U.S. Department of Transportation

BUDGET ESTIMATES

FISCAL YEAR 2017

FEDERAL AVIATION ADMINISTRATION

SUBMITTED FOR USE OF THE COMMITTEE ON APPROPRIATIONS

INSERT TAB HERE:

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

INSERT TAB HERE:

SECTION 1: OVERVIEW

OVERVIEW

Introduction

The Federal Aviation Administration (FAA) operates the safest and most efficient aerospace system in the world. We have proudly delivered on this promise since 1958, providing the world's leading aviation system and setting an unparalleled standard for safety and efficiency that is emulated globally. Today, our mission is framed by four strategic initiatives: making aviation safer and smarter; delivering benefits through technology and infrastructure; enhancing global leadership; and empowering and innovating with FAA's people.

To this end, we are using these strategic initiatives as the framework for transforming FAA and the aerospace system. By focusing on risk-based decision making, we will build on safety management principles to proactively address emerging safety risks at a system level. We will lay the foundation for the National Airspace System (NAS) of the future by achieving prioritized Next Generation Air Transportation System (NextGen) benefits, integrating new user entrants, and delivering more efficient, streamlined services. We will improve safety, efficiency, and environment sustainability across the globe through an approach that shapes global standards, enhances collaboration and better targets FAA resources. And lastly, we are preparing for the future by identifying, recruiting and training a workforce with the leadership, technical and functional skills to ensure the United States has the safest and most productive aviation sector.

Ten years ago we embarked on our ambitious transformation program while supporting an already aging legacy infrastructure. The FAA began the process of reinventing the NAS, replacing legacy tools, procedures, capabilities and technologies to more efficiently and safely move air traffic using modern systems and methods. The FAA's implementation of NextGen was predicated on a stable and sufficient level of funding over multiple years to efficiently complete this transformation. When FAA's NextGen plans were developed in 2009, the Facilities & Equipment (F&E) funding profile rose rapidly, and the outyear funding target was approximately $1 billion higher than it is today.

F&E funding was reduced from $2.9 billion per year in FY 2009-2010 to just $2.6 billion per year in FY 2013-2015. The FAA addressed these funding challenges by re-focusing our efforts on achieving some near-term NextGen benefits while delaying others, and making targeted investments to extend the lifecycle of certain systems and equipment. We deferred maintenance on other existing infrastructure, causing the maintenance backlog to grow.

In the face of these challenges, the FAA has made solid progress implementing the NextGen foundation and delivering near-term NextGen benefits to our users. We will continue collaborating with industry to deliver the next wave of benefits from the systems, technologies and procedures that will provide enhanced levels of safety and tangible efficiencies for the traveling public.

The increased F&E funding provided in FY 2016 is having a meaningful impact on our ability to deliver these benefits and restore our infrastructure. We are funding restoration of support space for air traffic operations that has not been renovated in 50 years, replacing obsolete plant equipment that provides environmental controls for employees and NAS equipment, replacing and upgrading power systems and the fuel sources that supply them, and remediating asbestos, mold, and fire risks to employees. This budget request will continue the funding levels necessary to make broad investments in our infrastructure while realizing benefits of NextGen. The NextGen investments will reduce delays, expand air traffic system capacity, and mitigate aviation's impact on the environment, while ensuring the highest levels of safety.

The needs of the NAS and the aviation community it serves continue to evolve. New users such as Unmanned Aircraft Systems (UAS) and commercial space vehicles are entering our nation's airspace with increasing frequency. Building the NAS of the future to accommodate these new entrants is requiring a fresh approach to our vision of how the airspace will be managed. This is also causing us to think critically about what parts of our existing infrastructure need to be sustained. With the introduction of satellite-based surveillance and other technologies, continued remediation of some existing NAS infrastructure will be unnecessary beyond the mid-2020s. Sustained higher funding levels now will allow us to introduce the new capabilities that enable a wide-scale divestiture of this infrastructure by that timeframe.

Our budget proposal provides funding to effectively operate our air traffic control system, build on our investments in NextGen, and efficiently recapitalize our aging facilities while simultaneously ensuring that our nation continues to maintain the safest and most efficient aerospace system today and in the future. Our total FY 2017 budget request of $15.9 billion represents a responsible approach to funding FAA while honoring the spending limits enacted in the Bipartisan Budget Act of 2015. The requested funding levels are commensurate with those enacted for FY 2016, which allow FAA to cover the cost of its operations and increase investment in its facilities and equipment. Maintaining these funding levels for FY 2017 will allow FAA to continue making critical investments in its infrastructure needs while deploying key NextGen benefits to our stakeholders and upholding vital safety programs. This request is an investment in the future of aviation, an industry which accounts for more than five percent of our nation's gross domestic product.

The FAA's current authorization expires in March 2016. The following core principles provide a framework for deliberations about the FAA's next authorization:

- Maintain the safest aviation system in the world;
- Modernize the FAA's air traffic control system;
- Secure appropriate funding for the nation's airports;
- Enable the integration of new users into the NAS;
- Foster an FAA culture of innovation and efficiency;
- Allow the better alignment of resources with the needs of the NAS;
- Strengthen the DOT's global leadership in aviation;
- Ensure a strong consumer protection regime for the flying public; and
- Foster competition, new entry, and connectivity to the National Air Transportation System.

These principles are intended to guide reauthorization to improve safety, make the national airspace system more efficient, and improve service for air travelers and other stakeholders. The FAA is still recovering from the budget cuts imposed by sequestration in FY 2013 and the resulting impact to controller staffing, and these principles are a critical part of avoiding such disruptions in the future. To augment stability, the budget also again requests added flexibility by proposing the authority to transfer up to ten percent across FAA budget accounts, subject to approval by both Congressional Committees on Appropriations. We look forward to working with all of our stakeholders to bring to fruition an FAA authorization that is reflective of these core principles and continues to improve the safest and most efficient aviation system in the world.

Overview by Appropriation Account

Operations

The FY 2017 request of $10.0 billion for Operations represents a 1 percent increase above the FY 2016 enacted level. This request provides a total of $116.2 million for unavoidable adjustments, $15.3 million in program increases, and -$46.9 million in cost saving initiatives.

Unavoidable adjustments include pay increases consistent with government-wide inflationary factors ($106.4 million), two less compensable days (-$54.0 million), annualization of Full Time Equivalents (FTEs) ($15.3 million), GSA rent increases ($7.9 million), and $3.3 million for the Department of Transportation's projected Working Capital Fund obligation. The unavoidable adjustments to the Operations budget also include $37.3 million in costs that are transitioning from the Facilities and Equipment (F&E) account. The FAA spends over $2 billion a year on new air traffic control and safety related systems in the F&E account. This total includes major expenditures on infrastructure sustainment as well as the acquisition and installation of new assets and systems, including NextGen capabilities. After new systems are installed in the NAS, their costs for operation and maintenance (O&M) transfers to the Operations account. Systems transitioning from F&E to Operations in FY 2017 include System-Wide Information Management (SWIM) Segment 2A at $10.9 million, System Approach for Safety Oversight (SASO) at $7.6 million, Integrated Display System Replacement (IDSR) at $4.2 million, Runway Status Lights (RWSL) at $1.4 million and other various programs totaling $13 million. This funding is necessary for the continued operations and maintenance at sites at which these systems have been deployed.

In addition to these unavoidable adjustments, the Operations request includes programmatic increases of $15.3 million and 147 FTE. This includes $2.9 million for increases in Aviation Safety (AVS) staffing for safety inspectors, engineers and other safety critical staff for integration of Unmanned Aircraft Systems (UAS), as well as $250 thousand for Policy, International Affairs, and Environment (APL) to develop in-house capability to generate a forecast of future UAS activity. In Commercial Space Transportation (AST), $723 thousand is requested for mission critical operational staffing to support launch and reentry integration, as well as staffing to support an increased demand in license and permit determinations, certifications, and other authorizations required by this growing industry. In Security and Hazardous Materials Safety (ASH), $0.6 million is requested for additional staff to address safety assurance and risk management issues related to the Hazardous Materials Safety Program (HMSP). In addition, $0.5 million is requested in AVS for increasing data capabilities within the Hazard Tracking System.

In the area of security, the FAA is requesting increases of $7.5 million and 14 FTEs. Of this total $1.7 million is to implement recommendations from the Chicago Air Route Traffic Control Center (ZAU) Security Review and NAS Tier 1 Facility Resiliency Review, which reevaluated the security levels and associated protective measures needed at critical NAS operations facilities. The request also includes $1.8 million for the FAA's Insider Threat Detection and Mitigation Program (ITDMP) to deter, detect and mitigate potential employee threats to national security and/or aviation safety and provide a solution to integrate network monitoring capability. Lastly, the Information System Security (ISS) request provides $4.0 million to improve FAA's cybersecurity detection, response, and recovery capabilities.

Initiatives that are designed to achieve cost savings reduce the Operations budget request for FY 2017 by a total of $46.9 million. The request includes $2.8 million to support the Lean Maintenance and Revalidation Program (LMRP). LMRP analyzes cost and performance data, maintenance activities, and sustainment and support requirements, and from this, identifies cost savings/avoidance opportunities. The FAA anticipates this activity could yield $6.5 million in cost savings. In addition, the FAA will achieve administrative efficiencies of $40 million through cost reductions and avoidance in various areas such as contractual services and supplies.

Facilities & Equipment (F&E)

The FY 2017 budget request includes $2.8 billion for Facilities and Equipment. This request includes funding for critical system and facility infrastructure, and it takes into account the near-term priorities identified by the NextGen Advisory Committee. In recent years, sequestration, government shutdowns, short-term reauthorization extensions, and declining budget levels forced FAA to reduce or defer capital investment. The agency had to choose between sustaining current infrastructure and keeping NextGen progress on track. As we work with our industry partners to take aviation into the future, it is critical that we inspire confidence in FAA's ability to deliver on investments. In developing the FY 2017 budget, we have focused on those items which will inspire industry confidence, garner the associated industry investments that make NextGen viable, and provide benefits to users.

<u>Sustainment of Infrastructure</u>
Of the total request for F&E, approximately $1.9 billion keeps the current NAS maintained and operational, including $464 million -- a $4 million increase over the FY 2016 enacted level -- to help bring FAA facilities into a state of good repair. After years of underinvestment in sustainment, this increase will reduce the maintenance backlog, helping ensure that the systems remain operational and the staff are safe. Continued progress to further reduce the backlog will require ongoing support over several years.

Investments in sustainment must be accompanied by divestiture and decommissioning of infrastructure to reduce the ground-based footprint of the NAS wherever feasible. The FY 2017 request proposes $7.0 million for funding of the Very High Frequency Omni-Directional Range (VOR) Minimum Operating Network (MON) to begin the realization of that goal by cutting the number of those facilities while continuing to support the transition to a Performance Based Navigation (PBN) route structure.

In addition, the FY 2017 request proposes initial funding for Next Generation Surveillance and Weather Radar Capability and Back-up Surveillance Capability. This program will replace NAS radars that are twenty to forty years of age. New systems are necessary to both reduce operations and maintenance costs and to incorporate new technology that detects and tracks UAS and other non-cooperative aircraft. The request also supports the ongoing sustainment of systems, ranging from radars to weather sensors/systems to navigation aids and satellite leases, all of which will continue to be needed to support NAS services in the FY 2017 timeframe and beyond.

<u>NextGen</u>
The total request for F&E also includes $877.4 million for the NextGen portfolio, a 3 percent increase above the FY 2016 enacted level. This funding fully supports program segments such as the core ADS-B (Automatic Dependent Surveillance – Broadcast) program at $31.1 million, En Route Automation Modernization Technology Refresh at $78 million, Data Communications terminal and En Route services at $232 million, the second segment of System Wide Information Management (SWIM) at $28.8 million, and the NAS Voice System, which will replace legacy voice switches by 2025, at $48.4 million. Finally, the budget request includes $50.6 million for Time Based flow Management, which enables the performance based navigation program to maximize traffic flow into and out of the busy metropolitan airspaces and corresponding airports.

Also included in the request is $41.8 million for two programs that work together to harden the NAS against domestic and foreign threats. Flight and Inter-facility Data Interface (FIDI) Modernization and Surveillance Interface Modernization (SIM), will work together to decommission legacy En Route Communication Gateway (ECG) equipment at all Air Route Traffic Control Centers and replace that means of data exchange with modern interfaces that only require standard FAA telecommunications infrastructure (FTI). These programs will ensure a robust and resilient NAS that will prevent and mitigate impacts to public safety and the U.S. economy.

The integration of both UAS and commercial space into the NAS are represented in the F&E budget request. $9 million is requested for UAS under the Separation Management Portfolio to ensure the unique operational implications are well understood and necessary infrastructure changes are implemented to allow UAS integration into the NAS. $2 million is included under the Air Traffic Management budget line item for commercial space integration into the NAS and that will allow commercial space launches and reentries to occur without significant disruptions to both space and air operators. The FAA feels strongly that additional budgetary resources are required to address emerging and expanding responsibilities in these areas and develop policies and procedures that support their integration into the NAS.

Research, Engineering & Development (RE&D)

The FY 2017 budget request of $167.5 million is a $1.5 million (1 percent) increase over the FY 2016 enacted level. This allows us to increase funding for Continuous Low Energy, Emission and Noise (CLEEN) above the FY 2016 Enacted level to support the President's Climate Change Action Plan. It also increases commercial space transportation research by almost $1.0 million and provides $1.0 million for NextGen information security research. NextGen Information Security is a new budget item for FY 2017 that supports research to help prevent disruptive cyber incidents that may affect the Air Traffic Control mission. This research will be performed in coordination with the FAA Cyber Security Steering Committee.

The request includes $83.7 million to support continued research in key safety areas such as fire safety, propulsion systems, advanced materials, aircraft icing, and continued airworthiness. For the Environment & Energy program, $15 million is requested to advance our understanding of the impacts of aviation on the environment and support the development of solutions to mitigate those impacts. A mission support requirement of $6.2 million supports the William J. Hughes Technical Center and System Planning and Resource Management.

The RE&D NextGen portfolio is $62.6 million. This supports NextGen-specific research in wake turbulence, human factors, clean aircraft technologies, unmanned aircraft systems and information security. The NextGen Alternative Fuels for General Aviation program is funded at $5.8 million to support the transition from the current aviation 100 low lead fuel to an unleaded replacement fuel that will have the least impact on the general aviation fleet. The NextGen Environmental Research request of $26.2 million supports a range of activities, including research to mature certifiable clean and quiet aircraft technologies the development of sustainable fuels, and the CLEEN program. Our RE&D request continues to support the safe integration of UAS technologies into the NAS, providing $8.4 million to conduct research on UAS technologies. The program is focused on sense and avoid and command and control requirements that will support the safe integration of UAS in the NAS within the 14 Code of Federal Regulations regulatory framework.

Grants-in-Aid for Airports

Airports remain a critical part of the aviation system infrastructure. The FAA's FY 2017 request provides the funding needed to ensure safety, capacity, and efficiency at our nation's airports through a combination of grant funding and revenue generated through Passenger Facility Charges (PFCs). Our $2.9 billion request supports our continued focus on safety-related development projects, including runway safety area improvements, runway incursion reduction, aviation safety management, and improving infrastructure conditions.

The FY 2017 budget continues to propose to eliminate passenger and cargo entitlement funding for large hub airports, and allows all commercial service airports to increase revenue through an increased PFC that provides them greater flexibility to generate their own revenue. This provides sufficient AIP resources to focus federal grants to support projects of high priority and aviation benefits in smaller commercial and general aviation airports that do not have access to additional revenue or other outside sources of capital.

The FAA requests $107.7 million for Personnel & Related Expenses, an increase of $0.6 million from the FY 2016 enacted level. The request also provides $31.3 million for Airport Technology Research, an increase of 1.2 percent from FY 2016. The additional funding will continue to support enhanced safety and pavement research efforts as well as increased studies for noise abatement and environment impacts. The budget continues to provide $15 million for the Airport Cooperative Research program.

NextGen

The FAA cannot realize the NextGen vision alone. Collaboration with all stakeholders, including the aviation industry, our union members, and Congress, is key to its success. We have worked with industry to determine what high-benefit, high-readiness NextGen capabilities the FAA will accomplish in the next one to three years, and what industry commitments are necessary for those activities to be successful. The FAA and the NextGen Advisory Committee (NAC) reached agreement on a joint implementation plan consisting of capabilities within four focus areas. This plan will advance our navigation capabilities through Performance-Based Navigation (PBN), increase capacity on parallel runways through Multiple Runway Operations, enhance airport surface operations through data sharing, and introduce Data Communications between cockpit and air traffic control. The plan identifies timelines, specific locations, and costs for each NAC priority. These priorities leverage equipment that operators have already invested in for other capabilities.

By supporting the NAC implementation plan, our FY 2017 budget request supports continued progress on our NextGen efforts and allows the FAA to focus funding on achieving near term capabilities that will inspire industry confidence, garner industry investments that will make NextGen viable, and deliver more immediate benefits to users while we consider longer term investments based on needs of the community and anticipated benefits.

The entire FY 2017 NextGen effort totals $1.0 billion distributed among F&E programs ($877.4 million), RE&D programs ($62.6 million) and Operations activities ($60.1 million). This investment profile reflects a 2 percent increase over the FY 2016 enacted level. The majority of this increase is in the F&E account, with enhanced investments in the Activity 2 implementation activities that will deliver capacity-enhancing NextGen solutions to the airspace system.

Now that the En Route Automation Modernization (ERAM) system is fully operational at the 20 FAA en-route centers across the continental United States, it serves as the backbone of the nation's airspace system. ERAM's flexible and expandable system design will accommodate en-route processing necessary for NextGen technologies such as Automatic Dependent Surveillance Broadcast (ADS-B) services, System Wide Information Management (SWIM), and Data Communications.

With the foundational ERAM system in place, we are now able to develop and deploy new tools and technologies that will improve the overall efficiency of the system. Our FY 2017 request therefore boosts funding to advance the Terminal Flight Data Manager (TFDM), Time Based Flow Management Program, Data Communications, and NextGen Weather Processor (NWP). TFDM will improve airport surface sequencing and scheduling, and also automate manual flight processes to enable enhanced data sharing. Time Based Flow Management will maximize the use of airports by getting the right aircraft to the right runway, in the right order and time. Data Communications will promote safety by reducing the frequency of talkovers and readback errors that can occur during analog voice communications with pilots. And NWP will functionally replace existing FAA weather processor systems and host new capabilities that better meet real time needs. Together, these new tools will enable our air traffic controllers to ensure that planes are routed more safely and efficiently through congested airways and around dangerous weather. This also means that our airlines will reduce fuel burn and that everyone enjoys the benefit of more reliable, predictable airline schedules.

In addition, the FY 2017 budget provides increased funding for the integration of UAS into the NAS, as those operations are expected to rise dramatically in both the public and private sectors. This will reduce risk to the safety of operations that result from the increased UAS operations. The NAS Infrastructure Portfolio is also increased to include new air traffic management requirements that will improve communication standards, UAS collision avoidance systems, and the integration of weather data into automated trajectory systems.

Support for NextGen is essential and we are all pioneers in the next generation of flight as we strive to maintain aviation as a vital player in the 21st century economy.

Conclusion

The overall health of the U.S economy is highly dependent on the aviation industry. Civil aviation contributes roughly $1.5 trillion annually to the national economy and constitutes 5.4 percent of the gross domestic product. Aviation generates more than 11.8 million jobs, with earnings of $459 billion. The aerospace sector is a vital element in the country's balance of trade.

Aviation enables the economic benefits of tourism, shipping and travel for business or pleasure. Through our airports, aviation delivers economic impact to large and small communities across our Nation. The ongoing implementation of NextGen technologies, policies and procedures, will support the continued economic growth in the aviation industry and our country. The FAA's FY 2017 budget request will enable us to continue to protect and expand this vital economic engine, while moving forward with our transformation and fulfilling our mission of providing the safest and most efficient aerospace system in the world.

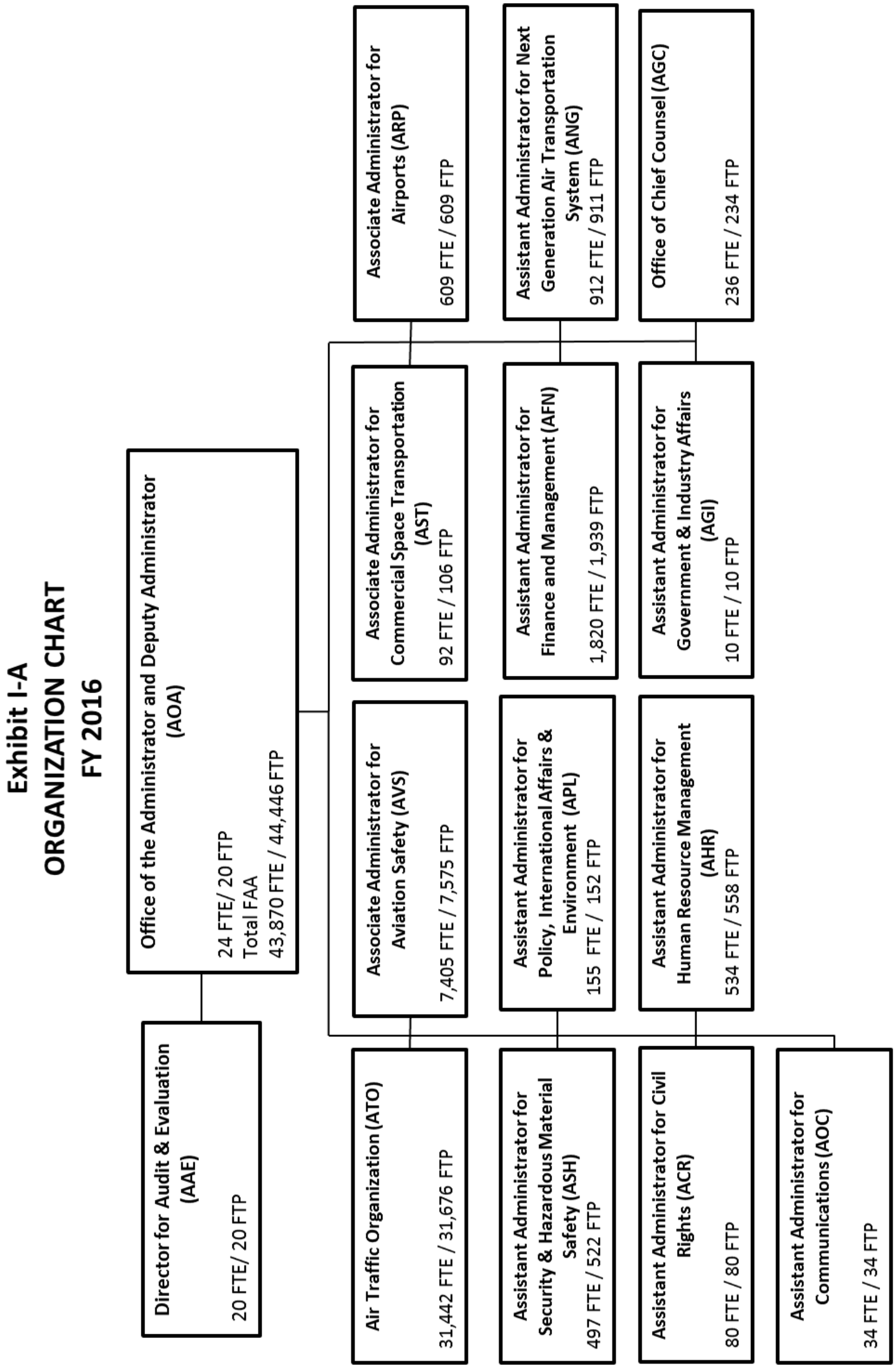
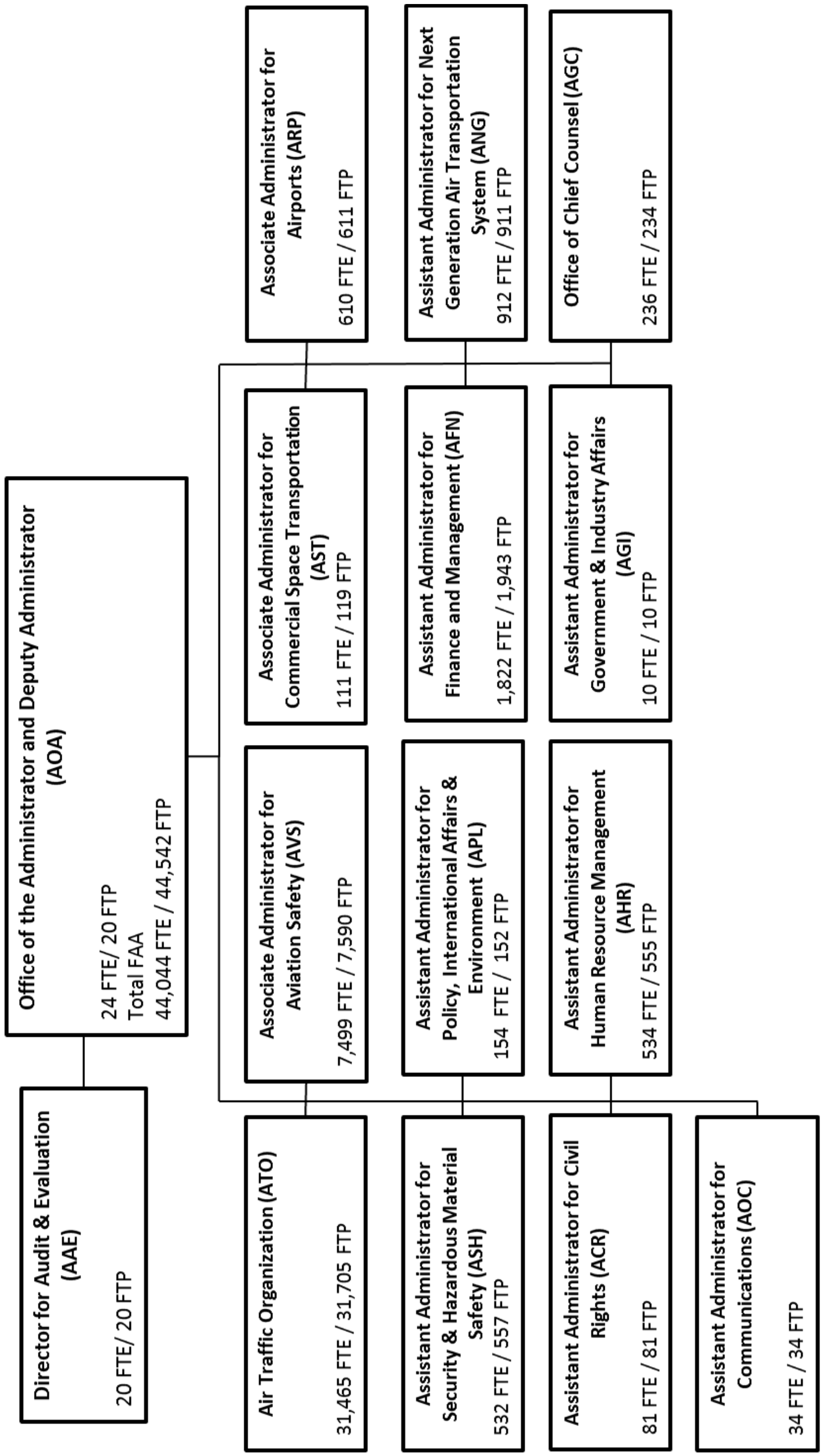


Exhibit I-A
ORGANIZATION CHART
FY 2016
Office of the Administrator and Deputy Administrator (AOA)
24 FTE/ 20 FTP
Total FAA
43,870 FTE / 44,446 FTP
Director for Audit & Evaluation (AAE)
20 FTE/ 20 FTP
Associate Administrator for Airports (ARP)
609 FTE / 609 FTP
Assistant Administrator for Next Generation Air Transportation System (ANG)
912 FTE / 911 FTP
Office of Chief Counsel (AGC)
236 FTE / 234 FTP
Associate Administrator for Commercial Space Transportation (AST)
92 FTE / 106 FTP
Assistant Administrator for Finance and Management (AFN)
1,820 FTE / 1,939 FTP
Assistant Administrator for Government & Industry Affairs (AGI)
10 FTE / 10 FTP
Associate Administrator for Aviation Safety (AVS)
7,405 FTE / 7,575 FTP
Assistant Administrator for Policy, International Affairs & Environment (APL)
155 FTE / 152 FTP
Assistant Administrator for Human Resource Management (AHR)
534 FTE / 558 FTP
Air Traffic Organization (ATO)
31,442 FTE / 31,676 FTP
Assistant Administrator for Security & Hazardous Material Safety (ASH)
497 FTE / 522 FTP
Assistant Administrator for Civil Rights (ACR)
80 FTE / 80 FTP
Assistant Administrator for Communications (AOC)
34 FTE / 34 FTP

Exhibit I-B
ORGANIZATION CHART
FY 2017



INSERT TAB HERE:

SECTION 2: BUDGET SUMMARY TABLES

EXHIBIT II-1

FY 2017 COMPARATIVE STATEMENT OF NEW BUDGET AUTHORITY
FEDERAL AVIATION ADMINISTRATION
($000)

ACCOUNT NAME	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST
Operations	$9,740,700	$9,909,724	$9,994,352
Rescission			
Subtotal	**$9,740,700**	**$9,909,724**	**$9,994,352**
Facilities and Equipment	$2,600,000	$2,855,000	$2,838,000
Rescission			
Subtotal	**$2,600,000**	**$2,855,000**	**$2,838,000**
Research, Engineering and Development	$156,750	$166,000	$167,500
Rescission			
Subtotal	**$156,750**	**$166,000**	**$167,500**
Grants-in-Aid for Airports			
Contract Authority (AATF)	$3,350,000	$3,350,000	$2,900,000
Pop Up Contract Authority (49 USC 48112)	$130,000		
Rescission	($260,000)		
Cancellation			
Subtotal	**$3,220,000**	**$3,350,000**	**$2,900,000**
Obligation Limitation [Non-Add]	[$3,350,000]	[3,350,000]	[2,900,000]
Overflight Fees	$119,215	$111,000	$104,000
Overflight Fees (Transfer to EAS)	($102,840)	($111,000)	($104,000)
	---------------	---------------	---------------
TOTAL	**$15,733,826**	**$16,280,724**	**$15,899,852**
Appropriations	$15,863,826	$16,280,724	$15,899,852
Rescissions	($260,000)	$0	$0
Cancellations	$0	$0	$0

EXHIBIT II-2

FY 2017 TOTAL BUDGETARY RESOURCES BY APPROPRIATION ACCOUNT
FEDERAL AVIATION ADMINISTRATION
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

ACCOUNT NAME	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST
Operations	**9,740,700**	**9,909,724**	**9,994,352**
Air Traffic Organization (ATO)	7,396,654	7,506,934	7,539,785
Aviation Safety (AVS)	1,218,458	1,258,411	1,286,982
Commercial Space Transportation (AST)	16,605	17,800	19,826
Finance & Management (AFN)	756,047	760,500	771,342
NextGen (ANG)	60,089	60,089	60,155
Security and Hazardous Materials Safety (ASH)*		99,239	107,161
Staff Offices	292,847	206,751	209,101
Facilities & Equipment	**2,600,000**	**2,855,000**	**2,838,000**
Engineering, Development, Test and Evaluation	177,937	156,050	146,960
Air Traffic Control Facilities and Equipment	1,577,983	1,832,201	1,631,410
Non-Air Traffic Control Facilities and Equipment	158,280	171,000	182,930
Facilities and Equipment Mission Support	225,800	225,700	237,400
Personnel and Related Expenses	460,000	470,049	489,000
Sustain ADS-B Services and WAAS GEOs **			150,300
Research, Engineering & Development	**156,750**	**166,000**	**167,500**
Improve Aviation Safety	91,019	95,969	97,870
Improve Efficiency	22,286	22,589	22,243
Reduce Environmental Impacts	37,935	41,897	41,187
Mission Support	5,510	5,545	6,200
Grants-in-Aid for Airports	**3,350,000**	**3,350,000**	**2,900,000**
Grants-in-Aid for Airports	3,192,650	3,191,900	2,745,934
Personnel & Related Expenses	107,100	107,100	107,691
Airport Technology Research	29,750	31,000	31,375
Small Community Air Service	5,500	5,000	0
Airport Cooperative Research Program	15,000	15,000	15,000
TOTAL:	**15,847,450**	**16,280,724**	**15,899,852**

* The Office of Security Hazardous Materials Safety (ASH) was previously included within the Staff Offices; starting in FY 2016 ASH is displayed as a Line of Business

** Funds are transferred from Activity 2 to Activity 6 in FY 2017 to support ADS-B and WAAS ongoing activities.

EXHIBIT II-4

FY 2017 BUDGET AUTHORITY
FEDERAL AVIATION ADMINISTRATION
($000)

ACCOUNT NAME	Mandatory/ Discretionary	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST
Operations	**D**	**$9,740,700**	**$9,909,724**	**$9,994,352**
General		$1,145,700	$1,987,724	$2,386,352
AATF		$8,595,000	$7,922,000	$7,608,000
Facilities & Equipment (AATF)	**D**	**$2,600,000**	**$2,855,000**	**$2,838,000**
Research, Engineering & Development (AAT	**D**	**$156,750**	**$166,000**	**$167,500**
Grants in Aid for Airports (AATF)	**M**	**$3,220,000**	**$3,350,000**	**$2,900,000**
Contract Authority (AATF)	**M**	$3,350,000	$3,350,000	$2,900,000
Pop Up Contract Authority (49 USC 48112)	**D/M**	$130,000		
Rescission	**D/M**	($260,000)		
Cancellation - CHIMPS	**D/M**			
Aviation User Fees	**M**	**$119,215**	**$111,000**	**$104,000**
Aviation User Fees (transfer to EAS)	**M**	**($102,840)**	**($111,000)**	**($104,000)**
		---------------	---------------	---------------
TOTAL:		**$15,733,826**	**$16,280,724**	**$15,899,852**
[Mandatory]		$3,236,376	$3,350,000	$2,900,000
[Discretionary]		$12,497,450	$12,930,724	$12,999,852
		---------------	---------------	---------------
[General]		$1,145,700	$1,987,724	$2,386,352
[AATF]		$14,571,750	$14,293,000	$13,513,500

Note: Totals may not add due to rounding.

EXHIBIT II-5

FY 2017 OUTLAYS
FEDERAL AVIATION ADMINISTRATION
($000)

ACCOUNT NAME	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST
Operations	**$9,688,866**	**$10,078,017**	**$10,172,427**
General	$1,093,866	$2,156,017	$2,564,427
AATF	$8,595,000	$7,922,000	$7,608,000
Facilities & Equipment	**$2,619,980**	**$2,734,352**	**$2,907,834**
Aviation Insurance Revolving Account (M)	**$14,167**	**($28,000)**	**($52,000)**
Research, Engineering & Development	**$156,492**	**$177,480**	**$184,400**
Grants-in-Aid for Airports	**$3,140,347**	**$3,414,766**	**$3,365,100**
Aviation User Fees (Overflight) (M)	**$16,837**		
Franchise Fund	**$5,779**	**($16,000)**	**$3,000**
TOTAL:	**$15,642,468**	**$16,360,616**	**$16,580,761**
[Mandatory]	$31,004	($28,000)	($52,000)
[Discretionary]	$15,611,464	$16,388,616	$16,632,761

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
Federal Aviation Administration
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

		Baseline Changes											
Operations	**FY 2016 Enacted**	**Annualization of 2016 Pay Raises**	**Annualization of 2016 FTE**	**2017 Pay Raises**	**Two Less Compensable Days (260 days)**	**GSA Rent**	**Transition from F&E to Ops**	**WCF Increase/ Decrease**	**Lean Maintenance Cost Savings**	**Administrative Efficiencies**	**FY 2017 Baseline Estimate**	**Program Increases/ Decreases**	**FY 2017 Request**
PERSONNEL RESOURCES (FTE)													
Direct FTE	40,383		114								40,497	33	40,530
FINANCIAL RESOURCES													
ADMINISTRATIVE EXPENSES													
Salaries and Benefits	6,974,971	22,669	15,289	83,708	-53,974					-1,388	7,041,275	3,994	7,045,269
Travel	155,010						1,672				156,682	502	157,184
Transportation	24,325										24,325	0	24,325
GSA Rent	126,503					7,948	3,097			-29	137,519	8	137,527
Rental Payments to Others	63,731										63,731	175	63,906
Communications, Rent & Utilities	300,482						2,700			-155	303,027	0	303,027
Printing	6,237										6,237	0	6,237
Other Services	2,071,575						28,159	3,264		-38,732	2,064,266	6,996	2,071,262
Supplies	123,120						1,636				124,756	73	124,829
Equipment	56,665						60		-6,500		50,225	3,583	53,808
Lands and Structures	1,697										1,697	0	1,697
Grants, Claims and Subsidies	2,423										2,423	0	2,423
Insurance Claims and Indemnities	2,985									-127	2,858	0	2,858
Admin Subtotal	**$ 9,909,724**	**$ 22,669**	**$ 15,289**	**$ 83,708**	**$ (53,974)**	**$ 7,948**	**$ 37,324**	**$ 3,264**	**$ (6,500)**	**$ (40,431)**	**$ 9,979,021**	**$ 15,331**	**$ 9,994,352**
PROGRAMS													
Air Traffic Organization (ATO)	7,506,934	17,572		64,884	-42,135		27,409	323	-6,500	-30,982	7,537,505	2,280	7,539,785
Aviation Safety (AVS)	1,258,411	3,389	11,650	12,510	-7,871		9,915	467		-5,028	1,283,443	3,539	1,286,982
Commercial Space Transportation (AST)	17,800	48	1,258	179	-106					-76	19,103	723	19,826
Finance and Management (AFN)	760,500	809		2,987	-1,910	7,948		-24		-2,968	767,342	4,000	771,342
NextGen (ANG)	60,089	94		347	-220					-155	60,155	0	60,155
Security and Hazardous Materials Safety (ASH)	99,239	237	2,381	876	-532			1,096		-418	102,879	4,282	107,161
Staff Offices	206,751	520		1,925	-1,200			1,402		-804	208,594	507	209,101
Programs Subtotal	**$ 9,909,724**	**$ 22,669**	**$ 15,289**	**$ 83,708**	**$ (53,974)**	**$ 7,948**	**$ 37,324**	**$ 3,264**	**$ (6,500)**	**$ (40,431)**	**$ 9,979,021**	**$ 15,331**	**$ 9,994,352**
TOTAL	**$ 9,909,724**	**$ 22,669**	**$ 15,289**	**$ 83,708**	**$ (53,974)**	**$ 7,948**	**$ 37,324**	**$ 3,264**	**$ (6,500)**	**$ (40,431)**	**$ 9,979,021**	**$ 15,331**	**$ 9,994,352**

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
Federal Aviation Administration
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

Facilities & Equipment	FY 2016 Enacted	Baseline Changes: Annualization of 2016 Pay Raises	Annualization of 2016 FTE	2017 Pay Raises	Two Less Compensable Days (260 days)	GSA Rent	WCF Increase/ Decrease	Inflation/ Deflation	FY 2017 Baseline Estimate	Program Increases/ Decreases	FY 2017 Request
PERSONNEL RESOURCES (FTE)											
Direct FTE	2,629		10						2,639	16	2,655
FINANCIAL RESOURCES											
ADMINISTRATIVE EXPENSES											
Salaries and Benefits	413,336	1,343	1,500	4,960	-3,140				417,999	2,499	420,498
Travel	42,046							420	42,466	5,234	47,700
Transportation	2,709							27	2,736	-54	2,682
GSA Rent	0							0	0		0
Rental Payments to Others	33,272							333	33,605	0	33,605
Communications & Utilities	28,557							286	28,843	-205	28,638
Printing	14							0	14	16	30
Other Services:	1,979,333							19,793	1,999,126	-6,833	1,992,293
-WCF	48							0	48		48
Supplies	19,117							191	19,308	0	19,308
Equipment	211,636							2,116	213,752	-30,568	183,185
Lands and Structures	118,525							1,185	119,710	-16,169	103,542
Grants, Claims, Subsidies and Interest	6,407							64	6,471	0	6,471
Admin Subtotal	**2,855,000**	**1,343**	**1,500**	**4,960**	**-3,140**	**0**	**0**	**24,417**	**2,884,080**	**-46,080**	**2,838,000**
PROGRAMS											
Engineering, Development, Test and Evaluation	156,050							1,561	157,611	-10,651	146,960
Air Traffic Control Facilities and Equipment	1,832,201							18,322	1,850,523	-219,113	1,631,410
Non-Air Traffic Control Facilities and Equipment	171,000							1,710	172,710	10,220	182,930
Facilities and Equipment Mission Support	225,700							2,257	227,957	9,443	237,400
Personnel & Related Expenses	470,049	1,343	1,500	4,960	-3,140			567	475,279	13,721	489,000
ADS-B Subscription and WAAS GEOs *	0									150,300	150,300
Programs Subtotal	**2,855,000**	**1,343**	**1,500**	**4,960**	**-3,140**	**0**	**0**	**24,417**	**2,884,080**	**-46,080**	**2,838,000**
TOTAL	**2,855,000**	**1,343**	**1,500**	**4,960**	**-3,140**	**0**	**0**	**24,417**	**2,884,080**	**-46,080**	**2,838,000**

* Funds are transferred from Activity 2 to Activity 6 in FY 2017 to support ADS-B and WAAS ongoing activities.

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
Federal Aviation Administration
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

		Baseline Changes									
Research, Engineering & Development	**FY 2016 Enacted**	**Annualization of 2016 Pay Raises**	**Annualization of 2016 FTE**	**2017 Pay Raises**	**Two Less Compensable Days (260 days)**	**GSA Rent**	**WCF Increase/ Decrease**	**Inflation/ Deflation**	**FY 2017 Baseline Estimate**	**Program Increases/ Decreases**	**FY 2017 Request**
PERSONNEL RESOURCES (FTE)	249								249		249
Direct FTE	249								249		249
FINANCIAL RESOURCES											
ADMINISTRATIVE EXPENSES											
Salaries and Benefits	38,462	96		463	-294				38,727		38,727
Travel	1,800							18	1,818		1,818
Transportation	41								41		41
GSA Rent									0		0
Communications, & Utilities	14								14		14
Printing	4								4		4
Other Services:									0		0
-WCF									0		0
-Other	105,790							1,058	106,848	-40	106,808
Supplies	1,482							15	1,497		1,497
Equipment	1,220							12	1,232		1,232
Grants, Claims & Subsidies	17,188							172	17,360		17,360
Admin Subtotal	**166,000**	**96**	**0**	**463**	**-294**	**0**	**0**	**1,275**	**167,540**	**-40**	**167,500**
PROGRAMS											
Improve Aviation Safety	95,969	79		378	-240			645	96,831	1,040	97,871
Economic Competitiveness	22,589	4		20	-13			209	22,809	-567	22,242
Environmental Sustainability	41,897	6		28	-18			395	42,308	-1,122	41,186
Mission Support	5,545	8		37	-23			25	5,592	609	6,201
Programs Subtotal	**166,000**	**96**	**0**	**463**	**-294**	**0**	**0**	**1,275**	**167,540**	**-40**	**167,500**
TOTAL	**166,000**	**96**	**0**	**463**	**-294**	**0**	**0**	**1,275**	**167,540**	**-40**	**167,500**

EXHIBIT II-6
SUMMARY OF REQUESTED FUNDING CHANGES FROM BASE
Federal Aviation Administration
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

Grants-in-Aid for Airports	FY 2016 Enacted	Baseline Changes: Annualization of 2016 Pay Raises	Annualization of 2016 FTE	2017 Pay Raises	Two Less Compensable Days (260 days)	GSA Rent	WCF Increase/ Decrease	Inflation/ Deflation	FY 2017 Baseline Estimate	Program Increases/ Decreases	FY 2017 Request
PERSONNEL RESOURCES (FTE)											
Direct FTE	609								609	1	610
FINANCIAL RESOURCES											
ADMINISTRATIVE EXPENSES											
Salaries and Benefits	89,888	292	74	1,079	-686				90,647	148	90,795
Travel	2,953							29	2,982		2,982
Transportation	264							2	266		266
GSA Rent	102							1	103		103
Rental Payments to Others	880							8	888		888
Communications, Rent & Utilities	496							5	501		501
Printing	497							5	502		502
Other Services:									0		0
-WCF	134						8		142		142
-Advisory and Assistance Services	25,254							252	25,506		25,506
-Other	30,558							305	30,863	-580	30,283
Supplies	653							6	659		659
Equipment	973							9	982		982
Lands and Structures	1,003							10	1,013		1,013
Grants, Claims & Subsidies	3,191,308							0	3,191,308	-445,966	2,745,342
Insurance Claims and Indemnities	1							0	1		1
Interest and Dividends	36							0	36		36
Financial transfers	5,000							0	5,000	-5,000	0
Admin Subtotal	**3,350,000**	**292**	**74**	**1,079**	**-686**	**0**	**8**	**632**	**3,351,398**	**-451,398**	**2,900,000**
PROGRAMS											
Grants	3,191,900	0		0	0		0	0	3,191,900	-445,966	2,745,934
Personnel and Related Expenses	107,100	277		1,022	-650		8	219	107,975	-284	107,691
Airport Technology Research	31,000	13	74	46	-29		0	271	31,375	0	31,375
Airport Cooperative Research	15,000	3	0	10	-7		0	141	15,148	-148	15,000
Small Community Air Service	5,000			0	0		0	0	5,000	-5,000	0
Programs Subtotal	**3,350,000**	**293**	**74**	**1,079**	**-686**	**0**	**8**	**632**	**3,351,398**	**-451,398**	**2,900,000**
TOTAL	**3,350,000**	**293**	**74**	**1,079**	**-686**	**0**	**8**	**632**	**3,351,398**	**-451,398**	**2,900,000**

EXHIBIT II-7
WORKING CAPITAL FUND
FEDERAL AVIATION ADMINISTRATION
($000)

	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST	*CHANGE
DIRECT:				
Facilities & Equipment	35	48	48	**-**
Grants-in-Aid for Airports	924	135	143	**8**
***Operations**	45,811	48,889	52,738	**3,849**
TOTAL	**$ 46,770**	**$ 49,072**	**$ 52,929**	**$ 3,857**

Footnote:

F&E, Grants-in-Aid for Airports funding only support E-gov Inititatives.

*The FAA's FY2017 funding request for Operations is $3,264 versus $3,849. This is based on the delta between FY 2016 Request1B and the FY 2017 OST estimate with exclusion of base funded items being transferred into WCF (i.e, Employee Express and News Media).

EXHIBIT II-8
FEDERAL AVIATION ADMINISTRATION
PERSONNEL RESOURCE -- SUMMARY
TOTAL FULL-TIME EQUIVALENTS

	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST
DIRECT FUNDED BY APPROPRIATION			
Operations	39,923	40,383	40,530
Facilities & Equipment	2,619	2,629	2,655
Research, Engineering & Development	234	249	249
Grants-in-Aid for Airports	579	609	610
SUBTOTAL, DIRECT FUNDED	43,355	43,870	44,044
REIMBURSEMENTS / ALLOCATIONS / OTHER			
Reimbursements and 'Other'			
Operations	230	222	222
Aviation Insurance Revolving Fund	4	4	4
Facilities & Equipment	68	68	68
Grants-in-Aid for Airports	-	1	2
Administrative Services Franchise Fund	1,645	1,823	1,822
Allocations from other Organizations			
SUBTOTAL, REIMBURSE./ALLOC./OTH.	1,947	2,118	2,118
TOTAL FTEs	**45,302**	**45,988**	**46,162**

EXHIBIT II-9
FEDERAL AVIATION ADMINISTRATION
RESOURCE SUMMARY – STAFFING
FULL-TIME PERMANENT POSITIONS

	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST
DIRECT FUNDED BY APPROPRIATION			
Operations	39,911	40,902	40,964
Facilities & Equipment	2,658	2,678	2,710
Research, Engineering & Development	233	257	257
Grants-in-Aid for Airports	585	609	611
SUBTOTAL, DIRECT FUNDED	43,387	44,446	44,542
REIMBURSEMENTS / ALLOCATIONS / OTHER			
Reimbursements and 'Other'			
Operations	97	175	175
Aviation Insurance Revolving Fund	3	4	4
Facilities & Equipment	24	39	39
Grants-in-Aid for Airports	-	2	2
Administrative Services Franchise Fund	1,634	1,772	1,773
Allocations from other Organizations			
SUBTOTAL, REIMBURSE./ALLOC./OTH.	1,758	1,992	1,993
TOTAL POSITIONS	**45,145**	**46,438**	**46,535**

EXHIBIT II-10
FEDERAL AVIATION ADMINISTRATION
USER FEES
($000)

	FY 2015 ACTUAL	FY 2016 ESTIMATE	FY 2017 ESTIMATE
USER FEE			
Civil Aviation Registry Fees	389	500	500
Foreign Repair Station/Certification Fees	8,386	12,000	12,000
Aeronautical Charting Fees	6,826	9,000	9,000
Overflight Fees	99,563	111,018	104,239
Total User Fees	**115,164**	**132,518**	**125,739**

INSERT TAB HERE:

SECTION 3: BUDGET BY APPROPRIATIONS ACCOUNT

INSERT TAB HERE:

3A. OPERATIONS

OPERATIONS

(AIRPORT AND AIRWAY TRUST FUND)

For necessary expenses of the Federal Aviation Administration, not otherwise provided for, including operations and research activities related to commercial space transportation, administrative expenses for research and development, establishment of air navigation facilities, the operation (including leasing) and maintenance of aircraft, subsidizing the cost of aeronautical charts and maps sold to the public, lease or purchase of passenger motor vehicles for replacement only, in addition to amounts made available by Public Law 112–95, $9,994,352,000 of which $7,608,000,000 shall be derived from the Airport and Airway Trust Fund: Provided, That not to exceed 2 percent of any budget activity, except for aviation safety budget activity, may be transferred to any budget activity under this heading: Provided further, That no transfer may increase or decrease any appropriation by more than 2 percent: Provided further, That funds may be used to enter into a grant agreement with a nonprofit standard-setting organization to assist in the development of aviation safety standards: Provided further, That none of the funds in this Act shall be available for new applicants for the second career training program: Provided further, That there may be credited to this appropriation, as offsetting collections, funds received from States, counties, municipalities, foreign authorities, other public authorities, and private sources for expenses incurred in the provision of agency services, including receipts for the maintenance and operation of air navigation facilities, and for issuance, renewal or modification of certificates, including airman, aircraft, and repair station certificates, or for tests related thereto, or for processing major repair or alteration forms.

