacted by the program include: Communication, Automation, Surveillance, Power, Navigational, and Weather.

#### ***Program Plans FY2015 – Performance Output Goals***

- Procure and deliver 20 communication test sets.
- Procure and deliver 40 telephone test sets.
- Procure and deliver 30 cable and antenna analyzers.

#### ***Program Plans FY2016 – 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 FY2017 – 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 FY2018 – 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 FY2019 – 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.

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**3A11, MOBILE ASSETS MANAGEMENT PROGRAM**

**FY 2015 Request \$4.0M**

**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 30KW 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 and are experiencing serious material failures, must be replaced. 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 one of the 12 programs included in FAA's NAS Sustainment Strategy.

National Deployment Centers shall be established in each Service Area. The Central Service Area and Western Service Area will establish their Deployment Centers in FY 2014, and the Eastern Service Area will establish its Deployment Center(s) in FY 2015. The Deployment Centers will serve as national 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/assessment with the receiving custodian. The Deployment Center will maintain a website schedule of the mobile assets deployments within their area of responsibility. The mobile assets will be maintained by the District Offices and Systems Support Center (SSC) personnel at the appropriate 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 augment, continuity or restoral service for radars, control towers, and communications systems. Hurricane Katrina and the Haiti earthquake revealed that the FAA was not well prepared to provide onsite NAS restoral service for disaster response. Each year there are 10-15 ATCT modernization efforts in progress which require mobile assets to maintain operations. Assets are not always available necessitating the development of “work around” procedures result in extending the duration of the projects. Additionally, the majority of the ATCTs are over 50 years old resulting in an increasing number of unforeseen outages requiring mobile assets to maintain operations.

### *Program Plans FY 2015 – Performance Output Goals*

- Acquire three large Self-Contained MATCTs.
- Develop prototype modular ATCT, across multiple years.
- Repair / modernize six two position MATCTs.
- Establish a National Deployment Center for ESA.

### *Program Plans FY 2016 – Performance Output Goals*

- Acquire a Modular MATCT.
- Repair / modernize six two position MATCTs.

### *Program Plans FY 2017 – Performance Output Goals*

- Acquire a Modular MATCT.
- 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.

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## **3A12, AEROSPACE MEDICINE SAFETY INFORMATION SYSTEM (AMSIS)**

### **FY 2015 Request \$3.0M**

- A, Aerospace Medicine Safety Information System (AMSIS), A35.01-01
- X, Aerospace Medical Equipment Needs (AMEN) – Technology Refresh – Phase 2, M53.01-02

## **A, Aerospace Medicine Safety Information System (AMSIS), A35.01-01**

### **Program Description**

The Aerospace Medicine Safety Information System (AMSIS) 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:

- the 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 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.

AMSIS completed an Investment Analysis Readiness Decision (IARD) in Q4 FY 2013; and is on track for an Initial Investment Decision (IID) by Q4 FY 2014; and Final Investment Decision (FID) by Q4 FY 2015.

### **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 2015 – Performance Output Goals***

- Achieve Final Investment Decision (FID).
- Complete development of implementation plan.
- Award contract.
- Document prioritization of automation of core AAM IT capabilities for rapid deployment.
- Develop modular components of airmen certification and data verification functionality.

#### ***Program Plans FY 2016 – Performance Output Goals***

- Update implementation plan.
- Complete initial core functionality internal to AAM.

- Complete initial interagency information exchanges of airmen certification criteria.
- Complete a limited deployment of diverse web-enabled mobile interface options.

***Program Plans FY 2017 – Performance Output Goals***

- Update implementation plan.
- Update Enterprise Architecture and technology constraints documents.
- Complete development of full operational capability.

***Program Plans FY 2018-2019 – Performance Output Goals***

- None.

## **X, Aerospace Medical Equipment Needs (AMEN) – Technology Refresh – Phase 2, M53.01-02**

### **Program Description**

The Civil Aerospace Medical Institute (CAMI), located at the FAA Mike Monroney Aeronautical Center (MMAC) in Oklahoma City, OK, is the medical certification, education, research, and occupational medicine wing of the Office of Aerospace Medicine (AAM) within the FAA’s Aviation Safety Organization (AVS). CAMI’s personnel work in sophisticated research laboratories and testing facilities with the need for modern scientific, engineering, simulation, and medical systems.

Much of the laboratory equipment used by CAMI’s scientists, physicians, and engineers is old and becoming obsolete. This aging equipment places several accreditations at risk, and does not allow the FAA to keep up with science and technology advances currently available in the market. AMEN 2 introduces the technology refresh of CAMI Human Factors laboratory assets. The research simulators rely extensively on computer systems which currently are 3-18 years old. Computers age more rapidly than other equipment, and frequently fail without warning. This is especially true of the video-intensive computers that are necessary to support mid- and high-fidelity simulations. By FY 2016, the equipment to be replaced will be 6 – 31 years old with an average of 13 years, resulting in a serious shortfall in system capability and efficiency

AMEN 2 is designed to replace 11 items: three research simulators, two biochemistry testing systems, two specialized cameras, one anthropometric test dummy, one engineering calibration device, and two data acquisition & processing systems. AMEN will also plan for additional acquisitions for the continued technical refresh of CAMI laboratories starting in FY 2020.

AMEN 2 is currently working towards the Investment Analysis Readiness Decision (IARD) phase of the FAA Acquisition Management System (AMS). AMEN 2 Final Investment Decision (FID) is scheduled for August 2015.

### **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 are:

- Assessment of very large datasets concerning aircrew medical certification, and their involvement in aviation accidents and incidents;
- Development of procedures to detect aeromedically unsafe conditions and trends;
- Assessment of crash environments to determine restraint performance, and safety device effectiveness;

- Assessment of human performance at altitude, adequacy of protective breathing equipment, aircraft environmental control systems/cabin air quality, and methods of detection/protection from chemical, biological, and radiological threats;
- Evaluations of human factors concerns associated with advanced multifunction displays and controls in general aviation and air traffic control;
- Evaluation of NextGen technologies and procedures including human-in-the-loop simulation studies concerning the usability of proposed automation concepts and the effects of those concepts on ATC workload, situation awareness, and performance; and
- Development and assessment of measures of performance in ATCs and technical operations specialists.

***Program Plans FY 2015 – Performance Output Goals***

- None.

***Program Plans FY 2016 – Performance Output Goals***

- Contract Awards to replace eleven 11 items:
  - Two biochemistry testing systems
  - Two specialized cameras
  - One anthropometric test dummy
  - One engineering calibration device
  - One data acquisition & processing system

***Program Plans FY 2017 – Performance Output Goals***

- Contract Award to replace a research simulator: General Air Traffic and Technical Operations Research Laboratory.

***Program Plans FY 2018 – Performance Output Goals***

- Contract Award to replace a research simulator: Technically Advanced General Aviation Research Simulator.

***Program Plans FY 2019 – Performance Output Goals***

- Contract Award to replace a research simulator: Air Traffic Control Advanced Research Simulator.
- Contract Award to refresh data acquisition & processing system: High Performance Aeromedical Research Computing System.

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**3A13, TOWER SIMULATION SYSTEM (TSS) TECHNOLOGY REFRESH**

**FY 2015 Request \$3.0M**

**National Airspace System (NAS) Training - Equipment Modernization – Training Simulators – Tower Simulation System, M20.01-04**

**Program Description**

The Tower Simulation System (TSS) program will provide technology refresh of obsolete tower simulation equipment. The TSS system is currently deployed at 29 sites which provide satellite capabilities for an additional 126 facilities. TSS provides support for controller qualification and skill enhancement training.

The TSS is a full-scale tower simulator providing an interactive, highly realistic environment for controller training. The TSS can support up to four simultaneous positions including local, ground and flight data/clearance delivery and coordinator. Trainees can achieve initial proficiency in the simulator, and when that training is complete 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 talk to the simulator. The voice recognition system interprets the student's commands and translates them into actual aircraft movement depicted on the screen. A recorded playback feature allows instructors to review and evaluate performance with 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 5 years old and is becoming more expensive to operate and maintain. The projection screens will be replaced with updated visual technology and video processors to increase fidelity, processing power and potentially decrease footprint size and reduce maintenance costs.

The IARD is planned for 4Q FY 2014.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

TSS technology refresh will reduce operational and maintenance costs by providing new equipment that requires less maintenance and energy costs. Also, if the system becomes inoperable due to equipment failures, the cost of training would increase. A 12% reduction in training times has been experienced at locations with TSS.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Procure and install equipment for 10 locations.

#### ***Program Plans FY 2016-2019 – Performance Output Goals***

- None.

## **B: Training, Equipment, and Facilities**

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### **3B01, AERONAUTICAL CENTER INFRASTRUCTURE MODERNIZATION**

**FY 2015 Request \$13.2M**

#### **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/Nav aids), NAS Logistics, airmen/aircraft registration, safety, and Business Services. Program funding will be used for facility renovation, building system replacement, and telecommunications infrastructure upgrade.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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, 13% of 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 2015 – Performance Output Goals***

- Award renovation construction contracts for the Environmental System Support (Bldg 152) to replace mechanical systems, upgrade electrical wiring, plumbing, and provide energy efficiencies in lighting and insulation.
- Award phase 1 (of 4) relocation construction of ASR-9/Mode S, ARSR-3, Common Air Route Surveillance Radar (CARSR) and ASR-8 radars.
- Complete Phase 2 (of 4) renovation construction of the Systems Training Building (Bldg 23) to add seismic and wind bracing to the building, Replace mechanical systems, (HVAC, boilers, chillers), replace electrical systems, plumbing, and provide energy efficiency in lighting and insulation.
- Award contracts for Phase 4 (of 6) telecom network design, test, reconfigure network for redundancy, reliability, security in 11 of 78 buildings. Includes security assessments, upgrades, disaster recovery testing, installation of duct banks/ fiber cable on west campus for redundancy of network routers and upgrades of Center network to support redundancy, reliability, security and availability.
- Complete network design, test, reconfiguration, security assessments and upgrades, disaster recovery testing and installation of duct banks/fiber cable for North campus.