Program and Financing (in millions of dollars)

Identification code: 69-1301-0-1-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Obligations by program activity:			
0001	Air Traffic Organization (ATO)	7,400	7,522	7,555
0002	NextGen	60	60	60
0003	Finance & Management	755	761	774
0004	Regulation & Certification	1,230	1,270	1,299
0005	Commercial Space Transportation	17	18	20
0006	Security & Hazardous Materials Safety	....	99	107
0007	Staff Offices	292	207	209
0100	Direct Program Activities Subtotal	9,754	9,937	10,024
0799	Total Direct Obligations	9,754	9,937	10,024
0801	Operations (Reimbursable)	146	191	191
0900	Total new obligations	9,900	10,128	10,215
	Budget resources:			
1000	Unobligated balance brought forward, Oct. 1	43	43	45
1021	Recoveries of prior year unpaid obligations	5	....	....
1050	Unobligated balance (total)	48	43	45
	Budget authority:			
	Appropriations, discretionary:			
	Unobligated Balance:			
1100	Appropriation	1,146	1,988	2,386
	Spending authority from offsetting collections, discretionary,			
1700	Collected	8,695	8,142	7,828
1701	Change in uncollected payments, Federal sources	65	....	....
1750	Spending auth from offsetting collections, disc (total)	8,760	8,142	7,828
1900	Budget authority (total)	9,906	10,130	10,214
1930	Total budgetary resources available	9,954	10,173	10,259
	Memorandum (non-add) entries:			
1940	Unobligated balance expiring	-11	....	....
1941	Unexpired unobligated balance, end of year	43	45	44
	Change in obligated balance:			
	Unpaid obligations:			
3000	Unpaid obligations, brought forward, Oct. 1	1,529	1,503	1,335
3010	Obligations incurred, unexpired accounts	9,900	10,128	10,215
3011	Obligations incurred, expired accounts	58	....	....
3020	Outlays (gross)	-9,901	-10,296	-10,394
3040	Recoveries of prior year unpaid obligations, unexpired	-5	....	....
3041	Recoveries of prior year unpaid obligations, expired	-78	....	....
3050	Unpaid obligations, end of year	1,503	1,335	1,156
	Uncollected payments:			
3060	Uncollected pymts, Fed sources, brought forward, Oct 1	-162	-125	-125
3070	Change in uncollected pymts, Fed sources, unexpired	-65	....	....
3071	Change in uncollected pymts, Fed sources, expired	102	....	....
3090	Uncollected pymts, Fed sources, end of year	-125	-125	-125
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	1,367	1,378	1,210
3200	Obligated balance, end of year	1,378	1,210	1,031
	Budget authority and outlays, net:			
	Discretionary:			
4000	Budget authority, gross	9,906	10,130	10,214
	Outlays, gross:			
4010	Outlays from new discretionary authority	8,590	8,940	9,015
4011	Outlays from discretionary balances	1,311	1,356	1,379
4020	Outlays, gross (total)	9,901	10,296	10,394
	Offsets against gross budget authority and outlays:			

Identification code: 69-1301-0-1-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Offsetting collections (collected) from:			
4030	Federal sources	-8,769	-8,097	-7,783
4033	Non-Federal sources	-33	-45	-45
4034	Offsetting governmental collections	-5	....	....
4040	Offsets against gross budget authority and outlays (total)	-8,807	-8,142	-7,828
	Additional offsets against gross budget authority only:			
4050	Change in uncollected pymts, Federal sources, unexpired	-65	....	....
4052	Offsetting collections credited to expired accounts	112	....	....
4060	Additional offsets against budget authority only (total)	47	....	....
4070	Budget authority, net (discretionary)	1,146	1,988	2,386
4080	Outlays, net (discretionary)	1,094	2,154	2,566
4180	Budget authority, net (total)	1,146	1,988	2,386
4190	Outlays, net (total)	1,094	2,154	2,566
	Memorandum (non-add) entries:			
5093	Unavailable balance, SOF: Offsetting collections	1	1	1
5095	Unavailable balance, EOY: Offsetting collections	1	1	1

For 2017, the Budget requests $9,994 million for Federal Aviation Administration (FAA) operations. These funds will be used to continue to promote aviation safety and efficiency. The Budget provides funding for the Air Traffic Organization (ATO) which is responsible for managing the air traffic control system. As a performance-based organization, the ATO is designed to provide cost-effective, efficient, and, above all, safe air traffic services. The Budget also funds the Aviation Safety Organization which ensures the safe operation of the airlines and certifies new aviation products. In addition, the request also funds regulation of the commercial space transportation industry, as well as FAA policy oversight and overall management functions.

Object Classification (in millions of dollars)

Identification code: 69-1301-0-1-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	4,511	4,628	4,677
11.3	Other than full-time permanent	29	30	31
11.5	Other personnel compensation	409	376	376
11.9	Total personnel compensation	4,949	5,034	5,084
12.1	Civilian personnel benefits	1,891	1,940	1,960
13.0	Benefits for former personnel	2	1	1
21.0	Travel and transportation of persons	155	155	157
22.0	Transportation of things	23	24	24
23.1	Rental payments to GSA	119	127	138
23.2	Rental payments to others	57	64	64
23.3	Communications, utilities, and miscellaneous charges	284	301	303
24.0	Printing and reproduction	7	6	6
25.1	Advisory and assistance services	571	664	643
25.2	Other services from non-Federal sources	1,501	1,434	1,458
26.0	Supplies and materials	131	123	125
31.0	Equipment	59	57	54
32.0	Land and structures	1	2	2
41.0	Grants, subsidies, and contributions	1	2	2
42.0	Insurance claims and indemnities	3	3	3
99.0	Direct obligations	9,754	9,937	10,024
99.0	Reimbursable obligations	146	191	191
99.9	Total new obligations	9,900	10,128	10,215

Employment Summary

Identification code: 69-1301-0-1-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
1001	Direct civilian full-time equivalent employment	39,923	40,383	40,530
2001	Reimbursable civilian full-time equivalent employment	230	222	222

Exhibit III-1

OPERATIONS
Summary by Program Activity
Appropriations, Obligation Limitations and Exempt Obligations
($000)

	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST	CHANGE FY 2016-2017
Air Traffic Organization (ATO)	7,396,654	7,506,934	7,539,785	32,851
Aviation Safety (AVS)	1,218,458	1,258,411	1,286,982	28,571
Commercial Space (AST)	16,605	17,800	19,826	2,026
Finance & Management (AFN)	756,047	760,500	771,342	10,842
NextGen (ANG)	60,089	60,089	60,155	66
Security and Hazardous Materials Safety (ASH)	0	99,239	107,161	7,922
Staff Offices	292,847	206,751	209,101	2,350
TOTAL	**$9,740,700**	**$9,909,724**	**$9,994,352**	**$84,628**
FTEs				
Direct Funded	39,923	40,383	40,530	147
Reimbursable, allocated, other	230	222	222	0

Program and Performance Statement

This account provides funds for the operation, maintenance, communications and logistical support of the air traffic control and air navigation systems. It also covers administrative and managerial costs for the FAA's regulatory, international, medical, engineering and development programs as well as policy oversight and overall management functions. The operations appropriation includes the following major activities:

(1) Operation on a 24-hour daily basis of a national air traffic system;
(2) Establishment and maintenance of a national system of aids to navigation;
(3) Establishment and surveillance of civil air regulations to assure safety in aviation;
(4) Development of standards, rules and regulations governing the physical fitness of airmen as well as the administration of an aviation medical research program;
(5) Regulation of the commercial space transportation industry;
(6) Administration of acquisition programs; and
(7) Headquarters, administration and other staff offices.
(8) In FY 2016, the Office of Security and Hazardous Materials Safety (ASH) received $1,641,000 for the Air Traffic Organization (ATO) to address recommendations resulting from a security review after the Chicago Center fire. The funding will be transferred in FY 2016 from ASH to ATO for execution and is within the 2% reprogramming threshold.

Exhibit III-1a

OPERATIONS
Summary Analysis of Change from FY 2016 to FY 2017
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

	Change from FY 2016 to FY 2017	
	Dollars	**FTE**
FY 2016 ENACTED	**$9,909,724**	**40,383**
ADJUSTMENTS TO BASE	**$116,228**	**114**
Annualization of FY 2016 Pay Raises [1.3%]	22,669	
Annualization of 2016 FTE	15,289	114
FY 2017 Pay Raises [1.6%]	83,708	
Two Less Compensable Days	-53,974	
GSA Rent	7,948	
Transition from F&E to Ops	37,324	
Working Capital Fund	3,264	
PROGRAM REDUCTIONS	**-$46,931**	**0**
Lean Maintenance Cost Savings	-6,500	
Administrative Efficiencies	-40,431	
NEW OR EXPANDED PROGRAMS	**$15,331**	**33**
Lean Maintenance and Revalidation Program	2,818	
Unmanned Aircraft Systems (UAS) Integration	3,100	9
Hazard Tracking Tool	500	
Commercial Space Transportation (CST) Operational Management Staff	723	7
Information System Security (ISS)	4,000	2
ZAU Security Review	1,746	10
Insider Threat Detection and Mitigation Program (ITDMP)	1,796	2
Hazardous Materials Safety Program (HMSP)	648	3
FY 2017 REQUEST	**$9,994,352**	**40,530**

Operations Summary
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$9,909,724**	**40,902**	**673**	**40,383**
Adjustments to Base	**$112,964**	**6**		**114**
Annualization of FY 2016 Pay Raises [1.3%]	22,669			
Annualization of 2016 FTE	15,289			114
FY 2017 Pay Raises [1.6%]	83,708			
Two Less Compensable Days	-53,974			
GSA Rent	7,948			
Transition from F&E to Ops	37,324			
FTP Adjustments		6		
Other Changes	**-$43,667**	**-3**		
Working Capital Fund	3,264			
Lean Maintenance Cost Savings	-6,500			
Administrative Efficiencies	-40,431	-3		
Discretionary Adjustments	**$15,331**	**59**	**2**	**33**
Lean Maintenance and Revalidation Program	2,818			
Unmanned Aircraft Systems (UAS) Integration	3,100	14	2	9
Hazard Tracking Tool	500			
Commercial Space Transportation (CST) Operational Management Staff	723	13		7
Information System Security (ISS)	4,000	4		2
ZAU Security Review	1,746	20		10
Insider Threat Detection and Mitigation Program (ITDMP)	1,796	3		2
Hazardous Materials Safety Program (HMSP)	648	5		3
Base Transfers				
Flight Standard Services Staffing				
Security and Hazardous Materials Safety Staffing				
Civil Rights Staffing				
FY 2017 Request	**$9,994,352**	**40,964**	**675**	**40,530**

Base Transfer Summary
($000)

	LOB/SO	FTE	FTP	Funding	LOB/SO	FTE	FTP	Funding
Flight Standard Services Staffing	ATO	-1	-1	-$189	AVS	1	1	$189
Security and Hazardous Materials Safety Staffing	ATO	-1	-1	-$92	ASH	1	1	$92
Civil Rights Staffing	ATO	-1	-1	-$257	ACR	1	1	$257
Total		**-3**	**-3**	**-$538**		**3**	**3**	**$538**

Staffing Summary -- FY 2015 - FY 2017

			Type	FY2015 Actual	FY2016 Enacted	FY2017 Request
Air Traffic Organization		ATO	FTP	29,350	29,786	29,783
			OTFTP	351	462	462
			FTE	29,411	29,606	29,603
Associate Administrator for Aviation Safety		AVS	FTP	7,196	7,406	7,421
			OTFTP	16	125	127
			FTE	7,068	7,246	7,339
Associate Administrator for Commercial Space Transportation		AST	FTP	78	106	119
			OTFTP	1	2	2
			FTE	79	92	111
Assistant Administrator for Finance and Management		AFN	FTP	1,623	1,789	1,793
			OTFTP	14	21	21
			FTE	1,638	1,664	1,666
Assistant Administrator for Next Generation Air Transportation System		ANG	FTP	192	201	201
			OTFTP	6	7	7
			FTE	197	201	201
Associate Administrator for Security and Hazardous Materials Safety		ASH	FTP	-	522	557
			OTFTP	-	-	-
			FTE	-	497	532
Staff Offices	Assistant Administrator for Human Resource Management	AHR	FTP	519	558	555
			OTFTP	4	31	31
			FTE	544	534	534
	Office of the Administrator and Deputy	AOA	FTP	18	20	20
			OTFTP	2	4	4
			FTE	22	24	24
	Assistant Administrator for Audit and Evaluation	AAE	FTP	19	20	20
			OTFTP	-	-	-
			FTE	19	20	20
	Assistant Administrator for Civil Rights	ACR	FTP	73	80	81
			OTFTP	3	4	4
			FTE	74	80	81
	Asst. Administrator for Government and Industry Affairs	AGI	FTP	7	10	10
			OTFTP	1	-	-
			FTE	8	10	10
	Assistant Administrator for Communications	AOC	FTP	29	34	34
			OTFTP	1	1	1
			FTE	30	34	34
	Office of Chief Counsel	AGC	FTP	225	234	234
			OTFTP	4	9	9
			FTE	233	236	236
	Asst. Administrator for Policy, International Affairs and Environment	APL	FTP	121	136	136
			OTFTP	6	7	7
			FTE	131	139	139
	Asst. Administrator for Security and Hazardous Materials Safety	ASH	FTP	461		
			OTFTP	4		
			FTE	469		
Total			FTP	39,911	40,902	40,964
			OTFTP	413	673	675
			FTE	39,923	40,383	40,530

*In previous budget submissions, the Office of Security and Hazardous Materials Safety (ASH) was displayed within the Staff Offices (SO); in FY 2016 ASH is displayed as a Line of Business (LOB).

FY 2015 - FY 2017 Resource Summary ($000)

			FY 2015 Actual	FY 2016 Enacted	FY 2017 Request
	Air Traffic Organization (ATO)	pcb	$ 5,316,511	$ 5,406,925	$ 5,446,708
		o/o	$ 2,080,143	$ 2,100,009	$ 2,093,077
	ATO Total		**$ 7,396,654**	**$ 7,506,934**	**$ 7,539,785**
	Associate Administrator for Aviation Safety (AVS)	pcb	$ 1,012,242	$ 1,042,424	$ 1,062,224
		o/o	$ 206,216	$ 215,987	$ 224,758
	AVS Total		**$ 1,218,458**	**$ 1,258,411**	**$ 1,286,982**
	Associate Administrator for Commercial Space Transportation (AST)	pcb	$ 13,410	$ 14,605	$ 16,707
		o/o	$ 3,195	$ 3,195	$ 3,119
	AST Total		**$ 16,605**	**$ 17,800**	**$ 19,826**
	Assistant Administrator for Finance and Management (AFN)	pcb	$ 244,640	$ 248,930	$ 251,157
		o/o	$ 511,407	$ 511,570	$ 520,185
	AFN Total		**$ 756,047**	**$ 760,500**	**$ 771,342**
	Assistant Administrator for NextGen Air Transportation System (ANG)	pcb	$ 28,434	$ 28,434	$ 28,655
		o/o	$ 31,655	$ 31,655	$ 31,500
	ANG Total		**$ 60,089**	**$ 60,089**	**$ 60,155**
	Associate Administrator for Security and Hazardous Materials Safety (ASH)	pcb	$ -	$ 73,031	$ 78,095
		o/o	$ -	$ 26,208	$ 29,066
	ASH Total		**$ -**	**$ 99,239**	**$ 107,161**
Staff Offices	Assistant Administrator for Human Resource Management (AHR)	pcb	$ 73,053	$ 74,498	$ 74,683
		o/o	$ 26,947	$ 26,708	$ 27,910
	AHR Total		**$ 100,000**	**$ 101,206**	**$ 102,593**
	Office of the Administrator and Deputy (AOA)	pcb	$ 3,465	$ 3,527	$ 3,554
		o/o	$ 552	$ 552	$ 536
	AOA Total		**$ 4,017**	**$ 4,079**	**$ 4,090**
	Assistant Administrator for Audit and Evaluation (AAE)	pcb	$ 2,873	$ 2,927	$ 2,948
		o/o	$ 327	$ 327	$ 314
	AAE Total		**$ 3,200**	**$ 3,254**	**$ 3,262**
	Assistant Administrator for Civil Rights (ACR)	pcb	$ 9,723	$ 9,892	$ 10,226
		o/o	$ 2,076	$ 2,076	$ 2,029
	ACR Total		**$ 11,799**	**$ 11,968**	**$ 12,255**
	Assistant Administrator for Government and Industry Affairs (AGI)	pcb	$ 1,456	$ 1,482	$ 1,490
		o/o	$ 74	$ 74	$ 74
	AGI Total		**$ 1,530**	**$ 1,556**	**$ 1,564**
	Assistant Administrator for Communications (AOC)	pcb	$ 5,861	$ 5,969	$ 6,015
		o/o	$ 342	$ 342	$ 318
	AOC Total		**$ 6,203**	**$ 6,311**	**$ 6,333**
	Office of the Chief Council (AGC)	pcb	$ 37,431	$ 38,127	$ 38,410
		o/o	$ 6,812	$ 6,659	$ 6,686
	AGC Total		**$ 44,243**	**$ 44,786**	**$ 45,096**
	Assistant Administrator for Policy, International Affairs and Environment (APL)	pcb	$ 23,792	$ 24,200	$ 24,397
		o/o	$ 9,391	$ 9,391	$ 9,511
	APL Total		**$ 33,183**	**$ 33,591**	**$ 33,908**
	Assistant Administrator for Security and HazMat Safety (ASH)	pcb	$ 69,234		
		o/o	$ 19,438		
	ASH Total		**$ 88,672**	**$ -**	**$ -**
Grand Total			**$ 9,740,700**	**$ 9,909,724**	**$ 9,994,352**

INSERT TAB HERE:

AIR TRAFFIC ORGANIZATION (ATO)

Air Traffic Organization (ATO)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$7,506,934**	**29,786**	**462**	**29,606**
Adjustments to Base	**$67,730**			
Annualization of FY 2016 Pay Raises 1.3%	17,572			
FY 2017 Pay Raises 1.6%	64,884			
Two Less Compensable Days	-42,135			
Transition from F&E to Ops	27,409			
Other Changes	**-$37,159**			
Working Capital Fund	323			
Lean Maintenance Cost Savings	-6,500			
Administrative Efficiencies	-30,982			
Discretionary Adjustments	**$2,818**			
Lean Maintenance and Revalidation Program	2,818			
Base Transfers	**-$538**	**-3**		**-3**
Flight Standard Services Staffing	-189	-1		-1
Security and Hazardous Materials Safety Staffing	-92	-1		-1
Civil Rights Staffing	-257	-1		-1
FY 2017 Request	**$7,539,785**	**29,783**	**462**	**29,603**

Executive Summary: Air Traffic Organization (ATO)

What Is The Request And What Funds Are Currently Spent on the Program?

The FY 2017 request of $7,539,785,000 and 29,783 FTP / 29,603 FTE allows FAA to maintain our position as the global leader in delivering the world's safest, most secure air traffic services. This request provides an adjustment to base of $17,572,000 for the annualized cost of the FY 2016 pay increase, $64,884,000 for the 2017 pay raise, -$42,135,000 for two less compensable days and $27,409,000 for Transition to Operations and Maintenance (TOM) costs. Included in the request is a change of $323,000 for Working Capital Fund adjustments; -$6,500,000 for Lean Maintenance Cost Savings; -$30,982,000 for Administrative Efficiencies; $2,818,000 in discretionary adjustments for program increase requests; and -$538,142 for base transfer adjustments.

What is this Program and Why is it Necessary?

ATO is a Performance-Based Organization providing safe, secure, and cost-effective air traffic control services to commercial and private aviation and the military. We are more than 30,000 professional employees committed to providing safe and efficient air traffic control services. Many of our employees, including approximately 14,500 air traffic controllers, 5,000 air traffic supervisors and air traffic managers, 1,800 engineers, and 6,000 maintenance technicians, directly serve our customers. Our remaining employees work in a wide variety of professions to sustain the smooth operations of ATO. They research, plan, and build air traffic control equipment and programs; manage payroll and benefits programs; maintain productive relationships with the aviation industry and the general public; and ensure that the environment and ATO employees are protected.

ATO supports the **Department of Transportation's (DOT) strategic goals** and outcomes related to:

- **Safety:** "*Reduction in transportation related fatalities and injuries*";
- **Economic Competitiveness:** *"Maximum economic returns in transportation policies and investments*"**;** and
- **State of good repair:** *"Maintain or improve operating conditions and sustain assets"***.**

The ATO also supports **DOT's Priority Goal: "Reduction of Total Runway Incursions".**

ATO provides air traffic services for the Nation and is fully committed to the agency's mission. We handle 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year; a vital part of the Nation's economy. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.3 trillion in total economic activity, supporting 5.4 percent of U.S. Gross Domestic Product. Earning over $394 billion a year, 10 million people are employed in aviation-related fields.

Safety is ATO's highest priority. While the system is already exceedingly safe, we are making it safer by moving to a proactive safety culture in which every individual in ATO is committed to assessing and mitigating risks. While safety is paramount, we are also taking steps to enable growth and changes in aviation.

ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future.

ATO's seven service organizations include:

Air Traffic Services (AJT): Air Traffic Services provides air traffic control operations from 21 en-route, 543 terminal, and four Combined Control facilities in the U.S., Puerto Rico, and Guam. Air Traffic Services also controls more than 59 million square miles of airspace over the continental U.S. and the Atlantic and Pacific

Oceans including the South Pacific, to the Northern Polar Routes, the North Atlantic, the Caribbean, and the Gulf of Mexico. Every day we ensure thousands of positively controlled aircraft, en route from one terminal area to another, are directed to the safest, most efficient path onto their destinations.

The en-route domain provides service by controllers at 21 air route traffic control centers (ARTCCs) and two combined control facilities, which interface with more than 18 air navigation service providers. Terminal air traffic control (ATC) services include both airport surface operations and terminal area operations. Airport surface operations are conducted by controllers at 263 federal and 252 contract towers located at the Nation's airports. Terminal area operations are conducted by controllers at 161 TRACON facilities, which routinely handle aircraft within 40 miles of an airport.

The Contract Weather Observation Program provides quality weather monitoring, augmentation, and backup of automated weather systems (Automated Surface Observing System and Automated Weather Observation System).

Air Traffic Services is divided into three geographical service areas (Eastern, Central, and Western) to better manage the delivery of ATC services. The primary function of each service area is to oversee ATC operations within its geographical area and to ensure quality standards established for Safety, Capacity, and Organizational Excellence are met.

In addition to domestic air traffic control, Air Traffic Services also provides control services outside of the contiguous U.S.

Technical Operations (AJW): The NAS is composed of a mix of hardware and software systems that enable controllers to monitor and communicate with pilots and other ATC facilities. NAS system capabilities include automation, communication, surveillance and navigation. Failure at any point in the system can cause capacity reductions and potentially compromise safety. Reductions in capacity cause delays with costs to users and the flying public. Technical Operations ensures that terminal and en route controllers have all critical parts of the NAS infrastructure available for the safe and efficient delivery of air traffic services.

The mission of the Technical Operations Service Unit is to:

- Ensure efficient delivery of all NAS services for all stakeholders;
- Increase NAS capacity for all users through changes in technology;
- Maintain optimal NAS services for all users by strategically investing in the current infrastructure and providing operational oversight of leased NAS services;
- Improve situational awareness for pilots, controllers and airfield operators by providing them with real-time information concerning potential conflicts and offering possible resolutions; and
- Provide a safe and healthful workplace for all FAA employees through an active OSHA program.

Technical Operations supports the delivery of safe and efficient flight services to customers through responsive and cost effective maintenance of NAS facilities, systems, and equipment, and by providing operational oversight of leased services. The work consists of:

- NAS system design, development, acquisition, installation, maintenance, restoration, modification, certification and oversight of vendor supplied NAS services and vendor maintenance programs;
- Flight Inspection to support restorations and periodic inspection of NAVAIDs and the validation of instrument flight procedures;
- Facilities maintenance; and
- Engineering and assignment of aeronautical frequency spectrum.

Our core work is performed by the System Support Centers, Flight Inspection Field Offices, and Technical Operations Control Centers. These professionals focus daily on optimizing NAS performance through prioritization of response based on factors such as importance of the airport or ATC facility that is directly or indirectly affected by the equipment or service outage. This core work includes certification, maintenance, modifications, and technical documentation.

System Operations (AJR): The System Operations Service Unit consists of several directorates that perform essential functions in the daily operation of the NAS. These functions affect all aspects of FAA Air Traffic Control (ATC) operations and our engagement with other Government agencies, airlines, and foreign Air Navigation Service Providers (ANSPs). These directorates are:

- Air Traffic Control System Command Center (ATCSCC)
- Security
- Flight Services
- Data Management
- International
- Performance Analysis

Safety and Technical Training (AJI): Safety and Technical Training is the only organization within ATO that provides technical training to controllers, technicians, and engineers. We ensure the technical competency (knowledge and skills) of the workforce, and ensure we certify enough of the right workers to meet operational needs. We develop and deliver technical training programs for a workforce of approximately 14,500 air traffic controllers, 6,000 Airway Transportation Systems Specialist (ATSS), and 1,800 engineers.

Our safety programs validate and categorize airborne and surface safety occurrences; conduct in-depth analysis of airborne and surface events to identify hazards (determine causal factors and root causes); and implement corrective actions to mitigate identified hazards. In addition, Safety and Technical Training manages policy development, improves fatigue risks through a comprehensive fatigue risk management system, and facilitates an ongoing ATO safety culture transformation that leads to improved safety performance.

The work of ATO Safety and Technical Training benefits the Department of Transportation's (DOT) goal of Safety and will assist in preventing the loss of human life, reduction in transportation-related injuries and fatalities and is the lead for two of FAA's Priority Goals – Runway Incursion Rate and Hazards Mitigation. Safety and Technical Training also supports the FAA Administrator's initiative, Risk-Based Decision Making: to build on safety management principles to proactively address emerging safety risks by using consistent, data-informed approaches to make smarter, system-level, risk-based decisions.

Mission Support Services (AJV): The Mission Support Services mission is to promote the standardization of processes, efficiency, and effectiveness between Air Traffic Services, Technical Operations, and System Operations through shared services. The service unit's core work is performed at the three service center locations (Western, Eastern, and Central). Core work includes:

- Oversight and support for NAS procedures and changes which affect operations and special activities with the NAS.
- Development and dissemination of digital Aeronautical Charts and products.
- Inspections, evaluations, safety risk management, accident and incident information gathering and reporting services, and support for NAS procedures and changes which affect operations and special activities with the NAS.
- Standardized administrative support services.
- Financial, material, procurement, and logistical support services.
- Integrated planning, requirements management and program implementation management support services.

Management Services (AJG): The Management Services organization provides leadership and guidance to ATO in creating and maintaining a diverse, productive, professional workplace that enhances all ATO operations. The Management Services organization develops diversity and inclusion strategies and serves as ATO's center of expertise for resources, training, knowledge, and best practices for all diversity and inclusion efforts.

Management Services supports DOT's Strategic Plan's Organizational Excellence: Financial Performance goals. We recruit, develop, and retain a diverse and collaborative workforce by providing an all-encompassing career progression plan and leadership development program along with personnel and organizational policies that meet the needs of our highly skilled workforce. We ensure performance stays on track by providing the framework to integrate ATO's plans, programs, and activities. We work with aviation stakeholders to develop strategies for implementing solutions and to continue coordination with FAA offices.

Program Management (AJM): The **Program Management Organization (PMO)** provides full-life cycle program management capability across all of ATO from initial definition, through design, development, and effective deployment of both NAS sustainment and NextGen modernization systems.

The PMO was created after a comprehensive look at whether the agency was positioned strategically for success as we implement NextGen. The study, known as Foundation for Success, examined how our internal structures and processes could be improved to support NextGen. It was determined that better collaboration across lines of business would help us advance our initiatives more seamlessly and effectively.

Why Do We Want / Need To Fund The Program At The Requested Level?

ATO operates the most complex and technically advanced air traffic control system in the world. In FY 2017, an operating budget of $7,539,785,000 is required to sustain and improve effective and efficient air traffic control throughout U.S. airspace. The funding being requested will enable ATO, train our highly-skilled workforce, provide information and updates to the flying public to ensure safe air travel, maintain critical infrastructure necessary to operate the National Airspace System (NAS), provide full lifecycle management of systems entering the NAS, review and update navigational information to promote more efficient air transportation, and effectively control air traffic which is a major contributor to our national economy.

While the system is already exceedingly safe, ATO is making it safer by moving to a proactive safety culture in which every individual in ATO is committed to assessing and mitigating risks. While safety is paramount, we are also taking steps to enable growth and changes in aviation.

What Benefits will be provided to the American Public through this request?

ATO sets annual performance goals in safety, economic competitiveness, finance, international leadership, and organizational excellence. In **safety**, we track the commercial fatal accident rate, general aviation fatal accidents, rate of runway incursions, and operational errors. For **economic competitiveness**, we track average daily airport capacity, on-time arrivals, and adjusted operational availability. In the area of **finance**, we measure program performance using schedule and budget metrics. In **international leadership**, we synchronize Next Generation Air Transportation System (NextGen) systems and technologies with international standard setting organizations. For **organizational excellence**, we measure the number of air traffic controllers on-board as well as new hires.

Over the past 10 years, ATO has made extensive progress in all areas. The safety of American aviation is unparalleled. Since 2003, we have coordinated more than 135 million successful flights on commercial aircraft, transporting over 7 billion passengers safely to their destinations. This outstanding record is attributable to our efforts at reducing fatal accident rates, deploying systems and procedures to reduce serious runway incursions, and conducting training programs aimed at reducing operational errors.

Budget Summary

Air Traffic Organization (ATO)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	5,316,511	5,406,925	5,446,708	39,783
Program Costs	2,080,143	2,100,009	2,093,077	-6,932
Total	**$7,396,654**	**$7,506,934**	**$7,539,785**	**$32,851**
FTE	**29,411**	**29,606**	**29,603**	**-3**

The request of $7,539,785,000 and 29,783 FTP / 29,603 FTE allows FAA to maintain our position as the global leader in delivering the world's safest, most secure air traffic services. This request provides an adjustment to base of $17,572,000 for the annualized cost of the FY 2016 pay increase, $64,884,000 for the 2017 pay raise, -$42,135,000 for two less compensable days and $27,409,000 for Transition to Operations and Maintenance (TOM) costs. Included in the request is a change of $323,000 for Working Capital Fund adjustments; -$6,500,000 for Lean Maintenance Cost Savings; -$30,982,000 for Administrative Efficiencies; $2,818,000 in discretionary adjustments for program increase requests; and -$538,142 for base transfer adjustments.

Funding details for ATO's seven service units:

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Air Traffic Services (AJT)	3,930,299	4,003,800	4,031,947	28,147
Technical Operations (AJW)	1,594,442	1,632,880	1,639,736	6,856
System Operations (AJR)	299,610	316,561	317,224	663
Safety and Technical Training (AJI)	308,106	314,144	314,762	618
Mission Support Services (AJV)	281,708	290,435	291,642	1,207
Management Services (AJG)	302,646	217,871	188,076	-29,795
Program Management (AJM)	679,843	731,243	756,398	25,155
Total	**$7,396,654**	**$7,506,934**	**$7,539,785**	**$32,851**

Discretionary Adjustments:

Program	Service Unit	Amount
Lean Maintenance and Revalidation Program	AJW	2,818
Total Discretionary Adjustments		**$2,818**

Budget Summary (cont.)

Air Traffic Organization (ATO)
($000)

Transition to Operations and Maintenance:

Program	Service Unit	Amount
G05C.01-01, G05C.01-04 System Wide Information Management (SWIM)	AJM	10,929
A03.05-01 Integrated Display System – Replacement (IDSR)	AJM	4,271
G02S.01-01, G02S.03-01 Surveillance and Broadcast Services (SBS)	AJM	3,936
G02A.01-03/-06 Time Based Flow Management (TBFM) Work Package (WP) 2/3	AJM	1,951
G01A.01-01 ERAM FUSE – NextGen ABRR/PDRR/ERAM SWIM interface (Application Sustainment License)	AJM	2,423
A04.01-01Terminal Automation Modernization/Replacement (TAMR) Phase 1 G4 Technology Refresh (G4TR)	AJM	946
S11.01-02 Runway Status Lights (RWSL)	AJW	1,418
F31.01-01Mobile Assets Management Program (MAMP)	AJW	817
F24.01-02 Facility Security Risk Management (FSRM)	AJW	718
Total Transition to Operations and Maintenance		**$27,409**

Detailed Justification for the - Vice President Air Traffic Services, AJT

What Is The Request And What Funds Are Currently Spent on the Program?

**FY 2017 – Air Traffic Services – Budget Request
($000)**

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	3,710,199	3,774,333	3,802,480	28,147
Program Costs	220,100	229,467	229,467	-
Total	**$3,930,299**	**$4,003,800**	**$4,031,947**	**$28,147**
FTE	**19,107**	**18,849**	**18,849**	**-**

The FY 2017 budget request for Air Traffic Services is $4,031,947,000 and 18,975 FTP / 18,849 FTE. It provides for $12,266,228 for the annualized cost of the FY 2016 pay increase, $45,292,622 for FY 2017 pay raise, and -$29,412,561 for two less compensable days in FY 2017.

Air Traffic Services provides ATC operations at 567 service delivery points in the U.S., Puerto Rico, and Guam. Air Traffic Services provides its owners, customers, and system operators the highest degree of safety and service in the most efficient manner.

Air Traffic Services is unique in that it is not redundant or duplicative of any other Federal, state, local, or private effort. There is no overlap between FAA's management of the NAS and any other entity. While other entities provide air traffic control services (e.g., Department of Defense and Contract Towers), they do so only under FAA's authority and oversight. The responsibility to operate all air traffic activity within the NAS is carried on through-out the ATO, with Air Traffic Services managing airport and arrival/departure operations near the airport and en-route traffic between airports.

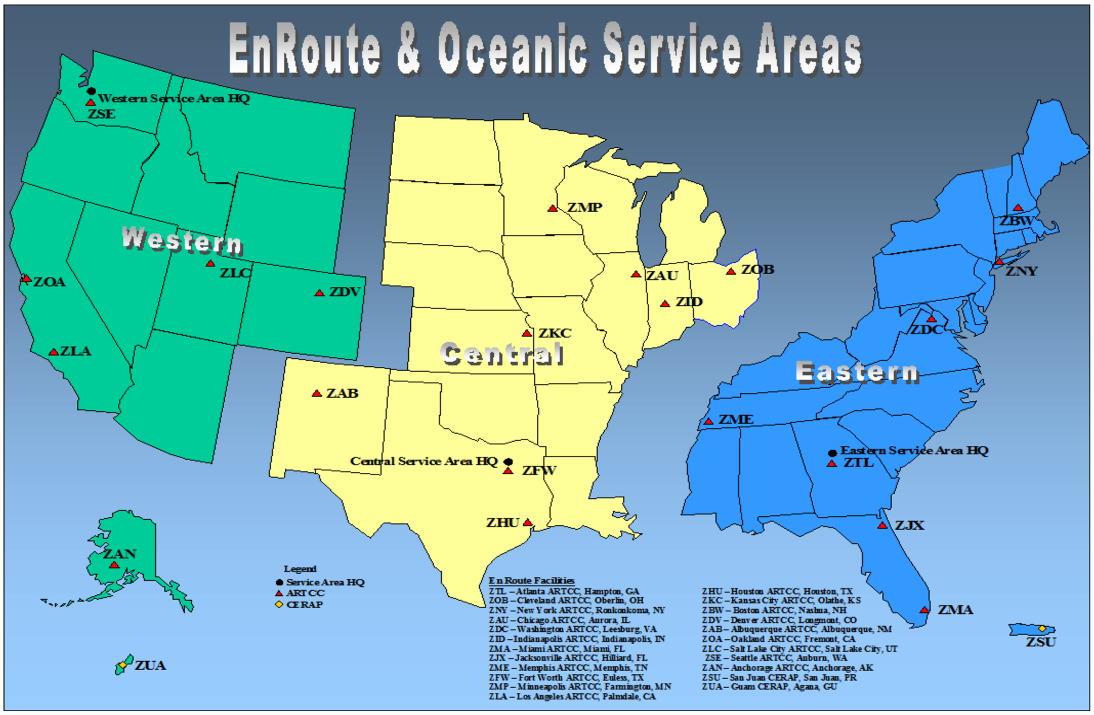
What is this Program and Why is it Necessary?

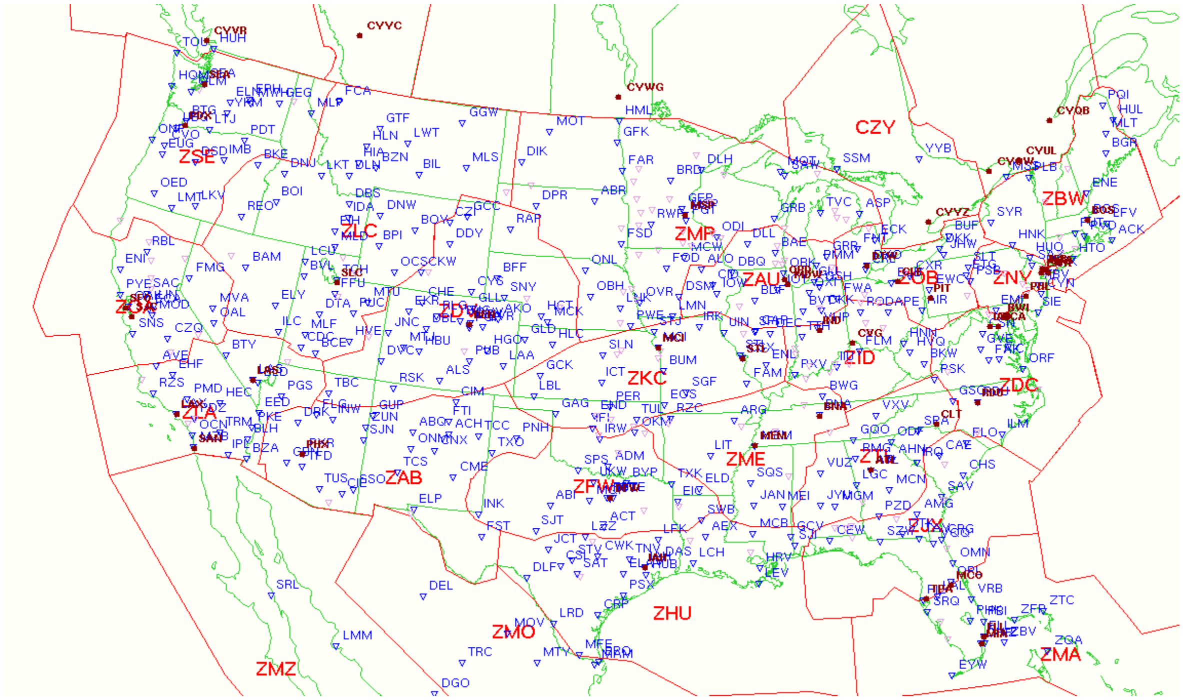
FAA's ATO handles 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. This activity is at the core of the U.S. aviation industry which contributes 5.4 percent of the total U.S. economy. The ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future. Air Traffic Services provides air traffic control operations from 21 en-route, 543 terminal, and four Combined Control facilities in the U.S., Puerto Rico, and Guam. Air Traffic Services also controls more than 59 million square miles of airspace over the continental U.S. and the Atlantic and Pacific Oceans including the South Pacific, to the Northern Polar Routes, the North Atlantic, the Caribbean, and the Gulf of Mexico. Every day we ensure thousands of positively controlled aircraft, en route from one terminal area to another, are directed to the safest, most efficient path onto their destinations.

The en-route domain provides service by controllers at 21 air route traffic control centers (ARTCCs) and two combined control facilities, which interface with more than 18 air navigation service providers. Terminal air traffic control (ATC) services include both airport surface operations and terminal area operations. Airport surface operations are conducted by controllers at 263 federal and 252 contract towers located at the Nation's airports. Terminal area operations are conducted by controllers at 161 TRACON facilities, which routinely handle aircraft within 40 miles of an airport.

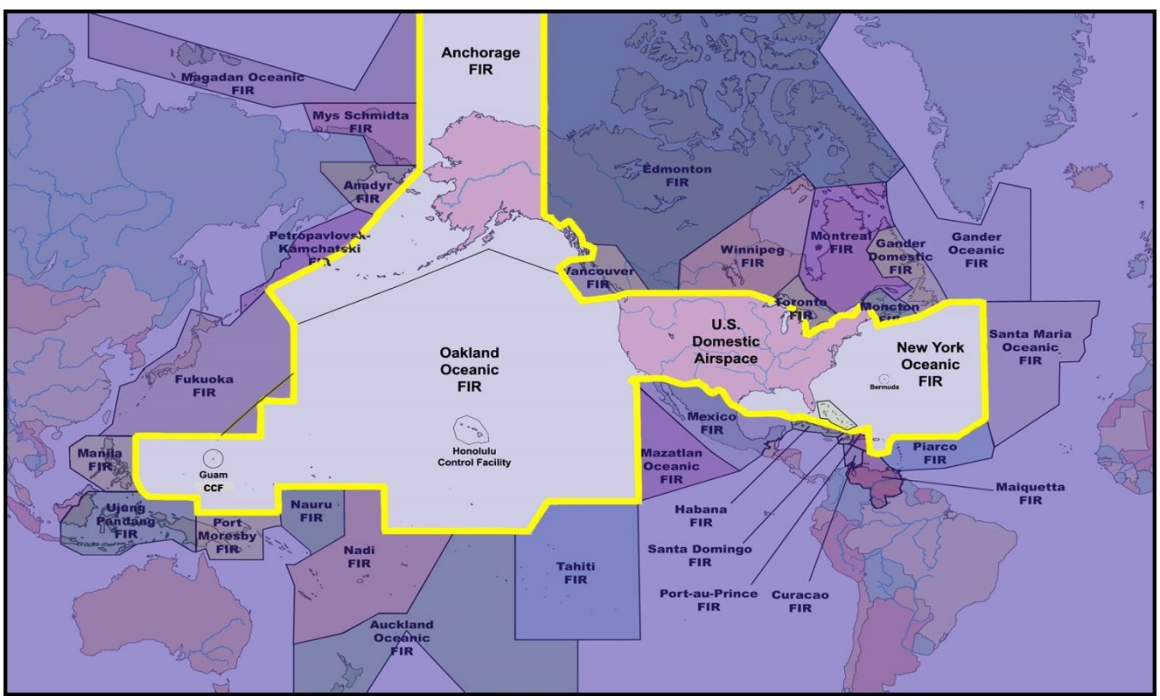
The Contract Weather Observation Program provides quality weather monitoring, augmentation, and backup of automated weather systems (Automated Surface Observing System and Automated Weather Observation System).

Air Traffic Services is divided into three geographical service areas (Eastern, Central, and Western) to better manage the delivery of ATC services. The primary function of each service area is to oversee ATC operations within its geographical area and to ensure quality standards established for Safety, Capacity, and Organizational Excellence are met. The first chart below shows where the service delivery points are for en route (21 ARTCCs and two combined control facilities). The second chart depicts the location of ATO's air traffic control towers and en-route center airspace.





In addition to domestic air traffic control, Air Traffic Services also provides control services outside of the contiguous U.S. as shown in the chart below.



By the end of FY 2016, planned accomplishments for Air Traffic Services include:

Air Traffic Services	▪ Develop superior performance standards through action plans made at the local facility level. Maintaining security standards through the local safety council's efforts, AJT will monitor and address identified safety issues in a timely manner. ▪ Continue efforts to ensure global harmonization of service improvements through collaboration with international and industry service providers by active participation and leadership in regional ICAO and inter-organizational workgroups and decision making processes. ▪ Use the cross-organizational Airport Obstructions Standards Committee (AOSC), develop recommended standards and action plans for runway procedures and other initiatives identified by the AOSC Steering Committee while maintaining an optimum balance among safety, capacity, and efficiency considerations. ▪ Continue efforts to improve the ATO's Air Traffic Services' (Terminal and En Route) SMS for the delivery of safe air traffic through participation in conducting compliance assessments at service area facilities, on-going participation of internal audits, and by conducting analysis of safety data for the purpose of proposing solutions to major safety risk concerns in the Terminal and En Route environments. ▪ Continue to conduct research to improve safety and increase throughput using wake turbulence monitoring, operational procedures, and controller tools.

Why Do We Want/Need To Fund The Program At The Requested Level?

ATO operates the most complex and technically advanced air traffic control system in the world. In FY 2017, an operating budget of $4,029,945,915 is required to sustain and improve effective and efficient air traffic control throughout U.S. airspace. The funding being requested will enable ATO, train our highly-skilled workforce, provide information and updates to the flying public to ensure safe air travel, maintain critical infrastructure necessary to operate the National Airspace System (NAS), provide full lifecycle management of systems entering the NAS, review and update navigational information to promote more efficient air transportation, and effectively control air traffic which is a major contributor to our national economy.

FY 2017 funding levels will support 19,445 FTPs in the Air Traffic Services unit whose primary function is to ensure the safe and efficient flow of ATC services throughout the NAS. In FY 2017, we will continue to increase safety efforts as well as increase capacity and efficiency of the NAS. We will continue to support achieving an average daily airport capacity for the Nation's Core Airports during reportable hours of 59,122 arrivals and departures per day in FY 2017 and a NAS on-time arrival rate of 88.0 percent at the Nation's Core Airports. In addition, we will continue efforts to decrease the number of operational errors in the terminal and en-route environments.

In support of DOT's **Safety and Economic Competitiveness** Strategic Plan goals key outcomes expected to be achieved in the budget year with the requested resources:

Safety:

- Support the improvements needed to decrease the rate of commercial and general aviation fatalities, as well as improvements to reduce runway incursions.
- Support the reduction of 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 (NAS) by developing a system that integrates remotely retrievable radar and other

NAS data feeds to provide a common platform to detect and report suspected losses of separation in the En Route, Terminal, and surface environments by the end of FY 2018.
- Support the design, development, and implementation of an improved runway incursion analysis capability.
- Provide operational support to determine root causal factors of pilot deviations and operational errors.

Economic Competitiveness:

- Implement enhancements (some requiring new technology insertion) to air traffic control aircraft wake hazard mitigation procedures that will allow more airport runway and air corridor throughput capacity while at the same time maintain the current level of flight safety. The enhancements to the wake mitigation procedures will improve arrival and departure slot usage per airport, directly increasing the airport throughput capacity.
- Provide the oversight, management, and support necessary to enable safe increases in capacity and efficiency through changes in airspace, improved procedures, and insertion of new technology into the operation. This includes providing complete analysis/report of NextGen arrival procedures initiatives and establishing a more effective separation standard for Instrument Flight Rule (IFR) operations between the final approach fix and runway threshold
- Support performance measure to maximize economic returns on transportation policies and investments through its support to achieve FAA's annual targets for average daily airport capacity at the Nation's Core Airports and adjusted operational availability.
- Support performance measure to be a competitive air transportation system responsive to consumers through its support to achieve FAA's annual targets for annual service volume and NAS on time arrivals.
- Support performance measure of U.S. transportation interests advanced in targeted markets around the world through its support to achieve FAA's annual targets for NextGen technologies.

Air Traffic Services also supports the FAA Mission and U.S. Transportation interests in advancing aviation in the U.S. and beyond. One of the activities we will assist in is to ensure harmonization of service improvements through collaboration with international and industry service providers by active participation and leadership in regional International Civil Aviation Organization (ICAO) and other inter-organizational workgroups.

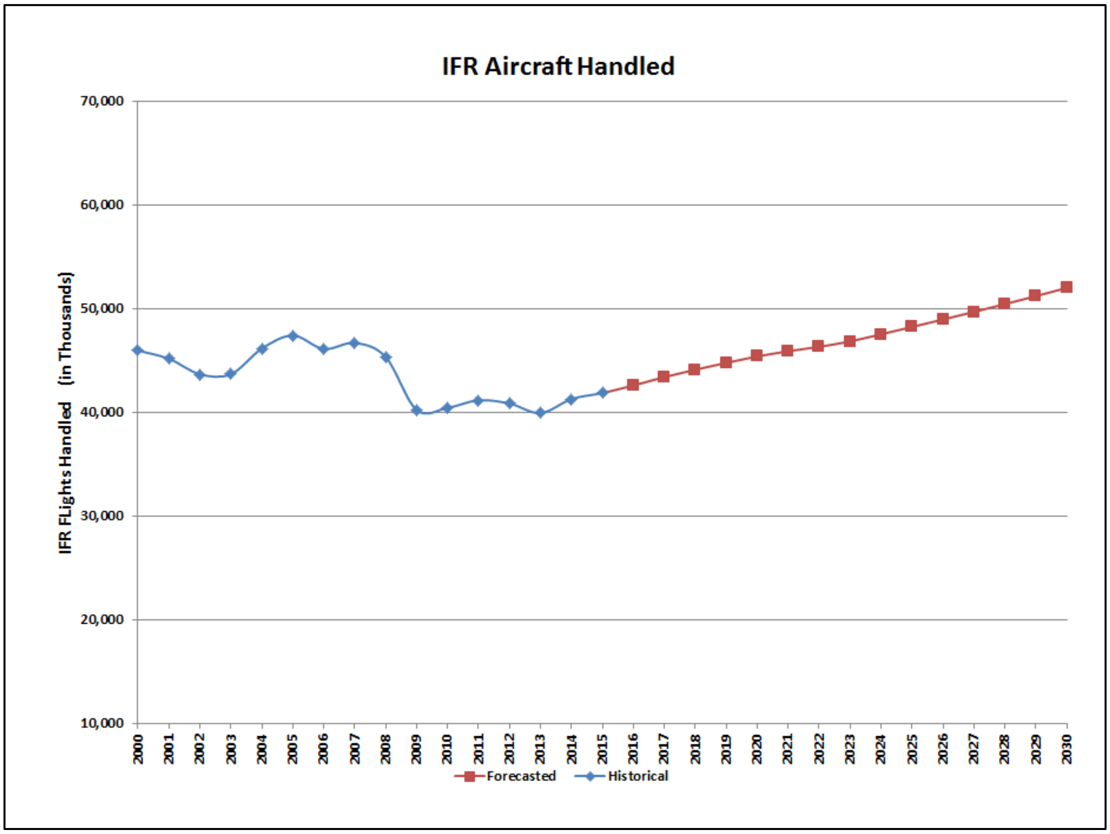
By the end of FY 2017 anticipated accomplishments for Air traffic Services include:

Air Traffic Services	▪ Continue efforts to improve the ATO's Air Traffic Services' (Terminal and En Route) SMS for the delivery of safe air traffic through participation in conducting compliance assessments at service area facilities, on-going participation of internal audits, and by conducting analysis of safety data for the purpose of proposing solutions to major safety risk concerns in the terminal and En Route environments. ▪ Continue efforts to ensure global harmonization of service improvements through collaboration with international and industry service providers by active participation and leadership in regional ICAO and inter-organizational workgroups and decision making processes. ▪ Continue to conduct research to improve safety and increase throughput using wake turbulence monitoring, operational procedures, and controller tools. ▪ Ensure terminal facilities can maximize airspace design for arrivals and departures by supporting a study to assess the viability of reducing the separation minima from obstructions including assessing any reductions of separation minima for obstruction and terrain that is based upon new radar capabilities or NextGen technologies for terminal approach controls including validation of analyses for operations near obstructions and near terrain.

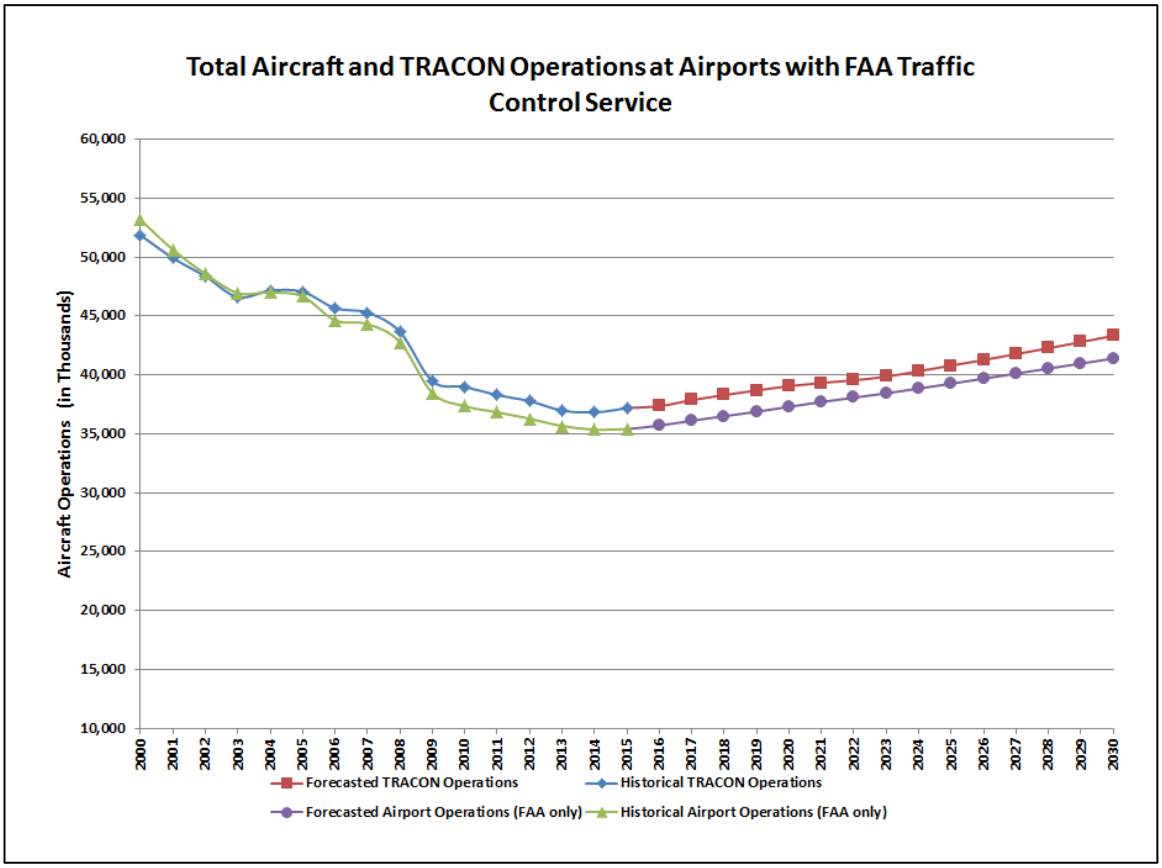
What Benefits will be provided to the American Public through this request?

The ATC system benefits the American public by preventing collisions between aircraft operating in the system, by providing an organized and expeditious flow of air traffic, and by providing support for National Security and Homeland Defense.

The chart below depicts the number of Instrument Flight Rules (IFR) flights handled. The number of IFR flights handled is calculated by multiplying the number of IFR departures (an en-route IFR flight which originates in the center's area and enters that center's airspace) by two, then adding the number of en route IFR flyovers (an IFR flight that originates outside the center's area and passes through the area without landing).



The chart below shows the total aircraft operations at airports with FAA traffic control services.



We have an important support role for initiatives related to the measurement and analysis of safety performance; global interoperability; reduction in transportation-related injuries; fatalities; and economic competitiveness. Air Traffic Services' efforts support an air transportation system responsive to consumer needs and helps maintain a well-trained controller workforce.

The Air Traffic Services unit is effective in achieving its annual performance goal for NAS on-time arrival and average daily airport capacity, which are tracked at the Nation's Core Airports and seven metropolitan areas. The terminal and en route domains have specific long-term performance goals, including "reducing the commercial air carrier and general aviation fatal accident rates;", "increase reliability/on-time performance of scheduled carriers" and "increase capacity for the Nation's Core Airports to meet projected demand/reduce congestion" (which are FAA goals included in the DOT Strategic Plan). We have also achieved the annual performance goals for runway incursions. This goal is tracked at all airports for which Air Traffic Services is responsible.

Air Traffic Services Scope of Operations

Number of Flights Handled Annually	43,550
Number of Air Traffic Controllers	102,877
Number of Facilities Operated	567
Amount of Airspace	5 Million Square Miles
Amount of Space Over Water	24 Million Square Miles

Detailed Justification for the – Vice President Technical Operations, AJW

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Technical Operations Services – Budget Request
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	1,045,899	1,063,979	1,071,564	7,585
Program Costs	548,543	568,901	568,172	-729
Total	**$1,594,442**	**$1,632,880**	**$1,639,736**	**$6,856**
FTE	**7,762**	**7,657**	**7,655**	**-2**

The FY 2017 budget request for Technical Operations Services is $1,639,735,498 and 7,802 FTP / 7,655 FTE. It provides for $3,457,830 for the annualized cost of the FY 2016 pay increase, $12,767,917 for the FY 2017 pay raise, $2,953,000 for the Transition to Operations and Maintenance (TOM), and -$8,291,353 for two less compensable days in FY 2017. The request also includes $2,818,000 for discretionary increases and -$6,500,000 in Lean Maintenance Savings. Also reflected in the budget is -$92,000 for 1FTP/1FTE Hazardous Materials Safety base transfer and -$257,142 for 1FTP/1FTE Technical Operations Services (AJW-17) base transfer.

ATO provides Air Traffic Control services in the Continental US, Alaska, and a significant portion of the Atlantic, Pacific and Caribbean airspace. The ATO operates out of 753 staffed locations (Towers, Centers, Automated Flight Service Centers (AFSS), and System Support Centers) and owns and operates over 67,000 pieces of equipment which make up the NAS.

Technical Operations supports the delivery of safe and efficient flight services to customers through responsive and cost effective maintenance of National Airspace System facilities, systems, and equipment, and by providing operational oversight of leased services.

What is this Program and Why is it Necessary?

FAA's ATO provides air traffic services for the Nation and is fully committed to the agency's mission. We handle 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year; a vital part of the Nation's economy. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.3 trillion in total economic activity, supporting 5.4 percent of U.S. Gross Domestic Product. Earning over $394 billion a year, 10 million people are employed in aviation-related fields.

ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future.

The NAS is composed of a mix of hardware and software systems that enable controllers to monitor and communicate with pilots and other ATC facilities. NAS system capabilities include automation, communication, surveillance and navigation. Failure at any point in the system can cause capacity reductions and potentially compromise safety. Reductions in capacity cause delays with costs to users and the flying public. Technical Operations ensures that terminal and en route controllers have all critical parts of the NAS infrastructure available for the safe and efficient delivery of air traffic services.

Technical Operations - NAS Systems and Facilities			
Staffed/Non Staffed Facilities		**NAS Equipment and Services**	
		Automation	2,449
		Communications	18,925
Towers	649	Infrastructure	23,959
Centers	23	Mission Support	3,497
AFSS	16	Navigation	13,630
Other Staffed Facilities	65	Surveillance	2,325
Non-staffed Facilities	12,450	Weather	2,344
Total – Facilities	**13,203**	**NAS Systems/Services**	**67,129**

The mission of the Technical Operations Service Unit is to:

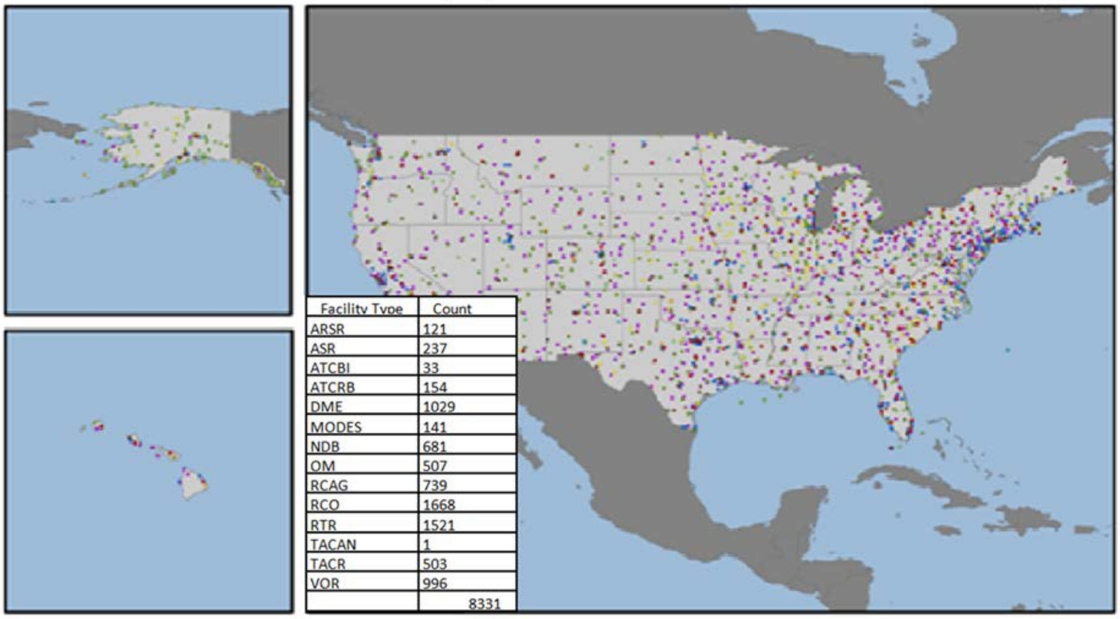
- Ensure efficient delivery of all NAS services for all stakeholders;
- Increase NAS capacity for all users through changes in technology;
- Maintain optimal NAS services for all users by strategically investing in the current infrastructure and providing operational oversight of leased NAS services;
- Improve situational awareness for pilots, controllers and airfield operators by providing them with real-time information concerning potential conflicts and offering possible resolutions; and
- Provide a safe and healthful workplace for all FAA employees through an active OSHA program.

Technical Operations supports the delivery of safe and efficient flight services to customers through responsive and cost effective maintenance of NAS facilities, systems, and equipment, and by providing operational oversight of leased services. The work consists of:

- NAS system design, development, acquisition, installation, maintenance, restoration, modification, certification and oversight of vendor supplied NAS services and vendor maintenance programs;
- Flight Inspection to support restorations and periodic inspection of NAVAIDs and the validation of instrument flight procedures;
- Facilities maintenance; and
- Engineering and assignment of aeronautical frequency spectrum.

Our core work is performed by the System Support Centers, Flight Inspection Field Offices, and Technical Operations Control Centers. These professionals focus daily on optimizing NAS performance through prioritization of response based on factors such as importance of the airport or ATC facility that is directly or indirectly affected by the equipment or service outage. This core work includes certification, maintenance, modifications, and technical documentation.

Aviation Equipment Across the NAS



Facility Type	Count
ARSR	121
ASR	237
ATCBI	33
ATCRB	154
DME	1029
MODES	141
NDB	681
OM	507
RCAG	739
RCO	1668
RTR	1521
TACAN	1
TACR	503
VOR	996
	8331

These graphics represent 8,331 of 70,701 facilities and equipment maintained by the FAA. Produced by AJW-1B February 2016

Why Do We Want / Need To Fund The Program At The Requested Level?

Without system specialists and management teams working to complete preventive maintenance and repair equipment, unscheduled outages can result in delays in the system, negatively impacting the flying public.

Technical Operations manages its operations by measuring performance of the NAS based on what systems or services are available for air traffic control operations (Adjusted Operational Availability). This metric directly impacts FAA's airport capacity metric (Average Daily Airport Capacity), as well as our safety reduction goals (Commercial and General Aviation Fatal Accident Rates).

Technical Operations Flight Inspection provides another vital link in the delivery of air traffic control services. Technical Operations employees conduct airborne inspection of electronic signals from ground-based NAVAIDS to support aircraft departure, en route, and arrival procedures. This group evaluates flight procedures for accuracy, human factors fly-ability, and obstacle clearance. Without this "check," the NAS would not be as safe as it is today.

Technical Operations manages and protects all civil aviation radio frequencies used by NAS communication, navigation, and surveillance systems. We resolve Radio Frequency Interference (RFI) that disrupt NAS operations and promote U.S. radio frequency spectrum positions and initiatives in the International Telecommunications Union Radio communication study groups and related World Radio Communication Conference activities. The management of radio frequency spectrum resources is vital to efficient operation of the NAS.

Funding the FY 2017 request at this level will allow Technical Operations to continue to maintain NAS availability and system integrity and to achieve these initiatives:

Technical Operations Services	▪ Deploy runway status lights at Airport Movement Area Safety System (AMASS) and Airport Surface Detection Equipment – Model X (ASDE-X) airports. ▪ Continue development and implementation of Technical Operations Control Centers to provide operational improvements such as improved response times, reduced service caused delays, reduced impact of NAS infrastructure anomalies, and reduced NAS service outage occurrences and durations. ▪ Develop and manage an ATC Facilities Strategic Sustainment Plan that maps both future infrastructure and future sustainment to right size the NAS. ▪ Provide continuous NAS information to external aviation partners by monitoring, restoring, and directing restoration of the systems and networks providing the information. ▪ Sustain operational availability of all facilities at 99 percent by sustaining power systems; evaluating system operations; and implementing solutions to increase operational readiness. In addition, complete funded activities of preventive maintenance, equipment modifications, service certifications, and restoration activities to include flight inspection and oversight of leased services. ▪ Improve incident detection within the NAS infrastructure environment and improve cyber incident response. ▪ 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. ▪ Reduce the general aviation fatal accident rate to no more than 1 fatal accident per 100,000 flight hours by 2018. ▪ Sustain adjusted operational availability of 99.7 percent for the reportable facilities and services that support the Nation's Core Airports. ▪ Achieve zero cyber-security events that disable or significantly degrade FAA services. •

Total requested Discretionary Increase Requests:

Programs	**Amount**	**FTP**	**FTE**
Lean Maintenance and Revalidation Program	2,818,000	-	-
Total	**$2,818,000**	**-**	**-**

Lean Maintenance and Revalidation Program: The Lean Maintenance and Revalidation Program (LMRP) assess equipment in the National Airspace System (NAS) and facilitate activities for cost savings initiatives in response to the Administrator's Strategic Initiative to (#2). The funding changes are driven by a need for a permanent program staff as well as engineering support to analyze the current NAS infrastructure, purchase equipment, and ultimately, reduce maintenance costs.

Total requested Transition to Operations and Maintenance (TOM):

Programs	Amount	FTP	FTE
S11.01-02 Runway Status Lights (RWSL)	1,418,000	-	-
F31.01-01Mobile Assets Management Program (MAMP)	817,000	-	-
F24.01-02 Facility Security Risk Management (FSRM)	718,000	-	-
Total	**$2,953,000**	**-**	**-**

S11.01-02 Runway Status Lights (RWSL) - RWSL integrates airport 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 a runway. This system's automation and integrated lights provides a traffic light system similar to what you would find on city streets for the taxiways and runways on busy airports. This is a new capability. Six locations: Las Vegas (LAS), St. Paul (MSP), Cleveland (CLT), Ft. Lauderdale (FLL), Detroit (DTW), and New York (LGA) were installed and had operational readiness in FY 2015. This request totals $1,418,000:

- $1,000,000 (Second Level Maintenance) for 24/7 contract support of the RWSL controlling automation hardware and software. This includes contract engineers to provide direct operational support via telephone technical assistance and/or on-site restoration efforts to resolve problems with the commissioned facilities. Their support also includes: design of modifications and performance of system optimization to improve the operational performance of the equipment, verification that proposed software changes made by the prime contractor do not impact the operational capabilities of the system, and development of test plans and procedures to conduct system level testing of the performance of the software upgrades.
- $93,646 (Integrated Logistics Support) for replacement light bulbs, light fixtures, and spares.
- $324,338 (Physical Infrastructure Support) for increased power costs.

F31.01-01 Mobile Assets Management Program (MAMP) - MAMP provides for the continuity, restoration, or augmentation of NAS operations at FAA operational facilities. Many facilities that make up the NAS have mobile varieties as well, i.e. mobile engine generator, mobile RADAR and mobile communications outlet. The deployment of these mobile assets provide continued availability of air traffic control services and navigation while the permanent asset is out of service due to disaster or long term maintenance. For example, a mobile ATCT was deployed at Napa, CA, after an earthquake at that location put the ATCT out of commission. It will remain in service until the permanent ATCT is repaired. Also, sometimes mobile ATCT's are deployed for one time increases in air traffic for special events, such as, golf tournaments, air shows, or auto races. This program provides for a central location for storage, maintenance, and deployment for mobile assets. In FY 2015, one Deployable Air Traffic Control Facility (DATCF) was deployed and made available for service in FY 2015, which will require funds for operations and maintenance in FY 2017. This request totals $817,000:

- $629,495 (1st Level Engineering/Maintenance) for Corrective Maintenance contract support for repairs made on site, as well as, tune ups and preventative checkups of hardware. This includes associated travel, transportation, and supplies.
- $20,000 (2nd Level Engineering) for contract support for Software Maintenance and Integration Support.
- $7,585 (Recurring Training) training on the varied mobile assets and systems for the Air Transportation System Specialists.
- $4,500 (Integrated Logistics Support) for supplies, spares, etc.
- $155,000 (Physical Infrastructure Support) for the facility rent and upkeep to store the mobile assets until needed.

F24.01-02 Facility Security Risk Management (FSRM) - FSRM program implements standardized facility protective measures at all FAA staffed facilities. These measures include: personnel access control (via card readers, fencing, gates, and security guards), surveillance (cameras), vehicle access control (barriers), visibility enhancements (lighting), and x-ray machines. The program participates in the construction of facilities that secure FAA personnel and assets, such as, guard houses and facility retrofitting to protect against blast (explosive attacks). The funding requested will provide for the ongoing operation and maintenance of the physical infrastructure that supports the access control security systems purchased and placed in service in FY 2015. There were 87 FSRM Access Control Security Systems installed in FY 2015.

- $718,000 (Physical Infrastructure Support) for contract maintenance of card readers, cameras,x-ray machines, and vehicle barriers.

What Benefits will be provided to the American Public through this request?

The NAS is an inherently complex system, with multiple levels of redundancy to assure ongoing availability of key services. Technical Operations ensures thousands of systems, facilities, and pieces of equipment are operationally ready to manage our Nation's air traffic control system. The ability of the NAS to continually provide operational availability and awareness to controllers and pilots is crucial to both safety and capacity.

The goal for Adjusted Operational Availability is expected to remain at 99.7 percent. ATO analyzes various performance data to increase or maintain the targeted level of performance in order to provide appropriate safety and capacity outcomes to system users.

The target performance level is met by adherence to FAA maintenance policies and procedures for NAS monitoring, control, maintenance, and restoration. This strict adherence optimizes service availability for the Nation's Core Airports.

Complementing the safety of air travelers is the security of the FAA facilities and employees whose job it is to ensure the safe and efficient control of flight operations. The provisioning of high quality, professional guard services at staffed FAA facilities ensures that the work of controlling flight operations can proceed without interruption.

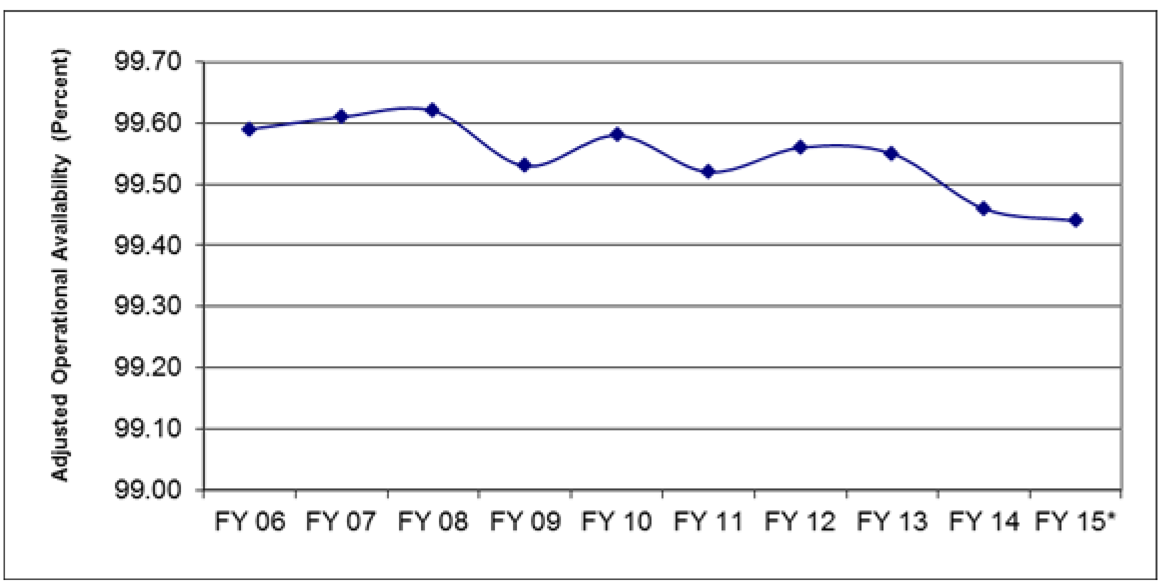


Figure 7: Adjusted Operational Availability of NAS Capabilities
Note: *FY 2015 data thru 09/30/15

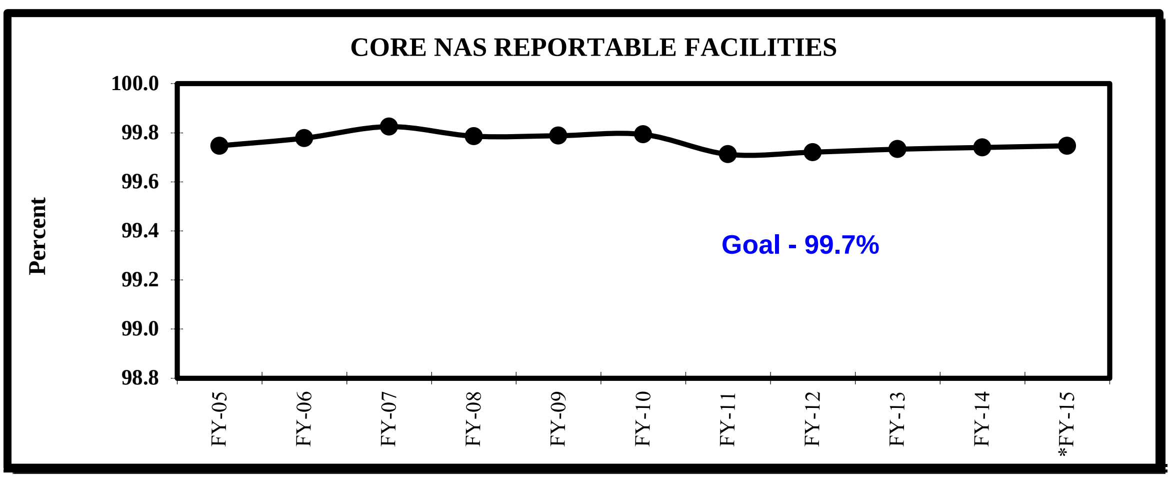
Systems Maintenance Field Maintenance Performance Indicators

Fiscal Year	Number of Facilities**	Adjusted Operational Availability	Reliability
2005	22,792	99.62%	99.90%
2006	22,860	99.59%	99.85%
2007	22,637	99.62%	99.84%
2008	22,611	99.62%	99.84%
2009	22,804	99.53%	99.85%
2010	22,419	99.58%	99.85%
2011	22,451	99.52%	99.85%
2012	22,022	99.57%	99.86%
2013	26,624	99.55%	99.85%
2014	26,554	99.46%	99.84%
2015	26,450	99.44%	99.85%

*FY 2015 data thru 09/30/15
**Operational facilities deemed reportable in FAA Order 6040.15, "National Airspace Performance Reporting System." (The grouping in NASPAS for "NAS Reportable Facilities" was updated in October 2013)

Adjusted Availability for Nation's Core Airports
(Reportable Facilities)
FY 2015 Goal (Maintain adjusted availability of Nation's Core Airports NAS reportable facilities at 99.70%)

Target: 99.70%
FYTD: 99.75%
Aug 15:........99.81%
Sep 15:........99.85%
Sep 14:........99.66%



For the month of September 2015, we are above the goal for adjusted operational availability. Compared to August 2015, the adjusted operational availability for the Core Airports (reportable facilities) increased by 0.042%. Compared to September 2014, the adjusted operational availability for the Core Airports (reportable facilities) increased by 0.190 %.

Note: Data Source – NASPAS ***(The NASPAS database is validated continuously)***
Fiscal Year 15 through September 30, 2015

Detailed Justification for the - Vice President System Operations, AJR

What Is The Request And What Funds Are Currently Spent on the Program?

**FY 2017 – System Operations Services – Budget Request
($000)**

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	87,499	89,012	89,675	663
Program Costs	212,111	227,549	227,549	-
Total	**$299,610**	**$316,561**	**$317,224**	**$663**
FTE	**444**	**438**	**438**	**-**

The FY 2017 budget request for System Operations Services is $317,223,794 and 457 FTP / 438 FTE. It provides for $289,279 for the annualized cost of the FY 2016 pay increase, $1,068,153 for the FY 2017 pay raise, and -$693,648 for two less compensable days in FY 2017.

Systems Operations (AJR) provides a broad range of operational services to the Air Traffic Organization (ATO). All national air traffic flow management initiatives are provided by AJR along with policy and concept development for new airport surface flow management programs. AJR is working to provide gate-to-gate strategic traffic management. We are the focal point for stakeholder interaction through formal Collaborative Decision Making venues and serve as FAA's Customer Advocate. We provide all national flight service functions and operational oversight to all National Airspace System (NAS) security issues. As overall NAS management requires exacting data exchange, we manage FAA data policy and orders. With data management we provide ATO with system performance analysis, trending and forecasting. Finally, in promoting FAA's sophisticated approach to air traffic system management we enable the global outreach to the international community on behalf of ATO, providing subject matter experts and operational insight to our global partners

What is this Program and Why is it Necessary?

FAA's ATO provides air traffic services for the Nation and is fully committed to the agency's mission. We handle 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year; a vital part of the Nation's economy. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.3 trillion in total economic activity, supporting 5.4 percent of U.S. Gross Domestic Product. Earning over $394 billion a year, 10 million people are employed in aviation-related fields.

ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future.

The System Operations Service Unit consists of several directorates that perform essential functions in the daily operation of the NAS. These functions affect all aspects of FAA Air Traffic Control (ATC) operations and our engagement with other Government agencies, airlines, and foreign Air Navigation Service Providers (ANSPs). These directorates are:

- Air Traffic Control System Command Center (ATCSCC)
- Security
- Flight Services
- Data Management
- International
- Performance Analysis

Systems Operations primary operational responsibility is managing FAA's **Air Traffic Control System Command Center (ATCSCC)**. The Command Center exercises command, control and oversight of air traffic activity within the National Airspace System (NAS). The facility, located in northern Virginia, coordinates all air traffic movement, both civil and military, in domestic and oceanic airspace. Its staff strategically manages air traffic to minimize delays and congestion, while maximizing the overall use of the NAS. System demand frequently exceeds system capacity due to weather, airport delays, special use restrictions, and security restrictions. The ATCSCC regulates the flow of air traffic to minimize delays and congestion while maximizing the overall operation of the NAS. Decisions are carried out in cooperation with airline personnel, traffic management specialists and controllers at affected facilities. The Airport Surface Efficiency Group within AJR-1 serves as a single point of responsibility, authority, and accountability for improving surface operations in coordination with industry. It provides shared situational awareness of surface movements through surveillance and data exchange. With industry, the Systems Operations Directorate defines system requirements, metrics, and interoperability standards for improved decision making of traffic flow management, and facilitates the implementation of integrated airport movement management decision support tools, standards, and processes.

The **Security Directorate** orchestrates ATO's efforts to protect the U.S. and its interests from national defense, homeland security, and law enforcement-related threats and natural hazards involving the air domain. The Security Directorate leads ATO's efforts to mitigate the impact of those threats and hazards on the safety and efficiency of the National Airspace System. System Operations Security comprises a small headquarters command and support component and Air Traffic Security Control (ATSC) watch-standing teams and operations liaisons at key air defense and homeland security nodes.

Flight Services collects and disseminates aeronautical and meteorological information and provides customized pre-flight and in-flight briefings to domestic and international General Aviation (GA) communities, military aircraft, air carriers, and federal and local law enforcement. In support of the fundamental transformation to a smaller, more efficient NAS with increased safety and user benefits, Flight Services will modernize its services and delivery methodologies and leverage technology.

The **Data Management Directorate** is responsible for four primary functional program areas that include: facilitating the NAS Data Release Board External Data and information Distribution Process, maintaining the NAS Data Warehouse, developing ATO Data and Information Sharing Policy and Standards, and administering the ATO Block Aircraft Registration Request (BARR) program. Data Management also has responsibility for managing ATO data and information assets. The Directorate's mission is to enhance information resources through strategic planning and program office support. Its staff supports development and implementation of data management standards and best practices to promote open data sharing and aligned with national policies. The Directorate provides program support to data registration, data standardization, data policy, data security and lifecycle data management. This scope includes supporting FAA programs, governmental agencies, and aviation communities of interest (COIs).

International is focused on the harmonization of international standards for ATM services. This requires extensive multilateral and bilateral consultation in international forums with global partners, civil aviation authorities, and air navigation service providers. International is also committed to leading global and regional efforts to foster air navigation solutions that result not only in operational efficiency gains for providers, but reduced fuel consumption and carbon emissions for operators and an overall decrease in civil aviation's carbon footprint. The leadership continues to be showcased in regional partnerships such as the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) and the Asia and Pacific Initiative to Reduce Emissions (ASPIRE).

The **Performance Analysis Directorate** monitors the operational performance of the NAS and is responsible for developing and coordinating FAA operational metrics. The Directorate also maintains an analytical tool, Performance Data and Reporting System (PDARS), which provides operational facilities with gate-to-gate flight and operational data. The Modernization of PDARS will provide the next generation of PDARS through the implementation of the Data, Visualization, Analysis and Report System IDVARS). This proves an enterprise solution that facilitates greater access to analysis ready processed data found in the current system. As part of its performance analysis role, the Directorate monitors airline schedules and behavior, reporting monthly on the likely impact of schedules on performance.

In addition to maintaining a high level of daily performance in FY 2016, key Systems Operations outputs include:

System Operations Services	▪ ATCSCC improvements in critical information-sharing with aviation stakeholders to more effectively manage flight diversions during severe weather events. ▪ Monitor the NAS average daily airport capacity for the Nation's Core Airports of 59,122 arrival and departures per day. ▪ Maintain an average daily airport capacity for the seven metropolitan areas of 39,484 arrivals and departures per day. ▪ Improve management of surface flow operations to increase throughput, reduce surface-related delays and decrease fuel consumption and emissions, while providing opportunities to reduce noise and improve safety. ▪ Continue to strengthen the preparedness and consequence management capabilities used to sustain NAS operations and to support disaster response air missions in the face of critical events, including natural disasters and large scale terrorist attacks. ▪ Award a new Flight Services follow-on contract. ▪ Develop policy and procedures for implantation of the President's Open Data Policy in ATO. ▪ Collaborate with international organizations to produce International Civil Aviation Organization (ICAO) and Civil Air Navigation Services Organization (CANSO) documents recommending improved operational practices and analyzing operational performance. ▪ Completed DVARS design requirements.

Why Do We Want / Need To Fund The Program At The Requested Level?

Funding the FY 2017 request at this level will allow System Operations to maintain the National Airspace System (NAS) by accomplishing the following initiatives which will continue to improve NAS efficiency, safety, and security. Key outcomes include:

System Operations Services	• Continuing to execute the real-time use of the NAS to ensure safe and efficient use of available airspace, equipment, and workforce resources through planning, directing, implementing, overseeing, and continuously regulating the flow of air traffic to minimize delays and congestion while maximizing the overall operation of the NAS throughout the United States. • Utilizing the Collaborative Trajectory Options Program giving flight operators flexibility to propose multiple trajectories or routes when weather or other factors impact air traffic flow and develop the Collaborative Decision Making (CDM) process model and share airport surface data with stakeholders. • Incorporating commercial space launches into the NAS. • Continuing to lead ATO's crisis management efforts to sustain the continuity of NAS operations and to support the National Response Framework during critical events such as catastrophic hurricanes or large scale terrorist attacks. • Working in conjunction with the PMO to continue to modernize Flight Services in order to create efficiencies through automation. • Supporting implementation of the President's Open Data Policy and the associated Executive Orders in ATO. • Executing the program for aircraft owners that blocks display of their flight information in the Aircraft Situation Display to Industry data feed.

	• Supporting ATO implementation of ICAO's Global Air Navigation Plan (GANP), the Aviation System Block Upgrade (ASBU) initiative and Global Air Safety Plan (GASP). • Supporting the Administrator's Global Leadership Initiative through participation on the International Steering Committee, as well as supporting AJR's role as the co-chair of the International Advisory Board. • Provide direct technical support and strategic guidance to support daily requirements of operational facilities that interface with foreign air navigation service providers. • Ensure harmonization of domestic U.S. air traffic operations and Next Generation Air Transportation. • System (NextGen) technologies, procedures, and standards with the global civil aviation community. • Support ATO implementation of ICAO's Global Air Navigation Plan (GANP), the Aviation System Block Upgrade (ASBU) initiative and Global Air Safety Plan (GASP). • Support ATO personnel participating in international activities, providing briefings, talking points, and logistical information. • Coordinate ATO international activities with other lines of business. • Facilitate execution of the ATO International Strategic Plan. • Provide leadership to the core business of the safe, secure, and efficient operation of the NAS as it pertains to International issues. •

What Benefits will be provided to the American Public through this request?

The flying public benefits directly by the work System Operations will perform with the dollars requested. System Operations' management of air traffic to minimize NAS delays and congestion delivers an efficient and safe mode of transportation to travelers. Coordination with law enforcement agencies protects the flying public from security threats and natural hazards. General Aviation communities benefit from the aeronautical and meteorological information that System Operations disseminates. By developing and coordinating FAA operational metrics, System Operations develops recommendations for improving NAS capacity and system efficiency to reduce delays at specific airports. The flying public also benefits from the work System Operations is doing internationally to harmonize standards for ATM services.

The ATCSCC provides strategic and tactical NAS oversight, and regulates real-time air traffic when constraints such as weather, runway closures, equipment outages, security issues or other impacting conditions affect the NAS. The ATCSCC provides a network-centric platform from which the agency manages and recovers from large-scale disaster recovery events and infrastructure outages.

The Airport Surface Efficiency Group's work to improve surface operations will lead to efficiencies that will save fuel, reduce emissions and provide a better flying experience to the public. As the industry affairs lead, the Group participates with aviation industry stakeholders in Collaborative Decision Making (CDM) forums to coordinate and improve various facets of airport surface operations.

The International Directorate will:

- Coordinate and facilitate the ATO strategic vision and supporting activities in the Europe, Africa, and Middle East regions, as well as global forums dealing with cross-regional air traffic initiatives, policies, and standards;
- Support ATO participation in CANSO Operations Standing Committee and Safety Standing Committee;
- Represent ATO at meetings of the CANSO Polity Standing Committee, Asia Pacific CEO Committee, and Latin America/Caribbean CEO Committee;
- Facilitate and participate in meetings of the ICAO Cross-Polar Working Group (CPWG) and in meetings of the ICAO Volcanic Ash Exercise Steering Group (VOLCEX);

- Represent ATO at meetings of ICAO Planning and Implementation Regional Groups (PIRGs) and of the Asia-Pacific Air Traffic Flow Management Steering Group (ATFMSG);
- Represent ATO at the annual meeting of the Asia-Pacific Initiative to Reduce Emissions (ASPIRE);
- Facilitate and participate in meetings for the Informal Pacific ATM Coordinating Group (IPACG) and represent ATO at Future Air Transportation System (FATS) working group meetings with Japan; and
- Facilitate meetings of ATO personnel with international counterparts on various topics as needed.

The Performance Analysis Directorate (AJR-G) is responsible for the FAA's Metrics Harmonization effort, which addresses terminology, methodology, and stewardship across FAA lines of business for all metrics. Its purpose is to bring order, consistency, and accuracy to metric reporting. AJR-G facilitates the modeling, measurement and analysis of airfield improvements, air traffic procedures, and other technological implementations to improve airport capacity and NAS efficiency. The directorate's Performance Data Analysis and Reporting System (PDARS) provides the FAA analysis-ready PDARS data and Gate to Gate Analysis in support of programs such as Performance Based Navigation, NextGen, Commercial Space, Security, and Safety Risk Management analysis.

Detailed Justification for the - Vice President Safety and Technical Training, AJI

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Safety and Technical Training Services – Budget Request ($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	81,416	82,823	83,441	618
Program Costs	226,690	231,321	231,321	-
Total	**$308,106**	**$314,144**	**$314,762**	**$618**
FTE	**538**	**531**	**531**	**-**

The FY 2017 budget request for Safety and Technical Training is requesting $314,762,318 and 530 FTP / 531 FTE. It provides for $269,168 for the annualized cost of the FY 2016 pay increase, $993,895 for the FY 2017 pay raise, -$645,425 for two less compensable days in FY 2017.

Safety and Technical Training is the only organization within ATO that provides technical training to controllers, technicians, and engineers. We ensure the technical competency (knowledge and skills) of the workforce, and ensure we certify enough of the right workers to meet operational needs. We develop and deliver technical training programs for a workforce of approximately 14,500 air traffic controllers, 6,000 Airway Transportation Systems Specialist (ATSS), and 1,800 engineers.

Our safety programs validate and categorize airborne and surface safety occurrences; conduct in-depth analysis of airborne and surface events to identify hazards (determine causal factors and root causes); and implement corrective actions to mitigate identified hazards. In addition, Safety and Technical Training manages policy development, improves fatigue risks through a comprehensive fatigue risk management system, and facilitates an ongoing ATO safety culture transformation that leads to improved safety performance.

What is this Program and Why is it Necessary?

FAA's ATO provides air traffic services for the Nation and is fully committed to the agency's mission. We handle 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year; a vital part of the Nation's economy. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.3 trillion in total economic activity, supporting 5.4 percent of U.S. Gross Domestic Product. Earning over $394 billion a year, 10 million people are employed in aviation-related fields.

ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future

The work of **ATO Safety and Technical Training** benefits the Department of Transportation's (DOT) goal of Safety and will assist in preventing the loss of human life, reduction in transportation-related injuries and fatalities and is the lead for two of FAA's Priority Goals – Runway Incursion Rate and Hazards Mitigation. Safety and Technical Training also supports the FAA Administrator's initiative, Risk-Based Decision Making: to build on safety management principles to proactively address emerging safety risks by using consistent, data-informed approaches to make smarter, system-level, risk-based decisions.

We identify and mitigate aircraft collision risks during the delivery of air traffic separation services. We are the focal point for auditing safety, quality assurance, and risk identification in ATO, and reporting findings to improve safety performance. Safety and Technical Training integrates the functions of data and information from investigations, evaluations, independent assessments, safety risk management, runway safety, and operational services to identify collision risks, influence their resolution, and provide information on assessments of operational and safety performance within the NAS.

Safety and Technical Training provides all technical training to controllers, technicians, and engineers. We ensure the technical competency (knowledge and skills) of the workforce, and ensure we certify enough of the right workers to meet operational needs.

We deliver state-of-the-art training solutions to meet our ever-changing employee demographics and operational requirements both today and throughout the transition to NextGen. We are undertaking major course redesign work, augmenting field training, and providing a high-level of service and customer support to our facilities.

Safety and Technical Training uses contract resources to provide a broad range of comprehensive professional, technical, and support services including, but not limited to, air transportation support, engineering services, training development and maintenance, and training delivery. Our safety programs validate and categorize airborne, surface and technical safety occurrences; conducts in-depth analysis of airborne, surface and technical events to identify hazards (determine casual factors and root causes); and implement corrective actions to mitigate identified hazards. In addition, Safety and Technical Training manages policy development, improves fatigue risks through a comprehensive fatigue risk management system, and facilitates an ongoing ATO safety culture transformation that leads to improved safety performance.

Safety and Technical Training also provides logistical support and subject matter expertise in aircraft accident litigation where allegations of negligence are made, in whole or part, involving ATO employees.

By the end of FY 2016, the accomplishments for Safety and Technical Training will include:

Safety and Technical Training Services	• Evolving our comprehensive event reporting, risk reduction and investigation policies to help us measure the effectiveness of our Safety Management System. • Using the best analytical tools, such as the Traffic Analysis Review Program (TARP), to not only measure compliance with safety standards but to also enable digital analysis of radar data throughout the NAS. These sophisticated tools enable management at all levels to identify safety issues, determine the likelihood of occurrence, target correction, and establish monitoring systems to evaluate the effectiveness of mitigations implemented. • Continuing to target efforts to significantly remove risk from the NAS with new risk analysis processes, new safety performance metrics (i.e., System Risk Event Rate (SRER), Performance Data Analysis and Reporting System (PDARS) and tools (i.e., Risk Analysis Process (RAP), Event Review Committee (ERC), Corrective Action Requests (CAR), Partnership for Safety (PFS), and Safety Analytics Tool (SAT)). • Implementing common taxonomy into two additional risk assessment processes. • Providing safety data to support facility action plan development. Enhancing the Airborne and Surface Risk Analysis Processes (RAPs) to address the strength and reliability of barriers and to redesign the Repeatability section of the RAP tools. • Developing the requirements for new RAP functionality to address the risk associated with Minimum Vectoring Altitude (MVA) Violations and Traffic Alert and Collision Avoidance (TCAS) system Resolution Advisories (RA). • Enhancing Safety Management Tracking System (SMTS), including support for Waivers and Audits and Assessments functionality. • Enhancing the ability to conduct analysis and reporting of information

	that ensures the effectiveness of Quality Assurance and Quality Control programs. • Developing and employing a service integrity risk analysis process (SI-RAP) to analyze reported problems with the air traffic system technical systems and services. • Provide Human Factors support to Safety and Training activities to increase understanding of human factors across the operation and how the inclusion of that understanding in day to day operations, can increase safety and human performance. • Attain at least 1,300 new hire air traffic controller Academy training completions.

Why Do We Want / Need To Fund The Program At The Requested Level?

Funding Safety and Technical Training programs at the requested level will provide the necessary resources to ensure risk in the delivery of air navigation services is effectively managed, operational personnel understand and participate in disclosing and addressing safety issues, air traffic facilities are properly staffed with the optimum number of qualified individuals, and personnel receive timely training directly tied to addressing safety concerns in the NAS.

Funding of Safety and Technical Training programs impact the development and implementation of NextGen. Controllers and technicians need significant training to operate and maintain NextGen systems. Safety and Technical Training are working in partnership with the NextGen program office to ensure training is an integral part of the transformation of the NAS and in the development and implementation of NextGen systems. Safety and Technical Training also completes independent safety assessments prior to NextGen systems being used in a live air traffic environment. Our application of safety risk management on the introduction of new technologies and procedures into the NAS ensures a safe transition to NextGen.

Safety and Technical Training has already undertaken measures to reduce costs through more effective contract management and will continue to work toward maximizing available resources. To fulfill our core responsibilities and deploy new technologies, processes, and policies in support of these efforts, the requested level of funding is necessary to fully realize the capabilities of a realigned organization that provides safety and technical training services for the entire ATO.

In FY 2017, key outcomes expected to be achieved with the requested resources:

Safety and Technical Training Services	• Conduct analysis and disseminate findings of Risk Analysis Events (loss of less than 66 percent required radar separation) on a quarterly basis which supports the identification of ATO system issues hazards. • Improved identification of system risk for surface safety occurrences which support the development and implementation of corrective actions to mitigate hazards associated with identified risk. This will mitigate risk associated with runway incursions (total and A&B (most serious)). • Transformation of Quality Assurance (QA) and Quality Control (QC) processes for Technical Operations by modernizing current QA and QC processes to proactively address emerging safety risk by using consistent, data-informed approaches to make smarter, system-level, risk-based decisions. Founded on safety management principles, the goal is to identify the most serious technical safety hazards, measure compliance with existing requirements, as well as assess the effectiveness of applied risk mitigations. • Fully implement and apply the service integrity risk analysis process (SI-RAP) to analyze reported problems with the air traffic system technical systems and services. • Begin deployment of Closed Runway Operation Prevention Device

	(CROPD). Research and Development of integrated safety logic and other surface-blinded applications. • Implement new RAP functionality to address the risk associated with Minimum Vectoring Altitude (MVA) Violations, Wake Turbulence and Traffic Alert and Collision Avoidance (TCAS) system Resolution Advisories (RA). • Develop new safety performance metrics and dashboards that improve our ability to ensure the effectiveness of safety mitigation strategies. • Addition of a voluntary safety reporting program for ATO technicians, to learn more about the technical risks existing within the increasingly automated NAS, and then develop plans mitigate those risks. • Enhancing National Runway Safety Plan long term initiatives and focusing on safety mitigation strategies. • Improved safety culture that promotes a non-punitive, voluntary reporting environment that encourages employees at all levels to report safety issues and concerns without fear of reprisal. • Improved litigation support to the FAA's Office of Chief Counsel, Aircraft Accident Litigation and Enforcement Divisions, by managing discovery and coordinating with the air traffic facilities for access to air traffic witnesses and the collection of evidence in property lost, personal injury, and wrongful death tort actions against the government; provides expert consultation regarding all air traffic matters. • Improved training, procedures, evaluation, analysis, testing, and certification to reduce the risk of runway incursions resulting from errors by pilots, air traffic controllers, pedestrians, vehicle operators, tug operators, and individuals conducting aircraft taxi operations. • Deploy a field level certified safety community working hand in hand with HQ on risk management. • Enhance SMS and Risk Management philosophies, processes, and tools throughout ATO. • Provide sufficient numbers of trained/qualified individuals to meet operational needs based on the controller and technician work force plans. • Improve the technical requirements for air traffic controller training to standardize training across the NAS. • Complete the integration of ATO Learning Content Management System (LCMS). • Deploy annual controller and technician recurrent training while incorporating ATO professional standards. • Develop guidance to ensure the FAA will comply with ICAO Fatigue regulation proposed to take effect in 2020. • Conduct analysis of fatigue levels at sample facilities. • Embed Human Factors in to incident and event analysis across the NAS. •

What Benefits will be provided to the American Public through this request?

Safety and Technical Training ensures the safety of the flying public. All our programs are geared toward finding risk in the NAS, then fixing it. The benefits of our programs are manifested in risk reduction. Through risk mitigation, risk management, SMS, and voluntary reporting systems, Safety and Technical Training helps FAA accomplish its commitment to the flying public to provide the safest aviation system in the world.

Safety and Technical Training continues to provide the flying public with the safest aviation system by continuing to focus on safety culture, outreach, awareness, improved procedures and infrastructure, and technology. Additionally, it ensures all technical employees in every FAA facility are educationally equipped to perform their duties in the NAS. We have become more efficient not only within our office, but our outreach activities and technological advances have also helped improve the way FAA conducts safety as a whole.

Detailed Justification for the - Vice President for Mission Support Services, AJV

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Mission Support Services – Budget Request
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	184,044	187,225	188,432	1,207
Program Costs	97,664	103,210	103,210	-
Total	**$281,708**	**$290,435**	**$291,642**	**$1,207**
FTE	**1,368**	**1,350**	**1,349**	**-1**

The FY 2017 budget request for Mission Support Services is $291,642,000 and 1,261 FTP / 1,349 FTE. It provides for $608,465 for the annualized cost of the FY 2016 pay increase, $2,246,735 for the FY 2017 pay raise, and -$1,459,006 for two less compensable days in FY 2017. It also includes -$189,000 for 1FTP/FTE Flight Standard Service base transfer.

The Mission Support Services mission is to promote the standardization of processes, efficiency, and effectiveness between Air Traffic Services, Technical Operations, and System Operations through shared services. The service unit's core work is performed at the three service center locations (Western, Eastern, and Central). Core work includes:

- Oversight and support for NAS procedures and changes which affect operations and special activities with the NAS.
- Development and dissemination of digital Aeronautical Charts and products.
- Inspections, evaluations, safety risk management, accident and incident information gathering and reporting services, and support for NAS procedures and changes which affect operations and special activities with the NAS.
- Standardized administrative support services.
- Financial, material, procurement, and logistical support services.
- Integrated planning, requirements management and program implementation management support services.

What is this Program and Why is it Necessary?

FAA's ATO provides air traffic services for the Nation and is fully committed to the agency's mission. We handle 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year; a vital part of the Nation's economy. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.3 trillion in total economic activity, supporting 5.4 percent of U.S. Gross Domestic Product. Earning over $394 billion a year, 10 million people are employed in aviation-related fields.

ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future.

Mission Support Services is comprised of: three **Service Centers** and four **Directorates.**

The **Service Centers** are located in Atlanta, Fort Worth, and Seattle and provide support to the Director of Operations in matters concerning airspace and procedures, quality assurance, equipment installation, financial management, materiel management, procurement, hiring, and training. Each service center is comprised of five groups: Administrative Services, Business Services, Planning and Requirements, Operations Support, and Quality Control. The shared services model brings people together with similar expertise, allows sharing of ideas and resources, fosters collaboration to promote standardization of processes, improves efficiency and effectiveness, and enhances communication to achieve results among service units.

The **Airspace Services Directorate** provides an important systems view that incorporates transition access/egress points available through newer technologies that are not tied to ground-based navigation aids. Airspace Services is responsible for coordinating all Airspace redesign efforts and the implementation of new Performance-Based Navigation (PBN) routes and procedures. Airspace Services is also responsible for protecting safety of air navigation and efficient utilization of navigable airspace through the obstruction evaluation processes as outlined in 14 CFR Part 77.