### ***Program Plans FY 2016 – Performance Output Goals***

- Award renovation construction contract for Phase 1 renovation of Multi-Purpose Building #24, to replace mechanical systems, upgrade electrical wiring, plumbing, and provide energy efficiencies in lighting and insulation.
- 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 Bldg 214 network diversity and availability.
- Complete network design, test, reconfiguration, security assessments and upgrades, disaster recovery testing and installation of duct banks/fiber for west campus.

### ***Program Plans FY 2017 – Performance Output Goals***

- Complete renovation construction of Bldg 152, the Environmental Systems Support.
- 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 duct banks, fiber/copper cable for Bldg. 215 and southeast campus network diversity and availability.
- Complete network design, test, reconfiguration, security assessments and upgrades, disaster recovery testing and installation of duct banks/fiber cable for Bldg 214.

### ***Program Plans FY 2018 – Performance Output Goals***

- Complete construction of Phase 1 (of 7) Multi-Purpose Building renovation to replace mechanical systems, upgrade electrical wiring, plumbing, and provide energy efficiencies in lighting and insulation.

- Award renovation construction contract for Phase 2 renovation of Multi-Purpose Building #24 to replace mechanical systems, upgrade electrical wiring, plumbing, and provide energy efficiencies in lighting and insulation.
- 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 Bldg. 22 and central campus network diversity and availability.
- Complete network design, test, reconfiguration, security assessments, security upgrades, disaster recovery testing, and installation of duct banks/fiber cable for Bldg 215 and southeast campus.

***Program Plans FY 2019 – Performance Output Goals***

- Complete renovation construction for Phase 2 (of 7) renovation of Multi-Purpose Building #24 to replace mechanical systems, upgrade electrical wiring, plumbing, and provide energy efficiencies in lighting and insulation.
- 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 Bldg. 219 and northwest campus network diversity and availability.
- Complete network design, test, reconfiguration, security assessments, security upgrades, disaster recovery testing, and installation of duct banks/fiber cable for Bldg 22 and central campus.

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**3B02, DISTANCE LEARNING**

**FY 2015 Request \$1.5M**

**Distance Learning, M10.00-00**

**Program Description**

The Distance Learning program will provide for technology refresh of Computer-Based Instruction (CBI) Delivery Platforms at all CBI Learning Centers, and it will 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 CBI Platforms 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 CBI Platforms 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 will begin a new technology refresh cycle which covers the years FY2014 – FY2017. A subsequent technology refresh cycle will begin in FY 2018 and will run through 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 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 CBI 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 much 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 \$16.8M savings in travel and

per diem each year. These efficiencies combine to produce a better prepared, better trained, and safer diverse workforce.

**Program Plans FY 2015 – Performance Output Goals**

- Award contract to provide for the technology refresh of 725 out of 2275 (60%) CBI Platforms at Air Traffic Facilities (ARTCC, Terminal) and FCT CBI Learning Centers by Sept-2015.
- Provide updates to courseware and application via network and/or DVD’s to 2275 CBI Platforms by Sept-2015.

**Program Plans FY 2016 – Performance Output Goals**

- Award contract to provide for the technology refresh of 515 out of 2275 (82.4%) CBI Platforms at ATO-TO and FCT learning centers by Sept-2016.
- Provide updates to courseware and application via network and/or DVD’s to 2275 CBI Platforms by Sept-2016.

**Program Plans FY 2017 – Performance Output Goals**

- Award contract to provide for technology refresh of 400 out of 2275 (100%; end of refresh cycle FY14-FY17) CBI Platforms at ATO-TO FCT learning centers by Sept-2017.
- Provide updates to courseware and applications via network and/or DVD’s to 2275 CBI Platforms by Sept-2017.

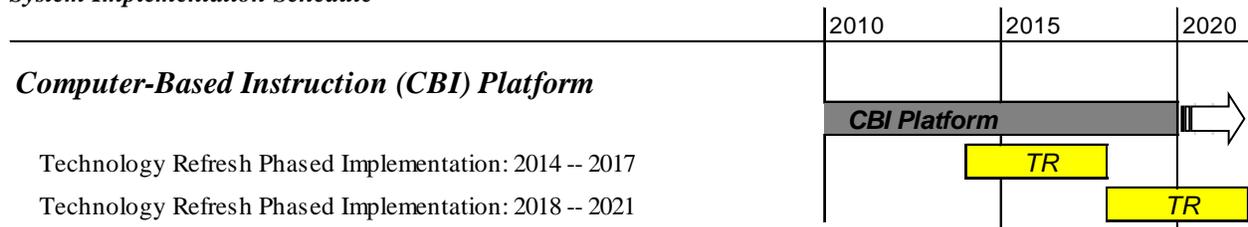
**Program Plans FY 2018 – Performance Output Goals**

- Award contract to provide for technology refresh of 635 out of 2275 (27.9%) CBI Platforms at En Route Air Traffic Facilities (ARTCC, TRACONS) and FCT CBI Learning Centers by Sept-2018.
- Provide updates to courseware and application via network and/or DVD’s to 2275 CBI Platforms by Sept-2018.

**Program Plans FY 2019 – Performance Output Goals**

- Award contract to provide for technology refresh of 600 out of 2275 (54.3%) CBI Platforms at Air Traffic Facilities (ARTCC, Terminal) and FCT CBI Learning Centers by Sept-2019.
- Provide updates to courseware and application via network and/or DVD’s to 2275 CBI Platforms by Sept-2019.

**System Implementation Schedule**



## ACTIVITY 4: FACILITIES AND EQUIPMENT MISSION SUPPORT

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### 4A01, SYSTEM ENGINEERING (SE2020) AND DEVELOPMENT SUPPORT

#### FY 2015 Request \$34.5M

- A, CIP Systems Engineering & Development Support – SE2020, M03.03-01
- B, Provide ANF/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: Screening Information Request 1 (SIR 1) Research and Mission Analysis; and Screening Information Request 2 (SIR 2) Systems Engineering.

SIR 1 Research and Mission Analysis supports the full range of NextGen Research & Mission Analysis support services in one or more functional task areas related to NextGen and activities necessary to reach the Investment Analysis Readiness Decision (IARD) phase in the Acquisition Management System (AMS) Lifecycle. SIR 1 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

SIR 2 Systems Engineering supports systems engineering activities that occur throughout the AMS Lifecycle for both NextGen and non-NextGen service activities. SIR 2 Systems Engineering does not perform R&D, post-FID full-scale development, NAS system maintenance, or program management support for program offices responsible for fielding and/or maintaining NAS systems. The majority of SIR 2 Systems Engineering activities are expected to occur after the AMS Lifecycle Acquisition Management phase, "Concept and Requirements Definition" (CRD). In addition, SIR 2 Systems Engineering supports pre-IARD activities related to the technology refresh of current NAS systems before the "Solution Implementation" phase of the AMS lifecycle. SIR 2 Systems Engineering supports the following activities:

- Concept and Requirements Definition
- Final Investment Analysis

- Final Requirements Documents, Enterprise Architectural Products
- Safety and Regulatory
- Business Continuity Planning
- Portfolio Analyses
- Maintenance, Operation and Enhancements of Financial Systems
- 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
- Cognitive Task Analysis Methods
- Cost Benefit Analysis

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

### **Relationship to Performance Metric**

The SE2020 program contributes to the performance 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. In addition, financial management and investment analysis support helps the FAA track cost, balance competing budgetary resources and make important decisions necessary to ensure that program dollars provide the greatest return on investment.

#### ***Program Plans FY 2015 – Performance Output Goals***

- Award Vendor Program Management Task Orders.
- 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 2020 Showcase.
- Exercise First Option Period for 2020 Full and Open prime vendors.
- Issue new Small Business contract award(s) (Strategy to be determined).
- Perform vendor fee reconciliation.

#### ***Program Plans FY 2016 – Performance Output Goals***

- 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 2020 Showcase.
- 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 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 2020 Showcase.

***Program Plans FY 2018 – Performance Output Goals***

- 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 2020 Showcase.
- Exercise Second Option Period for 2020 Full and Open prime vendors.
- Perform vendor fee reconciliation.

***Program Plans FY 2019 – Performance Output Goals***

- 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 2020 Showcase.
- Perform vendor fee reconciliation.

**B, Provide ANF/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 such as installing a communications link for a new facility or service; and 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 2015-2019 – Performance Output Goals***

- Implement projects as approved in the budget year.

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## **4A02, PROGRAM SUPPORT LEASES**

**FY 2015 Request \$43.2M**

### **Program Support Leases, M08.06-00**

#### **Program Description**

Program Support Leases fund over 2,800 leases that support air traffic operations and the program provides oversight of existing and new leases. FAA leases land needed for building shelters and transmission towers for communication, surveillance, and navigation systems (including air rights restrictions around the facilities as necessary to prevent interference with electronic signals). The program also leases land and technical commercial space for ATCTs, system support facilities, and other mission related activities. The program provides management and consulting support services and develops technical guidance for entering into new lease agreements. 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 air traffic control towers 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. 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 potential cost effective alternatives such as collocating with another facility. Lease arrangements can be complex requiring negotiations with multiple owners and accommodating stringent site specific requirements to meet operational needs. A business case assessment using decision making tools evaluates potential new leases to determine the most cost effective solution that will have the least risk for unsatisfactory performance. Approximately 500 expiring leases over the three service areas are reviewed each year.

Lease costs normally escalate because the market value of land continues to increase. When lease costs increase, it can be more cost effective to own property rather than continue a lease. In those cases, the program will not renew the lease and 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, we are facing more Holdover leases and, in some cases, legal action. In some cases, a site is purchased to avoid an inverse condemnation situation. The increase in purchases continues to build and 12% of our budget is allocated to purchases. We currently have approximately 125 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 collocation as leases expire,
- Converting leases to ownership where feasible,
- Terminating leases that are not needed for future operations, and
- Negotiating fair and reasonable lease rates when leases are renewed.

#### **Program Plans FY 2015 – Performance Output Goals**

- Conduct six site surveys to determine best alternatives to pursue regarding FY 2016 expiring leases.
- Conduct quarterly teleconference meetings with Service Areas on Facilities & Equipment (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.

***Program Plans FY 2016 – Performance Output Goals***

- Conduct six site surveys to determine best alternatives to pursue regarding FY 2017 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.

***Program Plans FY 2017 – Performance Output Goals***

- Conduct six site surveys to determine best alternatives to pursue regarding FY 2018 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.