The **Aeronautical Information Services (AIS)** Directorate is the authoritative government source for collecting, validating, storing, maintaining, and disseminating aeronautical data for the United States and its territories. Aeronautical Information Services develops and maintains all public instrument flight procedures and airways. AIS also serves as the FAA's aeronautical charting authority for the development, publication, and dissemination of aeronautical charts and products to support aviation and to meet demand for increased capacity, efficiency, and predictability in the airspace, routes, and airports of the National Airspace System (NAS). Supports real-time aviation activities, meets air transportation's demand for increased capacity, efficiency, and predictability in the airspace, routes, and airports of the National Airspace System (NAS) while ensuring that safety factors and environmental regulations are satisfied diligently.

The **Operational Concepts, Validation, & Requirements** Directorate develops, integrates and prioritizes ATO requirements based on operational needs. Through structured service analysis, it identifies, coordinates, and interprets the end users' needs. Based on these needs and applying its operational, technical, and project management expertise, it develops operational requirements and validates new concepts. It then leads emerging capabilities through the AMS Concept and Requirements Definition and Investment Analysis phases, after which it ensures continuity of requirements through the subsequent phases of the AMS lifecycle.

The **Air Traffic Standards and Procedures** Directorate provides policy and procedural management and support to air traffic operations and serves as the primary point of contact for Terminal, En Route and Oceanic/Offshore, traffic management operations on standards and procedures issues.

By the end of FY 2016, significant accomplishments for Mission Support Services will include the following:

Mission Support Services	▪ Continue development of the Federal NOTAM system including 120 additional deployments of the NOTAM Manager to public use airports. ▪ Develop and publish 100+ Wide Area Augmentation System (WAAS) Localizer Performance with Vertical Guidance (LPV)/ Localizer Performance (LP) procedures. ▪ Complete all required modifications, revisions, and updates to Approach, Departure, Arrival and Airway Instrument Flight Procedures (IFPs) through the issuance of critical amendments, IFP Notice to Airmen (NOTAMs), completing biennial IFP periodic reviews, obstacle review and analysis of all proposed new construction, and updating/revising Aeronautical Chart Products as necessary to ensure currency and adapt the IFP infrastructure to reflect the changes occurring in the NAS. ▪ Complete all required revisions and updates on Instrument Flight Rule (IFR) and Visual Flight Rule (VFR) Aeronautical Chart Products. Airport and Facilities Directory (A/FD), airport diagrams and sketches and the Terminal Procedure Publications (TPPs). ▪ Create/build new and maintain ATC Radar Video Maps (RVMs), and Minimum Vector Altitude (MVA) maps in support of Air Traffic Controllers to safely guide aircraft through the NAS. ▪ Develop, coordinate and present FAA and U.S. positions on

	operations in oceanic and offshore airspace with other FAA LOBs, U.S. organizations, other States and international organizations. ▪ Provide policy guidance to support Time Based Flow Management as an integral system in the NAS to support NextGen's mission and ensure future capabilities are implemented consistently. ▪ Implement ADS-B In Trail Procedures and ADS-C Climb Procedures into the ATOP oceanic automation platform with reduced separation while in oceanic airspace. ▪ Implement WAKE RECAT 2.0 at Southern California TRACON and 2 more key sites. ▪ Complete airspace and safety analysis for expanding access beyond the UAS rule for pathfinder program initiatives. ▪ Complete Pre-Implementation Evaluation activities at three Metroplex sites. ▪ Complete Post-Implementation Review and Modifications at two Metroplex sites Complete over 80,000 aeronautical studies and publish determinations on the extent that structures impact aviation safety and the National Airspace System.

Why Do We Want/Need To Fund The Program At The Requested Level?

Funding requested in FY 2017 will provide continued Mission Support Services contributions in the transition to NextGen. Funding will also allow continued development of PBN criteria and procedures, along with additional staffing at headquarters and service centers for continued development of cornerstone documents, safety studies, and research needed for the safe integration of UAS into the NAS.

FY 2017 funding for Mission Support Services will:

Mission Support Services	▪ Complete Metroplex pre-implementation/evaluation activities at one Metroplex location. ▪ Complete Metroplex implementation activities at five Metroplex locations. ▪ Complete all required modifications, revisions, and updates to Approach, Departure, Arrival and Airway Instrument Flight Procedures (IFPs) through the issuance of critical amendments, IFP Notice to Airmen (NOTAMs), completing biennial IFP periodic reviews, and updating/revising Aeronautical Chart Products as necessary to ensure currency and adapt the IFP infrastructure to reflect the changes occurring in the NAS. ▪ Complete all required revisions and updates on Instrument Flight Rule (IFR) and Visual Flight Rule (VFR) Aeronautical Chart Products. Airport and Facilities Directory (A/FD), airport diagrams and sketches and the Terminal Procedure Publications (TPPs). ▪ Complete all required aeronautical studies for proposed new construction to protect the existing IFP's or any future IFP development to ensure the safety of air navigations and efficient utilization of navigable airspace in the NAS. ▪ Create/build new and maintain ATC Radar Video Maps (RVMs), and Minimum Vector Altitude (MVA) maps in support of Air Traffic Controllers to safely guide aircraft through the NAS. ▪ Complete all required obstacle review and analysis of all proposed new construction to protect the existing IFP's or any future IFP development to ensure the safety in the NAS. ▪ Create/build new and maintain ATC Radar Video Maps (RVMs), Minimum Safe Altitude ATC facility RVMs, Minimum Safety Altitude Warning (MSAW) system data files, and Minimum Vector Altitude

	(MVA) maps in support of Air Traffic Controllers to safely guide aircraft through the NAS. ▪ Research and respond to IFP inquiries, periodic review evaluations of IFPs and Aeronautical Radio incorporated (ARINC) coding of IFPs. ▪ Refine, design and conduct planning for New York metropolitan airspace design elements. ▪ Complete airspace and related safety studies and research to assist in the integration of unmanned aircraft into the NAS. This includes revisions to existing airspace regulations for UAS into the NAS. Additionally, we will complete exemptions to regulations for those pathfinder initiatives who seek relief from existing regulations. ▪ Demonstrate capture and dissemination capabilities for digital aeronautical information via web services and portals. This will result in relevant information being integrated into the common operating picture of the NAS via NOTAM distribution services over System Wide Information Management (SWIM). ▪ Provide policy guidance to support the Trajectory Management – Oceanic Tactical Trajectory Management (OTTM) project. These oceanic capabilities involve both procedural and automation changes. The implementation of these capabilities will occur incrementally and will eventually affect all domains and phases of flights to improve airspace capacity and allow more airspace users to optimize their flight trajectories through collaborative efforts with air traffic management resulting in savings of time, fuel, and emissions. ▪ Provide a Central Reporting Agency (CRA) which has responsibility for the daily monitoring, coordination, testing and problem research of issues involving Controller Pilot Data Link Communication (CPDLC) and ADS-C services while in oceanic airspace. The CRA has responsibility for addressing technical and operational issues and overall coordination of the implementation of the CPDLC/ADS-C technology in the Pacific and North Atlantic ICAO regions. ▪ Continue development of WAKE RECAT 2.5 and progress Global WAKE RECAT work. ▪ Support Terminal Procedures Global Harmonization.

What Benefits will be provided to the American Public through this request?

Many Mission Support Services outputs have direct benefit to the flying public. We reduce costs for users through more efficient use of the airspace gained through new procedures and better dissemination of charts and NOTAMS. We protect navigable airspace and increase efficiency through aeronautical studies to identify effects of potential construction projects on the NAS. Safety is improved through better procedures, awareness and mitigating of obstructions to navigation, and the use of weather cameras in remote locations in Alaska.

The FAA is committed to providing end-to-end PBN capabilities in the NAS. We have already developed and implemented 895 RNAV SIDs/STARs; 716 RNP Authorization Required (AR) instrument approach procedures (including lines of minima); and 236 Q/T Routes in addition to Global Navigation Satellite System Minimum En Route Altitude (GNSS MEA) RNAV routes as of April 30, 2015. The use of these procedures has already provided significant efficiency and safety benefits to operators. Additionally, advancements in avionics, surveillance, navigational procedures, and the sharing of information allows for the predictability and repeatability needed for the best decisions made by flight operators and air traffic controllers alike. Continued evolution of Time Based Flow Management (TBFM) is needed to optimize capabilities and realize the benefits of Performance Based Navigation.

The Airspace Services Directorate establishes the foundation for navigable airspace through regulations and policy. This includes environmental assessments and polices to manage effective airspace use. Airspace

Services will complete regulatory development for sUAS operations over urban areas, extended line of sight operations and beyond line of sight operations. This will expand the use of unmanned aircraft while deliberation completes on the sUAS rulemaking actions.

Detailed Justification for the - Vice President Management Services, AJG

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Management Services – Budget Request
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	115,516	116,026	116,891	865
Program Costs	187,130	101,845	71,185	-30,660
Total	**$302,646**	**$217,871**	**$188,076**	**-$29,795**
FTE	**216**	**213**	**213**	**-**

The FY 2017 budget request for Management Services is $188,076,000 and 224 FTP / 213 FTE. It provides for $377,075 for the annualized cost of the FY 2016 pay increase, $1,392,336 for the FY 2017 pay raise, -$904,169 for two less compensable days in FY 2017, Included in the request is a change of $323,000 for Working Capital Fund adjustments, and -$30,982,000 for Administrative Efficiencies.

The Management Services organization provides leadership and guidance to ATO in creating and maintaining a diverse, productive, professional workplace that enhances all ATO operations. The Management Services organization develops diversity and inclusion strategies and serves as ATO's center of expertise for resources, training, knowledge, and best practices for all diversity and inclusion efforts.

Management Services supports DOT's Strategic Plan's Organizational Excellence: Financial Performance goals. We recruit, develop, and retain a diverse and collaborative workforce by providing an all-encompassing career progression plan and leadership development program along with personnel and organizational policies that meet the needs of our highly skilled workforce. We ensure performance stays on track by providing the framework to integrate ATO's plans, programs, and activities. We work with aviation stakeholders to develop strategies for implementing solutions and to continue coordination with FAA offices.

What is this Program and Why is it Necessary?

FAA's ATO provides air traffic services for the Nation and is fully committed to the agency's mission. We handle 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year; a vital part of the Nation's economy. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.3 trillion in total economic activity, supporting 5.4 percent of U.S. Gross Domestic Product. Earning over $394 billion a year, 10 million people are employed in aviation-related fields.

ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future.

Management Services ensures performance stays on track by providing the framework to integrate ATO's plans, programs, and activities with available budgets and resources. We provide a wide variety of administrative services that support the overall operation of ATO as an organization and help plan for a successful future. By providing performance measures, a foundation for administration, and communication of key goals and information to ATO, we support ATO in its core functions in accomplishing the organization's mission.

By the end of FY 2016, significant accomplishments for Management Services include:

Management Services	▪ An air traffic controller and technician workforce that supports the changing operational demands of the U.S. National Airspace System (NAS) and that is in support of the agency goals and priorities. This includes establishing prioritized and effective hiring and retention processes that supports NAS efficient streamlined services. ▪ The institution of real-time placement of new air traffic controllers to facilities that have immediate need including the ability to change priorities in hiring in days rather than a year out. ▪ A national program to prepare air traffic controllers, technicians, front line managers, and operations managers for success in their next level of leadership responsibility. ▪ A reduced number of employees on Office of Workers' Compensation Programs rolls and associated compensation costs. ▪ A Recruitment and Outreach Program to attract a diverse applicant pool for ATO mission-critical occupations. ▪ A space strategy to co-locate offices and reduce the ATO space footprint and annual lease costs.

Why Do We Want/Need To Fund The Program At The Requested Level?

ATO is a performance-based organization and Management Services ensures performance stays on track by providing the framework to integrate ATO's plans, programs, and activities within allocated budgets. The organization is diverse and works together to provide a wide variety of administrative type services that support the overall operation and inter-workings of ATO and help plan for a successful future.

Funding requested in FY 2017 will allow Management Services to support key initiatives such as meeting Office of Personnel Management Hiring Standards and maintaining the air traffic controller, technician and field/Headquarters management workforce at optimum levels. Requested funding levels will also allow Management Services to provide training services, consultations, and interventions to ATO service units to identify and reduce or eliminate barriers to maintaining a professional, model workplace.

FY 2017 funding for Management Services will:

Management Services	• Continue National ATO hiring programs and processes to ensure FAA has the controllers and technicians needed to operate and maintain the NAS, including leading the Centralized Selection Process. • Recruit, hire and train the number of controllers and technicians required to operate and maintain the NAS. • Establish outreach strategies and major initiatives to promote education and public awareness of aviation occupations and other critical hiring opportunities within the ATO to establish a broad-based diverse pipeline. • Develop and implement an integrated strategy in managing labor relationships and liaison activities across ATO organizations and bargaining units. • Provide Human Resource Management (AHR) with a centralized and focused point of contact for technical information. • Continue the consolidation of ATO space leases to result in savings in Operations dollars for reinvestment in the operation of the National Airspace System. • Promote ATO Career Progression Plan tools accessible to 100 percent of the ATO population.

Funding will also provide $3, 355,000 for Labor Management Relations (LMR).

What Benefits will be provided to the American Public through this request?

Personnel resources are the key element to ensure the American public can safely and efficiently use air transportation. Air traffic controller and technician candidates must consistently enter the pipeline so that they are trained and certified prior to supporting the NAS. Management Services recruits, hires and processes these candidates through our training facilities in Oklahoma City, OK.

The management workforce at our ATC facilities comes from our certified air traffic controller ranks. Management Services develops succession planning programs and training to prepare for the transition of the workforce. By ensuring the aviation workforce is available at all levels, Management Services plays an integral role in continuing the seamless operation of the NAS.

Federal Aviation Administration Safety Workforce New Hires Placed

	FY 2014 Actual	FY 2015 Actual	FY 2016 Actual to Date	FY 2016 Projected Thru EOY	FY 2016 Planned	FY 2017 Planned
Air Traffic Controllers	1,112	1345	502	1,345	1,619	1,781
Technicians	181	292	78	282	360	360

Detailed Justification for the - Vice President Program Management Organization, AJM

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Program Management Organization – Budget Request ($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	91,938	93,527	94,225	698
Program Costs	587,905	637,716	662,173	24,457
Total	**$679,843**	**$731,243**	**$756,398**	**$25,155**
FTE	**576**	**568**	**568**	**-**

FAA's Program Management Organization (PMO) request is $756,398,000 and 534 FTP / 568 FTE. It provides for $303,955 for the annualized cost of the FY 2016 pay increase, $1,122,342 for the FY 2017 pay raise, $24,457,000 for Transition to Operations and Maintenance (TOM) for new systems entering the NAS, and -$728,837 for two less compensable days in FY 2017.

What is this Program and Why is it Necessary?

FAA's ATO provides air traffic services for the Nation and is fully committed to the agency's mission. We handle 25,800 scheduled passenger flights per day at US airports and helps transport over 756 million passengers per year; a vital part of the Nation's economy. In total, the ATO handles 44,000 IFR (Instrument Flight Rules) flights per day, and manages 136,000 operations (including departures, arrivals and over-flights) per day at FAA and contract towers. FAA data shows that civil aviation accounted for over $1.3 trillion in total economic activity, supporting 5.4 percent of U.S. Gross Domestic Product. Earning over $394 billion a year, 10 million people are employed in aviation-related fields.

ATO relies on numerous programs to maintain the safety and efficiency of the current system and ensure its viability well into the future.

The PMO provides full-life cycle program management capability across all of ATO from initial definition, through design, development, and effective deployment of both NAS sustainment and NextGen modernization systems.

The PMO was created after a comprehensive look at whether the agency was positioned strategically for success as we implement NextGen. The study, known as Foundation for Success, examined how our internal structures and processes could be improved to support NextGen. It was determined that better collaboration across lines of business would help us advance our initiatives more seamlessly and effectively.

The PMO is made up of the following directorates:

> The **Air Traffic Systems Directorate** develops, acquires, deploys, maintains, sustains, and improves automation, surveillance, and decision support systems that provide aircraft separation assurance and system-wide efficiency through flow control. We maintain approximately 8,500 pieces of equipment at nearly 67,000 facilities. Headquarters and Technical Center employees are responsible for sustainment management, engineering, production, logistics, testing, training, and systems and procedures implementation. Since the mid-1990s, we have fielded modern air traffic control, communications, display, and weather systems for controller use. Major acquisition programs such as ERAM and Automatic Dependent Surveillance-Broadcast (ADS-B) are replacing yesterday's equipment with flexible, resilient, scalable, and adaptive systems that will provide the platform for NextGen. We are saving money for air carriers and general aviation, reducing delays for passengers, and decreasing airplane emissions.

The **Enterprise Services Directorate** is responsible for communications, weather, and aeronautical information products and services for the NAS.

- Navigation Services covers projects in the following areas: Global Positioning System (GPS) Satellite-Based Augmentation, GPS Ground-Based Augmentation, Ground Systems, Lighting Systems, and Technical Support.
- Communications Services provides communications and telecommunications services consistent with International Civil Aviation Organization (ICAO) standards required for air traffic control within the NAS. It provides communications infrastructure and services for the Department of Defense (DOD) to ensure interoperability with the NAS.
- Weather services provide sensor, processor, and distribution systems required to provide accurate forecasts for timely air traffic decisions.
- Through unique customer/client relationships and customer-derived requirements, we manage the full life-cycle for communications, navigation, and weather services.

In addition to managing the implementation of new programs, the PMO is responsible for providing in-service management of many NAS automation and communication systems. The activities include:

- Maintenance of service availability of automation platforms by providing sufficient second-level engineering and supply support for critical operational systems, such as: En Route Communications Gateway (ECG), ERAM, Advanced Technologies and Oceanic Procedures (ATOP), En Route Information Display (ERIDS), Flight Data Processor (FDP) 2000, Flight Data Input Output (FDIO), and Micro En Route Automated Radar Tracking System (MEART).
- Sustainment of operational Wide Area Augmentation System (WAAS) and deployment of WAAS maintenance releases.
- Support of NAS Voice System (NVS), System Wide Information Management (SWIM), and Data Communication System (DataComm) operational programs.
- Sustainment of the Weather and Radar Processor (WARP) service in accordance with the program specification and requirements.
- Ongoing support for the Runway Status Lights (RWSL) installed at select airports.
- Maintenance and support for the sites transitioning from CARTS to STARS
- Sustainment of adjusted operational availability of select terminal equipment at 99.7 percent for the reportable facilities that support the Nation's Core Airports.

By the end of FY 2016, PMO's significant accomplishments include:

Program Management Services	▪ Purchasing and Deploying SWIM NEMS Nodes for the following Air Route Traffic Control Centers: Denver (ZDV), Memphis (ZME), Indianapolis (ZID), and Houston (ZHU). ▪ Continue development and deployment of new Collaborative Air Traffic Management Technologies (CATMT) capabilities to reduce traffic delays associated with disruptive events in the NAS, such as severe weather, NAS equipment outages, and excessive traffic volume. ▪ Complete deployment of Airborne Re-route (ABRR) which provides the ability to electronically send TFM-generated airborne reroutes to En Route automation for ATC execution. ▪ Complete the Traffic Flow Management System (TFMS) Technology Refresh which replaces the hardware of the Traffic Flow Management (TFM) Production Center at the FAA's WJHTC, Disaster Recovery Center (DRC), and developmental facility. ▪ Provide Strategic Flow Management Integration (execution of flow strategies into controller tools). The program provides for the implementation of ERAM modifications needed to receive/process the Traffic Management Initiatives (TMI) in the ERAM baseline

	timeframe. ▪ Continue work on Flow Control – Strategic Flow Enhancement. This program will analyze the mid-term (FY 2012-2018) air traffic management (ATM) building blocks needed for the transition to the future NextGen system and the capability to improve the predictions for both capacity and demand. This program develops promising potential concepts to address operational Traffic Flow Management (TFM) shortfalls and prepares documentation for the developed concepts to achieve Investment Decisions. ▪ Complete engineering, start implementation and deployment of System Enhancement and Technical Refresh (SE/TR) changes for ERAM. ▪ Complete turn on of ABRR capability at all 20 ARTCC's. ▪ Start the national roll out for Ground Interval Management Spacing (GIM-S) capability. ▪ Improve on-time performance and operator and passenger access to information by using TFM, Time Based Flow Management (TBFM), and CATMT, such as Airspace Flow Programs.

Why Do We Want/Need To Fund The Program At The Requested Level?

The PMO plays a significant role associated with transition to NextGen. Controllers currently communicate with pilots using voice where revisions to aircraft flight paths are made through multiple instructions or lengthy verbal exchange. Many of the transformational improvements associated with NextGen including trajectory-based flight and net-centric operations cannot be achieved using the present automation, decision support, or voice-based communications system.

Funding requested in the FY 2017 submission will continue the transition to NextGen. In addition to en route automation modernization, supported by ADS-B, we are modernizing and providing commonality in terminal automation, coupling it with ADS-B and providing upgrades to Collaborative Air Traffic Management Tools to support NextGen operations. Connecting all of the automation to and through a flexible digital communications infrastructure, and feeding it with spaced-based navigation will provide the information to both controllers, flow managers, dispatchers, and pilots necessary for the efficient and responsive NAS envisioned by NextGen.

By the end of FY 2017, PMO's anticipated accomplishments include:

Program Management Services	• Deployment of over 1,000 new Digital Multimode Radios. • Continued acquisition and deployment of NVS, SWIM, and DataComm programs. • Continued sustainment of operational WAAS through procurement of spares for logistics support, full Contractor Depot Logistics Support (CDLS) to include LRU test, repair and replacement along with supply support, Radio Frequency Interference testing, evaluation of potential threats, mitigation needed for the restoration of any outages experienced by WAAS, providing Second-Level Engineering Support for hardware/software support, repairs performed, anomaly investigation, and site restoration of WAAS. Plan, engineer, and develop WAAS changes to support yearly maintenance release. • Deployment of the final capability of CATMT Work Package (WP3) which provides two additional capability suites to improve the *congestion management tools available to the Traffic Management Units. • Maintain en route and oceanic air traffic systems in a state which will

	not degrade the services provided to the flying public. • Sustain terminal air traffic systems in a state which will not degrade the services provided to the flying public. • Continue implementation and deployment of System Enhancements/Tech Refreshes (SE/TR) changes for ERAM. • Continue national roll out of Ground Based Interval Management for Spacing (GIM-S). •

Total requested Transition to Operations and Maintenance (TOM):

Programs	Amount	FTP	FTE
G05C.01-01, G05C.01-04 System Wide Information Management (SWIM)	10,929,000	-	-
A03.05-01 Integrated Display System – Replacement (IDSR)	4,271,000	-	-
G02S.01-01, G02S.03-01 Surveillance and Broadcast Services (SBS)	3,936,000	-	-
G02A.01-03/-06 Time Based Flow Management (TBFM) Work Package (WP) 2/3	1,951,000	-	-
G01A.01-01 ERAM FUSE – NextGen ABRR/PDRR/ERAM SWIM interface (Application Sustainment License)	2,423,000	-	-
A04.01-01Terminal Automation Modernization/Replacement (TAMR) Phase 1 G4 Technology Refresh (G4TR)	946,000	-	-
Total	**$24,456,000**	**-**	**-**

G05C.01-01, G05C.01-04 System Wide Information Management (SWIM) - SWIM is an information management and data sharing system for NextGen. In FY 2015, SWIM NAS Enterprise Messaging Services (NEMS) nodes were deployed in Oakland (ZOA), Anchorage (ZAN), New York (ZNY), Jacksonville (ZJX) and NEMS SWIM Flight data Publication Service (SFDPS) facilities in Salt Lake (SLC) and Atlanta (ATL). The Program also implemented enterprise messaging via the NEMS for new service providers and facilitated the transition by Segment 1 SWIM Implementing Programs (SIPs) to using the NEMS. This request for Segment 1 and 2a, totals $10,929,000:

- $2,105,930 (1st Level Engineering/Maintenance) for Corrective Maintenance contract support for 24/7 repairs made on site as well as tune ups and preventative checkups of hardware. This includes associated travel, transportation, and supplies.
- $8,763,069 (2nd Level Engineering) for Second Level Maintenance contract support for 24/7 of hardware and software. This includes contract engineers to provide direct operational support via telephone technical assistance and/or on-site restoration efforts to resolve problems with the commissioned facilities. Their support also includes: design of modifications and performance of system optimization to improve the operational performance of the equipment, verification that proposed software changes made by the prime contractor do not impact the operational capabilities of the system, and development of test plans and procedures to conduct system level testing of the performance of the software upgrades.
- $60,000 (Infrastructure Support) for additional power costs.

A03.05-01 Integrated Display System (IDS) Replacement – IDS Replacement is a local and wide area network information dissemination and display system that consolidates information from several FAA and National Weather Service (NWS) weather subsystems onto a single display and distributes the data to air traffic controllers and airspace managers at TRACON and Tower (ATCTs) facilities. The IDS-R program not only provides for the replacement but also provides for enhanced capabilities of the legacy Integrated Display Systems-4 (IDS-4) with current technology. In FY 2015, 20 individual sites were installed. This request totals $4,271,000:

- $557,474 (1st Level Engineering/Maintenance) for contract support for direct field-level maintenance of hardware.

- $1,312,175 (2nd Level Engineering) for 24/7 support of hardware and software maintenance. This includes contract engineers to provide direct operational support via telephone technical assistance and/or on-site restoration efforts to resolve problems with the commissioned facilities. Their support also includes: design of modifications and performance of system optimization to improve the operational performance of the equipment, verification that proposed software changes made by the prime contractor do not impact the operational capabilities of the system, and development of test plans and procedures to conduct system level testing of the performance of the software upgrades.
- $1,027,026 (Telecommunications) for costs that have increased due to increased data requirements and redundancy.
- $440,567 (Integrated Logistics Support) for Commercial Depot Logistics Services (CDLS) for replenishment of spares.
- $933,361 (Physical Infrastructure Support) for increased power requirements.

G02S.01-01, G02S.03-01 Surveillance and Broadcast Services (SBS) – ADS-B is an advanced surveillance technology that provides highly accurate and comprehensive surveillance information. In FY 2015, recently installed components include: Surveillance and Broadcast Services Monitor (SBSM) which provides status monitoring for all equipment and services provided to the FAA by Exelis under the surveillance and Broadcast Services (SBS) contract (Dual redundancy at WJHTC and MMAC (OEX)), Service Availability Prediction Tool (SAPT) which is the system used to determine the anticipated availability of aircraft onboard equipment, Wide-Area Multilateration (WAM) system which is a surveillance system that supports critical air traffic control services (three systems – Colorado, Juneau, Alaska (INU), and Dual redundancy at MMAC (OEX)), and SBS which monitors aircraft avionics for compliance with the rule for SBS and provides reports to Flight Standards Service (AFS) for their compliance work. SBS baseline surveillance service also includes ADS-B coverage for the US portion of the Gulf of Mexico request, which supports expansion of three additional ADS-B radio stations in Mexico to provide full Gulf of Mexico coverage. Funding provides for First and Second Level Maintenance and Logistics Support. This request totals $3,936,000:

- $1,206,159 (1st Level Engineering/Maintenance) for 24/7 Corrective Maintenance contract support for repairs, tune ups, and checkups for the new facilities and services commissioned in FY 2015. This includes increased travel and transportation costs for these new locations.
- $2,610,277 (2nd Level Engineering) for 24/7 maintenance contract support of hardware and software. This includes contract engineers to provide direct operational support via telephone technical assistance and/or on-site restoration efforts to resolve problems with the commissioned facilities. Their support also includes: design of modifications and performance of system optimization to improve the operational performance of the equipment, verification that proposed software changes made by the prime contractor do not impact the operational capabilities of the system, and development of test plans and procedures to conduct system level testing of the performance of the software upgrades.
- $120,000 (Integrated Logistics Support) for activities and replenishment spares to support all fielded SBS systems. This includes ordering, replenishing, exchanging, receiving, tracking, cataloging, and inventory management of replenishment spares needed in order to operate and maintain the SBS systems at both the site, and depot levels.
-

G02A.01-03/-06 Time Based Flow Management (TBFM) - TBFM WP3 will implement additional NextGen concepts, such as Terminal Spacing and Sequencing (TSS), which provides efficient sequencing and runway assignment by extending time based metering to the runway and expansion of the Integrated Departure/Arrival Capability (IDAC). In FY 2015, IDAC has been installed at 5 ARTCCs: Los Angeles (ZLA), Indianapolis (ZID), Cleveland (ZOB), Washington, DC (ZDC), and Boston (ZBW). This request totals $1,951,000:

- $1,653,000 (2nd Level Engineering) for second level maintenance and associated travel, and supplies. This includes contract engineers to provide direct operational support via telephone technical assistance and/or on-site restoration efforts to resolve problems with the commissioned TBFM facilities. Their support also includes: design of modifications and performance of system optimization to improve the operational performance of the NAS TBFM facilities, verification that proposed software changes made by the prime contractor do not impact the operational capabilities of the system, and development of test plans and procedures to conduct system level testing of the performance of the software upgrades.

- $298,000 (Telecommunications) for costs for the IDAC and TSS services has increased due to increased data requirements and redundancy.

G01A.01-01 En Route Automation Modernization (ERAM) FUSE – NextGen ABRR/PDRR/ERAM SWIM Interface (Application Sustainment and License) – This is a NextGen CATM portfolio initiative which required modifications to hardware and software in both ERAM and TFMS system. The ERAM SWIM interface was developed to disseminate PreDeparture Reroute (PDRR) and Airborne Reroute (ABRR) information from the Traffic Flow Management system (TFMS) to ARTCCs. When Air traffic controllers change the routes of aircraft due to weather it changes the aircrafts flight plan. When this is a last minute change to the flight plan the information needs to be shared throughout the NAS. The SWIM system can communicate these changes, but because ERAM and TFMS run on different software languages it requires software to translate into both software languages. The interface was placed in service at 20 ARTCC sites in FY 2015. The primary interface uses SOA application "*Redhat Fuse"* software. The SWIM program office, under the Site Implementing Program (SIP) paid for the SW development and FUSE licenses from FY 2013 to FY 2016. This system is not replacing an existing system, but is an enhancement to the current system. Implemented in FY 2015, PDRR and ABRR will be operated and maintained beginning in FY 2017. This request totals $2,423,000:

- $523,000 (2nd Level Engineering) for second level maintenance providing SWIM interface with ERAM and TFMS facilities. This includes contract engineers to provide direct operational support via telephone technical assistance and/or on-site restoration efforts to resolve problems with the commissioned facilities. Their support also includes: design of modifications and performance of system optimization to improve the operational performance of the equipment, verification that proposed software changes made by the prime contractor do not impact the operational capabilities of the system, and development of test plans and procedures to conduct system level testing of the performance of the software upgrades.
- $1,900,000 (Physical Infrastructure Support) for increased costs for "*Redhat Fuse"* license and version upgrades and hardware logistics costs.

A04.01-01 Terminal Automation Modernization/Replacement (TAMR) Phase 1 G4 Technology Refresh (G4TR) – The current scope of the TAMR Phase 1 program is to technologically refresh and enhance systems already deployed. The Terminal Automation System (STARS) has been deployed at some locations for years. The current Air traffic controller workstation is called a G1 which is being replaced by G4 work stations. The G4 workstations will have increased capabilities. The modernization will also be less likely to fail due to the creation more redundant backups. One of the backups is a completely redundant telephone network for each G4 workstation. Eight sites were upgraded in FY 2015. These sites were Seattle (S46), New Orleans (MSY), Tampa (TPA), Salt Lake (S56), Ft. Lauderdale (FXE), Miami (MIA), Philadelphia (PHL), and Cleveland (CLE). This increases the leased telecommunications costs from that of the original system.

- $946,000 (Telecommunications) for increased costs associated with separate wiring requirements for G-4 backup redundancy for systems at the 6 facilities replaced in FY 2015.

What Benefits will be provided to the American Public through this request?

The PMO will improve consistency of program execution through robust information sharing with stakeholders, institutionalization of acquisition best practices and community review of lessons learned. The PMO will standardize the required steps, from definition and design through development and deployment, creating a bridge between concepts and operational use of technologies. Having a portfolio of programs under one umbrella provides the potential for streamlining, better cost control and economies of scale to better manage uncertainty.

The FAA will undertake groundbreaking system enhancements and improvements in the upcoming years. A sampling of these system implementations is ERAM, STARS/TAMR, ADS-B, and DataComm. Implementation of these systems will prepare the NAS and American public to fully utilize the technological advances provided by NextGen. NextGen will improve the safety of the NAS by providing near real-time flight data information, reduced flight times, better communications channels, and more accurate flight tracking. The PMO provides the program management expertise to consistently and effectively implement these programs. Through PMO leadership, coordination and direction, the American public will begin to take advantage of the benefits of NextGen.

ATO Explanation of Funding Changes

	Dollars ($000)	FTE
Air Traffic Organization	**$32,851**	**-3**
Overview: For FY 2017, the Air Traffic Organization (ATO) requests $7,539,785,000 and 29,603 FTEs to meet its mission. The FY 2017 request level reflects adjustments to base, other changes, discretionary adjustments and base transfers. This represents an increase of $32,851,000 over the FY 2016 enacted level.		
Adjustments to Base	**$67,730**	**-**
Annualization of FY 2016 Pay Raises: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.0 percent.	17,572	
FY 2017 Pay Raises: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	64,884	
Two Less Compensable Days: This decrease represents two less compensable days in FY 2016 (260 days in FY 2017 vs. 262 days in FY 2016).	- 42,135	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **System Wide Information Management (SWIM)** – SWIM is an information management and data sharing system for NEXGEN. In FY 2015, SWIM NAS Enterprise Messaging Services (NEMS) nodes were deployed in Anchorage (ZAN), Oakland (ZOA), Jacksonville (ZJX), and New York (ZNY) Centers and NEMS SWIM Flight data Publication Service (SFDPS) facilities in Salt Lake City (SLC) and Atlanta (ATL). The program also implemented enterprise messaging via the NEMS for new service providers and facilitated the transition by Segment 1 SIPs to using the NEMS. Funds will provide Segment 1 and 2a, with first and second level engineering support, and physical infrastructure support.	10,929	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Terminal Automation Modernization/Replacement (TAMR) Phase 1 G4 Technology Refresh (G4TR)** – The current scope of the TAMR Phase 1 program is to technologically refresh and enhance systems already deployed. In FY 2015, eight sites were upgraded: Seattle (S46), New Orleans (MSY), Tampa (TPA), Salt Lake (S56), Fort Lauderdale (FXE), Miami (MIA), Philadelphia (PHL), and Cleveland (CLE). The funding request provides for increased telecommunication costs because of a separate wiring requirement (G-4 backup for redundancy).	946	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Integrated Display System Replacement (IDS-R)** – The IDS-R program provides for the replacement of the legacy integrated Display systems-4 (IDS-4) with current technology. In FY 2015, 20 individual sites were installed. Funding provides for first and second level engineering, telecommunication, logistics and physical infrastructure support.	4,271	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Surveillance and Broadcast Services (SBS)** – ADS-B is an advanced surveillance technology that provides highly accurate and comprehensive surveillance information. In FY 2015, the following components were installed: Surveillance and Broadcast Services Monitor (SBSM), Service Availability Prediction Tool (SAPT), Wide-Area Multilateration (WAM), and Compliance Monitor (SBS). The funding request provides first and second level engineering and logistics support.	3,936	

	Dollars ($000)	FTE
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Time Based Flow Management (TBFM) Work Package (WP) 2/3** – TBFM WP3 will implement additional NextGen concepts, such as, Terminal Spacing and Sequencing (TSS), which provides efficient sequencing and runway assignment by extending time based metering to the runway and expansion of the Integrated Departure/Arrival Capability (IDAC). In FY 2015, IDAC was installed at 5 ARTCCs: Los Angeles (LAX), Indianapolis (ZID), Cleveland (ZOB), Washington (ZDC), and Boston (ZBW). The funding request provides for second level engineering and telecommunications support.	1,951	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **ERAM FUSE – NextGen ABRR/PDRR/ERAM SWIM Interface** The ERAM SWIM interface was developed to disseminate pre departure and airborne reroute (ABRR) information from the traffic flow management system (TFMS) to ARTCCs. The interface was placed in service at 20 ARTCC sites in FY 2015. The funding request will provides for second level engineering and maintenance support, training, licenses, version upgrades, physical infrastructure and logistics support.	2,423	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Mobile Assets Management Program (MAMP)** – The Mobile Assets Management Program (MAMP) provides for the continuity, restoration, and/or augmentation of NAS operations at FAA operational facilities. One Deployable Air Traffic Control Facility (DATCF) was deployed and made available for service in FY 2015. The funding request provides for first and second level engineering, training, logistics and physical infrastructure support.	817	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Runway Status Lights (RWSL)** — Runway Status Lights integrate airport 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 a runway. Six locations: Las Vegas (LAS), Minneapolis (MSP), Cleveland (CLT), Ft. Lauderdale (FLL), Detroit (DTW), and New York were installed and achieved operational readiness in FY 2015. Funding provides for second level engineering, logistics support, and physical infrastructure.	1,418	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Facility Security Risk Management (FSRM)**— The Facility Security Risk Management (FSRM) program implements standardized facility protective measures at all FAA staffed facilities. These measures include: personnel access control (via card readers, fencing, gates and security guards), surveillance (cameras), vehicle access control (barriers), visibility enhancements (lighting) and x-ray machines. The funding requested will provide for the ongoing operation and maintenance of the physical infrastructure that supports the 87 FSRM Access Control Security Systems installed in FY 2015.	718	
Other Changes	**-$37,159**	**-**
Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's (DOT) Working Capital Fund (WCF) profile. These adjustments are being made to best align each office's resources within their expected WCF costs.	323	
Lean Maintenance Cost Savings: The FAA will assess equipment in the National Airspace System (NAS) and facilitate activities for cost savings. To effectively achieve this, the Lean Maintenance and Revalidation Program (LMRP) will analyze cost and performance data,	- 6,500	

	Dollars ($000)	FTE
maintenance activities, sustainment and support requirements, in order to identify cost savings/avoidance opportunities. FAA anticipates this activity could yield $6.5 million in cost savings/cost avoidance in FY 2016 and FY 2017.		
Administrative Efficiencies: Air Traffic Organization (ATO) will achieve administrative efficiencies through cost reductions and avoidance in various areas such as contractual services and supplies.	- 30,982	
Discretionary Adjustments	**$2,818**	**-**
Lean Maintenance and Revalidation Program: This funding request is to provide support for the Lean Maintenance and Revalidation Program (LMRP) which assesses equipment in the National Airspace System (NAS) and facilitates activities to identify potential cost savings initiatives. Funding is requested for ASR-9/ASR-11 rotary joint replacement and decommissioning of equipment.	2,818	
Base Transfers	**-$538**	**-3**
Flight Standard Services Staffing (ATO to AVS): This request transfers funding -$189K and 1FTP/1FTE from the Air Traffic Organization, Mission Support Services (ATO/AJV) to Aviation Safety, Flight Standard Services (AVS/AFS).	-189	-1
Security and Hazardous Materials Safety Staffing (ATO to ASH): This request transfers funding -$92K and 1FTP/1FTE from the Air Traffic Organization, Technical Operations Services (ATO/AJW) to the Office of Security and Hazardous Materials Safety (ASH).	-92	-1
Civil Rights Staffing (ATO to ACR): This request transfers funding -$257K and 1FTP/1FTE from the Air Traffic Organization, Technical Operations Services (ATO/AJW) to the Office of Civil Rights (ACR).	-257	-1

Traditional Tables for Air Traffic Organization

The following page represents information traditionally provided to the Committees on Appropriation for the FAA's air traffic control functions.

Controller Workforce FY 1981 through FY 2015

FY 1992	15,147	FY 2001	15,223	FY 2010	15,696
FY 1993	14,970	FY 2002	15,478	FY 2011	15,418
FY 1994	14,953	FY 2003	15,691	FY 2012	15,211
FY 1995	14,614	FY 2004	14,934	FY 2013	15,211
FY 1996	14,360	FY 2005	14,540	FY 2014	14,330
FY 1997	14,588	FY 2006	14,618	FY 2015	14,143
FY 1998	14,966	FY 2007	14,874	FY 2016 Est.	14,156
FY 1999	15,153	FY 2008	15,381	FY 2017 Req.	14,271
FY 2000	15,153	FY 2009	15,770		

System Maintenance Overtime

	FY 2015 Actual	FY 2016 Estimated	FY 2017 Request
Field Maintenance			
Hours	267	251	258
Amount	17,990	16,769	17,203
Program and Technical Support			
Hours	23	22	22
Amount	1,718	1,669	1,712
Total			
Hours	290	273	280
Amount	19,708	18,438	18,915

INSERT TAB HERE:

AVIATION SAFETY (AVS)

Aviation Safety Organization (AVS)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$1,258,411**	**7,406**	**125**	**7,246**
Adjustments to Base	**$29,593**			**83**
Annualization of FY 2016 Pay Raises 1.3%	3,389			
Annualization of 2016 FTE	11,650			83
FY 2017 Pay Raises 1.6%	12,510			
Two Less Compensable Days	-7,871			
Transition from F&E to Ops	9,915			
Other Changes	**-$4,561**			
Working Capital Fund	467			
Administrative Efficiencies	-5,028			
Discretionary Adjustments	**$3,350**	**14**	**2**	**9**
Unmanned Aircraft Systems (UAS) Integration	2,850	14	2	9
Hazard Tracking Tool	$500			
Base Transfers	**$189**	**1**		**1**
Flight Standard Services Staffing	189	1		1
FY 2017 Request	**$1,286,982**	**7,421**	**127**	**7,339**

(Page Intentionally Left Blank)

Executive Summary: Aviation Safety (AVS)

What is the request and what funds are currently spent on the program?

The request of $1,286,982,000 and 7,339 full-time equivalents (FTEs) allows Aviation Safety (AVS) to provide core services of certification, production approval, and continued airworthiness of aircraft as well as certification of pilots, mechanics, and others in safety-related positions; expand Unmanned Aircraft System (UAS) Integration into the National Airspace System (NAS); and enhance safety data reporting capabilities through increased data sources.

What is this program and why is it necessary?

AVS is responsible for setting the safety standards for every product, person, and organization that produces and operates aircraft in the NAS.

AVS provides the following services:

- Surveillance and oversight of existing certificate holders.
- Development and establishment of safety and certification standards for the civil aviation industry.
- Surveillance and oversight of air carriers, GA operators, repair stations, manufacturers and airman.
- Issuing or denying certifications.
- Ongoing and wide-ranging transformation of the NAS encompassed by NextGen.

These essential activities contribute to the Department of Transportation (DOT) safety goal, which is the FAA's highest priority.

AVS has eight services and offices:

Flight Standards (AFS): Flight Standards Service promotes safety in air transportation by setting the standards for certification and oversight of airmen, air operators, air agencies, and designees as well as safety of flight of civil aircraft in air commerce; sets regulations and standards that consider the air carrier's duty to operate in the public interest at the highest possible degree of safety; sets regulations and standards for other air commerce, air agencies, and airmen at the appropriate level of safety in the public interest; accomplishes certification, inspections, surveillance, investigation, and enforcement activities; and manages the system for registry of civil aircraft and all official airmen records.

Aircraft Certification (AIR): The Aircraft Certification Service develops and administers safety standards governing the design, production and airworthiness of civil aeronautical products; oversees design, production, and airworthiness certification programs to ensure compliance with prescribed safety standards; establishes and maintains a Safety Performance Management (SPM) system for continued operational safety of aircraft; provides oversight of approval holders, designees, and delegated organizations; and works with aviation authorities, manufacturers, and other stakeholders to help them improve safety in the international air transportation system.

Aerospace Medicine (AAM): The Office of Aerospace Medicine oversees a broad range of medical programs and services for both the domestic and international aviation communities; performs medical certification of airmen; inspects and oversees aviation industry drug and alcohol testing programs; performs medical clearance of air traffic control specialists (ATCSs); oversees drug and alcohol testing of FAA employees with safety-sensitive jobs and jobs requiring security clearances; performs aerospace medicine and human factors research; manages employee occupational health and health awareness programs; and performs oversight of aviation medical examiners (AMEs).

Rulemaking (ARM): The Office of Rulemaking manages FAA's rulemaking program, processes, and timelines; develops proposed and final rules; manages responses to petitions for rulemaking and for exemption from regulatory requirements; and oversees rulemaking advisory committees that provide advice and recommendations on aviation-related issues.

Accident Investigation & Prevention (AVP): The Office of Accident Investigation and Prevention investigates aviation accidents and incidents to detect unsafe conditions and trends and to coordinate the corrective action process; investigates major or significant accidents and incidents to identify safety deficiencies and unsafe conditions and recommend policy; coordinates with the responsible FAA office for evaluation and corrective action; analyzes accident and incident data and other safety data to identify safety issues and trends; addresses National Transportation Safety Board (NTSB) and internal FAA Safety Recommendations; and leads Safety Management System (SMS) implementation efforts for FAA and AVS.

Air Traffic Safety Oversight (AOV): Air Traffic Oversight Service establishes safety standards and provides independent oversight of the Air Traffic Organization (ATO) through auditing, surveillance, investigations, inspections, and cooperation with other FAA safety services; approves the ATO SMS and monitors the ATO for compliance with the approved SMS; reviews and approves the ATO's safety implementation actions and risk management strategies; and ensures consistency in the application of requirements through credentialing programs for ATO operation personnel and safety audits of ATO operations and system processes.

Unmanned Aircraft Systems Integration (AUS): The UAS Integration Office is responsible for the safe, efficient, and timely integration of UAS into the NAS, which encompasses supporting the development, implementation, and maintenance of operating regulations, policies, guidance, requirements, criteria, and procedures related to UAS integration; determining and prioritizing UAS research needs and requirements; leading agency UAS standards development and international harmonization efforts; facilitating programs to advance UAS integration activities beyond the scope of the proposed small UAS rule; and developing and implementing communications and outreach/educational initiatives.

Quality, Integration, & Executive Service (AQS): The Office of Quality, Integration, & Executive Services provides executive oversight and direction of consolidated management support services for all of AVS; manages all phases of planning, financial management, IT liaison services, and administrative activities for the immediate office of the associate administrator; approves, oversees, and facilitates integration initiatives among the AVS services and offices; oversees the AVS Quality Management System (QMS); provides budget and labor distribution reporting management; and provides AVS training, planning, and human resource management.

Why do we want/need to fund the program at the requested level?

Public expectation is that the FAA will continuously reduce the risk of flying while enabling new technologies to enter into the aviation system. This requested funding level will enable AVS to maintain existing staffing resource levels for continued operational safety, while increasing staffing for UAS certification and integration services. AVS projects the need for additional safety staffing to meet growing demands for UAS operations, while continuing to expand delegation responsibilities to designees for future NAS growth. FAA/AVS forecast changes in the demand for non-UAS type certification design approvals required by applicants, production certificates provided to manufacturers, and supplier control audits conducted at manufacturers to remain relatively flat from FY 2016 to FY 2017. Analysis of Labor Distribution Reporting hours using the AVS Staffing Tool and Reporting System (ASTARS) shows forecasted safety work activities remaining relatively unchanged with the exception of UAS within the NAS. The most recent data also indicates that the time to complete certifications for the design of new aviation products and airworthiness directives issued to correct aircraft safety deficiencies remained relatively constant. The number of aviation products requiring certification and approvals services is anticipated to expand within the systems, and complexity is anticipated to increase as new technologies are introduced. These factors are driving the need for additional inspectors, engineers and other safety critical positions.

AVS supports the DOT Strategic Plan Safety Goal – specifically contributing toward the outcome of reducing transportation related injuries and fatalities. AVS activities in support of the safety strategic plan safety goal include:

- Establishing regulations and standards, and conducting inspections, audits, surveillance, investigations, enforcement and certification activities related to operators, airmen and designees, aircraft manufacturers and suppliers. AFS, AIR, AAM, AOV, AVP and AUS partner with other AVS organizations, other FAA LOBs and other aviation agencies to assist with NextGen implementation. AVS also promotes safety of flight for civil aircraft and air commerce.

- Providing project management and analytical support to FAA teams on all agency rules as well as safety critical data analysis of the aviation industry. ARM and AQS work with other AVS organizations, FAA LOBs and other aviation agencies to help support system safety.
- Establishing, approving, and accepting safety standards in providing independent oversight of the ATO through safety surveillance, audits, and targeted inspections; monitoring ATC procedures and operations, technical operations and facilities, and personnel certification criteria; establishing standards and managing the credentialing of ATO safety personnel, including air traffic controllers and airway transportation specialists; executing approvals, acceptances, or updates of new ATO safety standards, waivers, or modifications; and monitoring the daily operations of the NAS.
- Providing accident and incident investigation services, as well as safety data analysis of the aviation industry. We work closely with the NTSB on appropriate aviation-related matters.
- Directing and managing the maintenance and improvement of the ISO-9001:2008-based QMS for all AVS services and offices and establishing integration policy and processes for safety systems.

AVS services and offices will partner with other FAA LOBs and other aviation agencies to implement NextGen. Additional specific skill sets are needed to develop standards, rulemaking, and policy for flight technologies and procedures supporting safe flight using Enhanced Flight Vision System, Synthetic Vision Systems, Area Navigation/Required Navigation Performance procedures, ADS-B and NextGen weather in the cockpit initiatives. ADS-B represents the foundation of the NextGen air traffic system. UAS are playing an increased role in daily operations in the NAS and must be safely integrated.

The implementation of Performance-Based Navigation within the NextGen framework requires changes in the character and manner by which instrument procedure standards and criteria are developed. Certification and Flight Standardization Boards of New Aircraft provide risk assessments and safety analyses and are required to prepare the NAS for the introduction of new aircraft. This includes international introduction of new aircraft as well. AVS is responsible for delivering new training on the certification, installation and operation of the new NextGen equipment to inspectors in multiple NextGen technologies.

The requested funding level will provide additional resources for surveillance and oversight of the existing aviation fleet and production manufacturers, as well as accommodate new operators and technologies into the NAS.

What benefits will be provided to the American Public through this request?

AVS will provide the American Public safety and economic benefits by maintaining oversight of the NAS through increased data analysis techniques used for audits, surveillance, and certification of aircraft operators and production manufacturers, pilots, mechanics, and other safety related positions.

AVS will expand certification and integration services for newly designed and manufactured aviation products associated with UAS. The additional engineer and inspector resources will provide manufacturing and operational approvals of UAS technologies while maintaining safety oversight services within the NAS. AVS will increase surveillance and certification services as well as integration activities for UAS. Our strategic goal for staffing is to have the right number of safety critical and support employees in the right locations, thereby providing the aviation community with surveillance and oversight of air carriers, GA operations, repair stations, manufacturers, and airmen. This request will enable oversight, audit activities, and certification activities for FAR Parts 121, 135, and 145 and manufacturers to be expanded beyond current levels.

AVS will provide increased levels of oversight and surveillance, rulemaking, and certification services for existing and new operators and manufacturers. As the number of aircraft flying in the NAS grows, and new aircraft models and technologies are introduced, they will be provided certification services based on available resources. This resource request will enable sequencing time for operator and production certification services to be reduced.

AVS will provide certification and operation services for operators, manufacturers, and air traffic controllers to assist in the introduction of new technologies that will identify precisely where an aircraft is at any given moment, and how long it will take to reach its destination. NextGen satellite technologies will make this information available to both pilots and controllers, with levels of accuracy and precision unattainable by radar. Even though planes will be flying closer together, the precise information provided by NextGen will increase safety by allowing pilots to know exactly where their aircraft is located in relation to other aircraft throughout all phases of flight. AVS will expand current service levels to accommodate unmet industry demands for certification and surveillance requirements and will continue to balance certification resources against the need to maintain safe operations for the existing fleet and manufacturers.

Finally, AVS will effectively lead and manage the FAA's Risk-Based Decision Making (RBDM) Initiative. Through this initiative, the FAA will build on safety management principles to proactively address emerging safety risk by using consistent, data-informed approaches to make smarter, system-level, risk-based decisions. Enhanced data analysis capabilities within the Hazard Tracking System based on evolution of SMS principles, improved business processes, and optimized database information will enable the FAA to be more proactive about safety make smarter, risk-based decisions throughout the agency, with industry and global stakeholders. The request will build on the existing RBDM policies and processes within the FAA and expand activities currently underway to evolve toward the use of SMS throughout the agency.

The AVS organizational structure is depicted in Figure 1 below:

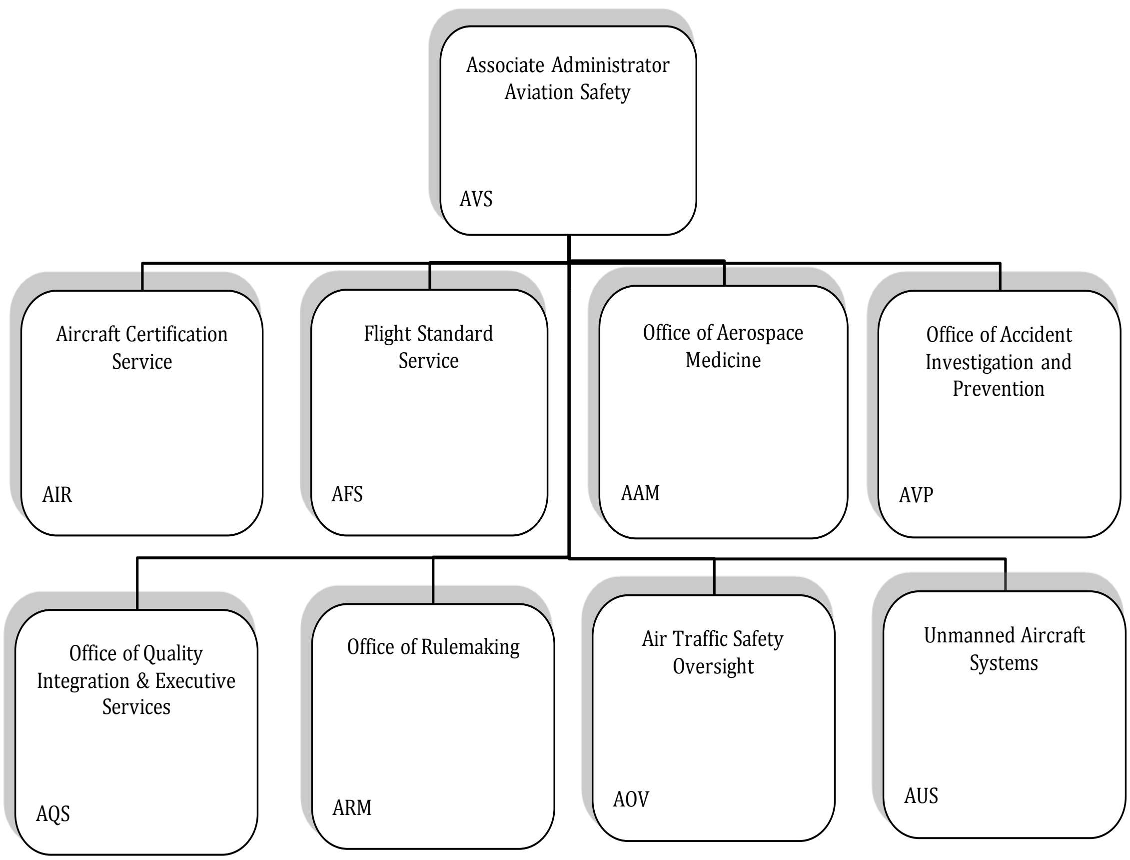


Figure 1 – AVS Organizational Chart

Budget Summary

Aviation Safety Organization (AVS)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	1,012,242	1,042,424	1,062,224	19,900
Program Costs	206,216	215,987	224,758	8,771
Total	**$1,218,458**	**$1,258,411**	**$1,286,982**	**$28,571**
FTE	**7,068**	**7,246**	**7,339**	**93**

The request of $1,286,982,000 and 7,339 FTE (FTEs) allows for AVS to provide core services of certification, production approval, and continued airworthiness of aircraft as well as the certification of pilots, mechanics, and others in safety-related positions; expand UAS integration into the NAS; and enhance safety data reporting capabilities through increased data sources. This request also includes $467,000 in Working Capital Fund adjustments and a base transfer of $189,000 and 1 FTE.

Funding details for AVS's eight services and offices:

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Flight Standards Service	851,773	874,549	874,709	160
Aircraft Certification Service	215,291	222,336	226,700	4,364
Office of Aerospace Medicine	56,272	60,114	62,548	2,434
Office of Rulemaking	6,218	6,368	6,504	136
Accident Investigation & Prevention Service	21,587	25,713	26,442	729
Air Traffic Safety Oversight Service	23,492	23,967	24,105	138
Office of Unmanned Aircraft Systems	0	0	12,185	12,185
Office of Quality, Integration and Executive Service	43,825	45,364	53,789	8,425
Total	**$1,218,458**	**$1,258,411**	**$1,286,982**	**$28,571**

Discretionary Adjustments:

Program	Service Unit	Amount
Unmanned Aircraft Systems (AUS) Integration	AFS/AIR	2,850
Hazard Tracking Tool	AVP	500
Total Discretionary Adjustments		**$3,350**

Transition to Operations and Maintenance:

Program	Service Unit	Amount
A25.02-01/02, Safety Approach for Safety Oversight (SASO)	AFS, AQS	7,663
A26.01-01, Aviation Safety Knowledge Management Environment (ASKME)	AIR, AQS	444
A17.01-02, Regulation & Certification Infrastructure for Safety System (RCISS)	AVS, AQS	1,808
Total Transition to Operations and Maintenance		**$9,915**

Detailed Justification for – Flight Standards (AFS)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Flight Standards Service (AFS)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	717,679	737,585	746,305	8,720
Program Costs	134,094	136,964	128,404	-8,560
Total	**$851,773**	**$874,549**	**$874,709**	**$160**
FTE	**5,133**	**5,247**	**5,273**	**26**

The FY 2017 request of $874,709,000 and 5,273 FTEs allows AFS to provide certification and surveillance of U.S. air carriers and foreign air carriers operating in and over the U.S. through the establishment and oversight of safety requirements, standards, and regulations. Current funds cover 8 regional offices, 79 flight standards district offices, 18 certificate management offices, 4 international field offices, and 5 aircraft evaluation group offices.

What is this program and why is it necessary?

AFS provides core services of certification, production approval, and continued airworthiness of aircraft as well as the certification of pilots, mechanics, and others in safety-related positions; expands UAS integration into the NAS; and enhances safety data reporting capabilities through increased data sources.

In FY 2017, AFS will develop policies, procedures, and approval processes to enable UAS operations; conduct and participate in Pilot Seminars and Flight Instructor Refresher Courses and Commercial Flight Instructor/Designated Pilot Examiner refresher courses at towered and non-towered airports; develop appropriate policy, procedural guidance, and certificate management programs for the emerging technologies needed to transition and operate in the NextGen environment; validate effectiveness of initiatives, interventions, and recommendations implemented by the General Aviation (GA) Loss of Control workgroup and the amateur-built flight standardization board to mitigate loss of control causes in GA; establish the infrastructure necessary to oversee the implementation of SMS by 14 CFR Part 121 Air Carriers; integrate Safety Assurance System (SAS) in all the field offices; formalize an AFS Internal Safety Assurance Program; and implement a secure FAA airman test delivery system that incorporates new technology and is supported by training and testing documents that embrace NextGen concepts.

AFS FY 2015-2017 programs, including **UAS, SAS, Air Carrier Training Aviation Rulemaking Committee, Airman Certification System Improvement, Activities from FAA Modernization and Reform Act, and Certification & Oversight of New Entrants,** are aligned with the following agency strategic goals:

- *NAS of the Future: Deliver Benefit through Technology/Infrastructure*
- *RBDM: Make Aviation Safer and Smarter*

Anticipated FY 2016 Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Flight Standards Service	• Developing policies, procedures, and approval processes to enable UAS operations. • Conducting and participating in Pilot Seminars and Flight Instructor Refresher Courses and Commercial Flight Instructor/Designated Pilot Examiner refresher courses at towered and non-towered airports. • Developing appropriate policy, procedural guidance, and certificate management programs for the emerging technologies needed to transition and operate in the NextGen environment. • Validating effectiveness of initiatives, interventions, and recommendations, implemented by the GA Loss of Control workgroup and the amateur-built flight standardization board to mitigate loss of control causes in GA. • Establishing the infrastructure necessary to oversee the implementation of SMS by 14 CFR Part 121 Air Carriers. • Deploying SAS to field offices. • Formalizing an AFS Internal Safety Assurance Program. • Developing a secure FAA airman test delivery system that incorporates new technology and is supported by training and testing documents, which embraces NextGen concepts.

Why do we want/need to fund the program at the requested level?

AFS plays a vital role in supporting Agency emerging technology initiatives by developing standards, policy, and guidance needed to transition and operate in the NextGen environment; establishing regulations and standards, conducting inspections, audits, surveillance, investigations, enforcement and certification activities related to operators, airmen and designees.

In FY 2017 AFS plans to expand UAS integration into the NAS and certification/integration services for newly designed and manufactured aviation products associated with UAS.

Anticipated FY 2017 Accomplishments:

Function/Office	FY 2017 Anticipated Accomplishments
Flight Standards Service	• Developing policies, procedures, and approval processes to enable UAS operations. • Delivering Pilot Seminars and Flight Instructor Refresher Courses and Commercial Flight Instructor/Designated Pilot Examiner refresher courses at towered and non-towered airports. • Continuing developing policy, procedural guidance, and certificate management programs for the emerging technologies needed to transition and operate in the NextGen environment. • Evaluating effectiveness of initiatives, interventions, and recommendations, implemented by the GA Loss of Control workgroup and the amateur-built flight standardization board to mitigate loss of control causes in GA. • Continuing to develop the infrastructure necessary to oversee the implementation of SMS by 14 CFR Part 121 Air Carriers. • Integrating SAS in all the field offices. • Formalizing an AFS Internal Safety Assurance Program. • Implementing a secure FAA airman test delivery system that incorporates new technology and is supported by training and testing documents, which embraces NextGen concepts.

Total Requested Discretionary Increase Requests:

Programs	Amount	FTP	FTE
Unmanned Aircraft Systems (AUS) Integration	2,125,000	9	5
Total	**$2,125,000**	**9**	**5**

Unmanned Aircraft Systems (AUS) Integration: AFS is requesting $2,125,000 including 9 FTP and 5 FTE to facilitate UAS access to the NAS through the implementation of three focus areas that expand the current exemption and Certificates (COAs) of Authorization processes into new areas. This growth supports the NAS Initiative to safely and efficiently incorporate new aviation products and users such as UAS. AVS will continue to support the aviation industry's growing demand for aircraft, operator, and airmen certification services as they continue to grow for UAS products. New designs and products have been developed and must be safely integrated into the NAS.

This program will allow for the following:

- Timelier UAS registrations and operator certificates.
- Greater access to data relating to UAS aircraft and operators entering the world of aviation.

What Benefits will be provided to the American Public through this request?

The programmatic approach outlined in the NAS Initiative includes adapting services and regulatory approaches in order to integrate these new operations into the NAS in a timely fashion and with the same level of safety and efficiency as other legacy operations. This request will support the planning for and subsequent processing of exemptions and COAs associated with the expanded UAS access to the NAS. The Registry has and will continue to expand operations to include the processing of registration and recordation documents for aircraft in the UAS category. There are also maintenance and renewal activities associated with the issuance of certificates for the airmen/operator.

Detailed Justification for – Aircraft Certification Service (AIR)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Aircraft Certification Service (AIR)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	197,218	202,321	206,389	4,068
Program Costs	18,073	20,015	20,311	296
Total	**$215,291**	**$222,336**	**$226,700**	**$4,364**
FTE	**1,294**	**1,328**	**1,344**	**16**

The FY 2017 request of $226,700,000 and 1,344 FTEs allows AIR to provide regulatory oversight for type, production, and airworthiness certification of civil aeronautical products and parts. Current funds cover 14 Aircraft Certification Offices, 19 Manufacturing Inspection District Offices, 3 Manufacturing Inspection Satellite Offices, 1 CMO, 2 Certificate Management Units, and 2 International Offices (Brussels, Shanghai).

What is this Program and Why is it Necessary?

AIR's functions, which are essential to ensure the safety of the NAS, are establishing safety standards and procedures governing the design, production, and continued airworthiness of aircraft and aircraft parts; approving aircraft design, aircraft engines, propellers, and parts; issuing approvals to manufacturing facilities upon showing compliance to the applicable safety standards; determining whether aircraft meet applicable standards and are safe to fly; providing oversight and surveillance of approval holders to ensure continued compliance to safety standards; collecting and reviewing safety data, performing trend analysis, and taking the appropriate actions to ensure continued operational safety of the existing fleet; managing designee qualifications, appointments and oversight; and investigating possible violations and initiating compliance and enforcement actions.

In FY 2017, AIR will support agency emerging technology initiatives by developing standards, policy, and guidance needed to transition and operate in the NextGen environment, conducting inspections, audits, surveillance, investigations, enforcement and certification activities related to aircraft manufacturers and suppliers.

AIR FY 2015-2017 programs, including **FAA Modernization and Reform Activities under the Small Airplane Revitalization Act: Part 23 Rule & Part 21/SMS Rule; Organization Delegation Authorization (ODA) Improvements; Advancing our SMS; Globalization of the Aviation Manufacturing Industry; Developing Advisory Guidance for Certification of UAS,** are aligned with the following agency strategic goals:

- *RBDM: Make Aviation Safer and Smarter*
- *Global Leadership: Enhance Global Leadership*
- *NAS of the Future: Deliver Benefit through Technology/Infrastructure*

Anticipated FY 2016 Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Aircraft Certification Service	• Advancing rulemaking efforts to update regulations to incorporate safety management principles into the design and manufacturing environments. • Continuing to update airworthiness standards, policies, and processes to reflect the safety continuum and enabling the proper introduction and oversight of safety enhancing technologies. • Guiding development of standards and issuing policy and guidance associated with UAS. • Encouraging the implementation of voluntary safety enhancements by U.S. industry and the global community. • Continuing Part 23 rulemaking to improve the certification standards of small airplanes leading to improved safety and reduced cost. • Continuing the transition of existing fleet of piston-engine aircraft to unleaded fuel and enabling newly manufactured aircraft to be certificated with unleaded fuel. • Continuing to evolve and optimize our delegation system to reinforce a systems approach to safety.

Why Do We Want/Need to Fund the Program at the Requested Level?

AIR operations vital to aviation safety include promoting FAA Modernization and Reform activities under the Small Airplane Revitalization Act, developing the Part 23 and Part 21/SMS Rule, organizing ODA Improvements, implementing the Safety Continuum for other product types, advancing our SMS, globalizing the aviation manufacturing industry, and developing advisory guidance for certification of UAS.

Anticipated FY 2017 Accomplishments:

Function/Office	FY 2017 Anticipated Accomplishments
Aircraft Certification Service	• Continuing to advance rulemaking efforts to update regulations to incorporate safety management principles into the design and manufacturing environments. • Updating airworthiness standards, policies, and processes to reflect the safety continuum and enabling the proper introduction and oversight of safety enhancing technologies. • Guiding development of standards and issuing policy and guidance associated with UAS. • Encouraging the implementation of voluntary safety enhancements by U.S. industry and the global community. • Continuing Part 23 rulemaking to improve the certification standards of small airplanes leading to improved safety and reduced cost. • Transitioning the existing fleet of piston-engine aircraft to unleaded fuel and enabling newly manufactured aircraft to be certificated with unleaded fuel. • Evolving and optimizing our delegation system to reinforce a systems approach to safety.

Total Requested Discretionary Increase Requests:

Programs	Amount	FTP	FTE
Unmanned Aircraft Systems (UAS) Integration	725,000	5	4
Total	**$725,000**	**5**	**4**

Unmanned Aircraft Systems (UAS) Integration: AIR is requesting $725,000 to guide development of standards and issuing policy and guidance associated with UAS. This request will support the planning for and subsequent processing of residual and incoming Section 333 exemptions, COA, type certifications, and experimental certificates associated with the expanded UAS access to the NAS. In addition, this request supports development and coordination of design, production, and airworthiness requirements, certification procedures, and international harmonization of FAA UAS certification activities.

This program will allow for the following:

- Visual Line of Sight operations in urban areas, planned Beyond Visual Line of Sight (BVLOS) operations in rural areas, and dynamic BVLOS operations in rural areas.
- Continued development of UAS design approval process under the existing 21.17(b) special class type design regulations with its pathfinder project.

What Benefits will be provided to the American Public through this request?

The request provides for the expansion of services for type, production and airworthiness certification of civil aeronautical products and parts. AIR is responsible for the establishment of safety standards and procedures governing the design, production and continued airworthiness of aircraft and aircraft parts. AIR provides the American public the engineering and manufacturing expertise to determine if an aircraft meets applicable standards and is safe to fly.

Detailed Justification for – Office of Aerospace Medicine (AAM)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Office of Aerospace Medicine (AAM)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	43,974	47,194	49,543	2,349
Program Costs	12,298	12,920	13,005	85
Total	**$56,272**	**$60,114**	**$62,548**	**$2,434**
FTE	**355**	**383**	**397**	**14**

The FY 2017 request of $62,548,000 and 397 FTEs allows AAM to provide a broad range of external and internal aviation safety programs related to aerospace medicine. Current funds cover the AAM headquarters staff, medical specialties personnel, drug abatement division, 9 regional offices, 6 medical field offices, and the Civil Aerospace Medical Institute (CAMI).

What is this Program and Why is it Necessary?

AAM provides advice and technical support for medical policies and standards, medical rulemaking, airman medical certification appeals, psychiatry, agency employee medical clearance appeals. AAM manages the development, implementation, administration, and compliance monitoring of the aviation industry drug and alcohol testing programs; and supports a wide range of national programs and administrative activities within their geographical areas. At CAMI, AAM develops and manages a system for the medical examination and certification of U.S. civil airmen; conducts medical and related human factors research projects applicable to the FAA's mission; develops and administers aerospace medicine education programs; operates a medical clinic; provides occupational health programs for the Mike Monroney Aeronautical Center; and plans, develops, and administers basic and refresher AME training.

AAM FY 2015-2017 programs, including **AME Assisted Special Issuance and Conditions AMEs Can Issue Program, Aerospace Medicine Safety Information System, AAM SMS, Medical Guidance for Effective Screening for Disqualifying Medical Conditions, and International Leadership in Aerospace Medicine**, are aligned with the following agency strategic goals:

- *RBDM: Make Aviation Safer and Smarter*
- *NAS of the Future: Deliver Benefit through Technology/Infrastructure*
- *Global Leadership: Enhance Global Leadership*

Anticipated FY 2016 Accomplishments:

Function / Office	FY 2016 Anticipated Accomplishments
Office of Aerospace Medicine	• Leading the world in development of medical standards for pilots and ATCS. • Using risk based approaches to determine the eligibility of airmen and ATCS for medical certification and issuing medical certificates. • Developing appropriate medical protocols and reviewing complex medical cases to medically certify all applicants who can be safely qualified to fly. • Managing and supporting nearly 3,200 designees that perform critical aviation medical examiner duties for the FAA. • Issuing medical clearances to Air Traffic Controllers. • Improving our medically based approaches to managing aeromedical hazards. • Conducting compliance and enforcement surveillance inspections of aviation industry employers that have required employee drug and alcohol testing programs. • Managing the FAA internal substance abuse testing program. • Overseeing the AME Training and Oversight program for designees. • Providing critical physiological and survival training to thousands of GA and commercial pilots.

Why Do We Want / Need to Fund the Program at the Requested Level?

AAM is responsible for a broad range of external and internal aviation safety critical programs related to medicine. AAM leads the world in developing medical standards for pilots and ATCS; implements and manages systems to medically certify commercial and GA pilots; processes pilot medical certification and appeal cases, including special issuances for increasingly complex medical issues; manages medical clearance of ATCS; designates and overseeing AMEs; conducts compliance and enforcement inspections of aviation industry drug and alcohol testing programs; implements and oversees drug and alcohol testing of FAA employees in safety critical and security jobs; and provides critical physiological and survival training to thousands of GA and commercial airmen.

Anticipated FY 2017 Accomplishments:

Function / Office	FY 2017 Anticipated Accomplishments
Office of Aerospace Medicine	• Leading the world in development of medical standards for pilots and Air Traffic Controllers. • Expanding risk based approaches to determine the eligibility of airmen and Air Traffic Controllers for medical certification and issuing medical certificates. • Developing appropriate medical protocols and reviewing complex medical cases to medically certify all applicants who can be safely qualified to fly. • Managing and supporting nearly 3,200 designees that perform critical aviation medical examiner duties for the FAA. • Accelerating the issuance of medical clearances to Air Traffic Controllers. • Improving our medically based approaches to managing aeromedical hazards. • Conducting compliance and enforcement surveillance inspections of aviation industry employers that have required employee drug and alcohol testing programs. • Managing the FAA internal substance abuse testing program. • Overseeing the AME Training and Oversight program for designees. • Providing critical physiological and survival training to thousands of GA and commercial pilots.

What Benefits will be provided to the American Public through this request?

This request will support on-going safety requirements for airman and air traffic controller medical certification, surveillance of industry drug and alcohol programs, surveillance of Aerospace Medical Examiners (AMEs), delivery of aerospace medical education courses for airman and occupational safety and health management services for agency employees.

Detailed Justification for – Office of Rulemaking (ARM)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Office of Rulemaking (ARM)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	4,984	5,090	5,143	53
Program Costs	1,234	1,278	1,361	83
Total	**$6,218**	**$6,368**	**$6,504**	**$136**
FTE	**36**	**34**	**35**	**1**

The FY 2017 request of $6,504,000 and 35 FTEs allows ARM to ensure FAA regulations are developed to improve safety levels according to approved processes and are completed within mandated timelines. Current ARM funds cover two divisions and a program analysis staff.

What is this Program and Why is it Necessary?

ARM performs necessary rulemaking functions of developing, with the assistance of other internal stakeholders, FAA's rulemaking priorities for the current year and out-years; coordinates the development of rules with all internal and external stakeholders; processes petitions for rulemaking and petitions for exemption received from the aviation community; develops and implements improvements to critical FAA rulemaking and exemption processes and systems; and facilitates the ability of internal stakeholders to support such processes and systems.

ARM FY 2015-2017 programs, including **Private Pilot Privileges Rule, UAS Rulemaking Initiatives, Part 23 Rule, Communication, Navigation and Surveillance Rule, International Regulatory Cooperation, and the Rulemaking Prioritization Program**, are aligned with the following agency strategic goals:

- *NAS of the Future: Deliver Benefit through Technology/Infrastructure*
- *RBDM: Make Aviation Safer and Smarter*
- *Global Leadership: Enhance Global Leadership*

Anticipated FY 2016 Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Office of Rulemaking	• Implement recommendations of recently-completed in-depth FAA Rulemaking process analysis to most effectively address increased rulemaking workload. • Processing 85 percent of exemption requests within 120 days. • Improving the FAA's rulemaking program.

Why Do We Want/Need to Fund the Program at the Requested Level?

ARM is responsible for ensuring FAA regulations are developed to improve safety levels according to approved processes and are completed within mandated timelines. ARM accomplishes its rulemaking functions by developing, with the assistance of other internal stakeholders, FAA's rulemaking priorities for the current year and out-years, coordinating the development of rules with all internal and external stakeholders, processing petitions for rulemaking and petitions for exemption received from the aviation community, developing and implementing improvements to critical FAA rulemaking and exemption processes and systems, and facilitating the ability of internal stakeholders to support such processes and systems.

Anticipated FY 2017 Accomplishments:

Function/Office	FY 2017 Anticipated Accomplishments
Office of Rulemaking	• Leverage FY-16 process refinements to attain rulemaking schedule stability and provide completed FY17 documents within 90 days of date targets. • Processing 85 percent of exemption requests within 120 days. • Continuing to improve the FAA's rulemaking program.

What Benefits will be provided to the American Public through this request?

ARM maintains an extensive base of knowledge from processing UAS 333 exemptions which provide authorization for companies to operate UAS. With RBDM petition analyses, ARM discerns patterns in the requested operations, the aircraft, and the models of UAS on the market and uses a standardized process along with the conditions and limitations for each UAS exemption. With this process evolution ARM has taken the lead in UAS exemption processing for most new exemptions requests, which now require only a summary grant document. As a result, some 90 percent of UAS 333 petitions have been granted successfully.

Detailed Justification for – Office of Accident Investigation and Prevention (AVP)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Office of Accident Investigation and Prevention (AVP)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	11,120	11,709	11,868	159
Program Costs	10,467	14,004	14,574	570
Total	**$21,587**	**$25,713**	**$26,442**	**$729**
FTE	**64**	**65**	**67**	**2**

The FY 2017 request of $26,442,000 and 67 FTEs allows AVP to provide analytical capabilities to identify risk affecting the entire air transportation system and industry. Current funding supports headquarters staff and 4 divisions.

What is this Program and Why is it Necessary?

AVP is the principal organization within the FAA with respect to aircraft accident investigation and all activities related to the NTSB. Its mission is to make air travel safer through investigation, data collection, risk analysis, and information sharing. AVP identifies corrective measures based on accident data and FAA/NTSB safety recommendations; coordinates FAA-wide participation in accidents and incident investigations; collects aviation safety data, identifies trends; and measures effectiveness of interventions. AVP also leads agency efforts on RBDM and SMS.

AVP FY 2015-2017 programs, including **Commercial Aviation Safety Team, GA Joint Steering Committee, ASIAS, RBDM Strategic Initiative, and the Aviation Safety Research and Development Program**, are aligned with the following agency strategic goals:

- *NAS of the Future: Deliver Benefit through Technology/Infrastructure*
- *RBDM: Make Aviation Safer and Smarter*

Anticipated FY 2016 Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Office of Accident Investigation and Prevention	• Running agency efforts to effectively address NTSB recommendations issued to the FAA. • Leading agency efforts to effectively address FAA Safety recommendations. • Collecting and analyzing aviation safety data at a national level and consolidate the data under ASIAS. • Heading the FAA's Initiative on RBDM and aligning the activities with the FAA SMS, AVS SMS, and the U.S. State Safety Program (SSP). • Facilitating the continued maturation and evolution of the FAA's implementation of SMS and U.S. SSP focusing on the use of Safety Risk Management (SRM) and safety assurance processes. • Promoting SMS implementation across the aviation system and working with International Civil Aviation Organization (ICAO) and other Civil Aviation Authorities (CAA) to ensure consistency internationally. • Advancing accident investigation by using root cause analysis techniques in analyzing data in conjunction with activity surrounding major accident investigations. • Directing government/industry efforts for the Commercial Aviation Safety Team and the GA Joint Steering Committee.

Why Do We Want/Need To Fund The Program At The Requested Level?

AVP leads agency efforts on RBDM and SMS. It is responsible for analytical capabilities to identify risk affecting the entire air transportation system and industry. AVP identifies corrective measures based on accident data and FAA/NTSB safety recommendations; coordinates FAA-wide participation in accidents and incident investigations; and collects aviation safety data, identifies trends, and measures the effectiveness of interventions.

AVP heads agency efforts to effectively address NTSB and FAA Safety recommendations; collects and analyzes aviation safety data at a national level; and consolidates the data under ASIAS. AVP directs the initiative on RBDM and aligns the activities with the FAA SMS, AVS SMS, and the U.S. SSP; facilitates the continued maturation and evolution of the FAA's implementation of SMS and the U.S. SSP; focuses on the effective use of SRM and safety assurance processes; promotes SMS implementation across the aviation system; and works with ICAO and other CAA to ensure consistency internationally. AVP advances accident investigation by using root cause analysis techniques in examining data from major accident investigations and oversees government/industry efforts for the Commercial Aviation Safety Team and the GA Joint Steering Committee.

Anticipated FY 2017 Accomplishments:

Function/Office	FY 2017 Anticipated Accomplishments
Office of Accident Investigation and Prevention	• Leading agency efforts to effectively address NTSB recommendations issued to the FAA. • Leading agency efforts to effectively address FAA Safety recommendations. • Collecting and analyzing aviation safety data at a national level and consolidate the data under ASIAS. • Leading and managing the FAA's Initiative on RBDM and aligning the activities with the FAA SMS, AVS SMS, and the U.S. SSP. • Facilitating the continued maturation and evolution of the FAA's implementation of SMS and the U.S. SSP focusing on the effective use of SRM and safety assurance processes including the deployment of an initial FAA level hazard tracking system. • Promoting safety management implementation across the aviation system and working with ICAO and other CAA to ensure consistency internationally. • Advancing accident investigation by using root cause analysis techniques in analyzing data in conjunction with activity surrounding major accident.

Total Requested Discretionary Increase Requests:

Programs	Amount	FTP	FTE
Hazard Tracking Tool	500,000	-	-
Total	**$500,000**	**-**	**-**

Hazard Tracking Tool: AVP is requesting $500,000 to support the development of the Hazard Tracking Tool. This request will enable AVS to effectively lead and manage the FAA's Initiative on RBDM through the collection of safety data within the Hazard Tracking System to improve standardization, data access, and modeling integration, enhance decision-making processes, and evolve the oversight model for industry. Hazard tracking is a critical component of RBDM, SMS, and SPM. This request supports the initiative on RBDM by building on the foundation of existing policies and processes in the FAA, as well as the activities currently underway to evolve toward the use of SMS and SSP principles throughout the agency.

This program will allow for the following:

- Enhance data consistency and reduce manual processes.
- Achieve a critical component of the responsibilities of its new SPM branch.

What Benefits will be provided to the American public through this request?

This request supports the FAA's RBDM Strategic Initiative to Make Aviation Safer and Smarter by delivering advanced methods for historical risk analysis and future risk forecasting and by developing and operating safety management functions. As a result, newly identified hazards and ineffective controls for the most significant system-wide safety issues are identified, analyzed, and mitigated and safety performance is measured and managed. The request also supports the agency's strategic objectives by enhancing hazard tracking tools to ensure data consistency and reduce manual processes. The requirements for these programs have Congressional mandate and support initiatives such as the Commercial Air Carrier Fatality Rate, the GA Joint Steering Committee and NextGen Safety Analysis.

Detailed Justification for – Air Traffic Oversight Service (AOV)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Air Traffic Oversight Service (AOV)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	21,529	21,837	21,956	119
Program Costs	1,963	2,130	2,149	19
Total	**$23,492**	**$23,967**	**$24,105**	**$138**
FTE	**125**	**128**	**128**	**0**

The FY 2017 request of $24,105,000 and 128 FTEs allows AOV to establish safety standards and provides independent oversight of the ATO – the provider of air traffic services in the United States. Current funds cover headquarters staff, 2 divisions, and 3 field offices.

What is this Program and Why is it Necessary?

AOV validates the ATO safety-related processes used for the introduction of new separation standards and modifications of existing separation standards; approves new standards, waivers, extension and modification of existing waivers; analyzes and authorizes controls used by the ATO to mitigate hazards; participates in operational review and analysis of information pertaining to the ATO employees, operations and programs; develops and amends regulations and guidance for regulatory oversight and credentialing functions; participates in the development and harmonization of air traffic control international standards; and provides regulatory oversight of the ATO SMS.

AOV FY 2015-2017 programs, including **Air Traffic and Technical Operation Safety Report Event Reviews and Surveillance and Audits of ATO Facilities and Locations** are aligned with the following agency strategic goals:

- *NAS of the Future: Deliver Benefit through Technology/Infrastructure*
- *RBDM: Make Aviation Safer and Smarter*
- *Workforce of the Future: Empower and Innovate through FAA's People*

Anticipated FY 2016 Accomplishments:

Function / Office	FY 2016 Anticipated Accomplishments
Air Traffic Oversight Service	• Conducting risk-based audits of 60 facilities. • Conducting risk-based audits of 15 Technical Operations facilities/locations. • Surveillance of over 600 Air Traffic facilities and Technical Operation locations • Conducting independent risk-based audits of 150 Air Traffic facilities and Technical Operations locations • Issuing and renewing over 9,000 Air Traffic Control, Technical Operation, and Aeronautical Information credentials • Conducting over 18,000 Air Traffic and Technical Operation Safety Report Event Reviews • Approving over 100 changes to separation standards, procedures, alternative means of compliance, and hardware and automation modifications and upgrades in support of NextGen

Why Do We Want / Need to Fund the Program at the Requested Level?

AOV has the regulatory responsibility to provide independent safety oversight of the ATO and monitor ATO's compliance with safety standards and the SMS. AOV accomplishes its safety oversight functions by executing investigations of ATO accidents, incidents, and other occurrences that happen within the NAS; approving changes to separation standards, procedures, new systems, hardware, and automation modifications and upgrades; conducting system audits based on risk factors for accidents, incidents, operational errors, operational deviations, runway incursions, or significant non-compliance with approved safety standards in over 600 ATO facilities; and analyzing the causes of Operational Errors to enable development and implementation of safety critical corrective actions.

Anticipated FY 2017 Accomplishments:

Function / Office	FY 2017 Anticipated Accomplishments
Air Traffic Oversight Service	• Performing surveillance on approximately 500 ATO facilities and locations monthly, ensuring the safety of the NAS. • Auditing approximately 150 ATO facilities and locations annually, ensuring the safety of the NAS. • Overseeing the renewal and issuance of more than 1,000 Air Traffic Control and Technical Operations credentials monthly, ensuring the qualification of safety operators in the NAS. • Approving approximately 35 ATO alternative means of compliance requests annually, ensuring the optimization and safety of the NAS. • Conducting approximately 350 Air Traffic and Technical Operations Safety Report Event Reviews weekly, ensuring the safety of the NAS.

What Benefits will be provided to the American Public through this request?

This request will support on-going AOV oversight of the ATO safety standards through audits, surveillance, investigations and inspections. The program initiatives conducted by AOV through surveillance, inspections, and audits at ATO facilities will support on-going implementation of Safety Management System principles within the NAS.

Detailed Justification for – Unmanned Aircraft Systems Integration (AUS)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Office of Unmanned Aircraft Systems Integration (AUS)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	-	-	4,123	4,123
Program Costs	-	-	8,062	8,062
Total	**$-**	**$-**	**$12,185**	**$12,185**
FTE	**-**	**-**	**33**	**33**

The FY 2017 request of $12,185,000 and 33 FTEs allows AUS to develop policies, procedures and approval processes to enable greater expansion of unmanned aircraft systems into the NAS. FY 2017 funding supports headquarters staff and 4 divisions.

What is this Program and Why is it Necessary?

The UAS Integration Office is responsible for the safe, efficient, and timely integration of UAS into the NAS, which encompasses supporting the development, implementation, and maintenance of operating regulations, policies, guidance, requirements, criteria, and procedures related to UAS integration; determining and prioritizing UAS research needs and requirements; leading agency UAS standards development and international harmonization efforts; facilitating programs to advance UAS integration activities beyond the scope of the proposed small UAS rule; and developing and implementing communications and outreach/educational initiatives.

AUS FY 2017 programs and activities, including **the UAS Focus Area Pathfinder Initiatives, the UAS Test Sites, the Civil UAS Integration Roadmap, and the UAS Strategic Plan,** are aligned with the following agency strategic goals:

- RBDM: Make Aviation Safer and Smarter
- Workforce of the Future: Empower and Innovate through FAA's People

Anticipated FY 2017 Accomplishments

Function/Office	FY 2017 Anticipated Accomplishments
Office of Unmanned Aircraft Systems Integration	• Coordinate policies, procedures, and approval processes to enable UAS operations. • Guide development of standards, policy and guidance associated with UAS. • Expand integration services for newly designed and manufactured aviation products associated with UAS.

What Benefits will be provided to the American Public through this request?

This request will support the safe and efficient expansion of UAS operations in the NAS, including more efficient methods of processing of UAS registrations and enabling new UAS technologies and uses.

Detailed Justification for – Office of Quality, Integration, and Executive Services (AQS)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Office of Quality, Integration, and Executive Services (AQS)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	15,738	16,688	16,898	210
Program Costs	28,087	28,676	36,891	8,215
Total	**$43,825**	**$45,364**	**$53,789**	**$8,425**
FTE	**61**	**61**	**62**	**1**

The FY 2017 request of $53,789,000 and 62 FTEs allows AQS to provide executive oversight and direction of consolidated management support services for AVS. Current funds cover the AVS Executive Office, AQS Executive Management, and 4 divisions.

What is this Program and Why is it Necessary?

AQS coordinates the integration of business and operational processes across AVS. Its four divisions produce the following products and services: management of AVS QMS processes; oversight of special programs; leadership of strategic and business planning; development of employee training courses and programs; formulation and execution of the AVS budget; implementation of AVS human resource activities; coordination and oversight of all AVS administrative and management actions; and direction of the AVS internal communications program.

AQS FY 2015-2017 programs, including **AVS QMS, AVS Occupational Safety and Health (OSH), Program and AVS-wide integrated Environmental Management System (EMS), AVS Telework Program, AVS Internal Communications Program, AVS Diversity and Inclusion initiatives, Hiring Persons with Targeted Disabilities, Hiring Outreach and Recruitment Initiatives, Reasonable Accommodations,** are aligned with the following agency strategic goals:

- *RBDM: Make Aviation Safer and Smarter*
- *Workforce of the Future: Empower and Innovate through FAA's People*

Anticipated FY 2016 Accomplishments

Function/Office	FY 2016 Anticipated Accomplishments
Office of Quality, Integration, and Executive Services	• Supporting AVS delegation management including the migration of the designee data from the current systems to shared or new applications. • Maintaining the AVS ISO Certification. • Meeting the National Archives and Records Administration (NARA) annual requirements for Records Management. • Supporting the Government-wide initiative on Teleworking. • Implementing the AIR Policy and Regulation (engineer and inspector) portion of the ASTARS. • Exploring development of a Medical Certification Staffing Model. • Developing and implementing AVS-wide Human Resource and Leadership Development Programs in support of agency programs.

Why Do We Want/Need To Fund The Program At The Requested Level?

AQS is responsible for establishing integrated policy and processes for systems that support aviation safety. AQS manages the AVS-wide QMS and is the lead for maintaining the AVS ISO 9001:2008 certification. AQS manages and provides AVS-wide guidance for strategic and business planning, internal communications, OIG/GAO audits and reports to Congress, financial management, human resource management; integrates training and development services; oversees the AVS Environmental Protection Policy; and oversees the AVS OSH.

Anticipated FY 2017 Accomplishments

Function/Office	FY 2017 Anticipated Accomplishments
Office of Quality, Integration, and Executive Services	• Maintaining the AVS ISO Certification. • Meeting the NARA annual requirements for Records Management. • Supporting the Government-wide initiative on Teleworking. • Implementing the Office of Aerospace Medicine, Medical Certification component within the ASTARS. • Exploring development of an UAS Staffing Model. • Developing and implementing AVS-wide Human Resource and Leadership Development Programs in support of agency programs. • Implementing communications and employee engagement strategies to keep AVS employees informed of latest safety news pertinent to their mission. • Collaborating with the FAA Office of Communications and other LOBs to assist with agency-wide social engagement platforms such as IdeaHub. • Establishing an approach for improved management of AVS Information Technology Systems.

2017 AVS Transitions to Operations and Maintenance

Program	Service Unit	Amount
A25.02-01/02, Safety Approach for Safety Oversight (SASO)	AFS, AQS	7,663
A26.01-01, Aviation Safety Knowledge Management Environment (ASKME)	AIR, AQS	444
A17.01-02, Regulation & Certification Infrastructure for Safety System (RCISS)	AVS, AQS	1,808
Total Transition to Operations and Maintenance		**$9,915**

Safety Approach for Safety Oversight (SASO) Phase II Beta: $7,663,000: The SASO Program will transform AFS and the aviation industry to a national standard of system safety based upon ICAO SMS principles. Phase 2a developed the AFS Safety Assurance System (SAS), supporting the Safety Assurance component of the AVS SMS, for Title 14, Code of Federal Regulations (CFR) Parts 121 (major air carriers), 135 (on-demand or schedule operations) and 145 (repair stations). Phase 2a is currently in the Solution Implementation Phase of the Acquisition Management System (AMS) process. As of December 16th, 2015, a total of 100 of the planned 100 sites have achieved Initial Operational Capability. SASO Phase 2a Full Operational Capability (FOC) is scheduled for September 2016.

SASO Phase 2b is a continuation of the efforts begun in Phase 2a and has been segmented into two parts. SASO Phase 2b, Segment 1 includes additional SAS development for the remaining Title 14 CFR Parts for which AFS has oversight responsibility along with the development and implementation of the four SMS components; Safety Assurance, Safety Policy, Safety Risk Management and Safety Promotion. Development and implementation of the Safety Assurance component began in Phase 2a, with the development and deployment of the Safety Assurance System (SAS), but it will be further defined, developed and deployed in Phase 2b, Segment 1.

Aviation Safety Knowledge Management Environment (ASKME) Program, Segment 2. $444,000: This is a one-time request to support the transition of the Segment 2 Integrated System into operations, and required operations and preventative maintenance. ASKME systems support AIR business processes. The Aircraft Certification process software is being developed as part of the ASKME Segment 2 Integrated System, with the goal of streamlining the overall certification process. This supports Sec. 312 of P.L. 112-95, FAA SMS, and RBDM Strategic Initiative.

Regulation and Certification Infrastructure for System Safety (RCISS): $1,808,000: Contractor supports the RCISS Enterprise Architecture Framework (EAF) project that implements and maintains a new COTS data intelligence software tool that will play an integral part in agency adoption of Enterprise Information Management (EIM) as a strategic approach to optimizing information. This directly supports the RBDM initiative. EAF support is responsible for vital data architecture services including the following: Enterprise Data Architecture reviews, AMS artifacts, EIM architecture development, Federal Enterprise Architecture Data Reference Model mapping and data modeling, OMB Open Data Policy Support, FAA Data Registry metadata, Data Standards support, Data Sources for Service Oriented Architecture (SOA), and Master Data Management support. In FY 2015, a proof of concept of a new data intelligence tool that brought together disparate databases to create an enterprise picture of information was conducted. Its success, and eventual pilot and move to production, demonstrated the power of EIM supporting technologies for a data intensive organization like AVS. EAF contractors were vital in the development of plans and strategies supporting EIM for AVS.

Contract services for the RCISS SOA project are responsible for the overall implementation and maintenance of the RCISS SOA capability. Contract activities include defining the SOA strategy/roadmap and managing all provider and consumer access to enterprise web services, messaging, business process management and business rule products. They assist application teams in developing their solutions to leverage the SOA infrastructure and initiate standards for the use, performance, management and security of services or solutions available for reuse. They are also responsible for all SOA infrastructure upgrades, patches, designs and security reviews. A growing number of major application development programs are relying on the infrastructure these services provide. RCISS SOA capabilities result in overall better functionality and lifecycle cost savings for its customers who leverage its available reusable services. In FY 2015, SOA contract services supported Business Process Management and Business Rules Management middleware needs for AVS systems. Those services also supported build-out of the enterprise SOA environment to two geographically dispersed locations to support increased capacity, uptime and disaster recovery needs.

What Benefits will be provided to the American Public through this request?

This request will support AVS executive oversight and AQS management support of the organizational components that provide safety services. AQS cross-functional programs provide oversight and direction for QMS processes, strategic planning, employee development, finance and communication services that support the surveillance, certification, and rulemaking actions conducted by the organization's safety workforce.