***Program Plans FY 2018 – Performance Output Goals***

- Conduct six site surveys to determine best alternatives to pursue regarding FY 2019 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.

***Program Plans FY 2019 – Performance Output Goals***

- Conduct six site surveys to determine best alternatives to pursue regarding FY 2020 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.

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**4A03, LOGISTICS SUPPORT SERVICES (LSS)**

**FY 2015 Request \$11.5M**

**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, 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 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 ATCTs and 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 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

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 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 85% 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 2015 – Performance Output Goals***

- Complete 90% of the work assignments in support of:
  - The annual real property OMB inventory validation effort;
  - The "retired" real property disposal effort;
  - Capitalization efforts for both real and personal property assets; and
  - Regarding acquisition (MMAC only).
- Complete Option Year 1 acquisition activities to fully fund the program-funded task orders on the LSSC (5/22/15).

### ***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;
  - Capitalization efforts for both real and personal property assets; and
  - Regarding acquisition (MMAC only).
- Complete Option Year 2 acquisition activities to fully fund the program-funded task orders on the LSSC (5/22/16).

### ***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;
  - Capitalization efforts for both real and personal property assets; and
  - Regarding acquisition (MMAC only).
- Complete Option Year 3 acquisition activities to fully fund the program-funded task orders on the LSSC (5/22/17).

***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;
  - Capitalization efforts for both real and personal property assets; and
  - Regarding acquisition (MMAC only).
- Complete Option Year 4 acquisition activities to fully fund the program-funded task orders on the LSSC (5/22/18).

***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;
  - Capitalization efforts for both real and personal property assets; and
  - Regarding acquisition (MMAC only).
- Complete 100% of acquisition activities for a follow-on LSS contract to be awarded in FY 2019 (5/23/19).

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**4A04, MIKE MONRONEY AERONAUTICAL CENTER LEASES**

**FY 2015 Request \$18.4M**

**Aeronautical Center Lease, F19.00-00**

**Program Description**

The Aeronautical Center lease program pays the annual rent for leased land and buildings for approximately 80 percent of Aeronautical Center space (2.8M sq ft of leased space and 1,100 acres of land, having a replacement value of \$710M).

The Aeronautical Center is the FAA's centralized location that supports FAA National Airspace Systems (NAS) Air Operations/flight checks, engineering, system testing, training (Radar/Nav aids), NAS logistics, aviation regulation, registration, certification, aviation and transportation safety research, and Business Services in Oklahoma City.

The Center provides facilities that support the work of 7,100 employees, students, and contractors on a daily basis; and 10,000 to 11,000 visitors annually; 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
- Grounds Maintenance Building

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-critical facilities whose loss, damage, or destruction may have serious or catastrophic impact on the NAS.

Funding for this program assures continued availability of the Aeronautical Center facility, so that it can be used for the multiple functions currently housed there. 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 ATO by Engineering Organizations, Aviation System Standards (AVN) operations and flight check, the Logistics Center, Air Traffic Control training, ATO Technical Operations Training and Certification, and system testing of Radar and Nav aids. An additional 13% of Aeronautical Center space provides business service facilities for DOT/DELPHI/Prism/Castle Data Center Operations, consolidated Accounting Operations services, Acquisition, ATO Data Center Operations, and Aviation Safety (AVS/Civil Aeromedical Institute (CAMI)). The current lease is very cost efficient (\$17.51 per net square footage (nsf) compared to the \$25.20 GSA rate for Oklahoma City, 30% lower than GSA, a \$14.6M cost avoidance in FY 2012). Leasing is more cost effective than investing in the \$710M replacement cost of the leased facilities.

### *Program Plans FY 2015-2019 – Performance Output Goals*

- Complete monthly lease payments on time.

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## **4A05, TRANSITION ENGINEERING SUPPORT**

### **FY 2015 Request \$16.6M**

- 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 results in work products that support 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 providing Information Technology systems such as automation of the safety rule making 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 Thinking" model across all task orders. Through workforce alignment, infrastructure resizing, and process improvements, the program has achieved significant cost savings/avoidance.

### *Program Plans FY 2015-2019 – 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 Configuration Management Automation (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 planning and management,
- Configuration identification,
- Configuration control,
- Configuration status accounting, and
- Configuration audits.

The goal of configuration management is to record technical information on all systems installed in FAA facilities (including system specifications and installation data). 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 Enterprise Architecture (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 Enterprise Architecture (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 December 2014.

### **Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 2015 – Performance Output Goals***

- Achieve Contract Award.

***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 to achieve enterprise visibility of Non-NAS IT assets.

***Program Plans FY 2019 – Performance Output Goals***

- None.

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**4A06, TECHNICAL SUPPORT SERVICES CONTRACT (TSSC)**

**FY 2015 Request \$23.0M**

**Technical Support Services Contract (TSSC), M02.00-00**

**Program Description**

The TSSC Program provides a contract vehicle to augment FAA’s work-force 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; asbestos and obsolete equipment removal. 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 total number of FTEs provided will vary depending upon the amount of funding available from other programs (CIPs) that use TSSC support (since those programs must pay from their own funds for the contractor effort allotted to their project) to accomplish specific project needs.

TSSC operates similar to a performance-based contract. All work ordered incorporates quality, schedule, and cost metrics. The policy that requires the 100% work release performance measure ensures that each customer’s requirement is addressed. And measuring three other key performance metrics ensures that the FAA receives the highest quality output (products, services or deliverables), on-time, for the best value (cost) available. TSSC strives for small business participation by contractually requiring the following goals: Small Business (45%), Small Disadvantage (10%), Women-Owned (5%), Service Disabled Veteran-Owned (3%). TSSC incorporates and maintains internal automated cost control measures and audits of Contractor invoicing insuring that invoices submitted by the Contractor and paid by the FAA match the official accounting system (Delphi) procurement request (PR) account records at a rate of 99% or greater.

**Alignment of Program to FAA Strategic Priority and Performance Metric**

- *FAA Strategic Priority 2 – Deliver Benefits through Technology and Infrastructure.*
- *FAA Performance Metric 7 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (FAA Business Planning Metric)*

**Relationship to Performance Metric**

In a typical year, more than 3,700 separate projects are completed by FAA using the TSSC Program. Customers using TSSC support services benefit from high quality contractor labor support that is experienced, flexible, reliable,

and cost effective. This quality customer service is substantiated by the consistently high customer (engineer and Engineering Technical Officer) satisfaction ratings earned by the contractor during the bi-annual award fee process. The Prime contractor has typically been rated higher than 90 percent. Award fee ratings are based on metrics and feedback from customers for cost, schedule, management and technical performance by the TSSC Contractor.

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 2015-2019 – Performance Output Goals***

- Two award fee performance ratings per year, which measure FAA satisfaction with Contractor performance with regard to cost, schedule and quality.

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**4A07, RESOURCE TRACKING PROGRAM (RTP)**

**FY 2015 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 – Maintain 90 percent of major system investments within 10 percent variance of current baseline total budget at completion. (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 2015-2019 – Performance Output Goals***

- Deliver quarterly software upgrades to optimize project/program management.
- Provide monthly project management reports.

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**4A08, CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)**

**FY 2015 Request \$60.0M**

**CIP Systems Engineering & Technical Assistance – MITRE, M03.02-00**

**Program Description**

The 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 goals and outcomes of NextGen Implementation Plan, National Aviation Research Plan (NARP) and NAS Enterprise Architecture.

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, Architecture and NextGen System Integration; Improve understanding of the future environment, including anticipated demand at airports and for airspace; Anticipate the impact of planned improvements on future capacity; Develop and integrate the NextGen enterprise architecture, operational concepts, capability action plans, and roadmaps to ensure an integrated evolution that aligns with the agencies' enterprise architectures; Analyze NAS-wide strategic issues and ensuring their alignment with the evolving NextGen architecture; and Conduct research to gain a better understanding of late mid-term NextGen operational concept elements and how to transition to them.

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 to 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 by developing algorithms, prototype capabilities, and conducting Human-in-the-Loop (HITL) evaluations. Create consensus on new capabilities, procedures, and priorities for evolving the ATM operations. Evaluate NAS system-level performance. Develop operational strategies. Develop and evaluate new metrics to measure overall NAS operational performance. Research potential advancements in aviation technologies as elements of solutions that will permit the FAA to reduce its cost of ownership. Develop domestic and international requirements and engineering standards for future advancements in aviation technologies. Provide FAA with technical analyses of architecture alternatives. Provide technical and operational insight into systems that can be used to safely permit reduced separation standards and/or significantly increase overall system capacity and productivity. Assist the FAA in identifying and prioritizing among the more promising operational changes, procedures and enabling technologies. Develop and validate cross domain operational evolution plans. Conduct technology transfer of data, artifacts, and insights gained from research.

Airspace and Performance-Based Navigation. Leverage the precision, reliability, predictably, and efficiencies of improved navigation and procedures through Area Navigation (RNAV). Research 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 of

the NextGen to include research of avionics via proprietary agreements with avionics manufacturers. Identify issues and lessons learned for improving airspace and procedures design.

Validate Flight Standards procedure development tools. Analyze and engineer the processes that govern airspace strategic planning and analysis efforts to support the development of standards and guidelines for airspace redesign. Perform system-wide optimization analyses of airspace and procedures reflecting a strategic plan as key building blocks for NextGen. Design and execute technical analyses on airspace security incidents and their impacts on the NAS. Perform airspace security concept development and systems engineering analyses to develop and evolve the FAA's capabilities and tools for communicating, coordinating, and mitigating airspace security incidents. Develop and evaluate new operational security performance metrics.

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, and prioritize implementation of appropriate operational and technological mitigations, leading to a reduction in accidents and runway incursions. Develop metrics and processes that allow FAA to proactively identify potential safety issues with both operations and architecture. Identify risks before they lead to incidents or accidents. Identify and assess the feasibility of new or advanced capabilities and standards that mitigate safety issues in the NAS. Leverage the collaboration of operational experts across the agency and research into technologies and capabilities to improve safety. Enhance the quality and efficiency of TRACON and En Route controller training, to allow for reduced training time and cost, improved trainee success rates, and improved workforce capabilities (e.g., reduced operational errors, improved productivity). Improve the delivery, quality, flexibility, and standardization of controller training. Facilitate through training improvements more effective operational transitions of NextGen solutions.

Communications, Navigation, Surveillance, and Cyber-Security Infrastructure. Establish the Communications, Navigation, and Surveillance (CNS) foundation for FAA's mid-term and far-term evolution strategies. Develop and evaluate advanced NAS CNS system concepts and requirements, and assess alternative technological approaches to meeting requirements in cost-effective ways. Perform research, modeling, simulation, and demonstration of prototypes of technical and operational enhancements to the NAS CNS and cyber security systems. Conduct technical, architectural, operational, cost analyses, and modeling to support the implementation of CNS services in the NAS. Conduct spectrum analysis focusing on strategic issues related to the availability of adequate spectrum resources to support CNS for NextGen operational concepts. Conduct analysis of the operations enabled by data communications. Perform technical, architectural, and safety analysis. Participate in the development of international standards and harmonization to support the implementation of digital data communications services in the NAS. Conduct engineering analyses and assessments of industry provided solutions, and develop transition strategies for the FAA's NextGen Voice Communications System (NVS).

Unmanned Aircraft Systems. Provide technical analyses supporting strategic solutions for practical and coordinated 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. Collect and utilize NAS metrics to proactively detect issues prior to incidents or accidents.

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 laboratory infrastructure for expanded cross-domain scenario generation tools to support real-time Human-in-the-Loop as well as enable fast-time capabilities. Provide a data repository system that allows efficient access to aviation data and associated tools. Provide a flexible model of the NAS capable of quickly and reliably estimating the high-level impacts of new technologies, procedures, or infrastructure improvements on key system performance metrics. Conduct special studies of key subjects not directly related to a current outcome, if directed by FAA senior management.

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. Research future concepts and technologies to understand their potential impact on the NAS. Apply prototyping, in-lab demonstrations, and experimentations to test concepts. 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.*

### **Relationship to Performance Metric**

The CAASD provides independent advanced research and development required by the FAA to obtain operational concepts, technical analyses, prototypes, procedures, and systems requirements needed to fulfill the vision for the NAS enterprise architecture and the NextGen Implementation Plan. FAA adoption of the new systems and procedures in the NAS improves on-time performance, increases capacity, and provides a safer and more efficient global air transportation system.

#### ***Program Plans FY 2015-2019 – Performance Output Goals***

- Complete on-time 80% 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 MITRE progress.
- Conduct three FFRDC Executive Board milestone meetings.

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## **4A09, NEXTGEN – AERONAUTICAL INFORMATION MANAGEMENT PROGRAM**

**FY 2015 Request \$12.7M**

### **AIM Modernization Segment 2, G05A.02-05 / X, 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 NOTAM, airport, Special Activity Airspace (SAA), and other relevant aeronautical information such as Letter of Agreement constraints, procedures, and obstacles data. This information will be provided through enterprise support services and will support better decision-making by NAS operators.

AIM will implement information systems and services necessary to incorporate standard Geographic Information System (GIS) mapping and Common Structure and Status Data (CSSD) such as special activity airspace, NOTAM, airport configuration, and other aeronautical data. It improves on present information distribution because it is an integrated, enterprise level, digital source of aeronautical information, airport and airspace data necessary to achieve shared situational awareness.

#### AIM Modernization Segment 2 (G05A.02-05):

AIM Modernization Segment 2 will build on pre-implementation efforts that were performed in the NextGen CSSD 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 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.

Schedule to meet Final Investment Decision (FID):

- Investment Analysis Readiness Decision: Completed in February 2013;
- AIM Modernization Segment 2 IID – Completed in November 2013;
- Release of SIR for software development contract supporting AIM Modernization Segment 2 – Completed in January 2014;
- AIM Modernization Segment 2 FID – Scheduled for Q4 FY 2014.

#### AIM Modernization Segment 3 (G05A.02-06):

AIM Modernization Segment 3 will modernize and expand on the ACS enterprise service and initial SAA and GIS capabilities from 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. 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. The information services developed will provide end use applications with a much more integrated data set in more useable and flexible forms.

Concept and Requirements Definition Readiness Decision is scheduled for Q4 FY 2014

### **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 target enhancements and new functionality to 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.

Standardizing and centralizing aeronautical data within the NAS will support FAA's Strategic Priority to Make Aviation Safer and Smarter and will enhance the safety of FAA air traffic control systems. NAS safety depends upon the timely and accurate exchange of information between internal and external users.

#### ***Program Plans FY 2015 – Performance Output Goals***

##### AIM Modernization Segment 2 (G05A.02-05):

- Complete Preliminary Design Review (PDR) for Release 1 that includes the final System Segment Specification (SSS) and Verification Requirements Traceability Matrix (VRTM), and draft Release 1 Software Requirements Specifications (SRS), Software Design Document (SDD) and Web Service Description Documents (WSDD).
- Complete Detailed Design Review (DDR) for Release 1 that includes the final Release 1 SRS, SDD and WSDD.
- Complete Release 1 code development and development of test procedures.

AIM Modernization Segment 3 (G05A.02-06):

- None.

***Program Plans FY 2016 – Performance Output Goals***

AIM Modernization Segment 2 (G05A.02-05):

- 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 SRS, SDD and 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.

AIM Modernization Segment 3 (G05A.02-06):

- None.

***Program Plans FY 2017 – Performance Output Goals***

AIM Modernization Segment 2 (G05A.02-05):

- Complete Preliminary Design Review (PDR) for Release 3 that includes draft Release 3 SRS, SDD and WSDD.
- Complete Detailed Design Review (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.

AIM Modernization Segment 3 (G05A.02-06):

- Complete AIMM Segment 3 Chief Financial Officer documentation package.

***Program Plans FY 2018 – Performance Output Goals***

AIM Modernization Segment 2 (G05A.02-05):

- Complete delivery of Special Activity Airspace information into NAS Automation
- Complete post implementation review (PIR) for any identified trouble reports.

AIM Modernization Segment 3 (G05A.02-06):

- Exercise contract option for Segment 3.
- Complete System Requirements Review that includes the draft SSS and VRTM.

***Program Plans FY 2019 – Performance Output Goals***

AIM Modernization Segment 2 (G05A.02-05):

- None.

AIM Modernization Segment 3 (G05A.02-06):

- Complete Preliminary Design Review (PDR) for Release 1 that includes the final SSS and VRTM, and draft Release 1 SRS, SDD and WSDD.
- Complete Detailed Design Review (DDR) for Release 1 that includes the final Release 1 SRS, SDD and WSDD.
- Complete Release 1 code development and development of test procedures.

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**4A10, NEXTGEN – CROSS AGENCY NEXTGEN MANAGEMENT**

**FY 2015 Request \$2.0M**

**Cross Agency NextGen Management, G08M.04-01**

**Program Description**

The development of NextGen is a priority for the Administration and active participation by the NextGen agencies partners, like Department of Commerce (DOC), Department Of Homeland Security (DHS), National Aeronautics and Space Administration (NASA), and Department Of Defense (DOD), in this undertaking is necessary to

modernize the air transportation system and safely meet 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 – Organizations throughout the agency will continue to implement cost efficiency initiatives. FY 2014 Target: 90 percent of targeted savings. (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 2015 – 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 implementation to include up-to-date 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.
- Provide budgetary documentation of the FAA's funding for NextGen interagency collaboration.

#### ***Program Plans FY 2016-2019 – 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 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.

Federal Aviation Administration

National Airspace System

Capital Investment Plan

Appendix C

Fiscal Years 2015 – 2019

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BLI Number	Capital Budget Line Item (BLI) Program	FY 2015 Budget	FY 2016 Est.	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.
	<b>Activity 1: Engineering, Development, Test and Evaluation</b>	<b>\$170.9</b>	<b>\$201.0</b>	<b>\$271.8</b>	<b>\$315.7</b>	<b>\$318.1</b>
1A01	Advanced Technology Development and Prototyping (ATDP)	\$29.9	\$27.9	\$36.3	\$36.2	\$33.8
1A02	NAS Improvement of System Support Laboratory	\$1.0	\$1.0	\$1.0	\$1.0	\$1.0
1A03	William J. Hughes Technical Center Facilities	\$12.0	\$12.0	\$12.0	\$12.0	\$12.0
1A04	William J. Hughes Technical Center Infrastructure Sustainment	\$12.2	\$9.2	\$10.3	\$10.0	\$10.0
1A05	NextGen – Separation Management Portfolio	\$13.0	\$28.0	\$42.5	\$41.5	\$36.5
1A06	NextGen – Improved Surface/Terminal Flight Data Manager (TFDM) Portfolio	\$38.8	\$40.3	\$80.0	\$124.0	\$133.8
1A07	NextGen – On Demand NAS Portfolio	\$6.0	\$15.2	\$16.0	\$19.3	\$24.0
1A08	NextGen – Environment Portfolio	\$2.5	\$3.5	\$3.5	\$3.5	\$3.5
1A09	NextGen – Improved Multiple Runway Operations Portfolio	\$3.5	\$10.8	\$11.5	\$9.5	\$7.0
1A10	NextGen – NAS Infrastructure Portfolio	\$13.5	\$22.4	\$25.2	\$25.2	\$23.0
1A11	NextGen – Support Portfolio at WJHTC	\$13.0	\$11.0	\$12.0	\$12.0	\$12.0
1A12	NextGen – Performance Based Navigation & Metroplex Portfolio	\$25.5	\$19.7	\$21.5	\$21.5	\$21.5
	<b>Activity 2: Procurement and Modernization of Air Traffic Control Facilities and Equipment</b>	<b>\$1,585.7</b>	<b>\$1,606.8</b>	<b>\$1,590.5</b>	<b>\$1,597.3</b>	<b>\$1,663.6</b>
	<b>A. En Route Programs</b>	<b>\$734.0</b>	<b>\$746.3</b>	<b>\$779.0</b>	<b>\$734.9</b>	<b>\$745.0</b>
2A01	En Route Automation Modernization (ERAM)	\$10.5	\$0.0	\$0.0	\$0.0	\$0.0
2A02	NextGen – En Route Automation Modernization (ERAM) – System Enhancements and Technology Refresh	\$45.2	\$82.4	\$70.0	\$90.0	\$100.0
2A03	En Route Communications Gateway (ECG)	\$6.6	\$2.8	\$2.0	\$2.0	\$4.1
2A04	Next Generation Weather Radar (NEXRAD)	\$7.1	\$6.5	\$6.3	\$5.5	\$5.5
2A05	ARTCC Building Improvements/Plant Improvements	\$63.7	\$60.8	\$63.5	\$63.5	\$63.8
2A06	Air Traffic Management (ATM) – Traffic Flow Management (TFM)	\$5.7	\$0.0	\$8.0	\$7.0	\$5.0
2A07	Air/Ground Communications Infrastructure	\$3.9	\$3.0	\$3.2	\$3.2	\$3.3
2A08	Air Traffic Control En Route Radar Facilities Improvements	\$5.1	\$0.0	\$0.0	\$0.0	\$0.0
2A09	Voice Switching Control System (VSCS)	\$13.8	\$9.9	\$11.3	\$12.8	\$11.4
2A10	Oceanic Automation System (OAS)	\$3.5	\$0.0	\$0.0	\$0.0	\$0.0
2A11	Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)	\$40.0	\$43.3	\$50.0	\$50.0	\$50.0
2A12	NextGen – System-Wide Information Management (SWIM)	\$60.3	\$57.9	\$52.9	\$43.6	\$40.2
2A13	NextGen – Automatic Dependent Surveillance - Broadcast (ADS-B) NAS Wide	\$247.2	\$183.9	\$166.4	\$155.8	\$163.3
2A14	Windshear Detection Service (WDS)	\$4.3	\$5.2	\$4.5	\$1.0	\$2.8
2A15	NextGen – Collaborative Air Traffic Management Portfolio	\$13.5	\$20.8	\$22.7	\$35.3	\$36.3
2A16	NextGen – Time Based Flow Management (TBFM) Portfolio	\$21.0	\$22.2	\$28.2	\$35.8	\$54.9
2A17	NextGen – Next Generation Weather Processor (NWP)	\$23.3	\$42.4	\$48.1	\$35.2	\$22.7