AVS Explanation of Funding Changes

	Dollars ($000)	FTE
Aviation Safety	**$28,571**	**93**
Overview: For FY 2017, the Associate Administrator for Aviation Safety requests $1,286,982,000 and 7,339 FTEs to meet its safety mission. The FY 2017 request level reflects adjustments to base, other changes, discretionary adjustments, and a base transfer. This represents an increase of $28,571,000 over the FY 2016 enacted level.		
Adjustments to Base	**$29,593**	**83**
Annualization of FY 2016 Pay Raises: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.0 percent.	3,389	
Annualization of 2016 FTE: This increase provides for the annualized costs associated with FY 2016 new hires in AVS.	11,650	83
FY 2017 Pay Raises: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	12,510	
Two Less Compensable Days: This decrease represents two less compensable days in FY 2016 (260 days in FY 2017 vs. 262 days in FY 2016).	- 7,871	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Safety Approach for Safety Oversight (SASO) -** The SASO Program will transform the FAA's Flight Standards Service (AFS) and the aviation industry to a national standard of system safety based upon International Civil Aviation Organization (ICAO) Safety Management System (SMS) principles. SASO Phase 2a requirements include security, training and automation requirements. In FY 2015, a total of 100 sites achieved Initial Operational Capability (IOC). The funding request provides for second level engineering and recurring travel and training.	7,663	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Aviation Safety Knowledge Management Environment (ASKME) -** This request will provide $444,000 to transition Segment 2 Integrated Systems into operations, and required operations and preventative maintenance. ASKME supports AIR business processes. The aircraft certification process software is being developed as part of the ASKME Segment 2 Integrated System, with the goal of streamlining the overall certification process.	444	
Transition from Facilities & Equipment (F&E) to Operations (Ops): **Regulation and Certification Infrastructure for System Safety (RCISS) -** This request seeks to secure Operations & Maintenance (O&M) funding commensurate with supporting the capabilities fielded in support of the Aviation Safety (AVS) Information Technology (IT) infrastructure through investment of Facilities & Equipment (F&E) funding. The items transitioning from F&E to O&M include contractor support, maintenance of new IT software and data maintenance capabilities, and maintenance of critical telecommunications infrastructure components.	1,808	
Other Changes	**-$4,561**	**-**
Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's (DOT) Working Capital Fund (WCF) profile. These adjustments are being made to best align each office's resources within their expected WCF costs.	467	

	Dollars ($000)	FTE
Administrative Efficiencies: Aviation Safety (AVS) will achieve administrative efficiencies through cost reductions and avoidance in various areas such as contractual services and supplies.	- 5,028	
Discretionary Adjustments	**$3,350**	**9**
Unmanned Aircraft System (UAS) Integration: This increase supports the National Airspace System (NAS) Initiative to expand the safe and efficient incorporation of UAS. The program approach outlined in this Initiative includes adapting services and regulatory approaches in order to integrate UAS operations into the NAS in a timely fashion and with the same level of safety and efficiency as other legacy operations. The staffing requested will enable AVS to support increased demands for UAS services, such as the forthcoming certifications, operator applications and oversight and exemptions and Certificate of Authorization (COA) processes.	2,850	9
Hazard Tracking System: The Hazard Tracking System request will provide enhanced data consistency and reduce manual processes as well as mature the system from the initial capability. This request is aligned with the Administrator's Initiative on Risk-Based Decision Making (RBDM) by increasing data capabilities within the Hazard Tracking System for the collection safety information.	500	
Base Transfers	**$189**	**1**
Flight Standard Services Staffing (ATO to AVS): This request transfers $189K and 1FTP/1FTE from the Air Traffic Organization, Mission Support Services (ATO/AJV) to Aviation Safety, Flight Standard Services (AVS/AFS).	189	1

AVS Primary Stakeholders – Update In Process
(General Public is our Ultimate Customer)

Air Operator Certificates:	**5,276**	**Active Pilots:**	**721,894**
Major Air Carriers – (e.g. United Airlines)	81	ATP	157,738
Commuter Air Carriers/On Demand Air Taxis	2,075	Commercial	118,548
Commercial Operators (e.g. Baltimore Orioles)	80	Private	190,155
Foreign air carriers (e.g. Lufthansa)	492	Recreational	218
External Load (Logging/Oil Platform)	334	Sport	5,244
Agricultural Operators	1,850	Student	123,128
Public Use Authorities (State/City/Police)	364	Foreign Pilot	126,863
Air Agency Certificates:	**5,980**	**Non-Pilot Air Personnel:**	**762,217**
Pilot Training Schools	736	Mechanics & Repairmen	384,155
Repair stations	4,795	Control Tower Operators	36,855
Maintenance Training Schools	171	Flight Attendants	193,972
Pilot Training Centers	278	Ground Instructors	71,509
		Other (Dispatchers /Flight Navigators / Navigators /Parachute Riggers / Flight Engineers	75,726
Aircraft:	**307,781**		
Air Carrier Aircraft	7,237	**Flight Instructors:**	**101,956**
Commuter Air carrier Aircraft	155		
On-Demand Air Taxi Aircraft	10,695	**Airmen Medical Examinations:**	**379,809**
General Aviation Aircraft	289,694	Special Issuances	32,540
		Standard Issuances	347,269
Aviation Authorities – Other Countries:	**259**		
36 Bilateral Agreements	36	**Approved Manufacturers:**	**1,629**
Foreign Carrier Aviation Authorities	191		
Accident Investigation Authorities	32	**Aviation Industry Entities Covered by Anti-Drug & Alcohol Programs**	**1,619**
Check Airmen:	**12,537**		
Part 121	4,553	**National Transportation Safety Board:**	**447**
Parts 121/135	161	Safety Recommendations (5-year average)	74
Part 135	7,823	Open NTSB Safety Recommendations	341
		Major Investigations	32
Designees:	**9,635**		
Flight Standards	3,299	**ATCS Medical Clearance Exams:**	**13,305**
Aircraft Certification (includes ODAs)	3,142	Controller Workforce	13,219
Aerospace Medicine	3,194	Flight Service Station Workforce	86
Mechanics with Inspection Authority:	**21,194**		

As of July 2015

Staffing Information

	FY 2015 Actual	FY 2016 Enacted	Proposed Change	FY 2017 Request
Direct Full Time Equivalents (FTEs)	**7,068**	**7,246**	**93**	**7,339**
Flight Standards	5,133	5,247	26	5,273
Aircraft Certification	1,294	1,328	16	1,344
Aerospace Medicine	355	383	14	397
Rulemaking	36	34	1	35
Air Traffic Safety Oversight	125	128	0	128
Accident Investigation and Prevention	64	65	2	67
Unmanned Aircraft Systems	0	0	33	33
Quality, Integration and Executive Services	61	61	1	62
End of Year Employment (FTP)	**7,196**	**7,406**	**15**	**7,421**
Flight Standards	5,210	5,354	-20	5,334
Aircraft Certification	1,328	1,357	1	1,358
Aerospace Medicine	360	397	0	397
Rulemaking	39	36	0	36
Air Traffic Safety Oversight	131	133	0	133
Accident Investigation and Prevention	68	68	0	68
Unmanned Aircraft Systems	0	0	34	34
Quality, Integration and Executive Services	60	61	0	61

Safety Critical / Operational Support Staffing
End of Year Employment, Full Time Permanent

	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request
Flight Standards	**5,210**	**5,354**	**5,341**
Engineers	23	12	4
Aviation Safety Inspectors	4,026	4,184	4,177
Safety Technical Specialists	424	456	453
Operational Support	737	702	707
Aircraft Certification	**1,328**	**1,357**	**1,353**
Manufacturing Safety Inspectors	252	270	270
Pilots, Engineers and CSTAs	745	756	752
Safety Technical Specialist	183	172	172
Operational Support	148	159	159
Aerospace Medicine	**360**	**397**	**391**
Physicians, Physician Assistants, Nurses	52	57	57
Alcohol/Drug Abatement Inspectors	72	70	70
Safety Technical Specialist	193	226	220
Operational Support	43	44	44
Air Traffic Safety Oversight	**131**	**133**	**133**
Air Traffic Safety Inspectors	58	58	58
Safety Technical Specialist	68	68	68
Operational Support	5	7	7
Rulemaking	**39**	**36**	**38**
Safety Technical Specialist	36	33	35
Operational Support	3	3	3
Accident Investigation and Prevention Service	**68**	**68**	**70**
Air Safety Inspectors	8	9	9
Safety Technical Specialist	47	49	51
Operational Support	13	10	10
Unmanned Aircraft System Integration	**0**	**0**	**34**
Air Safety Inspectors/Engineers	0	0	25
Safety Technical Specialist	0	0	6
Operational Support	0	0	3
Quality, Integration and Executive Services	**60**	**61**	**61**
Safety Critical Staff	6	12	12
Operational Support	54	49	49
Total	**7,196**	**7,406**	**7,421**
Safety Critical Staff	6,193	6,432	6,439
Operational Support	1,003	974	982

As of January 2016

AVS Workload Indicators

	FY 2015 Actual	Estimated Change	FY 2016 Estimate	Estimated Change	FY 2017 Estimate
Flight Standards					
Airmen Certification Activities	220,349	4.1%	229,276	3.9%	238,203
Operator Certification / Certificate Management Activities	103,286	2.2%	105,604	2.2%	107,922
Investigation Activities	42,256	1.7%	42,976	1.7%	43,695
Non-ATOS Air Operator / Air Agency Surveillance Activities [Includes other than Part 121 Carriers]*	213,992	0.5%	215,051	0.5%	216,110
ATOS Operator Surveillance Activities	84,169	-1.0%	83,310	-1.0%	82,450
Enforcement and Investigation Activities	10,784	-4.3%	10,315	-4.5%	9,846
Education and Safety	11,715	10.0%	12,886	10.0%	14,175
Aircraft Registration Activities	713,000	5.0%	748,650	1.0%	756,137
Airmen Certification Examinations Activities	636,965	3.0%	656,074	3.0%	675,757
Aircraft Certification					
TC/STCs Issued	1,034	0.8%	1,042	-0.4%	1,038
Other Design Approvals Issued	3,137	0.5%	3,153	-0.3%	3,144
Production Approvals Issued	65	0.0%	65	1.5%	66
Airworthiness Directives Issued	358	3.4%	370	3.5%	383
Certificate Management Audits	2,462	0.3%	2,470	-0.8%	2,451
Aerospace Medicine					
Applications Processed / Received	379,809	-0.5%	378,008	1.5%	383,678
DWI/NDR Recommendations Processed	5,916	10.0%	6,508	1.5%	6,606
Number of AMEs	3,194	-2.6%	3,112	1.5%	3,159
Anti-Drug and Alcohol Registrations Completed	200	0.0%	200	0.0%	200
Anti-Drug and Alcohol MIS Annual Reports	4,000	0.0%	4,000	0.0%	4,000
Compliance and Enforcement Inspections	1,100	50.0%	1,650	0.0%	1,650
Number of Drug Tests	9,584	4.9%	10,058	0.0%	10,058
Number of Alcohol Tests	5,338	5.0%	5,605	0.0%	5,605
Accident Investigation and Prevention					
NTSB Recommendations Received	100	0.0%	100	0.0%	100
Accidents / Incidents Investigated	36	11.1%	40	0.0%	40
Follow-up Investigations	315	8.6%	342	1.8%	348
Special Accidents / Incidents Investigated	250	-100.0%	0	0.0%	0
NTSB Hearings Participated In	3	0.0%	3	0.0%	3
FAA Recommendations Received	300	0.0%	300	0.0%	300
NTSB Requests Received	672	0.4%	675	-1.9%	662
Rulemaking					
Exemptions	425	76.5%	750	100.0%	1500
Petitions for Rulemaking	25	-40.0%	15	33.3%	20
Rulemaking Projects	30	-16.7%	25	0.0%	25
Aviation Rulemaking Advisory Committee	0	0.0%	0	0.0%	0
Tasks	2	150.0%	5	-20.0%	4
Recommendations	2	150.0%	5	-20.0%	4
Air Traffic Safety Oversight					
Safety Analysis and Audits	168,500	0.0%	168,500	-8.8%	153,706

	FY 2015 Actual	Estimated Change	FY 2016 Estimate	Estimated Change	FY 2017 Estimate
Safety Incident Investigations	12,569	0.0%	12,569	135.5%	29,604
Air Traffic Change Approvals	10,400	0.0%	10,400	102.3%	21,035
Safety Report Reviews	24,599	0.0%	24,599	27.4%	31,327
Airmen Credentialing / Examination	27,899	0.0%	27,899	-31.8%	19,029
Education and Safety	52,500	0.0%	52,500	-20.4%	41,766

As of October 2015

INSERT TAB HERE:

COMMERCIAL SPACE TRANSPORTATION (AST)

Commercial Space Organization (AST)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$17,800**	**106**	**2**	**92**
Adjustments to Base	**$1,379**			**12**
Annualization FY 2016 Pay Raises 1.3%	48			
Annualization of 2016 FTE	1,258			12
FY 2017 Pay Raises 1.6%	179			
Two Less Compensable Days	-106			
Other Changes	**-$76**			
Administrative Efficiencies	-76			
Discretionary Adjustments	**$723**	**13**		**7**
Commercial Space Transportation (CST) Operational Management Staff	723	13		7
FY 2017 Request	**$19,826**	**119**	**2**	**111**

(Page Intentionally Left Blank)

Executive Summary: Commercial Space Transportation (AST)

What Is The Request And What Funds Are Currently Spent on the Program?

The request of $19,826,000 119 full-time permanent positions and 111 full-time equivalents allows AST to keep pace with the continued growth of the commercial space transportation industry.

What is this Program and Why is it Necessary?

AST's mission is to ensure protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch or reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation.

In all endeavors, safety is AST's highest priority. Our specific actions to ensure safe operations include: developing and publishing regulations; conducting environmental assessments; performing safety evaluations of proposed operations and launch sites; granting licenses, experimental permits, and safety approvals; conducting safety inspections; supporting range operations; and carrying activities in partnership with ATO to integrate commercial space operations into the National Airspace System.

Presidential policies have directed AST, through the Secretary of Transportation, to undertake new or enhanced safety roles, beyond its traditional functions. The National Space Policy (NSP) highlighted the critical importance of all departments and agencies in making efforts to preserve the space environment, promoting safe and responsible operations in space, and strengthening U.S. leadership in space.

Why Do We Want/Need To Fund The Program At The Requested Level?

Independent commercial space transportation activities are expanding at the same time NASA is increasingly relying on the commercial sector to provide cargo and crew services for the International Space Station. In addition, there is growing need to ensure the safe integration of space and air traffic, both domestically and internationally. Many planned missions will include technical and operational dimensions new in the 60-year history of spaceflight, involving an unprecedented level of complexity. This includes flyback boosters, autonomous safety systems, high frequency operations at existing airports, and reentries to sites within the Continental United States (CONUS). Funding at the requested level will ensure that AST has the technical, financial, and program support in place to address these activities and ensure public safety.

What Benefits will be provided to the American Public through this request?

From AST's inception in 1989 through 2015, the Office has licensed or permitted 290 commercial space launches and reentries. Commercial space transportation operations enhance citizens' lives through such activities as the launch of supplies for the International Space Station, deployment of communications satellites to ensure reliable cell phone operations, and the development of new transportation concepts and enabling technologies. This request will allow AST to keep pace with the increasing tempo of operations anticipated in the next few years and effectively evaluate the increasingly complex vehicles, systems, and operations.

Budget Summary

Commercial Space Transportation (AST)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	13,410	14,605	16,707	2,102
Program Costs	3,195	3,195	3,119	(76)
Total	**$16,605**	**$17,800**	**$ 19,826**	**$2,026**
FTE	**79**	**92**	**111**	**19**

The Office of Commercial Space Transportation's (AST) request of $19,826,000, 119 full-time permanent positions, and 111 FTE allows AST to keep pace with the continued growth of the commercial space transportation industry. The request includes $1,379,000 in net pay increases and $723 in discretionary increases.

Discretionary Adjustments:

Program	Amount
Operational Management Staff	723
Total Discretionary Adjustments	**$723**

Detailed Summary - Commercial Space Transportation (AST)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Commercial Space Transportation (AST)
$(000s)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	13,410	14,605	16,707	2,102
Program Costs	3,195	3,195	3,119	(76)
Total	**$16,605**	**$17,800**	**$ 19,826**	**$2,026**
FTE	**79**	**92**	**111**	**19**

The Office of Commercial Space Transportation's (AST) request of $19,826,000, 119 full-time permanent positions, and 111 FTE allows AST to keep pace with the continued growth of the commercial space transportation industry. The request includes $1,379,000 in net pay increases and $723 in discretionary increases.

What is this Program and Why is it Necessary?

FAA's Office of Commercial Space Transportation (AST) was established 1984 by Executive Order and the subsequent Commercial Space Launch Act. Our mission is to ensure protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch or reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation. Recent years have witnessed dramatic growth in both the number of commercial space transportation companies and operations. In addition, both the National Space Policy of 2010 and the National Space Transportation Policy of 2013 reflect a greater reliance by the Federal Government on the commercial space industry to accomplish national objectives. As a result, AST continues to see significant increases in the activities required to achieve its mission.

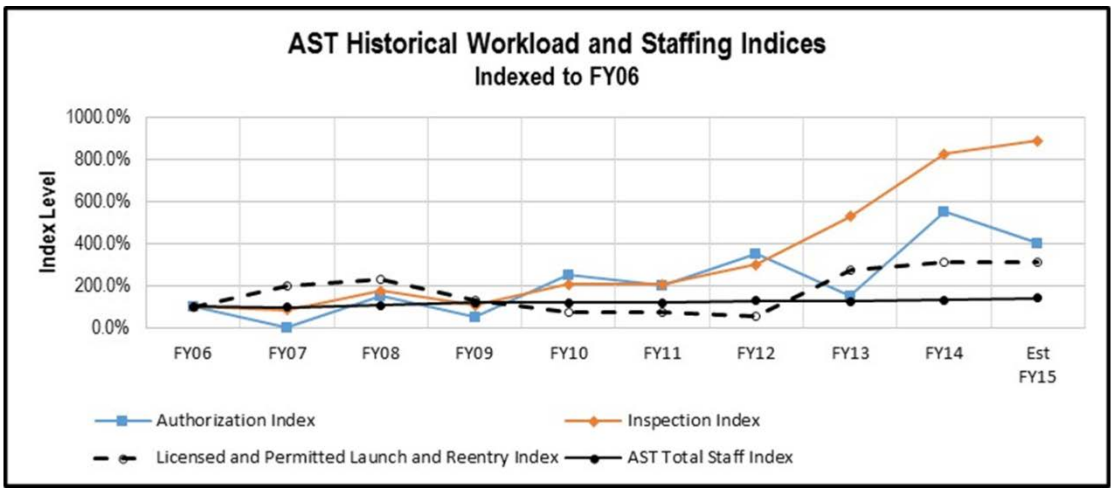
AST accomplishes its safety mission through the execution of its **licensing, permitting, and safety inspection** functions. The figure below highlights the trends in some of AST's workload indicators from 2006 – 2015.

- Four indices are:
  - The **Authorization Index** relates the number of *new* licenses, permits, and safety approvals made by AST in the given year relative to FY 2006. Note the Authorizations Index does not include license modifications or renewals at this point. New authorizations are shown to be a leading indicator of increased safety inspections and operations, which are illustrated by those respective indices which are also relative to their baseline FY 2006 level of activity.
  - Safety oversight – primarily through **on-site inspections** – is a core AST function, ensuring license and permit holders adhere to regulatory requirements. At least one inspection of launch operations is required at time of flight, but inspection also encompasses sending safety inspectors to launch and reentry operations to ensure an operator's compliance with regulations and the representations made in its application. Other key activities are also inspected, including dress rehearsals and the testing and installation of flight termination systems. Each year, AST conducts an inspection of all licensed launch sites. AST safety inspectors thoroughly document their findings and maintain a collection of safety lessons learned and best practices.

- AST is also responsible for **licensing** the operation of launch sites or "spaceports." Since 1996, we have licensed the operation of:
  - California Spaceport at Vandenberg Air Force Base;
  - Spaceport Florida at Cape Canaveral Air Force Station;
  - Mid-Atlantic Regional Spaceport at Wallops Flight Facility in Virginia;
  - Mojave Air and Space Port in California; Kodiak Launch Complex on Kodiak Island, Alaska;
  - Oklahoma Spaceport in Burns Flat, Oklahoma; Spaceport America near Las Cruces, New Mexico; and
  - Cecil Field in Jacksonville, Florida, and most recently the Midland International Airport in Midland, Texas.

  There are currently ten launch sites in pre-application consultation with AST.

- The AST **Total Staff Index** compares AST's on-board year end staffing level to that at the end of 2006. The figure highlights that in FY 2014 AST's workload for authorizations were up approximately 550%; inspections were up over 825%; and launch and reentry operations were up over 300%, compared to FY2006. However, AST's staffing was increased only 42% over this same timeframe.



AST also conducts pre-application consultation with every company or entity that approaches the FAA for a license or permit. This consultation process can last months or even years, as it serves to educate these proponents on the applicable regulations and assist them in identifying potential issues as they develop and shape their plans. In May 2015 AST was engaged in pre-application discussions on 39 distinct projects with companies and other potential applicants such as spaceport authorities.

With the recent issuance of Presidential policies, AST has been directed to undertake new or enhanced safety roles beyond its traditional functions. The National Space Policy (NSP) in 2010 highlighted the critical importance of all departments and agencies in making efforts to preserve the space environment, promoting safe and responsible operations in space, and strengthening U.S. leadership in space, while encouraging a robust and competitive commercial space sector. The National Space Transportation Policy issued in November 2013 went even further to direct AST to execute exclusive authority to address orbital debris mitigation practices for U.S.-licensed commercial launches.

The increasing pace of growth in commercial space transportation brings challenges beyond increasing launch rates. The threat of orbital debris continues to grow and jeopardizes the safety of operations entering and returning from orbit. In addition, new types of space vehicles, such as balloons and a variety of winged launch and reentry vehicles, increase the complexity of licensing and operations, as do new ventures like small-satellites, cube-satellites, and commercial orbital servicing and commercial space stations, as well as the dawn of commercial human spaceflight operations.

Function/Office	FY 2016 Anticipated Accomplishments
Commercial Space	• Completion of licensing and permitting evaluations within statutory time limits • Environmental assessment completion for all launches/reentries within the statutory time limits • Completion of additional safety approval applications, which evaluate space-related components, processes or services • Improving the integrated planning and execution of commercial space operations in the National Airspace System • Enhancing AST's regulatory framework, including continual engagement with those developing new projects, in order to keep regulations current with the increasing complexity and diversity of suborbital and orbital operations

Recognizing these growing needs, and consistent with Presidential policies, the Administrator's Strategic Initiative for the NAS requires that FAA develop and implement a strategy to ensure the efficient integration of air and space traffic. This work will be performed in partnership with the ATO, NextGen, and other FAA organizations. Through the establishment of these programs, AST will be well positioned to execute the direction of the President's policies and implement the Administrator's Strategic Initiative.

Why Do We Want/Need To Fund The Program At The Requested Level?

The funds in this request are necessary to enable AST to keep pace with the growth of the U.S. commercial space transportation industry. Commercial space transportation activities are expanding at the same time NASA is increasingly relying on the commercial sector to provide cargo services for the International Space Station, and someday, astronauts, as well. There also continues to be a growing need to ensure the safe integration of space and air traffic, both domestically and internationally. The budget request allows AST to ensure protection of the public, property, and the national security and foreign policy interests of the United States (U.S.) during commercial space launch or reentry activities, as well as encourage, facilitate and promote U.S. commercial space transportation.

The AST office has supported licensed commercial launches, reentries, and permitted launches. As the number of launches increases, the number of reviews, analyses, inspections, documents, studies, and regulations and operational integration will increase proportionally. AST has also seen an increase in the number of foreign space agencies seeking AST advice and guidance for activities in their own countries. AST is seeking additional staff to ensure each of these actions and more are completed in a timely manner to continue its strong support of the industry.

Function/Office	FY 2017 Anticipated Accomplishments
Commercial Space	• Continued completion of licensing and permitting evaluations within statutory time limits • Continued environmental assessment completion for all launches/reentries within the statutory time limits • Continued completion of additional safety approval applications, which evaluate space-related components, processes or services • Applied improvement of the integrated planning and execution of commercial space operations in the National Airspace System • Continued enhancement of AST's regulatory framework, including continual engagement with those developing new projects, in order to keep regulations current with the increasing complexity and diversity of suborbital and orbital operations

Total Requested Discretionary Increase Requests:

Programs	Amount	FTP	FTE
Operational Management Staff	723,000	13	7
Total	**$723,000**	**13**	**7**

Operational Management Staff ($723,000)
The additional federal staffing will support AST's continually and dramatically growing regulatory, safety, and airspace integration efforts for commercial space transportation; staff is also required for organizational support to ensure effective management of the daily requirements of the growing AST organizational responsibilities. These positions support both the operational aspects of AST (including AST's launch and reentry collision avoidance and NAS integration programs), as well as policy development, and financial and human resources efforts.

What Benefits will be provided to the American Public through this request?

Since AST's inception in 1989 through 2015, we have licensed and permitted 290 commercial space launches and reentries. AST also licenses the operations of nine launch sites in seven different states. These include the launch of supplies for the International Space Station, communications satellites and national security satellites, and a myriad of additional day-to-day outcomes such as on-demand television transmission satellites.

Of the nearly 1,000 operational satellites in orbit, nearly 70 percent are commercial. A considerable number of these satellites are approaching the end of their service life, requiring replacement in the coming years. In the past, foreign launchers held a large share of commercial satellite launches, but the success of lower cost U.S. launchers like SpaceX and recent geopolitical developments are anticipated to send much of this business back to U.S. companies who will require a license from the FAA to conduct their launches.

Beyond the traditional space lift market, commercial human space flights are anticipated to begin in earnest within the next several years. In the 60 years of space flight, less than 350 Americans have travelled to space. Over 700 people are currently signed up to fly on commercial suborbital flights that will be licensed by the FAA. AST is working to be able to support this continued growth.

The commercial space transportation arena remains an outstanding opportunity for the United States. New concepts and business opportunities are continually emerging, currently limited only by the capacity for innovation. The funding requested by AST will help ensure that the regulatory environment keeps pace with this dynamically growing industry, and that AST can maintain the most important aspect of its mission: protecting the safety of the public and their property.

AST Explanation of Funding Changes

	Dollars ($000)	FTE
Commercial Space Transportation	**$2,026**	**19**
Overview: For FY 2017, the Associate Administrator for Commercial Space Transportation requests $19,826,000 and 111 FTEs to meet its mission. The FY 2017 request level reflects adjustments to base, other changes, and discretionary adjustments. This represents an increase of $2,026,000 and 19 FTEs over the FY 2016 enacted level.		
Adjustments to Base	**$1,379**	**12**
Annualization of FY 2016 Pay Raises: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.0 percent.	48	
Annualization of 2016 FTE: This increase provides for the annualized costs associated with FY 2016 new hires in AST.	1,258	12
FY 2017 Pay Raises: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	179	
Two Less Compensable Days: This decrease represents two less compensable days in FY 2016 (260 days in FY 2017 vs. 262 days in FY 2016).	- 106	
Other Changes	**-$76**	**-**
Administrative Efficiencies: Commercial Space (AST) will achieve administrative efficiencies through cost reductions and avoidance in various areas such as contractual services and supplies.	- 76	
Discretionary Adjustments	**$723**	**7**
Commercial Space Transportation (CST) Operational Management Staff: This request is to support AST's continually and dramatically growing regulatory, safety, and airspace integration efforts for commercial space transportation. Additional operational management staff is requested; eight positions are requested for launch and reentry integration and five are requested to support the licensing and other authorizations needed by the industry.	723	7

INSERT TAB HERE:

FINANCE AND MANAGEMENT (AFN)

Office of Finance and Management (AFN)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$760,500**	**1,789**	**21**	**1,664**
Adjustments to Base	**$9,834**			
Annualization of FY 2016 Pay Raises 1.3%	809			
FY 2017 Pay Raises 1.6%	2,987			
Two Less Compensable Days	-1,910			
GSA Rent	7,948			
Other Changes	**-$2,992**			
Working Capital Fund	-24			
Administrative Efficiencies	-2,968			
Discretionary Adjustments	**$4,000**	**4**		**2**
Information System Security (ISS)	4,000	4		2
FY 2017 Request	**$771,342**	**1,793**	**21**	**1,666**

Executive Summary: Office of Finance and Management (AFN)

What is the request and what funds are currently spent on the program?

The FY 2017 request of $771,342,000, 1793 full-time permanent, and 1,666 full-time equivalent personnel allows the Office of Finance and Management (AFN) to provide centralized management and delivery of core services to FAA's 14 lines of business and staff offices, enabling them to focus on maintaining the world's safest, most secure air traffic services. These core services include finance, acquisitions, non-National Airspace System (NAS) information technology, and regions and property operations support.

What is the program and why is it necessary?

The Office of Finance and Management (AFN) is the shared services operating entity, responsible for providing and streamlining the agency's common business services through a consolidated, integrated approach. AFN oversees the delivery of finance, acquisitions, contracting, information technology, property, logistics, technical training, and regional integration services to customers across the agency and federal government. AFN leads the FAA's efforts to identify cost savings, leverage technology, and optimize resources throughout the agency in order to position the agency to achieve the aviation safety mission while maintaining the flexibility to accommodate ever-changing requirements. Each year, AFN manages the FAA's nearly $16 billion dollar budget, handles over 27,000 contract actions, supports more than 63,000 technology users, and detects and averts approximately 21 million cyber-attacks for NAS and non-NAS systems throughout FAA and DOT. AFN also manages and supports the FAA Academy which trains over 20,000 students, including new Air Traffic Controllers, and manages leases and property assets that house nearly 26,000 personnel and supports over 2,000 active agreements worth $400M of activity across the FAA and the Federal space employing best practices for an Office of Management and Budget (OMB) and a General Services Administration (GSA) designee.

AFN's five service organizations include:

Financial Services (ABA): ABA enables the FAA to achieve its aviation safety mission by formulating, executing, and managing budgets for each line of business and staff office, ensuring that funding is available to meet each organization's mission essential needs and that critical Aviation Safety, Air Traffic, and NextGen personnel, programs, and initiatives are prioritized to ensure the uninterrupted and improved efficiency and safety of the NAS. ABA leads the FAA in identifying cost savings, provides responsible financial management of budget appropriations, and manages the agency's workforce planning. ABA is responsible for preventing Anti-Deficiency Act violations, ensuring no duplicate payments are made to vendors, and saving taxpayer dollars. ABA strives to be responsible stewards, resulting in reduced cost and increased efficiency.

Acquisitions and Business Services (ACQ): ACQ is led by FAA's Federal Acquisition Executive (FAE) and serves as the executive agent for FAA's Acquisition Management System (AMS). The FAE chairs the FAA's Joint Resources Council (JRC), the FAA organizational investment review board. The FAE also manages FAA's investment management process for capital investments including NextGen and other major systems acquisitions. As the agency's procurement and contracting backbone, ACQ enables the FAA to achieve its aviation safety mission by securing the goods, services, resources, space, technologies, expertise, specialized skills, facilities, and tools the AVS and the ATO as well as the other LOBs and SOs in order to accomplish their mission. ACQ contracted for more than $4.3 billion in goods and services in FY 2015. That total is expected to rise in FY 2017 to keep pace with demands on the agency.

Information and Technology Services (AIT): As the agency's information and technology backbone, AIT enables the FAA to achieve its aviation safety mission by providing and overseeing all aspects of the agency's IT enterprise, allowing all lines of business and staff offices, including AVS and ATO, to seamlessly connect, interact, and respond to customers, stakeholders, colleagues, and resources easier and more reliably. AIT is responsible for providing IT services to more than 40,000 employees, as well as contractors across the FAA, for a total of 63,639 technology users. This includes the development and maintenance of over 650 systems and software applications and the streamlining of IT processes for a faster and more efficient user experience. AIT provides IT support for all mission support technology which includes IT training for FAA personnel. A key focus in FY 2017 will be to keep the FAA's network safe from cyber threats. Funding will ensure cyber security, maintain a comprehensive cyber threat intelligence analysis capability, and support innovative technology and tools to prevent attacks while continuing the agency on a path of increased efficiencies and innovation.

Regions and Property Operations (ARO): ARO enables the FAA to achieve its aviation safety mission by providing emergency readiness, property management, facilities management, corporate outreach, and infrastructure support. ARO manages facilities at FAA Headquarters, six Regional Offices, and three Service Center Regional Offices in addition to managing the FAA's portfolio of property assets exceeding $9 billion. There are three Regional Operations Centers (ROCs) located within the Service Centers which operate around the clock and provide backup support to the NAS. More than 26,000 personnel from every line of business and staff office across the FAA are housed in over 8 million square feet of leased or directly owned FAA properties throughout the country.

Mike Monroney Aeronautical Center (AMC)
In FY2016, the Department of Transportation requested a modification to the Federal Aviation Administration's (FAA) organizational structure to improve efficiency and enhance the quality of services. The Budget proposed is to realign AMC from ARC to reflect a direct reporting relationship to AFN-1. It is now the fifth service organization within AFN, ARC will become Regions and Property Operations (ARO).

The AMC located in Oklahoma City includes three key functions: the FAA Academy, the FAA Logistics Center and the Enterprise Services Center. AMC maintains and operates over 130 buildings at the Mike Monroney Aeronautical Center to include the physical plant; provides emergency planning, provides architecture and engineering design, construction, and space management support for the approximately 6,500 personnel located at AMC. AMC is the only source for three unique services for the FAA. The **FAA Academy** is the primary provider of technical training for the Agency and the largest training facility within the DOT. The FAA Academy delivers training and related support services to the Agency and other aviation organizations, both domestic and international. Approximately 20,000 students in safety related occupations are trained annually. The **FAA Logistics Center (FAALC)** is the primary provider for parts and logistics services in support of the Air Traffic Organization (ATO) and the National Airspace System (NAS). The FAALC manages the central NAS inventory warehouses and distribution facilities for FAA, providing routine and emergency logistics products and services to over 8,000 FAA customers at 42,000 facilities and 28,000 sites, as well as to the Department of Defense (Air Force, Navy, and Army), Department of Homeland Security (Customs and Border Protection), state agencies, and foreign countries.

The **Enterprise Services Center (ESC)** is one of four OMB-designated Shared Service Providers for financial services within the federal sector. ESC operates and hosts the Department-wide financial accounting system (Delphi) and provides a range of accounting services and financial management information technology services. Delphi and its associated financial management systems are national assets, serving 14 operating administrations (OAs) within DOT, and 7 additional federal entities. ESC also provides comprehensive enterprise system design, and technical and administrative management of information resource programs, operations, systems and programming services for assigned national and local programs.

Why do we want/need to fund the program at the requested level?

The requested funding for FY 2017 will support all of FAA's 14 lines of business and key initiatives that include:

- Ensuring efficient operations of backup command, control and communications centers for NAS;
- Protecting and updating the agency's IT infrastructure;
- Competing, negotiating, awarding, managing more than $4 billion in key contracts that support critical programs and projects including NextGen;
- Training for more than 20,000 personnel to keep the NAS operating at optimal capacity and efficiency at any given time;
- Maintaining 270,000 property assets.

Each AFN service area works to move the agency forward by streamlining processes previously handled at the line of business or staff office level. As a whole, AFN continues to find new and innovative ways to lessen the administrative burden on the agency's employees, allowing them to more efficiently and effectively meet their individual responsibilities to support the safety of the NAS.

What benefits will be provided to the American public through this request?

AFN's shared services approach to delivering the agency's common finance, acquisition, IT, and regions and property operations services promotes financial integrity, IT infrastructure security, continuous improvement, and streamlined products and services to support the FAA's vital aviation safety mission. AFN's integrated delivery model also focuses on reducing costs across the agency, saving taxpayer dollars while providing added value to all customers and stakeholders. As an innovative, forward-thinking organization, AFN strives to empower FAA personnel across the country to focus on the mission, lessening the administrative support burden on front-line organizations critical to maintaining the safest airspace system in the world. Ultimately, AFN benefits the American public by ensuring a more efficient, reliable, transparent and financially responsible FAA while providing additional support to other agencies and bureaus.

Budget Summary

Office of Finance and Management (AFN)

($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	244,640	248,930	251,157	2,227
Program Costs	511,407	511,570	520,185	8,615
Total	**$756,047**	**$760,500**	**$771,342**	**$10,842**
FTE	**1,665**	**1,664**	**1,666**	**2**

The FY 2017 request of $ $771,342,000, 1,793 full-time permanent, and 1,666 full-time equivalent personnel allows the Office of Finance and Management (AFN) to provide centralized management and delivery of core services to FAA's 14 lines of business and staff offices, enabling them to focus on maintaining the world's safest, most secure air traffic services. These core services include finance, acquisitions, non-NAS information technology, and regions and property operations support, technical training, supply chain management, enterprise system design and operation. This request also includes a ($24,000) decrease in the Department of Transportation's Working Capital Fund and additional costs associated with a critical agency rent increase of $7,948,000.

Funding details for AFN's five service units:

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Financial Services (ABA)	118,175	118,836	118,662	-174
Acquisition and Business Services (ACQ)	52,166	52,665	52,705	40
Information Services (AIT)	298,609	300,591	304,205	3,614
Regions and Property Operations (ARO)	287,097	288,408	254,046	-34,362
Mike Monroney Aeronautical Center (AMC)	-	-	41,724	41,724
Total	**$756,047**	**$760,500**	**$771,342**	**$10,842**

Discretionary Adjustments:

Program	Service Unit	Amount
Information System Security (ISS)	AIT	4,000
Total Discretionary Adjustments		**$4,000**

Detailed Justification for-Financial Services (ABA)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Financial Services (ABA)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	37,511	38,194	38,483	289
Program Costs	80,664	80,642	80,179	-463
Total	**$118,175**	**$118,836**	**$118,662**	**-$174**
FTE	**230**	**230**	**230**	**-**

The FY 2017 budget request of $118,662,000, 247 full-time permanent, and 230 full-time equivalent personnel support the Financial Services (ABA) Program. The Financial Services (ABA) request will support ongoing program support for continued financial operations and financial oversight for the Agency. This request also provides for the AFN staff office pay and non-pay activities including continuing program support for the centralized AFN employee and administrative services, strategic communications, and organizational performance services for all the functional areas under AFN.

What is this Program and Why is it Necessary?

Financial Services (ABA) is one of the five main functional areas under the Assistant Administrator for Finance and Management (AFN). ABA's mission is to provide timely products and services that support and promote the achievement of FAA goals. ABA is responsible for overseeing FAA's programming and execution of appropriated funding, financial systems and financial reporting, leading and implementing FAA's cost efficiency program, supporting FAA in labor negotiations, establishing staffing standards, financial management training, enforcing government-wide reforms, and ensuring resources are managed in accordance with all laws, policies, directives, and procedures.

ABA manages the FAA's annual and multi-year appropriations. For the proposed FY 2017, ABA will oversee nearly $16 billion across the FAA's four major appropriations. ABA is constantly evaluating ways to meet current financial needs while still making practical business decisions to invest in the future. Our organization is structured to provide budget services for all appropriations. ABA works to ensure the effective use of agency resources through performance reviews and program analysis in an ever-changing budget environment. An example of this is ABA's testing of grant payments. ABA completed population subject testing on 17,559 Airport Improvement Program (AIP) Grant Disbursements items amounting to $2.752 billion. From the population, 176 samples (approximately $15 million) were randomly selected for testing. The test results showed an estimated improper payment rate of 0.2 percent ($5.6 million of $2.752 billion) which made this program under the threshold for a high-risk program. Also the payments for Disaster Relief Fund were tested in FY 2014. The total population that was subject to testing included 202 payments for the Disaster Relief Fund amounting to $4.4 million. Forty-nine (49) samples, representing approximately $1.7 million in payments, were randomly tested and there were no findings.

FY 2016 Anticipated Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Office of Budget and Programs (ABP)	▪ Continue to present effective budget requests, conduct effective program oversight, and maintain required funding needs for total agency programs, including Operations, Airport Improvement Program (AIP), Research, Engineering & Development (RE&D), Facilities and Equipment (F&E), and NextGen modernization activities; ▪ Continue to ensure Agency funds and resources are utilized effectively and that FAA maintains compliance with the Anti-Deficiency Act; ▪ Continue to implement and improve the centralized structure for oversight of well over $400 million in reimbursable work; ▪ Continue to develop and enhance agency-wide training in financial management to ensure executives and managers understand their fiscal roles and responsibilities and employees are better equipped to meet increased efficiency and accountability objectives; and ▪ Continue to conduct a suite of formal financial training classes hosted within the FAA to enhance the corporate budgetary knowledge, standardize operating procedures, internal controls, purchase card use, and fund certification.
Office of Financial Analysis (AFA)	▪ Serve as Lead for agency-wide cost efficiency program. Continue to collect and analyze cost control efficiency data from multiple sources to identify trends in operational and overhead costs by facility, such as cost per controlled flight and ATO overhead rates; ▪ Continue to review acquisitions of $10 million or more to ensure the procurement represents a good investment of taxpayer resources and appropriate alternatives were considered; ▪ Continue to develop and establish, with program and management elements, numerical measures and indicators of financial performance, program performance, and the resulting public benefits achieved; and ▪ Continue updates to registry fees and overflight fees.
Office of Investment Planning and Analysis (AFI)	▪ Perform analysis of Agency investments and monitor acquisition program baselines; ▪ Support the full range of FAA acquisition decisions for both NAS and non-NAS programs; ▪ Apply business case discipline to new investment categories (e.g., facilities and variable quantity investments); and ▪ Develop and update cost estimator, schedule development, and other investment analysis training in support of the larger acquisition community.
Office of Financial Operations (AFO)	▪ Continue to support DOT core accounting system enhancements to improve financial business processes and provide timely and accurate financial information on FAA's programs. ▪ Continue to lead the Agency on all accounting operations and provide financial oversight and information to assist FAA organizations with making business decisions.

Function / Office	FY 2016 Anticipated Accomplishments
Office of Financial Reporting and Accountability (AFR)	▪ Obtain an unmodified audit opinion on Agency financial statements with no material weaknesses; ▪ Continue to expand the internal controls function to more rigorously identify both financial and operational areas for improvement which promotes required transparent and detailed reporting to the public; and ▪ Test grant program payments (and other programs that may be considered at high risk of improper payments) as required by the Improper Payments Information Act of 2002 (as amended by the Improper Payments Elimination and Recovery Act of 2010) and Executive Order 13520, Reducing Improper Payments and Eliminating Waste in Federal Programs dated Nov. 2009 ▪ Continue to maintain and update accounting policies and procedures and develop associated financial systems training.
Office of Labor Analysis (ALA)	▪ Produce the Controller Workforce Plan for 2016 – 2025 which is a projection of changes in air traffic forecasts, controller retirements, and staffing requirement ranges for our air traffic control facilities to support FAA's safety mission to meet external stakeholder requirements; ▪ Continue implementation of the Operational Planning and Scheduling (OPAS) System in air traffic control facilities; and ▪ Continue to expand the role of the Labor Analysis group to include workforce planning and labor cost analysis for FAA business units.

Why Do We Want / Need To Fund The Program At The Requested Level?

This funding will allow ABA to provide centralized agency-level financial functions that help improve accountability and enhance operational efficiency in the usage of FAA resources. Funding will also allow ABA to oversee and maintain the Agency's financial systems, financial policies, financial reporting, and spearhead the Agency cost efficiency program and other agency-wide management reforms to ensure resources are managed in accordance with all laws, policies, and procedures. Funding will enable ABA to continue to reinforce its financial management knowledge base with the improvement of DELPHI, PRISM (or replacement system), Cost Accounting System (CAS), and Labor Distribution Reporting (LDR) system.

The requested funding also supports the continued evaluation of FAA capital and operational business cases for thoroughness and accuracy in preparation for investment decisions, and ensures investments meet established business case criteria. Investment planning and analysis plays a significant role in the development and analysis of program requirements for the NextGen and operational programs. Funding below the requested level will reduce FAAs ability to perform the necessary analysis and evaluation of many FAA capital and operational business cases.

Labor costs are the FAA's single largest operating cost. The funding supports the development of benchmarking, plans, analyses, and models for labor related data, to support bargaining unit negotiations and cost efficiency in the FAA. The Labor Analysis office also leads the development of the annual Controller Workforce Plan and provides increasing support for other FAA workforce plans such as the Office of Aviation Safety (AVS) Workforce Plan. The Workforce Plans are key business tools that drive hiring, training, and staffing requirements across all FAA air traffic facilities.

FY 2017 Anticipated Accomplishments:

Function	FY 2017 Anticipated Accomplishments
Office of Budget and Programs (ABP)	▪ Present effective budget requests, conduct effective program oversight, and maintain required funding needs for an agency budget of $15.9 billion, including Operations, Airport Improvement Program (AIP), Research, Engineering & Development (RE&D), Facilities and Equipment (F&E), and NextGen modernization activities; ▪ Ensure Agency funds and resources are utilized effectively and that FAA maintains compliance with the Anti-Deficiency Act; ▪ Implement and improve the centralized structure for oversight of well over $400 million in reimbursable work; ▪ Develop and enhance agency-wide training in financial management to ensure executives and managers understand their fiscal roles and responsibilities and employees are better equipped to meet increased efficiency and accountability objectives; and ▪ Conduct a suite of formal financial training classes hosted within the FAA to standardize operating procedures, internal controls, purchase card use, and fund certification.
Office of Financial Analysis (AFA)	▪ Serve as Lead for agency-wide cost efficiency program. Continue to collect and analyze cost control efficiency data from multiple sources to identify trends in operational and overhead costs by facility such as cost per controlled flight and ATO overhead rates; ▪ Review acquisitions of $10 million or more to ensure the procurement represents a good investment of taxpayer resources and appropriate alternatives were considered; ▪ Develop and establish, with program and management elements, numerical measures and indicators of financial performance, program performance, and the resulting public benefits achieved; and ▪ Update registry fees and overflight fees.
Office of Investment Planning and Analysis (AFI)	▪ Perform analysis of Agency investments and monitor acquisition program baselines; ▪ Support the full range of FAA acquisition decisions for both NAS and non-NAS programs; and ▪ Develop and update cost estimator, schedule development, and other investment analysis training in support of the larger acquisition community.
Office of Financial Operations (AFO)	▪ Support DOT core accounting system enhancements to improve financial business processes and provide timely and accurate financial information on FAA's programs; ▪ Lead Agency accounting operations and provide financial oversight and information to assist FAA organizations with making business decisions; and ▪ Lead the agency replacement of Cru-ART with SISO (sign in/sign out) and Air Traffic Operations Management System (ATOMS) as the air traffic timekeeping system.
Office of Financial Reporting and Accountability (AFR)	▪ Obtain an unmodified audit opinion on Agency financial statements with no material weaknesses; ▪ Expand the internal controls function to more rigorously identify both financial and operational areas for improvement which promotes required transparent and detailed reporting to the public. ▪ Test grant program payments (and other programs that may be considered at high risk of improper payments) as

	required by the Improper Payments Information Act of 2002 (as amended by the Improper Payments Elimination and Recovery Act of 2010) and Executive Order 13520, Reducing Improper Payments and Eliminating Waste in Federal Programs dated Nov. 2009. ▪ Continue to improve the quality and accuracy of financial data to remediate audit findings and improve financial reports. This includes improving the quality of data submitted to the Department of Treasury via the Government-wide Treasury Account Symbol Adjusted Trial Balance System, to support improved government-wide financial reporting; and ▪ Maintain and update accounting policies and procedures and develop associated financial systems training.
Office of Labor Analysis (ALA)	▪ Produce the Controller Workforce Plan for 2017 – 2026 which is a projection of changes in air traffic forecasts, controller retirements, and staffing requirement ranges for our air traffic control facilities to support FAA's safety mission to meet external stakeholder requirements; ▪ Provide project management support for AVS Staffing Tool and Reporting System (ASTARS) and the annual AVS Workforce Plan; ▪ Continue implementation of the Operational Planning and Scheduling (OPAS) System in air traffic control facilities; and ▪ Expand the role of the Labor Analysis group to include workforce planning and labor cost analysis for FAA business units.

What Benefits will be provided to the American Public through this request?

ABA is the shared services provider to the FAA's 14 Lines of Businesses (LOBs) and Staff Offices (SOs) in the area of budget and financial management. The office has fundamental responsibilities to maintain a strong agency-wide foundation of accountability and financial management. The ability to capture this financial data ensures we achieve the President's goal of greater transparency in government. By consolidating and centralizing the agency's common financial services, ABA is able to lead the agency in identifying cost savings, providing consistent and sound financial management processes, increasing efficiencies, and reducing duplication. This enables the lines of business and staff offices to better focus their attention and resources on achieving their individual goals in supporting the FAA mission. Our program primarily supports the DOT goal of *Organizational Excellence* and the outcome of *Improved Financial Performance.*

In recent years, there has been an increased recognition of the need for effective oversight of financial decision-making processes. In response, the Agency has implemented oversight of proposed acquisitions, travel, and conferences, as well as new procedures to provide executive oversight over administrative information technology investments. This added oversight demonstrates the Agency's commitment to ensuring we manage the taxpayer's resources effectively. ABA's contributions to the Agency's success have been measured by how well cost and financial information are integrated into the Agency's business processes and by the analytical contribution that ABA-generated information makes to data-based decision-making within the Agency.

Detailed Justification for – Acquisition and Business Services (ACQ)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 –Acquisition and Business Services (ACQ)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	31,900	32,409	32,655	246
Program Costs	20,266	20,256	$20,050	-206
Total	**$52,166**	**52,665**	**52,705**	**$40**
FTE	**227**	**227**	**227**	**-**

The FY 2017 budget requests $52,705,000 for Acquisition and Business Services (ACQ) which includes 244 full-time permanent and 227 full-time equivalent personnel. This request will provide for salaries, benefits, annualized pay, and contract services. It includes adjustments for annualization of the FY 2016 pay raise.

What is this Program and Why is it Necessary?

ACQ serves as the executive agent for FAA's:

- Lifecycle acquisition and procurement policy,
- Investment decision process,
- Acquisition Workforce Plan,
- Certification program for personnel in a broad range of acquisition-related professions, and
- Acquisition program evaluation and oversight.

ACQ also acts as the Agency's small business advocate.

ACQ manages the investment decision making process for all investment decision authorities including the Joint Resources Council (JRC), which assists Agency executives in making timely and better-informed investment decisions. Additionally, ACQ manages the Earned Value Management (EVM) and post-implementation review processes on behalf of the Agency in accordance with OMB, GAO, and Acquisition Management System (AMS) policy requirements.

ACQ is led by FAA's Federal Acquisition Executive (FAE) and serves as the executive agent for FAA's Acquisition Management System (AMS). The FAE chairs the FAA's Joint Resources Council (JRC), the FAA organizational investment review board. The FAE also manages FAA's investment management process for capital investments including NextGen and other major systems acquisitions.

ACQ is responsible for establishing, managing, and overseeing AMS, the FAA's acquisition policy and guidance. A strong acquisition policy ensures the sustainability of the NAS and the agency as a whole. The policy ensures the proper use and control of federally-funded contracts for services and materials. Congress directed FAA, in 1996, to establish an acquisition system that would meet the unique needs of the Agency, and prohibited the Agency from applying the Federal Acquisition Regulation or any law authorizing implementation in the Federal Acquisition Regulation. In FY 2016, ACQ is leading a comprehensive review of the delivery, training, structure and content of AMS. The effort, called AMS 2016, will analyze AMS and its processes to confirm it represents best practices across Government and private industry, effectively supports the changing business needs of FAA stakeholders, and efficiently delivers requirements to achieve Agency mission. The unique authority offered under AMS allows FAA to establish DOT-wide strategic sourcing and cost avoidance programs like the Strategic Acquisition of Various Equipment and Supply (SAVES) program, which through July 2015 has generated DOT a cost avoidance of over $238 million.

ACQ supports over 4,000 acquisition professionals throughout the acquisition lifecycle to achieve and maintain professional development and certification for critical acquisition functions. This includes developing the FAA's

Acquisition Workforce Strategy; maintaining nine competency models and the tools necessary to operationalize them; managing seven certification programs; and providing over 200 training courses annually. ACQ conducts procurement actions for the FAA. In 2015 the organization conducted approximately 27,000 procurement actions totaling more than $4.3 billion for goods and services. Of the 27,000 procurement actions, ACQ conducted over 21,000 actions for the ATO with a total value over $2.9 billion and over 1,000 actions for AVS with a total value over $104 million.

Acquisitions and Business Services contribute in measurable ways to each of the Administrator's strategic priorities. The acquisition of critical NextGen systems and technologies contributes to the *Deliver Benefits Through Technology and Infrastructure* priority; and the acquisition of other products, services, systems, and facility infrastructure programs supports the *Make Aviation Smarter and Safer* priority. Additionally, FAA's Acquisition Workforce Plan, which ACQ leads, contributes directly to the *Empower and Innovate with the FAA's people* priority by developing a skilled acquisition workforce. Moreover, ACQ directly supports a variety of cost savings and efficiency targets and government-wide acquisition and procurement initiatives established by OMB, DOT, and FAA. We use metrics and performance measures to assess our progress. Below are ACQ's FY2016 Anticipated Accomplishments.

Anticipated FY 2016 Accomplishments:

Function	FY 2016 Anticipated Accomplishments
Acquisition Policy	▪ Manage, update, and strengthen FAA's AMS to ensure acquisition policy and guidance complies with applicable laws and other directives; ▪ Provide advice and assistance to Agency personnel; and ▪ Manage processes to enable timely, proper, and best-value acquisition of goods and services supporting safe and efficient operation of the NAS.
Strategic Sourcing	▪ Implement strategic sourcing contracts and other strategic acquisition initiatives to realize cost control; ▪ Establish sourcing vehicles that realize administrative efficiencies and meet agency needs in a streamlined and consistent manner; and ▪ Promote the expanded use of environmentally preferable products and services through "Green" requirements and processes embedded in strategic sourcing contracts.
Acquisition Oversight	▪ Perform nationwide contract acquisition reviews for compliance with policies and procedures, and implement corrective actions where necessary; and ▪ Track findings and recommendations to promote consistent implementation of FAA's process improvement and procurement integrity policies. ▪ Analyze acquisition data to formulate trends and traceable metrics; and ▪ Recommend improvements regarding agency policy and processes based on lessons learned, potential deficiencies and best practices.
FAA's Purchase Card Program	▪ Provide oversight of FAA's purchase card program to ensure compliance with regulation and policy; ▪ Promote uniform standards and policy interpretation, and identify and take appropriate action against improper use; and ▪ Increase usage of purchase cards to gain increased cost savings.

Function	FY 2016 Anticipated Accomplishments
Investment Decision Process & Acquisition Program Governance	▪ Support informed investment decisions (e.g., NextGen and other NAS system acquisitions) by managing FAA's investment decision-making process; ▪ Serve as the Executive Secretariat of the Joint Resources Council, ensuring that the AMS requirements leading to an investment decision are met prior to requests for investment decisions being presented to the Joint Resources Council; ▪ Plan and support on-going acquisition program oversight reviews; ▪ Plan decision meetings, document decisions made and action items assigned, tracking them to closure; ▪ Populate and maintain the agency's official repository of required investment decision documents and other records; and ▪ Serve as the focal point for providing documentation to internal and external stakeholders on investment decisions.
Earned-Value Management (EVM)	▪ Support the EVM process in the agency ensuring that the AMS outlined EVM policy and guidance is carried out by investment programs; ▪ Provide guidance and assistance to investment programs in the application of EVM; ▪ Ensure training is provided to investment programs in support of the application of EVM; and ▪ Conduct Integrated Baseline Reviews on investment programs along with validations of contractor EVM Systems.
Post-Implementation Reviews (PIR)	▪ Serve as the PIR Quality Officer ensuring implementation of the PIR policy as outlined in the AMS and ▪ Conduct post-implementation reviews (PIRs) of investment programs and act as independent reviewer of directorate lead PIRs to assess achievement of cost, performance, and benefits baseline expectations.
Streamline and Automate Procurement Processes	▪ Continue development support of FAA's Unified Contracting System (UCS) which will be an electronic, secure, internet-based, contract lifecycle management system.
Acquisition Workforce Strategy	▪ Manage annual updates of FAA's Acquisition Workforce Strategy and implement strategies and initiatives and ▪ Track gains, losses, and actual on-board data for personnel in the various acquisition professions, as well as tracking other workforce metrics, such as certification levels.
Acquisition Career Management	▪ Manage training and certification programs for acquisition personnel, including program/project managers, contracting officers/specialists, contracting officer's representatives (CORs), systems engineers, test and evaluation specialists, and logistics specialists and ▪ Develop and maintain an acquisition workforce portal, automated certification process tool, career path guidance, and other tools and guidance to build FAA's acquisition and program management capabilities.