BLI Number	Capital Budget Line Item (BLI) Program	FY 2015 Budget	FY 2016 Est.	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.
2A18	Airborne Collision Avoidance System X (ACAS X)	\$12.0	\$10.8	\$8.9	\$7.7	\$7.7
2A19	NextGen – Data Communication in support of NextGen	\$147.3	\$194.4	\$233.0	\$186.6	\$174.0
	<b>B. Terminal Programs</b>	<b>\$452.4</b>	<b>\$462.6</b>	<b>\$441.7</b>	<b>\$459.0</b>	<b>\$480.0</b>
2B01	Airport Surface Detection Equipment - Model X (ASDE-X)	\$5.4	\$10.5	\$8.4	\$0.0	\$0.0
2B02	Terminal Doppler Weather Radar (TDWR) – Provide	\$1.9	\$0.0	\$0.0	\$0.0	\$0.0
2B03	Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)	\$50.7	\$81.1	\$60.0	\$52.8	\$56.0
2B04	Terminal Automation Modernization/ Replacement Program (TAMR Phase 3)	\$136.2	\$110.0	\$111.9	\$35.5	\$0.0
2B05	Terminal Automation Program	\$1.6	\$2.7	\$2.7	\$2.8	\$2.8
2B06	Terminal Air Traffic Control Facilities - Replace	\$29.8	\$86.0	\$97.0	\$213.2	\$262.5
2B07	ATCT/Terminal Radar Approach Control (TRACON) Facilities - Improve	\$45.0	\$52.9	\$53.7	\$53.7	\$53.9
2B08	Terminal Voice Switch Replacement (TVSR)	\$2.0	\$0.0	\$0.0	\$0.0	\$0.0
2B09	NAS Facilities OSHA and Environmental Standards Compliance	\$43.5	\$26.0	\$26.0	\$29.0	\$26.0
2B10	Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)	\$13.6	\$3.8	\$3.5	\$1.2	\$0.0
2B11	Terminal Digital Radar (ASR-11) Technology Refresh and Mobile Airport Surveillance Radar (MASR)	\$21.1	\$9.9	\$6.1	\$3.2	\$4.4
2B12	Runway Status Lights (RWSL)	\$41.7	\$23.7	\$4.3	\$1.2	\$0.0
2B13	NextGen – National Airspace System Voice System (NVS)	\$20.6	\$25.0	\$40.0	\$40.0	\$50.0
2B14	Integrated Display System (IDS)	\$16.9	\$13.3	\$5.7	\$1.1	\$7.1
2B15	Remote Monitoring and Logging System (RMLS)	\$3.9	\$1.1	\$3.4	\$4.5	\$5.2
2B16	Mode S Service Life Extension Program (SLEP)	\$8.1	\$11.3	\$14.0	\$17.0	\$12.0
2B17	Surveillance Interface Modernization (SIM)	\$4.0	\$0.0	\$0.0	\$0.0	\$0.0
2B18	Voice Recorder Replacement Program (VRRP)	\$1.0	\$0.0	\$0.0	\$0.0	\$0.0
2B19	Precision Runway Monitor Alternate (PRMA)	\$1.0	\$0.0	\$0.0	\$0.0	\$0.0
2B20	Integrated Terminal Weather System (ITWS) Technology Refresh	\$4.4	\$5.4	\$5.0	\$3.8	\$0.0
	<b>C. Flight Service Programs</b>	<b>\$12.0</b>	<b>\$14.9</b>	<b>\$25.5</b>	<b>\$38.1</b>	<b>\$39.9</b>
2C01	Aviation Surface Weather Observation System	\$8.0	\$8.0	\$10.0	\$10.0	\$10.0
2C02	Future Flight Services Program (FFSP)	\$1.0	\$3.0	\$9.5	\$21.8	\$27.0
2C03	Alaska Flight Service Facility Modernization (AFSFM)	\$2.8	\$2.8	\$2.8	\$2.8	\$2.8
2C04	Weather Camera Program	\$0.2	\$1.1	\$3.2	\$3.5	\$0.1
	<b>D. Landing and Navigation Aids Programs</b>	<b>\$205.3</b>	<b>\$195.6</b>	<b>\$169.5</b>	<b>\$146.0</b>	<b>\$153.5</b>
2D01	VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME)	\$8.3	\$2.5	\$2.5	\$2.5	\$8.9
2D02	Instrument Landing Systems (ILS) – Establish	\$7.0	\$7.0	\$7.0	\$7.0	\$10.0
2D03	Wide Area Augmentation System (WAAS) for GPS	\$103.6	\$105.7	\$105.0	\$104.9	\$97.4
2D04	Runway Visual Range (RVR) & Enhanced Low Visibility Operations (ELVO) Program	\$6.0	\$6.0	\$6.5	\$4.0	\$6.0

BLI Number	Capital Budget Line Item (BLI) Program	FY 2015 Budget	FY 2016 Est.	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.
2D05	Approach Lighting System Improvement Program (ALSIP)	\$3.0	\$3.0	\$3.0	\$3.0	\$5.0
2D06	Distance Measuring Equipment (DME)	\$3.0	\$3.0	\$3.0	\$3.0	\$5.0
2D07	Visual Nav aids - Establish/Expand	\$2.0	\$2.0	\$2.0	\$2.0	\$2.0
2D08	Instrument Flight Procedures Automation (IFPA)	\$2.4	\$3.4	\$2.0	\$2.0	\$2.2
2D09	Navigation and Landing Aids – Service Life Extension Program (SLEP)	\$3.0	\$3.0	\$3.0	\$6.0	\$7.0
2D10	VASI Replacement – Replace with Precision Approach Path Indicator	\$5.0	\$5.0	\$5.0	\$5.0	\$10.0
2D11	Global Positioning System (GPS) Civil Requirements	\$27.0	\$25.0	\$11.0	\$0.0	\$0.0
2D12	Runway Safety Areas – Navigation Mitigation	\$35.0	\$30.0	\$19.5	\$6.6	\$0.0
	<b>E. Other ATC Facilities Programs</b>	<b>\$181.9</b>	<b>\$187.3</b>	<b>\$174.8</b>	<b>\$219.3</b>	<b>\$245.3</b>
2E01	Fuel Storage Tank Replacement and Management	\$15.5	\$14.0	\$14.0	\$16.0	\$14.0
2E02	Unstaffed Infrastructure Sustainment	\$32.3	\$32.9	\$33.8	\$43.8	\$44.1
2E03	Aircraft Related Equipment Program	\$9.0	\$11.4	\$9.0	\$9.0	\$9.0
2E04	Airport Cable Loop Systems – Sustained Support	\$5.0	\$5.0	\$5.0	\$10.0	\$10.0
2E05	Alaskan Satellite Telecommunication Infrastructure (ASTI)	\$11.4	\$12.5	\$1.5	\$0.0	\$0.0
2E06	Facilities Decommissioning	\$5.7	\$6.0	\$6.0	\$10.0	\$10.0
2E07	Electrical Power Systems – Sustain/Support	\$102.0	\$100.0	\$100.0	\$125.0	\$150.0
2E08	Energy Management and Compliance (EMC)	\$1.0	\$2.0	\$2.0	\$2.0	\$2.0
2E09X	Independent Operational Test and Evaluation	\$0.0	\$3.5	\$3.5	\$3.5	\$6.2
	<b>Activity 3: Non-Air Traffic Control Facilities and Equipment</b>	<b>\$158.3</b>	<b>\$146.7</b>	<b>\$129.2</b>	<b>\$125.4</b>	<b>\$121.7</b>
	<b>A. Support Programs</b>	<b>\$143.6</b>	<b>\$131.6</b>	<b>\$114.2</b>	<b>\$110.4</b>	<b>\$106.7</b>
3A01	Hazardous Materials Management	\$22.0	\$20.0	\$20.0	\$20.0	\$20.0
3A02	Aviation Safety Analysis System (ASAS)	\$11.9	\$20.2	\$11.3	\$15.3	\$11.0
3A03	Logistics Support System and Facilities (LSSF)	\$8.0	\$1.0	\$1.5	\$0.0	\$1.4
3A04	National Airspace System (NAS) Recovery Communications (RCOM)	\$12.0	\$12.0	\$12.0	\$12.0	\$12.0
3A05	Facility Security Risk Management	\$14.3	\$15.0	\$15.1	\$15.1	\$15.9
3A06	Information Security	\$12.0	\$12.0	\$12.0	\$12.0	\$12.0
3A07	System Approach for Safety Oversight (SASO)	\$22.5	\$16.9	\$9.5	\$9.0	\$5.0
3A08	Aviation Safety Knowledge Management Environment (ASKME)	\$10.2	\$7.5	\$4.2	\$0.0	\$0.0
3A09	NextGen – System Safety Management Portfolio	\$18.7	\$17.0	\$18.0	\$18.0	\$18.0
3A10	National Test Equipment Program	\$2.0	\$4.0	\$4.0	\$4.0	\$5.0
3A11	Mobile Assets Management Program	\$4.0	\$2.0	\$2.0	\$3.0	\$1.8
3A12	Aerospace Medicine Safety Information System (AMSIS)	\$3.0	\$4.0	\$4.6	\$2.0	\$4.6
3A13	Tower Simulation System (TSS) Technology Refresh	\$3.0	\$0.0	\$0.0	\$0.0	\$0.0

BLI Number	Capital Budget Line Item (BLI) Program	FY 2015 Budget	FY 2016 Est.	FY 2017 Est.	FY 2018 Est.	FY 2019 Est.
	<b>B. Training, Equipment and Facilities</b>	<b>\$14.7</b>	<b>\$15.1</b>	<b>\$15.0</b>	<b>\$15.0</b>	<b>\$15.0</b>
3B01	Aeronautical Center Infrastructure Modernization	\$13.2	\$14.1	\$14.0	\$14.0	\$14.0
3B02	Distance Learning	\$1.5	\$1.0	\$1.0	\$1.0	\$1.0
	<b>Activity 4: Facilities and Equipment Mission Support</b>	<b>\$225.8</b>	<b>\$233.6</b>	<b>\$243.8</b>	<b>\$252.2</b>	<b>\$243.2</b>
4A01	System Engineering (SE2020) and Development Support	\$34.5	\$35.0	\$35.0	\$35.0	\$35.0
4A02	Program Support Leases	\$43.2	\$44.7	\$46.6	\$49.7	\$50.0
4A03	Logistics Support Services (LSS)	\$11.5	\$11.0	\$11.0	\$11.0	\$11.0
4A04	Mike Monroney Aeronautical Center Leases	\$18.4	\$18.8	\$19.3	\$19.7	\$20.2
4A05	Transition Engineering Support	\$16.6	\$18.0	\$20.0	\$20.0	\$15.0
4A06	Technical Support Services Contract (TSSC)	\$23.0	\$24.0	\$25.0	\$30.0	\$30.0
4A07	Resource Tracking Program (RTP)	\$4.0	\$4.0	\$4.0	\$3.8	\$4.0
4A08	Center for Advanced Aviation System Development (CAASD)	\$60.0	\$60.0	\$65.0	\$65.0	\$65.0
4A09	NextGen – Aeronautical Information Management Program	\$12.7	\$15.1	\$14.9	\$15.0	\$10.0
4A10	NextGen – Cross Agency NextGen Management	\$2.0	\$3.0	\$3.0	\$3.0	\$3.0
	<b>Activity 5: Personnel Compensation, Benefits and Travel</b>	<b>\$463.0</b>	<b>\$467.0</b>	<b>\$475.7</b>	<b>\$480.5</b>	<b>\$486.3</b>
5A01	Personnel and Related Expenses	\$463.0	\$467.0	\$475.7	\$480.5	\$486.3
<p>Note: BLI numbers with X represent outyear programs not requested in the FY 2015 President's Budget. Note: FY 2016-2019 outyear funding amounts are estimates.</p>						
Total Year Funding		<b>\$2,603.7</b>	<b>\$2,655.0</b>	<b>\$2,711.0</b>	<b>\$2,771.0</b>	<b>\$2,833.0</b>
Targets		<b>\$2,603.7</b>	<b>\$2,655.0</b>	<b>\$2,711.0</b>	<b>\$2,771.0</b>	<b>\$2,833.0</b>

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Appendix D

Fiscal Years 2015 – 2019

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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 recommendation was to identify or establish a vehicle for regularly reporting to Congress and the public on ATO'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 Appendix provides the most current information for FAA's Major Active Programs and is in direct response to the GAO's recommendation.

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**FAA Capital Programs  
Current Information for Major Programs**

Programs	Original Baseline			Current Baseline			Current Estimate		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	<p><b>Current Baseline vs Original Baseline:</b> In Mar-11 the Joint Resources Council (JRC) approved a baseline schedule replan and strategic decision to incorporate the Colorado WAM, Phase II into the ADS-B baseline.</p> <p><b>Note:</b> Colorado WAM, Phase II was previously baselined in Dec-09</p> <p><b>Current Estimate vs Current Baseline:</b> The increase to the current baseline 1.0% variance 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 Applications Development.</p>
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	

**FAA Capital Programs  
Current Information for Major Programs**

Programs	Original Baseline			Current Baseline			Current Estimate		Comments
	Original APB Date	Completion Date	Budget \$M	Current APB Date	Revised Completion Date	Revised Budget \$M	Completion Date	Budget \$M	
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	<b>Current Estimate vs Current Baseline:</b> 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 delay results in a cascading negative effect on the development, testing and deployment of subsequent TFMS Releases 9, 10 and 11 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 ACAT 1	May-12	May-19	\$741.4	May-12	May-19	\$741.4	May-19	\$741.4	

**FAA Capital Programs  
Current Information for Major Programs**

Programs	Original Baseline			Current Baseline			Current Estimate		Comments
	Original APB Date	Completion Date	Budget \$M	Current APB Date	Revised Completion Date	Revised Budget \$M	Completion Date	Budget \$M	
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	<p><b>Current Baseline vs Original Baseline:</b> 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 (4) uneven stakeholder engagement during development/deployment.</p> <p><b>Current Estimate vs Current Baseline:</b> Cost Variance - \$43.9M of the variance results from OMB direction to transfer O&amp;M funding to the F&amp;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&amp;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.</p>
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	<p><b>NOTE:</b> New Addition to Appendix D. Final Investment Decision (FID) approved by JRC in Sept-13.</p>

**FAA Capital Programs  
Current Information for Major Programs**

Programs	Original Baseline			Current Baseline			Current Estimate		Comments
	Original APB Date	Completion Date	Budget \$M	Current APB Date	Revised Completion Date	Revised Budget \$M	Completion Date	Budget \$M	
Logistics Center Support System (LCSS) ACAT 2	Apr-10	Feb-14	\$67.4	Feb-12	Apr-14	\$67.4	Mar-16	\$79.4	<b>Current Estimate vs Current Baseline:</b> The cost increase of \$12M (-17.8% variance) and schedule delay of 23 months (-47.9% variance) are due to 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.
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	
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			Current Baseline			Current Estimate		Comments
	Original APB Date	Completion Date	Budget \$M	Current APB Date	Revised Completion Date	Revised Budget \$M	Completion Date	Budget \$M	
Runway Status Lights (RWSL) ACAT 1	Jan-10	Oct-15	\$327.4	Jul-13	Sep-17	\$366.7	Sep-17	\$366.7	<b>Current Baseline vs Original Baseline:</b> In Jul-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**

Programs	Original Baseline			Current Baseline			Current Estimate		Comments
	Original APB Date	Completion Date	Budget \$M	Current APB Date	Revised Completion Date	Revised Budget \$M	Completion Date	Budget \$M	
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	<b>Current Baseline vs Original Baseline:</b> 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			Current Baseline			Current Estimate		Comments
	Original APB Date	Completion Date	Budget \$M	Current APB Date	Revised Completion Date	Revised Budget \$M	Completion Date	Budget \$M	
Terminal Automation Modernization and Replacement, Phase 3, Segment 1 (TAMR P3, S1) ACAT 1	Dec-11	Oct-17	\$438.0	Dec-11	Oct-17	\$438.0	Oct-17	\$457.0	<b>Current Estimate vs Current Baseline:</b> The cost increase of \$19M (-4.3% variance) is due to new software enhancements identified by Terminal Requirements as critical for operational suitability; and additional funding for FAA Telecommunications Infrastructure (FTI) costs and Site Spares. The program office is evaluating additional changes as the waterfall deployments progress; currently only the additional \$19 million provided in FY14 is identified as an increase above the approved baseline.
Terminal Automation Modernization and Replacement, Phase 3, Segment 2 (TAMR P3, S2) ACAT 1	Sep-12	Aug-19	\$462.5	Sep-12	Aug-19	\$462.5	Aug-19	\$462.5	
Terminal Automation Modernization and Replacement (TAMR), Phase 1 Technology Refresh and Terminal Enhancements ACAT 1	Sep-12	Feb-20	\$531.5	Sep-12	Feb-20	\$531.5	Feb-20	\$531.5	
Time Based Flow Management (TBFM) ACAT 3	Apr-10	Nov-14	\$115.0	Apr-10	Nov-14	\$115.0	Nov-14	\$114.3	

**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	
Flight Standards Inspector Aircraft Replacement (FSIAR), Segment 2 ACAT 2	Sep-11	Aug-13	\$11.1	Sep-11	Aug-13	\$11.1	Aug-13	\$11.1	The 3rd (9 total) and final aircraft for this segment successfully reached Full Operating Capability (FOC) on August 13, 2013. The deployment of the 3rd aircraft into operations completed the acquisition of three Hawker Beechcraft C-90GTI aircraft.
Next Generation Air-to-Ground Communication System (NEXCOM) - Segment 1A ACAT 2	Sep-98	Sep-08	\$407.6	Dec-05	Sep-13	\$324.7	Sep-13	\$324.3	The program successfully completed cutover of the last En Route site on September 5, 2013. This completed the deployment of VHF Multimode Digital Radios (MDR) to the En Route facilities.
Wide Area Augmentation System (WAAS) ACAT 1	Jan-98	Aug-99	\$1,006.6	May-09	Sep-13	\$3,008.1	Jan-14	\$3,008.1	The WAAS Phase 3 program's final milestone is the Preliminary Design Review (PDR) for the 5th GEO, with a baseline completion date of Sept-13. The contract for the 5th GEO was awarded in September 2012. At that time, it was anticipated that a subcontract with a satellite provider would be in place by December 2012. In November 2012, the prime contractor, Raytheon, notified the FAA that the planned satellite subcontractor was unable to close their business case due to the loss of their anchor tenant. Raytheon secured a satellite with Satellites Mexicanos (SatMex) and the Authorization to Proceed to Phase 1 of implementation for the GEO 5 was awarded on July 11, 2013. The PDR was completed in Jan-14, resulting in a 4 month delay (-6.7% variance) to the segment baseline.