The illustrations below provide a few samples of key measures tracked:

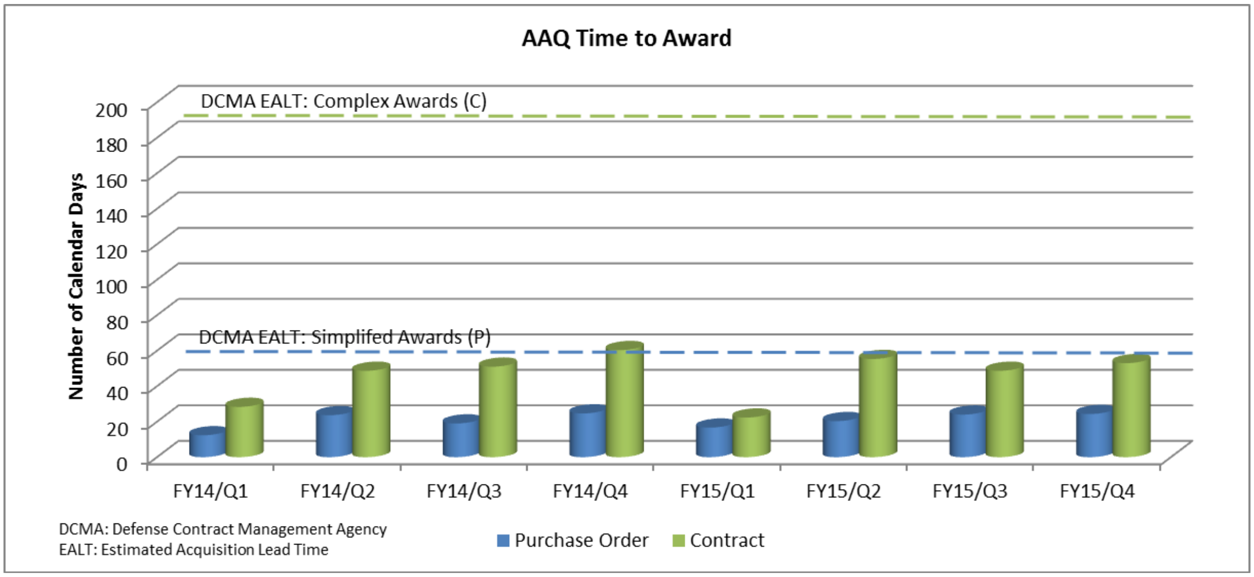


Figure 1 - ACQ Time to Award

Figure 1 presents the average numbers of days to issue purchase orders and award contracts within ACQ in relation to Defense Contract Management Agency (DCMA) Estimated Acquisition Lead Time (EALT) standards for simple and complex awards.

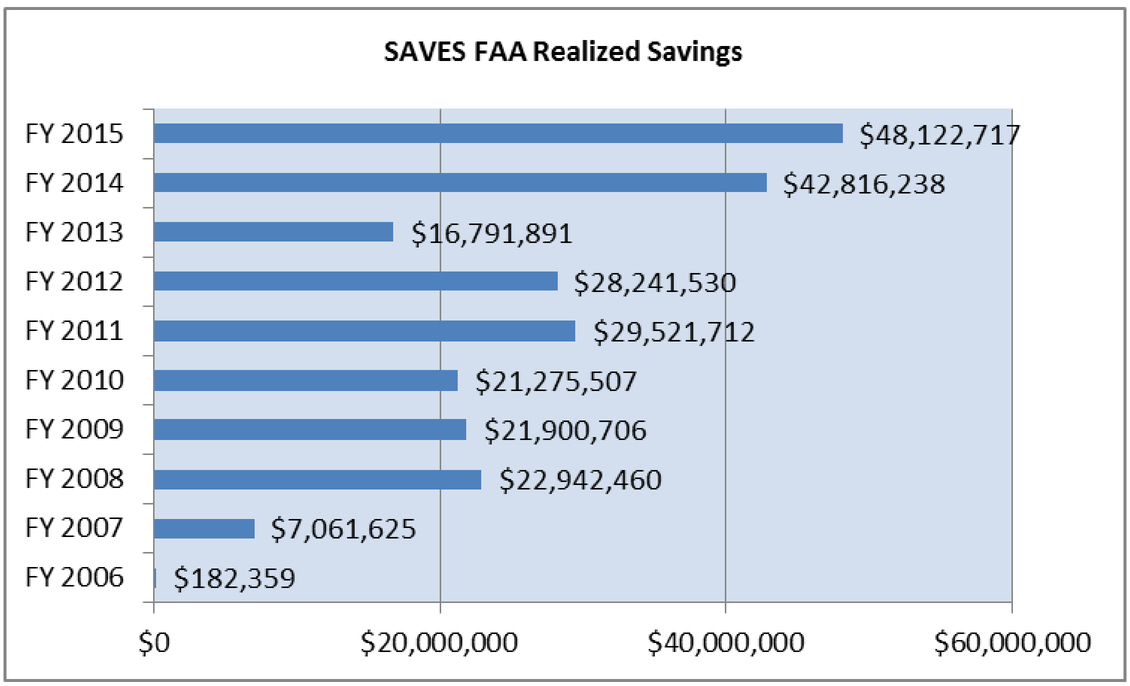


Figure 2 - SAVES Realized Savings

Figure 2 presents the FAA's historical savings realized through the use of select SAVES vendors with predefined cost savings and refunds.

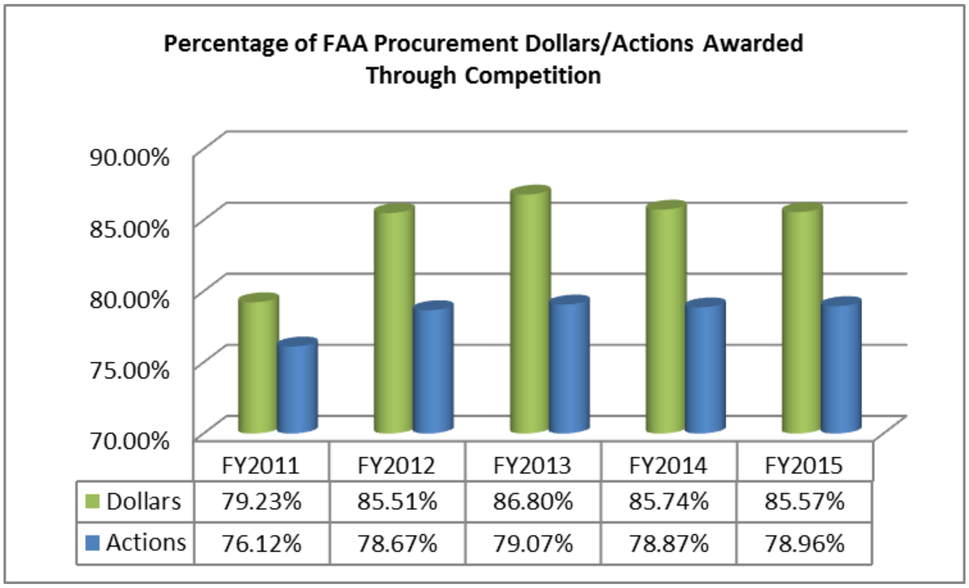


Figure 3 - Procurement Dollars/Actions

Figure 3 represents the percentage of procurement funds awarded through the FAA competitive contract award process.

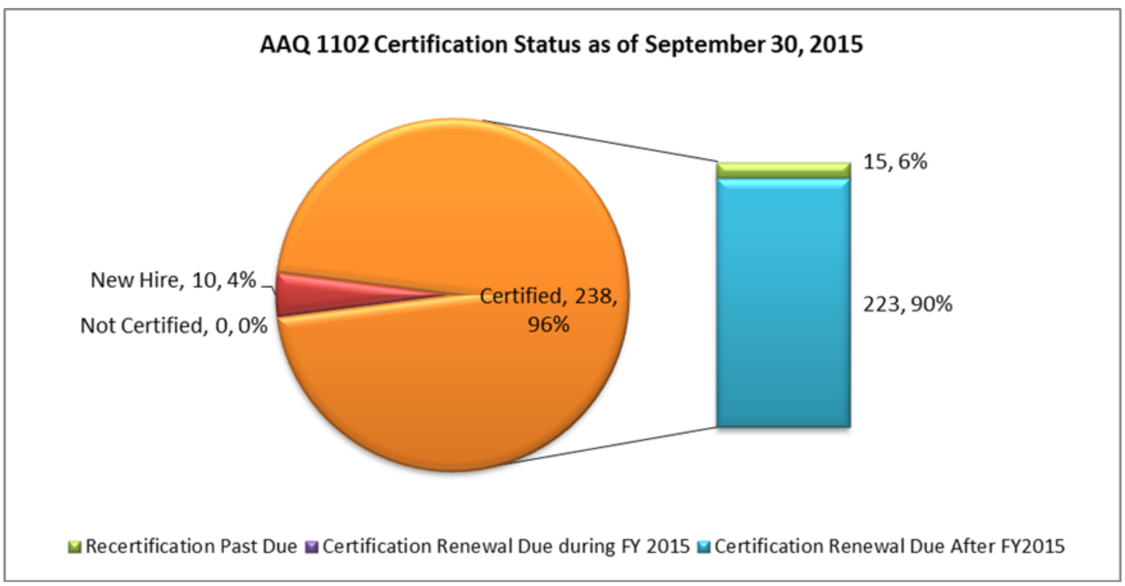


Figure 4 - Certification Status

Figure 4 provides certification status of acquisition personnel as of September 30, 2015.

Our partners and stakeholders include both internal and external customers. Internally, we provide agency-wide support on acquisition and contracts management as well as quality assurance on major NAS systems contract deliverables to FAA. We are an integral part of the NextGen development and support related changes to the NAS. We also continue to support existing FAA programs and lead the efforts in developing a competent and well-trained acquisition workforce.

Acquisition of quality goods and services is a core service, integral to the support and operation of the entire FAA and as such, the work being done by this organization to a large extent supports all of the DOT and FAA Strategic Plan Goals. However, two of these goals are specific to and supported by the Office of Acquisition and Business Services:

- Major System Investments - 90% of major baseline acquisition programs must be maintained within 10% of their current cost and schedule acquisition performance baseline
- The Agency must obtain an Unmodified Audit Opinion all of which tie to the Department's efficiency and effectiveness goals.

Why do We Want/Need to Fund the Program at the Requested Level?

The FAA contracted for more than $4.3 billion in goods and services in FY 2015 through approximately 25,000 procurement actions. These procurement actions were accomplished by warranted and certified Contracting Officers and involved the procurement of essential equipment, facilities, major systems, construction, research and development, supplies, and services needed to maintain FAA operations and programs, and for transition to NextGen. ACQ provides Quality Reliability Officers to ensure all systems, equipment, material and services conform to the technical requirements established in the contract. ACQ provides policy, oversight, training, and services to the acquisition workforce.

The funding in this request allows ACQ to execute contractual actions on behalf of the FAA and other external customers, conduct effective workforce planning and to train, develop, and certify personnel in key acquisition disciplines to ensure FAA has sufficient numbers of skilled acquisition professionals to successfully manage acquisitions. This funding will further allow ACQ to continue to strengthen and streamline acquisition policy and processes and provide adequate oversight of procurement actions throughout the Agency.

The FY 2017 budget request will allow ACQ to perform its mission. Current staff has assumed a larger work load because of NextGen activities and increased support to the Program Management Office in the ATO. Reduction to the ACQ budget will result in: 1) bottlenecks and delays in providing procurement support to NextGen investments and other agency investments; 2) a corresponding increase in the cost of these programs; 3) a reduction in the training supplied to our workforce; 4) a reduction of our overall capability; 5) slowing the acquisition process, and 6) increasing the financial risk to the taxpayers.

FY 2017 Anticipated Accomplishments:

Function	FY 2017 Anticipated Accomplishments
Award of Contracts, Orders, Agreements and Grants	▪ Advise, plan, negotiate and award cost-effective, best value contracts, purchase orders, delivery orders, agreements, and aviation research grants for FAA headquarters, Technical Center, Aeronautical Center, and the Service Areas. Support all FAA Lines of Business and all FAA programs. ▪ Procure essential equipment, facilities, major systems, construction, research and development, supplies and services needed to maintain FAA operations and programs, and for transition to NextGen.
Contract Administration	▪ Perform a full range of Contract Administration Services in accordance with AMS Policy; ▪ Assure contractor performance in accordance with contract terms and conditions; issue contract modifications, and monitor contract deliverables; ▪ Assure that subcontracting policies and requirements are followed; ▪ Review contractor invoices for payment; and ▪ Close out completed contracts.
Implement Process Improvements	▪ Develop and implement best practices in acquisition to deliver best value for the taxpayer and increase efficiency and effectiveness of procurement methods; ▪ Streamline time to award; ▪ Reduce cost to procure; and

Function	FY 2017 Anticipated Accomplishments
	▪ Comply with applicable laws, regulations, policy, best practices;
Small Business Development	▪ Manage small business policy, guidance and tools, to meet agency, department, and administration goals; ▪ Conduct internal and external small business outreach/training; and ▪ Target at least 25 percent of total direct procurement dollars as Small Business awards.
Cost/Price Analysis & Audits	▪ Provide expert-level cost/price analysis tools, training, advice, and assistance to FAA contracting and program personnel; ▪ Strengthen price negotiation to ensure FAA pays fair and reasonable rates for the products and services it procures; ▪ Provide direct cost/price analysis support for contract proposals to achieve savings for agency procurements; ▪ Improve pricing analyses, resulting in best value decisions and saving for agency acquisitions; ▪ Manage audits of cost reimbursable, time & material, and labor hour contracts with an estimated value of $100 million or more; and perform audits for at least 15 percent of these type contracts with estimated values below $100 million. ▪ Conduct audits of cost reimbursable, time & material, and labor hour contracts using commercial non-DCAA sources when FAA has primary administrative financial responsibility; ▪ Coordinate application of audited cost savings to agency contracts with contracting officers; and ▪ Provide subject-matter experts for pricing to assist acquisitions with protests, claims, proper billings, and closeout; and ▪ Update/maintain FAA Pricing Handbook.
Acquisition Policy	▪ Manage, update, and strengthen FAA's AMS to ensure acquisition policy and guidance complies with applicable laws and other directives; ▪ Provide acquisition advice and assistance to Agency personnel; and ▪ Manage processes to enable timely, proper, and best-value acquisition of goods and services supporting safe and efficient operation of the NAS.
Strategic Sourcing	▪ Implement strategic sourcing contracts and other strategic acquisition initiatives to realize cost control DOT-wide; ▪ Continue to implement and expand the use of SAVES by FAA and DOT to streamline the procurement process and realize cost efficiencies; ▪ Establish sourcing vehicles that realize administrative efficiencies and meet agency needs in a streamlined and consistent manner; ▪ Target a DOT FY2017 cost avoidance of $113M for SAVES; and ▪ Promote the expanded use of environmentally preferable products and services through "Green" requirements and processes embedded in strategic sourcing contracts.
Acquisition Oversight	▪ Perform nationwide acquisition reviews for compliance with policies and procedures, and implement corrective actions where necessary; ▪ Analyze acquisition data to formulate trends and traceable metrics; and ▪ Recommend improvements regarding agency policy and processes based on lessons learned, potential deficiencies and best practices.

Function	FY 2017 Anticipated Accomplishments
FAA's Purchase Card Program	▪ Provide oversight of FAA's purchase card program to ensure compliance with regulation and policy; ▪ Promote uniform standards and policy interpretation, and identify and take appropriate action against improper use; and ▪ Increase usage of purchase cards to gain increased cost savings.
Investment Decision Process & Acquisition Program Governance	▪ Support informed investment decisions (e.g., NextGen and other NAS system acquisitions) by managing FAA's investment decision-making process; ▪ Serve as the Executive Secretariat of the Joint Resources Council, ensuring that the AMS requirements leading to an investment decision are met prior to requests for investment decisions being presented to the Joint Resources Council; ▪ Plan and support on-going acquisition program oversight reviews; ▪ Plan decision meetings, document decisions made and action items assigned, tracking them to closure; ▪ Populate and maintain the agency's official repository of required investment decision documents and other records; and ▪ Serve as the focal point for providing documentation to internal and external stakeholders on investment decisions.
Earned-Value Management (EVM)	▪ Support the EVM process in the agency ensuring that the AMS outlined EVM policy and guidance is carried out by investment programs; ▪ Provide guidance and assistance to investment programs in the application of EVM; ▪ Ensure training is provided to investment programs in support of the application of EVM; and ▪ Conduct Integrated Baseline Reviews on investment programs along with validations of contractor EVM Systems.
Post-Implementation Reviews (PIR)	▪ Serve as the PIR Quality Officer ensuring implementation of the PIR policy as outlined in the AMS and ▪ Conduct post-implementation reviews (PIRs) of investment programs and act as independent reviewer of directorate led PIRs to assess achievement of cost, performance, and benefits baseline expectations.
Streamline and Automate Procurement Processes	▪ Continue support of FAA's Unified Contracting System (UCS) which will be an electronic, secure, internet-based, contract lifecycle management system.
Acquisition Workforce Strategy	▪ Manage annual updates of FAA's Acquisition Workforce Strategy and implement strategies and initiatives; and ▪ Track gains, losses, and actual on-board data for personnel in the various acquisition professions, as well as tracking other workforce metrics, such as certification levels.
Acquisition Career Management	▪ Manage training and certification programs for acquisition personnel, including program/project managers, contracting officers/specialists, contracting officer's representatives (CORs), systems engineers, test and evaluation specialists, and logistics specialists; and ▪ Develop and maintain an acquisition workforce portal, automated certification process tool, career path guidance, and other tools and guidance to build FAA's acquisition and program management capabilities.

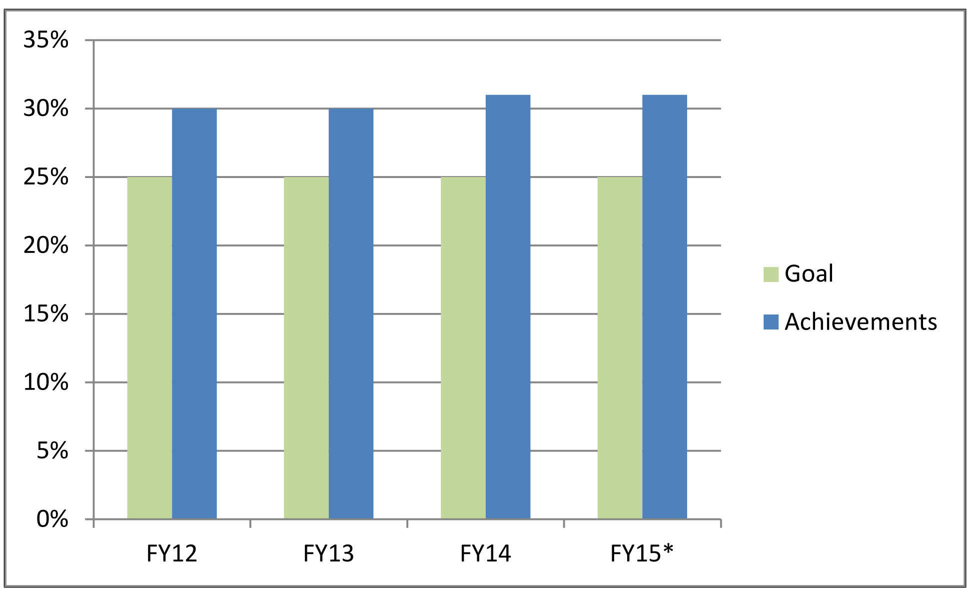
What Benefits will be provided to the American Public through this request?

Acquisition and Business Services procures the goods and services to support the safe and efficient operation of the NAS. In FY 2015, 90 percent of our major system investments were on budget and schedule. Our goal is to maintain this level of service for FY 2016 and FY 2017. ACQ has undertaken initiatives to strengthen our capabilities in managing our systems acquisition programs by incorporating key practices into our investments and operational review processes. ACQ has established Performance Metrics to measure the length of time taken to award particular categories of contracts. These metrics will allow us to report progress over time.

The development and implementation of NextGen is one of the most critical issues facing the FAA. The Agency must position itself to meet the increased acquisition workforce demands of NextGen through focused planning, competency development, and targeted recruiting and hiring. At the same time, Acquisition and Business Services must provide acquisition support to the existing NAS infrastructure and the FAA as a whole. The acquisition of all FAA aviation related systems, services, and applicable infrastructure support the FAA *Make Aviation Smarter and Safer* priority and benefit the long term safety of the flying public.

ACQ conducts customer satisfaction surveys as one means to assess quality and responsiveness in meeting Agency requirements. Employee attitude surveys as well as FedView survey results are used to assess employee engagement. We have established metrics to determine the success of the Acquisition Workforce Plan which will be used to report progress over time.

ACQ works to meet the FAA's goals for small businesses including small disadvantaged, women-owned and service-disabled veteran-owned small business goals. The FAA has established a performance metric of 25 percent of total contract funding to be awarded to small businesses. In Fiscal Year 2015, the FAA exceeded all small business goals.



*FY 2015 Data through 9/2/2015

Figure 1 - Small Business Goals and Achievements

Figure 1 - Small Business Goals and Achievements – the above graph provides the actual percentage of contract funds awarded to small businesses for the respective year in comparison to the agency goal.

Detailed Justification for –Information Services (AIT)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Information Services (AIT)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	105,230	107,105	108,257	1,152
Program Costs	193,379	193,486	195,948	2,462
Total	**$298,609**	**$300,591**	**$304,205**	**$3,614**
FTE	**667**	**667**	**669**	**2**

The FY 2017 funding request of $304,205,000 including 721 full-time permanent (FTP), and 669 full-time equivalent (FTE) personnel balances the costs of sustaining critical operations and systems, integrating effective new technology, and achieving efficiencies throughout AIT. Requested funds cover Information Technology (IT) federal staff, contract IT services, purchase and maintenance costs for hardware and software technology and IT mission support infrastructure operations in Headquarters, Centers, Regions and Lines of Business (LOB) field facilities.

What is this Program and Why is it Necessary?

AIT is the shared service provider for information technology across the FAA. AIT is responsible for providing IT services to more than 40,000 employees, as well as contractors across the FAA, for a total of 63,639 technology users at facilities nationwide. There is an increasing focus on cyber security and AIT ensures the integrity and availability of all critical FAA non-NAS systems, networks, and infrastructure under conditions of increased cyber terrorism. AIT develops and maintains 650 systems and software applications, 206 of which are mission critical. Eleven percent of the mission critical systems are public facing. AIT provides collaborative support including the Aviation Safety (AVS) Regulation and Certification Infrastructure for System Safety (RCISS) and the Aviation Safety Knowledge Management Environment (ASKME), and 61 Air Traffic (ATO) systems within En Route and Visual Charting, Instrument Flight Procedures and Aeronautical Information Systems, to make aviation safer, more efficient, reliable and secure.

AIT invests in new technologies and innovative ways to support the FAA safety mission. A key focus is on keeping data and systems safe from cyber terrorists bent on disrupting our computing power. Ensuring cybersecurity is an ongoing challenge as demonstrated in February 2015 by a malware incident that cost the agency millions in mitigation and restoration efforts.

AIT FY 2015-2017 strategic goals reflect those of the agency, with four AIT Key Initiatives **Cloud Services, Total Access, Collaboration, and Enterprise Information Management** aligned to the agency strategic goals:

- *NAS of the Future: Deliver Benefit through Technology/Infrastructure*
- *Workforce of the Future: Empower and Innovate through FAA's People*
- *Risk Based Decision Making: Make Aviation Safer and Smarter*

In FY 2015, the FAA was subject to an aggressive computer malware incident that impacted over 4,400 computers throughout the FAA nationwide. AIT acted quickly to implement the Department of Homeland Security (DHS) recommended plan for restoration and computer replacement. The AIT security office coordinated the eradication of the malware by shutting down, and then replacing infected administrative workstations within a 2 week timeframe minimizing the loss of productive time and preventing agency data loss.

As illustrated in Figures 2 and 3 below, there is no discernable or predictable pattern to either the number of cyber alerts, or to the number of alerts that result in the determination of a cyber-incident, triggering full investigation, research and reporting. However, an event such as the FY 2015 malware incident immediately triggers a sharp increase in the number of reportable cyber incidents, and considerable investment of cyber forensic analyst resources.

Figure 2 - FAA Total Monthly Cyber Alerts

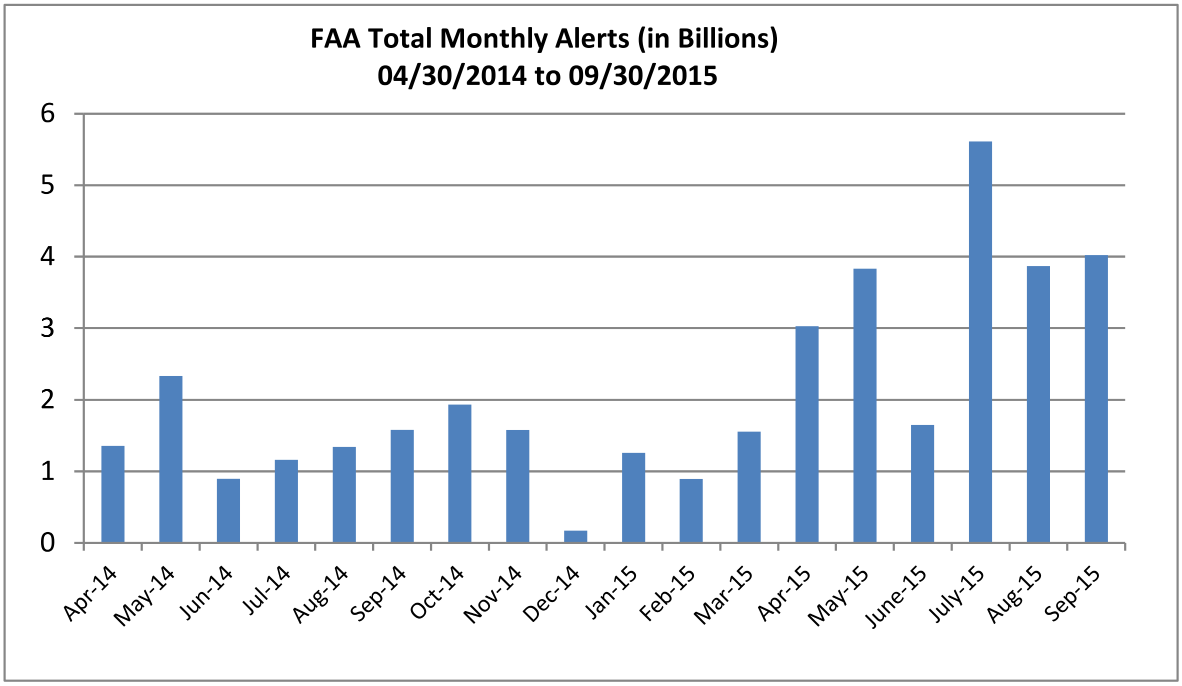
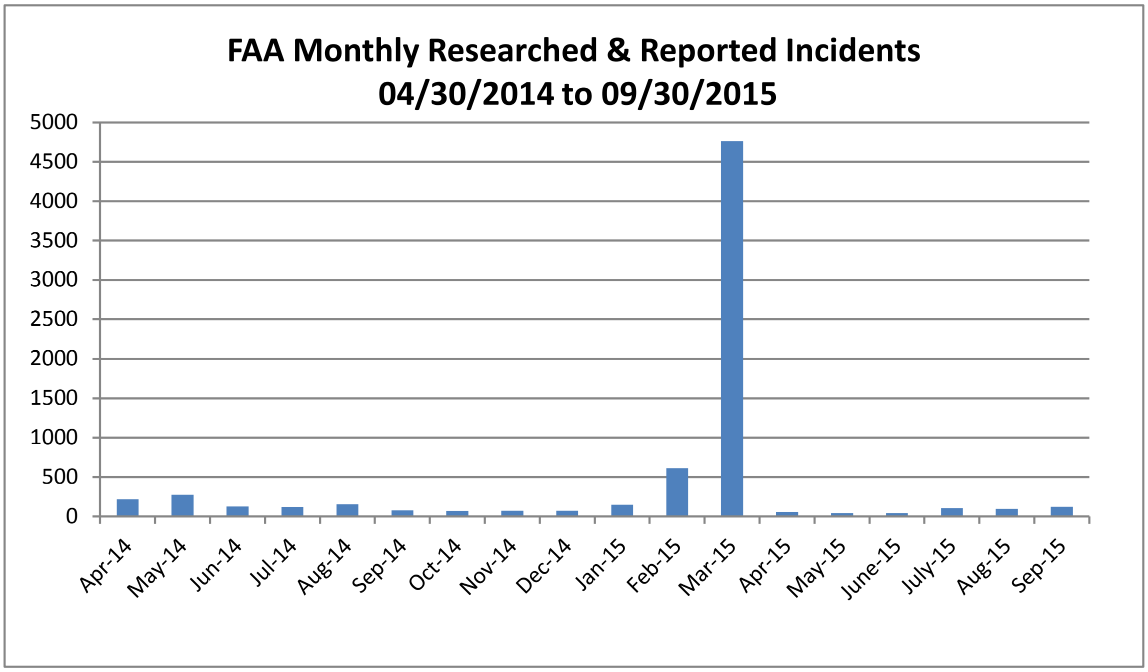


Figure 3 – FAA Monthly Researched & Reported Cyber Incidents



FY 2016 Anticipated Accomplishments:

Function/Office	FY16 Anticipated Accomplishments
Strategy & Performance Services ▪ Strategic Planning ▪ Capital Planning and Investment Control (CPIC) ▪ Workforce Development ▪ IT Lifecycle Management ▪ Asset Management ▪ Performance Management ▪ Verification and Validation	▪ Maintain four year Lifecycle Replacement (LCM) program, with a minimum of 25 percent annual replacement, to ensure FAA personnel have up-to-date, secure computing power to enable daily work functions. ▪ Reduce customer support request response times; FY 15 software requests response reduced by 40 percent from an average of 52 to 32 days. ▪ Update, maintain and submit IT Portfolio Summaries to OMB to enable effective, cost efficient portfolio management. ▪ Update and maintain the IT Strategy keeping AIT focused on its most critical goals and strategies to achieve organizational and agency mission goals. ▪ Develop enterprise IT roadmaps that ensure project and acquisition alignment to organization long-term objectives; for example the roadmap informed agency transition from costly Google Search to open-source "Elastic Search". ▪ Create a comprehensive Talent Management Strategy to identify and fill skill and resource gaps to maintain the highest level technology workforce.
Business Partnership Service ▪ Customer Engagement ▪ Collect, Analyze and Coordinate Business Needs ▪ Business Partnership Management ▪ Training Services ▪ Service Desk ▪ Desk side Services	▪ Improve capabilities and increase efficiencies through customized Dashboards to provide customers with tailored data and reporting capabilities "at their finger-tips" ▪ Transition to the new Integrated Service Center to consolidate three discrete programs into one Service Center supported by a single contract serving 63,369 customers. Improve customer communications and engagement leading to higher customer satisfaction as

	measured through incident based surveys at 96 percent. ▪ Meet agency performance metrics for Helpdesk services 94 percent of the time; metrics reported monthly.
Solutions Delivery ▪ Application Development ▪ Information Delivery ▪ Business Intelligence ▪ Collaboration ▪ Master Data Management ▪ Enterprise Architecture framework	▪ Continue to implement new Enterprise Content Management and Business Intelligence Services; consolidate data-centers for an integrated approach to data back-up, storage and retrieval to facilitate eDiscovery and eArchive, enabling the agency to respond to legal discovery in a cost effective and efficient manner. ▪ Improve email efficiencies post-cloud-based messaging services (SharePoint, EMS 365) implementation. ▪ Continue to implement mobile services that provide access to timely, useful, accurate, and actionable information anywhere, anytime, via any device. ▪ Develop and deploy the nation-wide Unmanned Aerial Systems (UAS) Registry. ▪ Launch the "B4UFly" (Before You Fly) mobile app on iOS and Android to provide model aircraft and drone operators with situational awareness using a real-time location-based evaluation to derive flight status indicators. ▪ Develop a straight-forward Witness Input Portal allowing concerned citizens to provide ground-based reports of observed UAS activities that may violate the law or otherwise present a security or physical risk.
Information Security & Privacy (IS&P) ▪ Privacy Management; ▪ Security & Privacy Risk Management ▪ IT Security & Privacy Governance; ▪ Security & Privacy Compliance (FISMA and C&A); ▪ Mitigation of Security Issues	▪ Protect, detect, and respond to cyber-attacks and ensure NAS systems and FAA networks sustain reliability and integrity. ▪ Continuously address high risk vulnerabilities. ▪ Meet mandatory statutory requirements for IT system authorizations and Continuous Diagnostics and Mitigation program. ▪ Reduce risks to Personally Identifiable Information (PII) and Sensitive information for data-at-rest, data-in-use, and data-in-motion.
Infrastructure & Operations ▪ Maintain Operational Environments (backbone, networks, systems, data centers, cloud) ▪ Recovery Operations ▪ Client Devices and Configuration Standards ▪ Mass Storage ▪ Backup Services	▪ Operate data centers, local and wide area networks at 99 percent uptime ▪ Implement a standard client configuration enterprise wide to include imaging, upgrading and maintaining the Maintenance Data Terminals used to patch NAS equipment. ▪ Award enterprise Cloud services contract to support both NAS and non-NAS.
Enterprise Program Management ▪ Program Management, Oversight and measurement ▪ Implement Solution Delivery Life Cycle (SDLC) ▪ Manage and Address IT Risk ▪ Manage and Coordinate IT Audits	▪ Use IT Portfolio Management across AIT to rationalize and optimize the FAA application and solutions portfolio: improve and standardize services, and achieve efficiencies. ▪ Improve IT policies, capital planning and investment control plans to assist the Agency in meeting its goal of less than 10 percent variance of baseline budget for major system investments. ▪ Continue to reduce redundancy and duplication to improve efficiency and effectiveness in service. For example, consolidate multiple systems into the Human Resources Information System (HRIS), and implement and maintain

	the system to improve accuracy and speed of data reporting.

Why Do We Want/Need To Fund The Program At The Requested Level?

Requested funding levels are critical to AIT in the area of cybersecurity. The FAA must ensure the integrity and availability of all critical systems, networks, and infrastructure under conditions of increased cyber terrorism and malicious activities by hackers and other unauthorized personnel. The Homeland Security Presidential Policy Directive 21 identifies the NAS as one of 16 critical infrastructure sectors and directs FAA to protect and ensure the integrity, confidentiality, and availability of all NAS Information Systems. Under the Federal Information Security Management Act of 2002, FAA must identify and provide information security protection commensurate with the risk and magnitude of potential harm that could result from unauthorized access, use, disclosure, disruption, modification, or destruction of information that supports the agency, aviation safety and security, and the NAS. The FAA Information Security & Privacy (IS&P) Directorate is a partnership between the FAA Chief Information Officer's organization and other FAA lines of business and staff offices (LOBs/SOs) with a focus on protecting FAA information and infrastructure.

Ensuring cybersecurity for our networks and data will remain an ongoing effort. We will continue to strengthen ties with our cybersecurity partners in the Departments of Transportation (DOT) and Homeland Security (DHS) in our efforts to harden our systems. In FY 2013, DHS initiated and led the federal Continuous Diagnostics and Mitigation (CDM) program. AIT is currently in the process of testing and implementing CDM tools and technologies within the FAA. In FY 2017, AIT will continue with Phase 2 of the CDM program, which includes goals such as network access control management, credentials and authentication management, account access management, and security-related behavior management. Our transition to this CDM program will inform Agency leaders, and provide timely, targeted, and prioritized information to enable high-risk vulnerability identification and mitigation. The Security Operations Center (SOC) Advanced Threat Analysis Group (ATAG) of subject matter experts will provide comprehensive cyber threat intelligence analysis capability in response to a range of advanced and sophisticated cyber threats.

Organizational changes and efficiencies gained throughout our transition to shared services have afforded AIT the ability to develop enterprise-wide initiatives and apply solutions to multiple lines of business and staff offices. As part of the "Total Access", AIT will work collaboratively with other LOBs, including NAS ATO and AVS mission support programs such as Aeronautical Information Systems, Terminal and Air Traffic Products and RCISS and ASKME, to support aviation safety applications that impact all national and international aerospace activity.

AIT will support AVS devices, IT infrastructure components, and specialized software applications for over 7,000 AVS safety workers. Requested funding will allow AIT to support two critical programs to FAA, RCISS and ASKME programs that will have transitioned from Capital Investment, to operation and maintenance. AIT will also support the National Offload Program (NOP) to improve public safety by providing NAS flight data to Safety Analytics and Controller Training applications. The data made available by NOP is leveraged in Safety Investigations, Loss of Separation Analysis & Congressional Reporting, Search & Rescue Operations, Approach & Departure Efficiency, and many more functions.

FY 2017 funding will support current operations and maintenance activities for agency-wide infrastructure computing power, multiple application systems that are used by all personnel to conduct work, and all security and privacy controls and protections to keep FAA data and systems safe, accessible and reliable. AIT will continue working to align the IT budget with industry best practices. On average, industry retains 1/3 of its operating budget to invest in new technologies and ideas to grow and evolve their businesses to meet the rapidly changing IT technology and information collection and application environment. During FY 2017, AIT plans to reach the industry standard by retaining 30 percent of its budget to invest in new technology to meet agency mission requirements.

In FY 2017, FAA anticipates a continuing IT organizational evolution to provide a customer-driven service organization that is efficient and effective in providing secure access to support enterprise organizational and operational excellence. The values that enable these activities are:

- **Innovate** – Foster a culture of innovating and forward thinking IT solutions that result in customer benefit realization.

- **Customer Focus –** Proactively improve our products and services through an understanding of how IT can support mission performance often as business partners to achieve the mission of the FAA.

- **Operational Excellence** – Provide consistent and reliable IT products and services that are continuously improved and optimized. Adopt, adapt and apply new technology to fit FAA business needs.

- **Organizational Excellence** – Establish and maintain a high-performing organization of capable, collaborative IT managers and practitioners. Attract and retain talent by encouraging professional development to foster career progression.

Prior year investments will continue to increase IT efficiency and quality of service in FY 2017. AIT is leveraging access to centralized expertise and infrastructure, and achieving a higher degree of transparency and accountability. We are enabling economies-of-scale within each IT function, while standardizing processes and eliminating redundancies. Providing comprehensive IT services through an Enterprise Shared Services approach enables AIT and the SOC to remain focused on maintaining the safest air transportation system in the world.

AIT will achieve its goals through implementation of the four major initiatives identified in its FY 2015 – FY 2017 Strategic Plan, to achieve the FY 2017 Planned Accomplishments aligned to FAA mission goals summarized below.

Key Open Government initiatives and mandates that the organization must deliver during FY 2017 include:

FY 2017 Anticipated Accomplishments:

Function/Activity	FY 2017 Anticipated Accomplishments
Optimize Information Access through Technology Innovation	▪ Provide customers access to data anytime anywhere and on any approved device through Cloud computing, to enable AIT to "leapfrog" from current more costly and dated technologies to platforms that provide our customers with more efficient and agile IT capabilities and services. In FY 2017, 100 percent FAA employees will be MyAccess compliant to enhance mobility capabilities. ▪ Leverage mobile and collaborative technologies such as smartphones, tablets, SharePoint, video-conferencing, social networks, and open portal blogs to deliver more transparent, accessible, productive and cost effective solutions to support the mission. ▪ Transition to three Cloud Deployment Models to meet agency, industry and public user security and operating needs. The models will serve the entire agency, both NAS and Non-NAS systems and users. In FY 2017, 50 percent of Tech Center, AMC and HQ IT infrastructure will be migrated to the cloud, and 100 percent of SharePoint/Knowledge Service Network (KSN) will transition to the cloud. ▪ Fully implement and continue enhancement of the internal AIT Enterprise Information Management (EIM) program: an integrative discipline for structuring and governing information assets across organizational and technological boundaries to improve efficiency, reduce costs, promote transparency and enable business insight. ▪ 100 percent of "high-value" FAA data will be registered in the Federal Data register. ▪ Support Risk Based Decision Making (RBDM); complete Big Data Proof of Concept with technologies in support of RBDM, and a plan for technology transfer of the threaded track solution using RADAR data and connecting it to additional data sources.

Function/Activity	FY 2017 Anticipated Accomplishments
IT Risk Management and Information Systems Security	▪ Address 80 percent of high value risks within 30 days. ▪ Continue oversight by the Cybersecurity Steering Committee to assure consistent risk acceptance decisions. ▪ Visualize vulnerabilities on all IP based systems. ▪ Use metrics and information to better inform and calculate risk. ▪ Evaluate solutions and services to achieve Continuous Diagnostics and Mitigation (CDM) Phase 2 goals such as network access control management, credentials and authentication management, account access management, and security-related behavior management. ▪ Validate full packet capture capability through the FAS at two new strategic network points. ▪ Integrate advanced and evolved vulnerability and United States Government Configuration Baseline (USGCB) scanning within the FAA's Internet Protocol (IP) based networks. ▪ Conduct software code vulnerability security analysis on 120 legacy and developmental agency systems.
Enable FAA's Employees to Work Smarter, Resource Optimization	• Leverage mobile and collaborative technologies such as smartphones, tablets, and collaborative software, enabling AIT to deliver more accessible, productive, and cost effective solutions to support the mission. Expand wireless capabilities to the remaining FAA facilities to accomplish 100 percent implementation throughout the Agency. • Reach final decision and implementation of proven processes for the current Pilot Program "Bring Your Own Devices" (BYOD), allowing FAA employees to use their personal mobile devices including smartphones, tablets and notebooks to access enterprise data and systems. • Promote a social collaboration environment, enabling our customers to work together and engage with stakeholders, and increase cross-Division and LOB communications and reduce stove-piping.

Total Requested Discretionary Increase Requests:

Programs	Amount	FTP	FTE
Information System Security (ISS)	4, 000,000	4	2
Total	**$4, 000,000**	**4**	**2**

Information System Security (ISS): The Information System Security (ISS) program is requesting $4,000,000, with 4 full-time permanent and 2 full-time equivalents to improve FAA's cybersecurity detection, response, and recovery capabilities. The targeted areas support the agency mission goals to promote Risk Based Decision Making and Make Aviation Safer & Smarter. The funds will support increased work in the following primary areas, as recommended by GAO, and in response to the recent FY 2015 virus malware event:

- Mitigate risk by enhancing testing to ensure that security controls are sufficient, are in place and operating effectively; examining artifacts such as audit reports, change tickets, and approval documents.

- Mitigate risk by protecting or limiting interconnection between NAS and Non-NAS systems, ensure timely response and remediation, and design and implement enhanced on-line and role-based training for all personnel and contractors, support security forensic and system scanning/review support.
- Maintain deployed cybersecurity tools for firewall/TIC analysis, full packet capture, forensics, and memory analysis, Wireless Intrusion Detection/Prevention Sensors, and continuous Diagnostics and Mitigation Operations and Maintenance costs for DHS systems that will transition to ISS maintenance and operation.

What Benefits will be provided to the American Public through this request?

AIT manages and supports over 63,639 technology users, and detects and averts more than 14 billion cyber alerts annually. AIT maintains and operates aviation safety systems and FAA computing infrastructure to ensure that mission critical data is reliable, accessible and secure. AIT provides cost effective IT framework and infrastructure, such as cloud computing to leverage technology in support of the Agency's mission.

AIT operates and maintains systems that directly support the NAS, and benefit the American public by making Aviation Safer and Smarter. For example, RCISS provides the infrastructure to the safety workforce to enable access to safety data, at the time and location needed to assess safety factors in real-time. The ASKME program provides Aircraft Certification Service aviation safety professionals with a repository of critical safety technical information and data, as well as analysis tools for knowledge collection, dissemination, and analysis. The Navigation Procedures project (NAVLean) improves and streamlines Instrument Flight Procedure (IFP) processes, and enables operational initiatives that minimize equipment and procedure outages at airports nation-wide. AIT's support and maintenance programs such as NOP improve public safety by providing NAS flight data to Safety Analytics and Controller Training applications.

Detailed Justification for –Regions and Property Operations (ARO)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Regions and Property Operations (ARO)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	70,000	71,222	58,383	-12,839
Program Costs	217,097	217,186	195,663	-21,523
Total	**$287,097**	**$288,408**	**$254,046**	-$34,362
FTE	**541**	**540**	**428**	-112

For FY 2017, $254,046,000, 461 full-time permanent and 428 full-time equivalent personnel are requested for FAA's Deputy Assistant Administrator for Regions and Property Operations. The request provides for base salaries and benefits and requests additional funding for FY 2017 pay-related increases. Non-pay inflation covers costs associated with critical agency requirements, an increase of $7,948,000 for rent. ARO's budget request includes a transfer of personnel and associated salary costs and programmatic costs from ARO to AFN/AMC.

Current funding provides ongoing regional facility and emergency operations, real property management and support, personal property management and support, training and other critical services to both internal and external customers for the FAA. The Deputy Assistant Administrator for Regions and Property Operations has the role and responsibility of Property Management Officer for FAA as currently defined in FAA Order 4600.27A "Personal Property Management."

What is this Program and Why is it Necessary?

ARO offices are located at the Washington headquarters and each of the nine regions.

Regional Administrators and their staffs represent the Agency among regional stakeholders that include, but are not limited to military services, aviation industry, government agencies, and aviation organizations, elected officials, educational institutions, and civic and private groups. The Regional Administrators serve as local representatives for the FAA Administrator and they are responsible for communicating with FAA's internal and external customers, disseminating information, and answering inquiries. Regional Administrators also manage the Regional Operations Centers (ROCs). ROCs provide critical around-the-clock crisis response capability, immediate command, and control for all incidents related to National Air Space (NAS) continuity. They monitor all Air Traffic events (Mandatory Occurrence Reports – MORs) and make appropriate notifications to Air Traffic offices in the service centers. Upon notification of an aircraft accident or incident, they make notifications to regional flight standards offices and local Flight Standards District Offices (FSDOs). Additionally, when requested, they establish communication conferences to obtain, analyze, and relay DOT crisis response capabilities information so that all involved FAA participants are kept informed enabling timely decision-making.

Real estate and personal property management services are provided in support of the FAA. ARO maintains the Department-wide inventory of real property and the data and performance measures associated with more than 95,000 buildings, structures, and land parcels. These include administrative offices, structures and land leases for NAS operational sites. ARO support provides for monitoring all GSA building operations activities; managing the nationwide rent, personal property, and government furnished property programs; and managing the motor vehicle program, parking, and transit benefits. ARO also manages the Agency's mail and printing program, the graphics department, and the design and construction of all administrative space occupied by the FAA.

ARO is also responsible for leading and integrating logistics initiatives to include personal property and real property management in support of FAA and DOT. ARO's facility management responsibilities include planning, programming, policies, and processes associated with Washington D.C. Metropolitan Area FAA buildings and structures including building security, parking management, and space and property management.

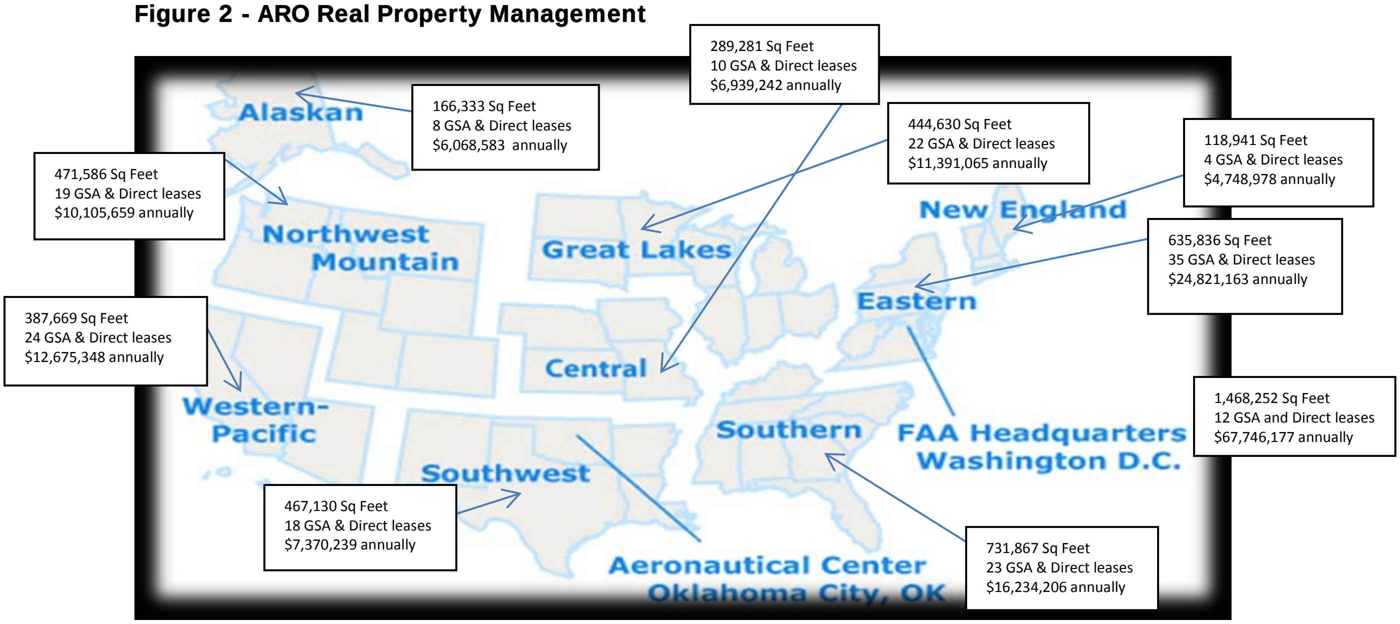
As part of ARO's personal property responsibilities, ARO establishes and oversees the agency's property management system for the management and physical control of over $9 billion in agency assets globally throughout the National Airspace System and international facilities. For ARO's real property management responsibilities, ARO establishes customer commitment agreements with customers. This includes overseeing administrative space leases within each of the nine regions administered by the GSA and field facilities for the Agency's AVS and ASH organizations.

Executive branch departments and agencies are required to establish clear goals and objectives to promote the efficient and economical use of America's real property assets and to assure management accountability for improving Federal real property management. The FAA has the lead responsibility for the DOT, and within the FAA, ARO leads the Federal Real Property Asset Management initiative. Assets that are surplus, not mission critical, in poor condition, under-utilized, and/or reflect high annual operation and maintenance costs are considered candidates for disposition. Real Property Asset Management continues to be one of the six agency wide initiatives - http://www.performance.gov/initiative/manage-property/home. On March 25, 2015, OMB released the National Strategy for Real Property and the companion Reduce the Footprint. The National Strategy a three-step framework to improve real property management: freeze growth in the inventory, measure performance to identify opportunities for efficiency improvements through data driven decision-making, and ultimately reduce the size of the inventory by prioritizing actions to consolidate, co-locate, and dispose of properties. Since 2006 the removal of more than $763 million of real property assets from the FAA portfolio has reduced the Agency's operation and maintenance costs by more than $77 million.