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Appendix E

Fiscal Years 2015 – 2019

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## LIST OF ACRONYMS AND ABBREVIATIONS

<b>--Number--</b>	
4D	four dimensional
<b>--A--</b>	
AAtS	airborne access to SWIM
AAM	office of aerospace medicine
AAR	airport arrival rate
ABAAS	architectural barriers act accessibility standards
ABRR	airborne reroute execution
AC	advisory circular
ACAS-X	redesigned airborne collision avoidance system
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
ACS	aeronautical common services
AEB	acquisition executive board
ADA	American Disabilities Act
ADAS	automated weather observation data acquisition system
ADD	airworthiness directives development
ADS-B	automatic dependent surveillance-broadcast
ADS-C	automatic dependent surveillance-contract
AEB	ASIAS executive board
AEDT	aviation environmental design tool
AES	alternative energy systems
AFIS	automatic flight inspection system
AFS	FAA flight technologies and procedures division
AFSFM	Alaskan flight service facility modernization
AFSS	automated flight service station
A/G	air-to-ground
AGIS	airport geographic information system
AGL	above ground level
AI	aeronautical information
AIM	aeronautical information management
AIO	Office of Chief Information Officer
AIR	FAA aircraft certification service
AirNav	airports and navigations aids
AISR	aeronautical information system replacement
AIXM	aeronautical information exchange model
ALDARS	automated lightning detection and reporting system
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
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 interfacility communications system
ANSP	air navigation service provider
AOC/FOC	airline operation center/flight operation center
AOCC	Atlantic operations control center
APB	acquisition program baseline
APNT	alternate positioning navigation and timing system
APP	automated procurement process
APT	advanced persistent threat
APTS	AVN process tracking system
ARAIM	advanced receiver autonomous integrity monitoring
ARC	aviation rulemaking committee
ARCM	airport and runway configuration management
ARE	aircraft and related equipment
ARMS	airspace resource management system
ARMT	airport resource management tool
ARSR	air route surveillance radar
ARTCC	air route traffic control center
ARTS IE/IIIE/IIIE	automated radar terminal system model IE/ IIIE /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
ASR-7, 8, 9, 11	airport surveillance radar model 7, 8, 9, and 11
ASR/CD	airport surveillance radar/common digitizer
ASSC	airport surface surveillance capability
ASTI	Alaskan satellite telecommunication infrastructure
ASTM	American Society for Testing and Materials
ASWON	automated surface weather observation network
ATAG	aerospace transportation advisory group
ATC	air traffic control
ATCBI-4, 5, and 6	air traffic control beacon interrogator model 4, 5, and 6
ATCRBS	air traffic control radar beacon system
ATCS	air traffic control specialist
ATCSCC	air traffic control system command center
ATCT	air traffic control tower
ATDP	advanced technology development 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	automatic terminal proximity alert
ATSS	airway transportation system specialist
ATS	air traffic services
AVN	Aviation System Standards office

AVS	FAA office of aviation safety
AWOS	automated weather observing system
AWSS	automated weather sensor systems
<b>--B--</b>	
BCAR	business case analysis report
BCD	baseline change decision
BIS	building instrumentation system
BLI	budget line item
BPM	business process management
BUEC	back up emergency communication
BVR	beacon video reconstitutor
BWM	bandwidth manager
<b>--C--</b>	
C3	command and control communications
CAASD	Center for Advanced Aviation System Development
CAC	central air conditioning
CAMI	Civil Aerospace Medical Institute
CANSO	civil air navigation service organization
CARF	central altitude reservation function
CARTS	common-automated radar tracking system
CARSR	common air route surveillance radar
CAS	commercially available software
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 video separation
CBI	computer-based instruction
CCS	conference control switch
CD 2	common digitizer (converts analog radar data to digital format)
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
CEDAR	comprehensive electronic data analysis
CERAP	center radar approach control
CFE	communications facilities enhancement
CFIT	controlled-flight-into-terrain
CFO	Chief Financial Officer
CFR	code of federal regulations
CI/EP	certification of imported/exported products
CIM	collaborative information management
CIO	chief information officer
CIWS	corridor integrated weather system
CIX	collaborative information exchange
CLEEN	continuous low energy, emissions and noise
CMA	configuration management automation

CMC	corrective maintenance contract
CNS	communications, navigation and surveillance
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 document
CRDR	concept requirements development readiness
CREWS	CTAS remote weather system
CSMC	cyber security management center
CSPA	closely spaced parallel approaches
CSPO	closely spaced parallel runway operations
CSPR	closely spaced parallel runways
CSSD	common status and structure data
CST	communication support team
CssWx	common support services weather
CTAS	center TRACON automation system
CTD	common terminal digitizer
CTS	coded time source
CWP	corporate work plan
CY	calendar year
<b>--D--</b>	
DALR	digital audio legal recorder
DA	decision altitude
DARPA	Defense Advanced Research Projects Agency
DASI	digital altimeter setting indicator
DataComm	data communications
DBRITE	digital bright radar indicator tower equipment
DC BUS	direct current electrical distribution system
DCIS	data communications integrated services
DCL	departure clearance
DCNS	data communication air/ground network service
DDR	detailed design review
DELPHI	DOT accounting system
DF	direction finder
DH	decision height
DHS	Department of Homeland Security
DME	distance measuring equipment
DMN	data multiplexing network
DMSMS	diminishing manufacturing sources and material sources
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DOTS+	dynamic ocean tracking system plus
DP	departure procedure
DR	data repository
DR	disaster recovery
DRC	disaster recovery center
DREN	defense research and engineering network

DRSR	digital remote surveillance communication interface processor replacement
D position	data controller position
DSP	departure spacing program
DSR	display system replacement
DST	decision support tool
DT&E	development test and evaluation
DUATS/S	direct user access terminal system
DVOR	doppler VOR
DVRS	digital voice recorder system
<b>--E--</b>	
EA	enterprise architecture
EBUS	enhanced backup surveillance
ECG	en route communication gateway
EDC	enterprise data center
EDDA	environmental due diligence audits
EDMS	electronics drawing management system
EFS	electronic file service
EFSTS	electronic flight strip transfer system
EFVS	enhanced flight vision systems
EISA	Energy Independence and Security Act of 2007
ELITE	enhanced local integrated tower equipment
ELVO	enhanced low visibility operations
EMC	energy management and compliance
EMS	environmental management system
EOF	emergency operating facility
EOL	end of life
EON	emergency operations network
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
E-Scan	electronic scan
ESCR	environmental site cleanup report
ESD	electrostatic discharge
ESSC	enhanced service small communities
ETR	emergency transmitter replacement
ETVS	enhanced terminal voice switch
EUROCONTROL	European ANSP
EVM	earned value management
EWD	weather information network server dissemination
<b>--F--</b>	
F-420	wind sensor
FAALC	FAA logistics center
FACT	future airport capacity task
FAF	final approach fix
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
FDCC	federal desktop core configuration
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
FICAM	federal identify credential and access management
FIAPA	flight inspection airborne processor application
FID	final investment decision
FIM-S	flight deck based interval management - spacing
FIR	flight information region
FIS-B	flight information service – broadcast
FISMA	federal information security management act
FIXM	flight information exchange model
FMC	flight management computer
FMS	flight management system
FNS	federal NOTAM system
FOC	final operating 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
FPPS	facility power panel schedule
FPS	fixed position surveillance
FSEP	facility service and equipment profile
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
<b>--G--</b>	
G-III	third generation reference receiver
GA	general aviation
GAO	Government Accountability Office
GAST-C	GBAS approach service type C
GBAS	ground-based augmentation system
GEO	geosynchronous communication satellite
G/G	ground to ground
GIM-S	ground based interval management - spacing

GIS	geographic information system
GLS	GPS landing system
GNAS	general NAS maintenance area
GNSS	global navigation satellite system
GOMEX	Gulf of Mexico
GPS	global positioning system
GSA	General Services Administration
GUI	graphical user interface
<b>--H--</b>	
HADDS	HOST ATM data distribution system
HAZMAT	hazardous materials
HCS	HOST computer system
HCP	hearing conservation program
HF	human factors
HGOPA	high gain open planar array
HIE	health information exchange
HITL	human-in-the-loop
HOST	en route computer system
HP DME	high power distance measuring equipment
HPSB	high performance sustainable building
HRJ	hydro-treated renewable jet (fuel)
HSI	human system integration
HSPD	Homeland Security Presidential Directive
HUD	heads-up-display
HUR	high update radar
HVAC	heating, ventilating and air conditioning
<b>--I--</b>	
IAP	initial investment analysis plan
IAPA	instrument approach procedures automation
IARD	investment analysis readiness decision
IATA	International Air Transport Association
IATI	international air traffic interoperability
ICAO	International Civil Aviation Organization
ICF	integrated control facility
IGCE	independent government cost estimate
ICMS	integrated control and management system
ICSS	integrated communications switching system
IDAC	integrated departure arrival capability
IDLM	interference detection, location and mitigation
IDS	information display system
IDS	integrated display system
IFIS	integrated flight information system
IFP	instrument flight procedures
IFPA	instrument flight procedures automation
IFR	instrument flight rule
IG	Inspector General
IGCE	independent government cost estimate
IID	initial investment decision
ILS	instrument landing system

IM	interval management
IMC	instrument meteorological conditions
IMS	interval management spacing
IOA	independent operational assessment
IOC	initial operating capability
IP	internet protocol
IPDS	instrument procedure development system
IRD	interface requirement document
IRU	inertial reference unit
ISAM	integrated safety assessment model
ISD	in service decision
ISO	International Standards Organization
ISPD	implementation strategy and planning document
ISS	information systems security
IT	information technology
IT	integration testing
ITP	in-trail procedures
ITWS	integrated terminal weather system
ITWS NFU	ITWS national weather service filter unit
IVSR	interim voice switch replacement
<b>--J--</b>	
JAWS	Juneau airport wind system
JPALS	joint precision approach and landing system
JPDO	Joint Planning and Development Office
JRC	joint resources council
<b>--K--</b>	
KVM	keyboard video mouse
KW	kilowatts
<b>--L--</b>	
L5	second civil frequency
LAAS	local area augmentation system
LAHSO	land and hold short operations
LAN	local area network
L-Band	radar frequency band 1-2 giga-hertz
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
LOA	letters of agreement
LOB	line of business
LOC	localizer
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 units
LSS	logistics support services
LSSF	logistics support system and facilities
LVO	low visibility operations
<b>--M--</b>	
MALSR	medium-intensity approach light system with runway alignment indicator lights
MAMP	mobile asset management program
MASPS	minimum aviation performance standards
MASR	mobile/transportable airport surveillance radar
MATCT	mobile air traffic control tower
MB	marker beacon
MDR	multimode digital radio
MDS	meteorological data server
MEARTS	microprocessor en route automated radar tracking system
MIT/LL	Massachusetts Institute of Technology Lincoln Laboratory
MITRE	MITRE Corporation
MLAT	multilateration
MMAC	Mike Monroney Aeronautical Center
MOA	memorandum of agreement
MOB	contract award mobility
MOCC	midstates operations control center
Mode S	mode select
MOIE	mission oriented investigation and experimentation
MON	minimum operational network
MOPS	minimum operational performance standards
MPAR	multi-function phased array radar
MTR	military training route
MTSR	maintenance test system replacements
MX	mobile engine generator
<b>--N--</b>	
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
NASPAC	national airspace system performance analysis capability
NASR	national airspace system resources
NAVAIDS	navigation aids
NAV Lean	navigation procedures implementation plan
NBSC	NextGen backup surveillance capability
NCAR	National Center for Atmospheric Research

NCP	NAS change proposal
NCR	NAS common reference
NDB	non-directional beacon
NEMC	NAS enterprise management centers
NEMS	NAS enterprise messaging service
NEPA	National Environmental Policy Act
NEXCOM	next generation air/ground communications
NEXRAD	next generation weather radar
NextGen	next generation air transportation system
NIDS	NAS information display system
NG-VRRP	next generation voice recorder replacement program
NGIP	NextGen implementation plan
NHIN	national health information network
NIEC	NextGen integration and evaluation capability
NISC	national airspace system implementation support contract
NLN	national logging network
NMCS	network management control system
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
NSIP	NAS segment implementation plan
NSOC	NextGen surface observation capability
NSOS	national security officer service
NSPD	National Security Presidential Directives
NSWRC	next generation surveillance and weather radar capability
NTML	national traffic management log
NTSB	National Transportation Safety Board
NVRP	NAS voice recorder program
NVS	national airspace system voice system
NWP	NextGen weather processor
NWS	National Weather Service
<b>--O--</b>	
OA	operational analysis
OAPM	optimization of airspace and procedures in the metroplex
OARS	operational analysis and reporting system
OASIS	operational and supportability implementation system
OCS	operational control segment
OCS(X)	modernized operational control segment
ODALS	omni-directional airport lighting system
OE	operational error
OEAAA	obstruction evaluation/airport airspace analysis
OEP	operational evolution partnership
OFDPS	offshore flight data processing system
OI	operational improvement
O&M	operation and maintenance

OMB	Office of Management and Budget
OMT	operator maintenance terminal
OPS	operations
OPSNET	operations network
ORD	operational readiness demonstration
OSD	operational suitability demonstration
OSHA	Occupational Safety and Health Administration
OT	operational testing
OT&E	operation test and evaluation
OTM	oceanic trajectory management
OTM 4D	four dimensional-oceanic trajectory management
OTTM	oceanic tactical trajectory management
<b>--P--</b>	
PA	paired approach
PAF	primary alternate facility
PAPI	precision approach path indicator
PBN	performance based navigation
PBWP	product based work plan
PCB	polychlorinated biphenyl
PCPS	purchase card purchasing system
PCS	power conditioning system
PDARS	performance data analysis and reporting system
PDMP	predefined metering points
PDR	preliminary design review
PPE	personal protective equipment
PGW	protocol gateway
PIREPS	pilot reports
PIV	personal identification verification
PLM	programming language for microcomputers
PNT	position, navigation and timing
POCC	pacific operations control center
PPR	preliminary program requirements
PPS	precise positioning service
PR	procurement request
PRISM	FAA purchasing management system
PRM-A	precision runway monitor – alternate
PRM-E	precision runway monitor – electronic scan radar
PRMR	precision runway monitor - replacement
PS3	power systems sustain support
<b>--Q--</b>	
QA	quality assurance
QMS	quality management system
<b>--R--</b>	
RA	resolution advisory
RAPCON	radar approach control
RAPPI	random access planned position indicator
RASP	regional ADAS service processor
RCAG	remote communication air to ground

RCE	radio control equipment
RCF	radio communication facilities
RCISS	regulation and certification infrastructure system safety
RCL	radio communication link
RCLR	radio communications link repeater
RCLT	radio communications link terminal
RCM	reliability centered maintenance
RCO	remote communications outlet
RCOM	recovery communications
R&D	research and development
RDA	radar data acquisition
RDVS	rapid deployment voice switch
RE&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
RFI ELIM	radio frequency interference elimination
RFP	request for proposal
RI	runway incursion
RID	runway incursion device
RIRP	runway incursion reduction program
RMA	reliability maintainability availability
RMLS	remote monitoring and logging system
RLMS	runway replacement lamp monitoring system
RMM	remote maintenance monitoring
RMP	resource and management plan
RNAV	area navigation
RNP-4	required navigation performance-4 nm
ROC	radar operations center
ROC	regional 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
RVP	radar video processors
RVR	runway visual range
RVSM	reduced vertical separation minimum
RWSL	runway status lights
RX	receiver
<b>--S--</b>	
S1P1	segment 1 phase 1
S1P2	segment 1 phase 2
SA	special authorization
SAA	special activities airspaces
SAAR	special aircraft and aircrew authorization required
SAIDS	system Atlanta information display system

SAMS	special use airspace management system
SAPA	simplified aircraft-based paired approach
SAR	search and rescue
SARA	Superfund Amendment and Reauthorization Act
SARPS	standards and recommended practices
SAS	safety assurance system
SAS	single authoritative source
SASS	small airport surveillance sensor
SASO	system approach for safety oversight
SATNAV	satellite navigation
SAWS	standalone weather sensors
SBAS	satellite based augmentation system
SBS	surveillance and broadcast services
SCDI	site control data interface
SCM	surface conformance monitoring
SCS	secure conference system
SDA	system design approval
SDAT	sector design and analysis tool
SDD	software design document
SE2020	system engineering 2020 contract
SESAR	Single European Sky ATM Research
SFA	special flight authorizations
SFMA	strategic flow management application
SGS-T	signal generator subsystem – type
SID	standard instrument departure
SIIA	simultaneous independent instrument approach
SIM	surveillance interface modernization
SIR	screening information request
SLEP	service life extension program
SMA	surface movement advisor
SMGCS	surface movement guidance control system
SMS	safety management system or surface management system
SOA	service oriented architecture
SOW	scope of work
SpclAC	special airworthiness certifications
SPO	safety policy
SPR	safety promotion
SPS	standard positioning service
SRM	safety risk management
SRMTS	safety risk management tracking system
SRS	software requirements specification
SSC	systems support center
SSD	significant standards difference
SSDI	system security design and integration
SSPP	strategic sustainability performance plan
SSRM	seismic safety risk mitigation
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
STARS ELITE	STARS enhanced local integrated tower equipment
STARS LITE	STARS local integrated tower equipment

STBO	surface trajectory based operation
STDDS	SWIM terminal data distribution system
StdAC	standard airworthiness certifications
STEM	science technology engineering math initiation
STEN	satellite telephone emergency network
STEP	sustainment and technology evolution plan
STF	surface tactical flow
STM	surveillance and tracking module
STM	surface traffic management
STVS	small tower voice switch
SUA	special use airspace
SW	software
SWAC	system-wide analysis capability
SWIM	system-wide information management
<b>--T--</b>	
TACAN	tactical air navigation antenna
TAMR	terminal automation modernization replacement
TARP	traffic analysis and review program
TBD	to be determined
TBFM	time-based flow management
TBM	time based metering
TBO	trajectory based operations
TCAS	traffic alert and collision avoidance system
TCS	terrestrial communication subsystem
TDLS	tower data link service
TDWR	terminal Doppler weather radar
TE	test equipment
TechNET	technicians network
TFDM	tower 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
TMA	traffic management advisor
TMC	traffic management coordinator
TMI	traffic management initiative
TMU	traffic management unit
TPC	TFM processing center
TR	technology refresh
TRACON	terminal radar approach control
TRS-R	TFM remote site – reengineering
TSO	technical standard order
TSS	tower simulation system
TSSC	technical support services contract
TVSR	terminal voice switch replacement
<b>--U--</b>	
UAS	unmanned aircraft system
UATR	universal access transceiver receiver

UAV	unmanned aerial vehicles
UCS	unified contracting system
UFPF	unified flight planning and filing
UHF	ultra high frequency
UIS	unstaffed infrastructure sustainment
UPS	uninterruptible power source
URET	user request evaluation tool
USGCB	U.S. government configuration baseline
USNS	U.S. Notices to Airmen system
<b>--V--</b>	
V	version
VASI	visual approach slope indicator
VDL	VHF data link
VDMR	VSCS display module replacement
VFR	visual flight rules
VHF	very high frequency
VITS	VSCS integrated test suite
VMC	visual meteorological conditions
VOIP	voice over internet protocol
VOR	very high frequency omni-directional range
VORTAC	very high frequency omni-directional 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
VTCR	VTABS test controller replacement
<b>--W--</b>	
WAAS	wide-area augmentation system
WAFS	world area forecast system
WAM	wide area multilateration
WARP	weather and radar processor
WARP RAMP	WARP radar and mosaic processor
WCS	web coverage services
WDS	windshear detection service
WebCM	web configuration management
WIFS	weather internet file service
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
WOCC	Washington operations center complex
WP	work package
WSDD	web service description documents

WSDS	wind shear detection services
WSP	weather systems processor
WTMA-P	wake turbulence mitigation for arrivals - procedures
WTMD	wake turbulence mitigation for departures
WTS-BMgmt	work tracking software - budget management
Wx	weather
Wx SAS 4D	weather single authoritative source 4 dimensional
WXXM	weather information exchange model