ARO Real Property Management

The graph below depicts ARO's GSA and Direct Lease Portfolio across the country.

Figure 2 - ARO Real Property Management



Notes: Total square footage is reported as it appears in Real Estate Management System (REMS) and may also include non-office space such as storage, equipment rooms, and common shared space. Included in the number of leases and related cost is antennas, parking leases, service contracts, and operating expense contracts.

FY 2016 Anticipated Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Regional Administrators ▪ Regional Operations Centers (ROCs)	▪ Conduct two 8-hour Service Area ROC transfer of operations exercises to maintain and enhance emergency preparedness; ▪ Conduct two ROC Emergency Operations Facility (EOF) exercises at the Service Center EOFs; ▪ Conduct one DOT Crisis Management Center (CMC) devolution exercise with the Southern Region Operations Center covering operations for the CMC; and ▪ Conduct one FAA Washington Operations Center (WOC) devolution exercise with the Southwest Region Operations Center covering operations for the WOC.
Real Estate and Personal Property ▪ Real Estate Management	▪ Ensure that all FAA employees engaged in real estate are trained in the latest real estate law and policies throughout the real property lifecycle; ▪ Realize savings of the annual real property lease and purchase costs through improved business processes; ▪ Complete 95 percent of the annual real property inventory target and report to DOT; and ▪ Achieve 50,000 square feet space reduction goal across FAA administrative space.
▪ Personal Property	▪ Develop and deliver corporate materiel and personal property training to ensure competency of Logistics Management Specialists; and ▪ Standardize the knowledge and skills required to serve as a Personal Property Custodian or Delegate within the agency.

Why Do We Want/Need To Fund The Program At The Requested Level?

Requested funding will allow ARO to oversee and manage facilities at FAA Headquarters, six Regional Offices, and three Regional Service Centers. There are three Regional Operations Centers (ROCs) located in the Regional Service Centers that provide critical backup support to the NAS. Funding at the requested level is critical in order for ARO to maintain its significant presence within the NAS. The funding will:

- keep facilities open, secure, and available to FAA personnel across the country; and
- keep all ROCs at peak readiness to respond to any NAS related incidents.

ARO's successful oversight and management of these activities directly contributes to the strategic initiative to *Make Aviation Safer and Smarter.*

The request of $254 million supports $242 million in rental costs and operating expenses for existing space and leases and funding for on-board personnel expenses. The balance of our request funds travel, training, mail and printing services throughout the regions and Headquarters, support contracts, and payments to the DOT working capital fund.

ARO's role as the Horizontal Integrator provides the ability to move swiftly within the FAA's larger vertically integrated business units to identify and coordinate expert resources within the Agency. ARO is able to move large-scale aviation projects forward and facilitate communications across multiple government branches or with external stakeholders. This includes working cross-functionally and developing solutions to remove project roadblocks, ensuring compliance with Federal and State legislation, identifying political impacts, recommending strategies for conflict resolution, managing FAA communications/expectations among aviation organizations, and developing collaborative internal and external partnerships. The requested funding supports all of these activities conducted by FAA personnel across the country supporting all types of aviation projects.

The administrative lease portfolios include both GSA and FAA direct leases and house approximately 26,000 employees in 7.9 million square feet of space. These facilities house all Lines of Business and cover the Headquarters and DC area offices, Regional Offices, as well as field facilities for personnel directly supporting aviation operations and safety. The ARO rent budget requirement will increase to $164M from $154M, from FY16 to FY17 due to the contractual terms of the existing and anticipated market rates for planned leases. Lease contracts dictate increases in base rent, and operating and maintenance costs, such as utilities, real estate taxes, repairs, janitorial, safety upgrades, guard services, and required renovations. New or succeeding leases that are negotiated are subject to rising market rents. ARO's primary avenue for mitigating rising budget costs is exiting or renegotiating unfavorable or underutilized leases and relocating staff into space at the appropriate size and rent. While these ongoing efforts have produced a reduction in administrative square footage, the overall portfolio cost continues to increase, while the rent budget baseline remains stagnant.

ARO's Regional Optimization project further enriches the "Shared Services" concept. It has identified multiple areas for realigning services and functions, streamlining managerial functions, and improving work processes to increase cost effectiveness, efficiency, and standardization of services. Implementation of these initiatives began in FY 2014 and will continue over a five-year period through FY 2018. The end-state regional structure will result in efficiencies in acquisition services as discussed under ACQ and the following ARO areas:

- Regional Operations Centers,
- Logistics and Real Estate Acquisitions,
- Aviation Education,
- International Work,
- Budgeting,
- and
- Human Resource Management.

FY 2017 Anticipated Accomplishments:

Function/Office	FY 2017 Anticipated Accomplishments
Regional Administrators ▪ Regional Operations Centers (ROCs)	▪ Conduct two 8-hour Service Area ROC transfer of operations exercises to maintain and enhance emergency preparedness; ▪ Conduct two ROC Emergency Operations Facility (EOF) exercises at the Service Center EOFs; ▪ Conduct one DOT Crisis Management Center (CMC) devolution exercise with the Southern Region Operations Center covering operations for the CMC; and ▪ Conduct one FAA Washington Operations Center (WOC) devolution exercise with the Southwest Region Operations Center covering operations for the WOC.
Real Estate and Personal Property ▪ Real Estate Management	▪ Realize savings of the annual real property lease and purchase costs through improved business processes; ▪ Complete 95 percent of the annual real property inventory target and report to DOT; ▪ Achieve 50,000 square feet space reduction goal across FAA administrative space; ▪ Ensure that all FAA employees engaged in real

	estate are trained in the latest real estate law and policies throughout the real property lifecycle; and ▪ Complete consolidation of FAA personnel in 5 facilities into the new ANM Regional Office building. The Agency footprint will be reduced by 59,613 sq. ft., a reduction of approximately 17 percent.
▪ Personal Property	▪ Develop and deliver corporate materiel and personal property training to ensure competency of Logistics Management Specialists; and ▪ Standardize the knowledge and skills required to serve as a Personal Property Custodian or Delegate within the agency.

What Benefits will be provided to the American Public through this request?

ARO helps facilitate large-scale aviation projects that reduce congestion and flight delays; coordinates communications response for aircraft accidents, emergencies, missing aircraft, hijackings, security threats, facility and system outages, airport closures, severe weather impacts, and earthquakes; and plays a critical role in FAA's overall emergency preparedness by providing 24/7 immediate command, control, and communications for all incidents related to NAS continuity.

ARO is responsible for the acquisition of leases and the operations and maintenance of facilities that house all LOBs throughout the NAS. This includes key personnel safety and security services including guard services, environmental monitoring and occupational safety, and emergency training and coordination. These services ensure a secure and well trained workforce is working for the flying public to support the safe and efficient operation of the National Airspace System.

ARO continues to make progress in greening by minimizing pollution and waste, and conserving natural resources. Embracing environmental greening initiatives not only benefits the American public now, it helps protect generations to come throughout the world.

Detailed Justification for –Mike Monroney Aeronautical Center (AMC)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Mike Monroney Aeronautical Center (AMC)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	-	-	13,379	13,379
Program Costs	-	-	28,345	28,345
Total	**-**	**-**	**$ 41,724**	**$ 41,724**
FTE	**-**	**-**	**112**	**112**

For FY 2017, $41,724,000, 120 full-time permanent, and 112 full-time equivalent personnel are requested for FAA's Mike Monroney Aeronautical Center (AMC). In FY17 AMC will be designated as a stand-alone functional area under the Assistant Administrator for Finance and Management. The request provides for base salaries and benefits including additional funding for FY 2017 pay-related increases.

Current funding provides ongoing campus, facility, environmental, safety, corporate technical training, excess and utilization of property, IT and associated functional activities, and other critical services to both internal and external customers for the AMC and FAA.

What is this Program and Why is it Necessary?

The FAA Academy located in Oklahoma City is the primary provider of technical training for the Agency and is the largest training facility within the DOT. Funds provide management and support of the FAA Academy. The FAA Academy delivers training and related support services to the Agency and other aviation organizations, both domestic and international. All introductory resident training for all Air Traffic Control (ATC) new hires is conducted at the Academy. Training approximately 20,000 students in safety related occupations annually. All infrastructure is either managed, funded, or both, for Air Traffic Controller training, Technical Operations training, Aviation Systems Standards training (including Air Certification training), and many other organizations across FAA. Funds also support the operation and maintenance of the facilities (classroom, specialized technical labs with various levels of fidelity, and administrative) which provide all types of FAA required technical training, either through resident, managed out-of-agency training, infrastructure intensive distance learning, or other high or low use of facilities.

The FAA Logistics Center (FAALC) is the primary provider for parts and logistics services in support of the Air Traffic Organization (ATO) and the National Airspace System (NAS). The FAALC manages the central NAS inventory warehouses and distribution facilities for FAA, providing routine and emergency logistics products and services to over 8,000 FAA customers at 42,000 facilities and 28,000 sites, as well as to the Department of Defense (Air Force, Navy, and Army), Department of Homeland Security (Customs and Border Protection), state agencies, and foreign countries. Supporting multiple agencies provides significant cost efficiencies associated with labor, processes, and infrastructure through economies of scale. The FAALC provides core logistics support functions including:

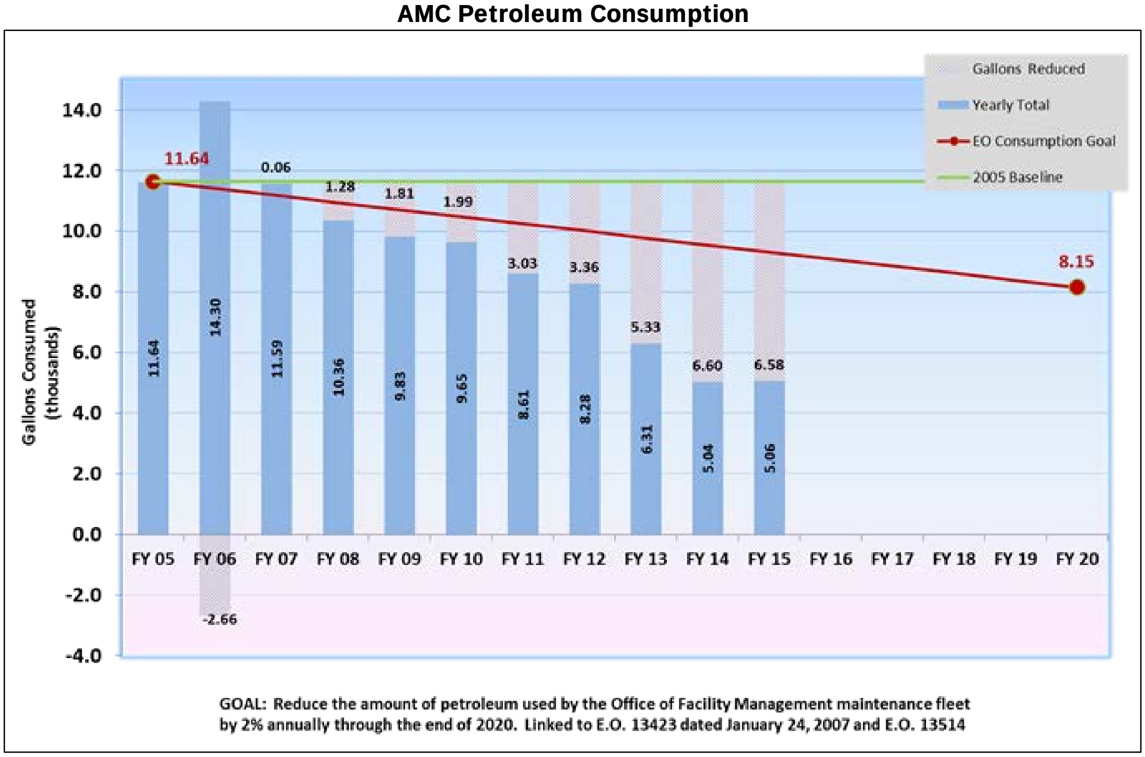
- Supply chain management, for approximately 62,000 National Stock Numbers (NSNs), with a net operational inventory value of $611 million;
- Centralized depot-level overhaul, maintenance and repair of NAS equipment, and on-site overhaul and maintenance for certain large systems such as towers and radar arrays;
- Storage and distribution management of NAS assets with 725,000 square feet of centralized warehouse space;
- Depot-level engineering support; and
- Agency focal point for depot-level integrated logistics planning and implementation for NAS acquisition programs.

Air traffic control systems use the products managed and repaired by the FAALC to ensure the safe and effective movement of aircraft through the NAS. The Agency is continuously seeking to improve its core logistics support functions, striving to reduce NAS asset delivery times and improve repair item quality. Expanding and improving system capabilities and performance will reduce operating costs by right-sizing the Agency's spares inventory, better managing depot throughput, and increasing visibility into vendor and parts performance. The FAALC is taking the lead in applying 2-D barcode technology to improve NAS asset visibility and tracking throughout the supply chain. Life-cycle logistics support is critical to the efficient, effective, and safe operation of the NAS. As the Agency moves toward NextGen technology, a fully-integrated logistics support approach is vital to ensure operational efficiency well into the future.

The **Enterprise Services Center (ESC)** is one of OMB's four designated Shared Service Providers for financial and accounting services within the federal sector. ESC provides comprehensive enterprise system design, and technical and administrative management of information resource programs, operations, systems and programming services for assigned national and local programs. ESC operates DOT's financial accounting system (Delphi) and provides a range of accounting services and financial management information system services to DOT and seven other governmental agencies including the Government Accountability Office (GAO) and the Securities and Exchange Commission (SEC). ESC's value lies in its ability to strengthen financial controls and transparency; improve efficiency; and standardize government Financial and Security services through partnerships, and innovation. By centralizing financial and accounting functions that were once performed in separate units or locations, ESC creates standardized and unified financial management practices throughout federal entities which lead to economies of scale. With the use of shared services expanding rapidly across the federal sector, it is important that ESC remains at the forefront of shared services.

Also, AMC has achieved significant energy conservation goals and continues to work towards meeting all Executive Order goals. Both efficiencies are illustrated below. Environmentally friendly improvements continue to be a priority for AMC.

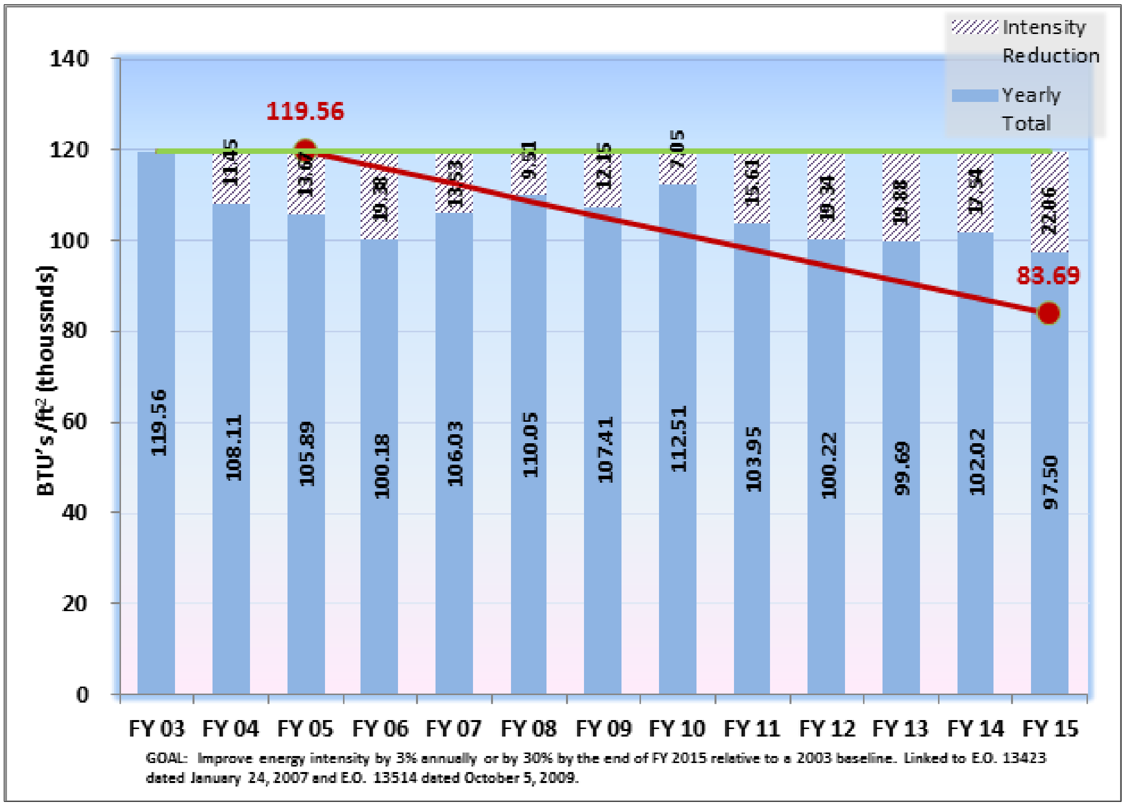
AMC Petroleum Consumption



FY 2005-FY 2020

To meet the goals specified in E.O. 13423 and 13514, the AMC has achieved reductions in the amount of petroleum used by the facility maintenance fleet each year since FY 2005. AMC anticipates a reduction in FY 2017 continuing the downward trend.

AMC Energy Intensity FY 2003 – 2015



Executive Order 13514 requires federal agencies to reduce energy consumption by 30 percent through the end of FY 2015, as compared to energy consumption in FY 2003. New Executive Order 13693 requires federal agencies to reduce energy intensity by 2.5% annually through the end of FY-2025 relative to the 2015 baseline. The AMC continues to achieve significant reductions in energy consumption.

FY 2016 Anticipated Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Mike Monroney Aeronautical Center ▪ FAA Academy and Air Traffic Control Training	▪ Conduct 100 percent of planned, programmed, and funded ATO Technical Training courses (100 percent of Air Traffic initial qualification); and ▪ Ensure ATO/AVS training continues to meet FAA requirements and is NAS-compliant.
▪ Logistics Services	▪ Ensure significant increase in work associated with Customs and Border Protection (CBP), in the areas of life cycle supply chain management and tower inspection/maintenance, will drive higher levels of synergy resulting in improved cost efficiencies and quality of logistics services provided to all customers; ▪ Increase cumulative fill rate for stocked items (expendable items and repaired items); ▪ Ensure full implementation of commercial-off-the-shelf software solution and integration with existing business applications; and ▪ Use root cause analysis, trending, and action

	plan tools to decrease defective parts while improving quality of assets provided to field technicians.
▪ Facilities	▪ Integrate environmental, occupational safety and health requirements, minimize pollution and waste, conserve natural resources, and prevent injury and illness while at work through utilization of a Quality Management System with management reviews and internal and external audits.
▪ Information Technology / Financial Services at AMC	▪ Maintain 99.5 percent availability for IT systems as defined in customer commitment agreements with customers; ▪ Manage overhead costs through establishment of targets and monitoring; and ▪ Improve service provision through timely mitigation of audit findings focusing on strengthening processes and closing process gaps.
▪ Franchise Fund Director	▪ Manage over 2,000 active agreements worth $400M of activity across FAA and the Federal space employing best practices for an Office of Management and Budget (OMB) and a General Services Administration (GSA) designee. These agreements are a part of the Franchise fund activities which include six franchise services lines.

Why Do We Want/Need To Fund The Program At The Requested Level?

Requested funding will allow AMC to oversee and manage facilities at the AMC, a key technical aeronautical center.

FY 2017 Anticipated Accomplishments:

Function/Office	FY 2017 Anticipated Accomplishments
Mike Monroney Aeronautical Center ▪ FAA Academy and Air Traffic Control Training	▪ Conduct 100 percent of planned, programmed, and funded ATO Technical Training courses (100 percent of Air Traffic initial qualification); and ▪ Ensure ATO/AVS training continues to meet FAA requirements and is NAS-compliant.
▪ Logistics Services	▪ Ensure significant increase in work associated with Customs and Border Protection (CBP), in the areas of life cycle supply chain management and tower inspection/maintenance, will drive higher levels of synergy resulting in improved cost efficiencies and quality of logistics services provided to all customers; ▪ Increase cumulative fill rate for stocked items (expendable items and repaired items); ▪ Ensure full implementation of commercial-off-the-shelf software solution and integration with existing business applications; and

▪ Facilities	▪ Use root cause analysis, trending, and action plan tools to decrease defective parts while improving quality of assets provided to field technicians. ▪ Integrate environmental, occupational safety and health requirements, minimize pollution and waste, conserve natural resources, and prevent injury and illness while at work through utilization of a Quality Management System with management reviews and internal and external audits.
▪ Information Technology / Financial Services at AMC	▪ Maintain 99.5 percent availability for IT systems as defined in customer commitment agreements with customers; ▪ Manage overhead costs through establishment of targets and monitoring; and ▪ Improve service provision through timely mitigation of audit findings focusing on strengthening processes and closing process gaps.
▪ Franchise Fund Director	▪ Manage over 2,000 active agreements worth $400M of activity across FAA and the Federal space employing best practices for an Office of Management and Budget (OMB) and a General Services Administration (GSA) designee. These agreements are a part of the Franchise fund activities which include six franchise services lines.

What Benefits will be provided to the American Public through this request?

AMC is responsible for the operation and maintenance of the AMC campus which house all LOBs. This includes key personnel training, safety and security services including guard services, environmental monitoring, and occupational safety. These services ensure a secure and well trained workforce is working for the flying public to support the safe and efficient operation of the National Airspace System.

The FAA Academy is the primary provider of technical training for the Agency. AMC trains approximately 20,000 students in safety related occupations annually, including air traffic control new hires and safety inspectors. The FAA Academy delivers training and related support services to the Agency and other aviation organizations, both domestic and international. The Academy keeps the flying public safe by providing well-trained, certified air traffic controllers to manage flights across the country and beyond.

AMC continues to make progress in greening by minimizing pollution and waste, and conserving natural resources. AMC has reduced petroleum fuel usage in its facility maintenance fleet since 2005 and expects the downward trend to continue through 2017 and beyond. Embracing environmental greening initiatives not only benefits the American public now, it helps protect generations to come throughout the world.

AFN Explanation of Funding Changes

	Dollars ($000)	FTE
Finance and Management	**$10,842**	**2**
Overview: For FY 2017, the Assistant Administrator for Finance and Management (AFN) requests $771,342,000 and 1,666 FTEs to meet its mission. The FY 2017 request level reflects adjustments to base, other changes, and discretionary adjustments. This represents an increase of $10,842,000 and 2 FTEs over the FY 2016 enacted level.		
Adjustments to Base	**$9,834**	**-**
Annualization of FY 2016 Pay Raises: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.0 percent.	809	
FY 2017 Pay Raises: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	2,987	
Two Less Compensable Days: This decrease represents two less compensable days in FY 2016 (260 days in FY 2017 vs. 262 days in FY 2016).	- 1,910	
GSA Rent: The rent budget will increase by an average 3.25 percent from FY 2016 to FY 2017 due to the contractual terms of the existing and anticipated market rates for planned leases. Lease contracts dictate increases in base rent, and operating and maintenance costs, such as utilities, real estate taxes, repairs, janitorial, safety upgrades, guard services, and required renovations. New or succeeding leases that are negotiated are subject to rising market rents. The administrative lease portfolios include both GSA and FAA direct leases and house approximately 26,000 employees in 7.9 million square feet of space. These facilities house all Lines of Business directly supporting operations (ATO) and safety (AVS) throughout 18 states and the District of Columbia.	7,948	
Other Changes	**-$2,992**	**-**
Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's (DOT) Working Capital Fund (WCF) profile. These adjustments are being made to best align each office's resources within their expected WCF costs.	-24	
Administrative Efficiencies: Finance and Management (AFN) will achieve administrative efficiencies through cost reductions and avoidance in various areas such as contractual services and supplies.	- 2,968	
Discretionary Adjustments	**$4,000**	**2**
Information Systems Security (ISS): This funding request is to improve FAA's cybersecurity detection, response, and recovery capabilities. The targeted areas support the agency mission goals to promote Risk Based Decision Making. Additional staffing resources and support are required to address weaknesses highlighted by the Dyre malware, and to implement several of the GAO Information Security audit recommendations. This includes risk mitigation associated with interconnectivity between NAS and Non-NAS systems and increased use of IP based communications, and enhanced training and communication, increased testing, and more rapid and effective response to intrusions.	4,000	2

(Page Intentionally Left Blank)

INSERT TAB HERE:

NEXTGEN (ANG)

NextGen and Operations Planning (ANG)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$60,089**	**201**	**7**	**201**
Adjustments to Base	**$221**			
Annualization of FY 2016 Pay Raises 1.3%	94			
FY 2017 Pay Raises 1.6%	347			
Two Less Compensable Days	-220			
Other Changes	**-$155**			
Administrative Efficiencies	-155			
FY 2017 Request	**$60,155**	**201**	**7**	**201**

(Page Intentionally Left Blank)

Executive Summary: NextGen and Operations Planning (ANG)

What Is The Request And What Funds Are Currently Spent on the Program?

The NextGen Organization requests $60,155 and 201 full-time permanent/full-time equivalent personnel in FY 2017 to manage the day-to-day operations and maintenance of the FAA's William J. Hughes Technical Center (WJHTC) campus in Atlantic City, N.J., and provide management and direction to the FAA's NextGen portfolio.

Nearly 48 percent of ANG's Operations budget is for payroll. In addition, annual operations and maintenance costs (non-pay) for WJHTC are approximately $26,252,000, or 44 percent, of ANG's operations budget. Non-pay costs are primarily for management of WJHTC properties that provide the necessary technical platforms for research, development, and testing of NextGen programs, as well as the around the clock operational support to En Route, Terminal, and other Air Traffic Control (ATC) facilities throughout the nation.

The WJHTC owns and operates approximately 1.6 million square feet of test and evaluation facilities, National Airspace System (NAS) field support facilities, research and development facilities, administrative facilities and numerous project test sites. As the FAA's Federal Laboratory, WJHTC is the principal source for conducting NextGen research, test, and evaluation. These sites and facilities provide the necessary technical platforms for research, development, and testing of NextGen programs.

The NextGen organization is also responsible for providing executive leadership and direction for the FAA's evolutionary "NextGen" blueprint for modernizing air transportation. NextGen represents a wide-ranging transformation of the entire NAS to meet future demand and support the economic viability of aviation, while improving safety and protecting the environment.

What is this Program and Why is it Necessary?

The William J. Hughes Technical Center (WJHTC) is FAA's national scientific test base for the research, development, test, and evaluation of air transportation systems. The research, testing and prototype development conducted by WJHTC staff helps shape the future of our Nation's air transportation system and make NextGen a reality. Realizing the future vision of aviation through integrated strategies and solutions that achieve national and international goals encapsulates the mission of the ANG organization. The ANG organization champions the evolution of NextGen through program management, enterprise system engineering, and technical integration expertise.

The Technical Center laboratories are the only location where it is possible to realistically simulate the National Airspace System (NAS). The test beds can be configured to replicate desired field configurations and provide direct field support for operational NAS systems. Problems identified at various field locations are quickly transmitted to the appropriate laboratory where solutions can be developed and tested. This keeps systems operational, avoiding service degradation and costly interruptions.

Why Do We Want/Need To Fund The Program At The Requested Level?

The budget request of $60,155 supports the ongoing operations of the WJHTC properties that provide the necessary technical platforms for research, development, and testing of NextGen programs, as well as the around the clock operational support to En Route, Terminal, and other Air Traffic Control (ATC) facilities throughout the nation.

What Benefits will be provided to the American Public through this request?

Through a continuous roll-out of improvements and upgrades, NextGen builds the capability to more precisely and efficiently guide and track air traffic, while saving fuel and reducing noise and pollution. The successful research, development, testing and evaluation lead to deployment of NextGen systems, capabilities and intended benefits to stakeholders. Other measures include Research and Development accomplishments indicated in the R&D Annual Review document published with the National Aviation Research Plan (NARP), 24x7x365 second level support of the National Airspace System (NAS), and technology transfer of research to industry and academia via Cooperative Research and Development Agreements and Grants.

Budget Summary:

FY 2017 – NextGen and Operations Planning (ANG)

($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	28,434	28,434	28,655	221
Program Costs	31,655	31,655	31,500	-155
Total	**$60,089**	**$60,089**	**$60,155**	**$66**
FTE	**197**	**201**	**201**	**-**

The NextGen Organization requests $60,155,000 and 201 full-time permanent/full-time equivalent personnel to support operations at the William J. Hughes Technical Center (WJHTC) and to further the successful transition to NextGen. This includes increases of $94,000 for the annualized cost of the FY 2016 pay raise; $347,000 for the FY 2017 pay raise; minus -$220,000 for two less compensable days in FY 2017. This request includes a decrease of -$155,000 for Administrative Efficiencies.

Detailed Justification for – NextGen (ANG)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – NextGen and Operations Planning (ANG)

($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	28,434	28,434	28,655	221
Program Costs	31,655	31,655	31,500	-155
Total	**$60,089**	**$60,089**	**$60,155**	**$66**
FTE	**201**	**201**	**201**	**-**

The NextGen Organization requests $60,155,000 and 201 full-time permanent/full-time equivalent personnel to support operations at the William J. Hughes Technical Center (WJHTC) and to further the successful transition to NextGen. This includes increases of $94,000 for the annualized cost of the FY 2016 pay raise; $347,000 for the FY 2017 pay raise; minus -$220,000 for two less compensable days in FY 2017. This request includes a decrease of -$155,000 for Administrative Efficiencies.

What is this Program and Why is it Necessary?

Realizing the future vision of aviation through integrated strategies and solutions that achieve national and international goals encapsulates the mission of the ANG organization. The organization champions the evolution of NextGen through program management, enterprise system engineering, and technical integration expertise. The William J. Hughes Technical Center (WJHTC) is FAA's national scientific test base for the research, development, test, and evaluation of air transportation systems. The research, testing and prototype development conducted by WJHTC staff helps shape the future of our Nation's air transportation system and make NextGen a reality.

The WJHTC owns and operates approximately 1.6 million square feet of test and evaluation facilities, NAS field support facilities, research and development facilities, administrative facilities and numerous project test sites. As the FAA's Federal Laboratory, WJHTC is the principal source for conducting NextGen research, test, and evaluation. These sites and facilities provide the necessary technical platforms for research, development, and testing of NextGen programs. WJHTC also provides around the clock operational support to En Route, Terminal, and other Air Traffic Control (ATC) facilities throughout the nation. Annual operations and maintenance costs for WJHTC are approximately $26,252,000 or 44 percent of ANG's operations budget.

This Program maintains facilities and support services for all properties at the William J. Hughes Technical Center including land, buildings and infrastructure.

Managing program performance and resource utilization, analyzing and measuring implementation benefits and testing new NAS capabilities are all essential elements of a successful transformative program. Program benefits assessment and resource management elements perform continuous analyses to support optimal NextGen resource investment decisions.

FY 2016 Anticipated Accomplishments:

Function / Activity	FY 2016 Anticipated Accomplishments
Facility & NextGen Related:	▪ Provide operational test and evaluation, including flight testing, of all FAA systems prior to implementation in the NAS. ▪ Provide world class laboratories for research, engineering, development, test, evaluation, and maintenance of air navigation, air traffic management, and future air transportation system capabilities. ▪ Provide development of long-range innovative aviation systems and concepts, development of new air traffic control equipment and software, and modification of existing systems and procedures. ▪ Conduct, coordinate, and support domestic and international research and development of aviation-related products and services. ▪ Characterize performance of current system and effects of proposed NextGen changes on pilots, controllers, aircraft, and related system components. ▪ Address and meet the rapidly changing needs of the aviation industry by introducing innovative concepts and technologies in the air traffic system through extensive work in evaluations, concept development, and demonstrations in a real-time environment.

Why Do We Want / Need To Fund The Program At The Requested Level?

WJHTC capabilities include research and development, verification and validation, test and evaluation, and sustainment of the FAA's full spectrum of aviation systems. The Center specializes in sustaining and modernizing air traffic control automation, communications, surveillance, navigation, traffic flow management, and weather systems, and supports advancements in airport and aircraft safety, human factors, and separation standards.

FY 2017 Anticipated Accomplishments:

Function / Activity	FY 2017 Anticipated Accomplishments
Facility Related:	• Provide the technical platform for research in aircraft safety (fire, structural, unmanned aircraft systems, etc.), airport technologies (safety, capacity), human factors, and weather. • Provide laboratory systems for: o Conducting integrated concept evaluations, modeling and simulations, and test and evaluation for all NextGen technologies in the National Airspace System (NAS). o 24x7x365 field support for all operational systems within the NAS. • Provide facility operations and maintenance,

	environmental management and maintenance, and engineering support for all facilities located at the WJHTC. • Safeguard both employees and campus infrastructure by ensuring compliance with environmental laws, policies, directives, and initiatives.
NextGen and Operational Related:	• Conduct successful research, development, testing and evaluation that lead to deployment of NextGen systems, capabilities and intended benefits to stakeholders. The deployment of several NextGen transformational programs, which are funded through the Facilities and Equipment account, are ongoing. • Prepare NextGen Program Performance measurement and benefits analyses. • Develop and coordinate the annual publication of the NextGen Implementation Plan. • Provide analytical studies and related safety monitoring services in support of separation reductions in U.S. sovereign airspace and international airspace where FAA has delegated authority to provide air traffic services. • Conduct the bi-annual review of the Performance of Reduced Vertical Separation Minimum Operations (RVSM) in North America (U.S., Canada, and Mexico) compared to International Civil Aviation Organization (ICAO) Recommended Requirements. • Conduct maintenance and operations of independent performance based monitoring for Altimetry System Error (ASE), a key component to the implementation of RVSM. • Provide improved advisories for Flight Operations Center (FOC)/Airline Operations Center (AOC)

Other measures indicating this program works are:

- Research and Development accomplishments indicated in the R&D Annual Review document published with the National Aviation Research Plan (NARP).
- 24x7x365 second level support of the NAS.
- Technology transfer of research to industry and academia via Cooperative Research and Development Agreements and Grants.

What Benefits will be provided to the American Public through this request?

Aviation sustains millions of jobs each year and accounts for more than 5 percent of the gross domestic product. Aviation enables the economic benefits of tourism, shipping and travel for business or pleasure. Airports provide economic impact to large and small communities across this country. Continued economic growth in the aviation industry is supported through the ongoing implementation of NextGen technologies, policies and procedures.

The WJHTC is a world class research institution that provides the American public with research, engineering, development, test, evaluation, and maintenance of air navigation, air traffic management, and future air transportation system capabilities. These capabilities directly affect the day-to day operation of the National Airspace System, ensuring that safety critical operational systems to are constantly maintained and improved. The technical expertise provided by the labs is also key to the implementation of future NextGen capabilities.

Through a continuous roll-out of improvements and upgrades, NextGen builds the capability to more precisely and efficiently guide and track air traffic, while saving fuel and reducing noise and pollution.

FAA estimates NextGen improvements will reduce delays 11 percent by 2020, compared to what would happen were planned NextGen improvements not implemented. These delay reductions will provide an estimated $18 billion in cumulative benefits through 2020. NextGen delay reductions are in addition to any reduction from future runway construction or expansion.

ANG Explanation of Funding Changes

	Dollars ($000)	FTE
NextGen	**$66**	**-**
Overview: For FY 2017, the Office of the Assistant Administrator for NextGen requests $60,155,000 and 201 FTEs to meet its mission. The FY 2017 request level reflects adjustments to base, and other changes. This represents an increase of $66,000 over the FY 2016 enacted level.		
Adjustments to Base	**$221**	**-**
Annualization of FY 2016 Pay Raises: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.0 percent.	94	
FY 2017 Pay Raises: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	347	
Two Less Compensable Days: This decrease represents two less compensable days in FY 2016 (260 days in FY 2017 vs. 262 days in FY 2016).	- 220	
Other Changes	**-$155**	**-**
Administrative Efficiencies: Nextgen and Operations Planning (ANG) will achieve administrative efficiencies through cost reductions and avoidance in various areas such as contractual services and supplies.	- 155	

(This page intentionally left blank)

INSERT TAB HERE:

SECURITY AND HAZARDOUS MATERIALS SAFETY (ASH)

Office of Security and Hazardous Materials Safety (ASH)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$99,239**	**522**		**497**
Adjustments to Base	**$2,962**	**6**		**19**
Annualization of FY 2016 Pay Raises 1.3%	237			
Annualization of 2016 FTE	2,381			19
FY 2017 Pay Raises 1.6%	876			
Two Less Compensable Days	-532			
FTP Adjustment		6		
Other Changes	**$678**			
Working Capital Fund	1,096			
Administrative Efficiencies	-418			
Discretionary Adjustments	**$4,190**	**28**		**15**
ZAU Security Review	1,746	20		10
Insider Threat Detection and Mitigation Program (ITDMP)	1,796	3		2
Hazardous Materials Safety Program (HMSP)	648	5		3
Base Transfers	**$92**	**1**		**1**
Security and Hazardous Materials Safety Staffing	92	1		1
FY 2017 Request	**$107,161**	**557**		**532**

(Page Intentionally Left Blank)

Executive Summary: Office of Security and Hazardous Materials Safety (ASH)

What Is The Request And What Funds Are Currently Spent On The Program?

The FY 2017 request for the Office of Security and Hazardous Materials Safety is $107,161,000 and 532 FTEs. This includes discretionary increase requests of $4,190,000 and 15 FTEs to support the development of the Insider Threat Detection and Mitigation Program (ITDMP), increase oversight of hazardous materials shippers and implement changes needed to enhance facility and personnel security measures for critical National Airspace System (NAS) operations facilities. These increases will allow ASH to meet its core inspection and security mission requirements.

What Is This Program And Why Is It Necessary?

The Office of Security and Hazardous Materials Safety ensures aviation safety, supports national security, and promotes an efficient airspace system through policy development and administering safety and security programs. ASH develops and implements policy to protect FAA employees, contractors, information, facilities and assets; provides Agency crisis management coordination, manages continuity of operations/continuity of government plans, facilities and communications, executes and supports FAA national security responsibilities and protects the flying public through the safe air transport of hazardous materials. Any failures or lapses in implementing these programs directly impacts NAS safety and security and FAA's ability to execute its functions as one of the key components of our country's transportation infrastructure and emergency response.

Recent high-profile personnel and information security-related events, such as the Navy Yard and Fort Hood shootings, the deliberately set fire at the Chicago Air Route Traffic Control Center (ARTCC), the release of sensitive classified information, and safety-related accidents and incidents involving hazardous materials, such as lithium batteries, have underscored the criticality of ASH's safety role in the NAS and security role within the agency.

Why Do We Want/Need To Fund The Program At The Requested Level?

This request includes additional funding and staffing to improve personnel and facility security, further develop the Presidentially-mandated Insider Threat Detection and Mitigation program and to expand the Hazardous Materials Safety Program. Any reduction to our request will negatively impact our ability to meet our critical safety and security mission responsibilities. In addition to the requested increases, the requested level is needed to protect FAA personnel, systems, information and facilities, and maintain base level Hazardous Materials Safety Program activities that promote the safety of the flying public globally.

What Benefits Will Be Provided To The American Public Through This Request?

ASH programs directly contribute to the safety and security of the flying public. In addition, each year ASH has consistently met projected targets for success as well as required cost efficiency and program effectiveness measures, demonstrating we are good stewards of public funds. We adhere to all regulations and laws pertaining to our work and ensure this through internal auditing and program oversight. ASH's execution of its safety and security missions minimizes the safety risk in the NAS for the flying public globally and protects the nation's economic and national security.

Budget Summary

Office of Security and Hazardous Materials Safety (ASH)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	69,234	73,031	78,095	5,064
Program Costs	19,438	26,208	29,066	2,858
Total	**$88,672**	**$99,239**	**$107,161**	**$7,922**
FTE	**469**	**497**	**532**	**35**

The request of $107,161,000 and 532 FTEs allows the Office of Security and Hazardous Materials Safety to protect the safety of FAA employees, facilities and assets, provide Agency crisis management coordination, and protect the flying public through the safe air transport of hazardous materials. This request includes $1,096,000 in Working Capital Fund adjustments, a reduction of $418,000 associated with administrative efficiencies, discretionary increases totaling $4,190,000 and a $92,000 base transfer.

Discretionary Adjustments

Program	Amount ($000)	FTP	FTE
ZAU Security Review	1,746	20	10
Hazardous Materials Safety Program (HMSP)	648	5	3
Insider Threat Detection and Mitigation (ITDMP)	1,796	3	2
Total	**$4,190**	**28**	**15**

Detailed Justification for – Security and Hazardous Materials Safety (ASH)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 - Security and Hazardous Materials Safety (ASH)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	69,234	73,031	78,095	5,064
Program Costs	19,438	26,208	29,066	2,858
Total	**$88,672**	**$99,239**	**$107,161**	**$7,922**
FTE	**469**	**497**	**532**	**35**

The FY 2017 request for the Office of Security and Hazardous Materials Safety (ASH) is $107,161,000 and 532 FTEs. This reflects a net of $2,962,000 in increases for pay-related adjustments; a $1,096,000 increase in ASH's payment to the Department's Working Capital Fund; discretionary increases of $4,190,000 and 15 FTEs to implement changes needed to enhance facility and personnel security measures for critical National Airspace System (NAS) operations facilities, support the Hazardous Materials Safety Program (HMSP), continue the necessary development of the FAA Defensive Counterintelligence and Insider Threat Detection and Mitigation Programs; and a base transfer of $92,000 and one FTP/FTE from the Air Traffic organization. This will allow ASH to meet its core safety and security mission requirements.

What is this Program and Why is it Necessary?

The mission of the Office of Security and Hazardous Materials Safety is to ensure aviation safety, support national security, and promote an efficient airspace system by developing and administering policies and programs. ASH develops and implements policies to protect FAA employees, contractors, information, facilities and assets; provides Agency crisis management coordination, manages continuity of operations / continuity of government facilities and communications, executes and supports FAA national security responsibilities and protects the flying public through the safe air transport of hazardous materials. Any failures or lapses in implementation of these programs directly impact the safety and security of the NAS and FAA's ability to execute its functions as one of the key components of our country's transportation infrastructure and emergency response.

After the Chicago Air Route Traffic Control Center (ZAU) fire incident in September 2014, ASH conducted a comprehensive security review, which resulted in identification of 42 recommendations – 24 of them significant – to improve security. This request includes funding for activities recommended for implementation in the areas of facility security, personnel security, and the insider threat program necessary to improve the security and support resiliency of FAA critical operations, especially at NAS Service Tier 1 facilities.

As our economic recovery continues, cargo and passenger volumes will continue to increase, with a concomitant increase in hazmat onboard aircraft. FAA's Hazardous Materials Safety Program has regulatory responsibilities over air transport of a wide array of hazmat, including lithium batteries. As lithium batteries increase in power and energy storage capacity, so too does their ability to initiate and fuel fires onboard aircraft that cannot be readily suppressed by current aircraft systems. Lithium batteries have caused dozens of fires in passenger baggage and in air cargo, and contributed to three air disasters/hull losses in recent years. Lithium batteries are widely used in consumer electronic devices – billions of batteries are manufactured globally each year – and the U.S. is the biggest market. This request includes additional funding for Air Carrier Oversight and Outreach through certificate management coordination, safety assurance and risk management through risk-based decision making, and safety promotion to educate the flying public and others that transport hazmat by air. In addition, the FAA continues to work collaboratively with Pipeline and Hazardous Materials Safety Administration (PHMSA), other federal agencies, International Hazmat Committees, and other Civil Aviation Authorities on domestic and international rulemaking and requirements that govern air transportation of hazardous materials, such as lithium batteries. For example, more recently, the FAA and PHMSA joined with other federal agencies to coordinate oversight authority and activities.

FY 2016 Anticipated Accomplishments:

Function / Office	FY 2016 Anticipated Accomplishments
Office of Hazardous Materials Safety (ADG) Responsible for ensuring and promoting the safe transportation of hazmat in air commerce ▪ Regulatory oversight of hazmat carried by the flying public or transported on aircraft ▪ Utilization of a Safety Management System approach, identify and address risks ▪ Conduct of national and international outreach to address the risk from air transportation of hazmat ▪ Representation of FAA on hazmat-related International Panels and Committees to develop standards and regulations for safe transportation of hazmat by air, and oversight and coordination of rulemaking efforts through DOT PHMSA	▪ Further integrate SMS and certificate management principles into the FAA Hazardous Materials Safety Program's oversight of FAR Part 121 and 135 air carriers, and coordinate with FAA's Office of Aviation Safety on surveillance of these air carriers' activities that are related to the air transportation of hazardous materials. ▪ Conduct national surveillance of air carriers, shippers, and aviation repair stations to assess and enforce hazmat safety regulations through coordination with other transportation modes and other agencies. ▪ Conduct global safety oversight activities in high risk areas for the transporting hazardous materials, including lithium batteries that are believed to have contributed to three recent catastrophic cargo aircraft accidents. ▪ Continue to lead/support global activities and initiatives related to the safe transportation of hazardous material by air through ICAO, International Air Transport Association (IATA) and other international bodies. ▪ Educate domestic and international passengers on the safety ramifications of transporting undeclared hazardous materials in baggage through the use of the internet and social media, in coordination with industry stakeholders and other agencies. ▪ Partner with other agencies and with other Department modes, to capitalize on technology to gain data and information for quantitative and qualitative analysis of trends useful for targeting hazmat compliance, enforcement and outreach activities.
Office of National Security Programs and Incident Response (AEO) Provides services in readiness, crisis management, and national security support to promote and ensure national airspace and aviation safety and security. ▪ Laser and UAS Investigations ▪ Law Enforcement Assistance Program ▪ Airmen, employee, and contractor Investigations ▪ Current Intelligence and Threat Evaluation Watch Operations 24/7 ▪ Insider Threat Detection and Mitigation ▪ Defensive Counterintelligence Program (DCIP)	▪ Ensure FAA executives have real-time access to and analysis of current intelligence and threat information, particularly during crisis and security incidents, through continuous interaction with Intelligence, Defense, and Law Enforcement Community agencies. ▪ Provide intelligence threat and analysis regarding emerging threats from new technologies, such as UAS, or in potentially hostile overseas locations into or over which U.S. operators and airmen fly, to support FAA execution of regulatory aviation safety responsibilities. ▪ Identify potential national security threats to and protect classified and sensitive security information related to the NAS. Information and networks remain at considerable risk to cyber compromise and economic espionage perpetrated by malicious insiders. ▪ Implement an Insider Threat program within the FAA

Function/Office	FY 2016 Anticipated Accomplishments
▪ Command and Control Communications and Continuity of Operations ▪ Incident and Crisis Management	that meets the requirements of EO 13587 and the minimum standards. ▪ Conduct counterintelligence awareness briefings for all FAA employees and targeted travel pre-briefings for executives and employees traveling to high-threat locations. ▪ Expeditiously analyze and share intelligence information regarding cyber threats to FAA data and networks. ▪ Revoke or suspend certificates of airmen convicted of drug related offenses. ▪ Partner with other agencies to investigate and take appropriate actions to reduce the number of individuals who shine lasers at aircraft who fly UAS contrary to Section 336 of the FAA Reauthorization Act of 2012. ▪ Ensure timely and thorough investigations are conducted in support of the safety whistleblower mission of the Office of Audit and Evaluation. ▪ Ensure FAA is able to maintain mission essential functions during all hazard situations through availability of continuity facilities and emergency communications capabilities. ▪ FAA executives and continuity personnel have priority access on landlines and cellular phones by managing the Government Emergency Telephone Service cards and the Wireless Priority Service programs.
Office of Security (AIN) Supervises nationwide security program areas and provides program policy guidance, oversight and evaluations. ▪ Facility Security Management Program (FSMP) ▪ Personnel Security Program ▪ Information Security Program ▪ Identification Media and Credential Program	▪ Support enhancement of the Facility Security Management Program and the Personnel Security Program that protects critical FAA infrastructure and personnel in the NAS. ▪ Increase frequency and complexity of FAA facility inspections and assessments and provide oversight to ensure FAA facilities are in compliance with facility and information security requirements that protect agency employees, visitors, information, systems and facilities at every level daily. ▪ Implement a consistent active shooter threat response awareness program at FAA facilities. ▪ Develop standards, programmatic safeguards and controls for protecting classified national security and sensitive unclassified information from loss, compromise or unauthorized disclosure. ▪ Process background investigations and fingerprint checks for FAA employees and contractors. ▪ Issue PIV cards to new employees and contractors, and renew expired ones and enable 100 percent of issued PIV cards for use within FAA facilities and information systems.

Why Do We Want/Need To Fund The Program At The Requested Level?

The requested funding is needed to maintain base level critical safety and security mission responsibilities that promote the safety of the flying public and protect FAA personnel, systems, information and facilities. Any reduction to our request will negatively impact our ability to meet critical FAA safety and security mission requirements. To expand our security mission, three increase requests are included in the FY 2017 budget:

Anticipated FY 2017 Accomplishments

Function/Activity	FY 2017 Anticipated Accomplishments
Office of Hazardous Materials Safety (ADG)	▪ Conduct oversight of shippers, air carriers and repair stations in accordance with the Hazardous Materials Regulations (49 CFR Parts 171-180), hazardous materials related requirements in 14 CFR, and focusing oversight efforts of FAA's Hazardous Materials Safety workforce on areas of highest risk. ▪ Advance safety in the NAS through participation in International Safety Organizations and collaboration with State Civil Aviation Authorities (CAAs) to address global safety oversight issues and to harmonize Hazardous Materials Regulations requirements with international standards. ▪ Continue studies with FAA's Office of Aviation Research (Tech Center) and external professional testing organizations to test select critical commodities, such as lithium batteries and packaging, to identify new risks, advance understanding of current risks, and work to strengthen Hazardous Materials Regulations and develop and coordinate guidance useful for setting national policy and industry standards to reduce and mitigate those risks.
Office of Security (AIN)	▪ Complete actions related to recommendations from the ZAU Security Review to enhance the Personnel, Information, and Facility Security Programs that protect critical FAA personnel, infrastructure, and information in the NAS. ▪ Provide oversight to ensure FAA facilities are in compliance with facility and information security requirements that protect agency employees, visitors, and information.
Office of National Security Programs and Incident Response (AEO)	▪ Operate 24/7 Intelligence Watch to ensure the WOCC and the Air Traffic Security Coordinators, who manage the Domestic Events Network (DEN), maintain situational awareness of all threats impacting aviation and the NAS, as well as provide threat analysis to support FAA decision-making regarding emerging threats to aviation safety from technologies or in overseas locations. ▪ Continue the development of FAA Counterintelligence and Insider Threat Detection and Mitigation programs to detect and respond to foreign intelligence and insider threats. ▪ Assist and support Federal, State, local, territorial, tribal, and international law enforcement agencies that investigate and interdict illicit use of aircraft in narcotics, weapons, and human trafficking. ▪ Complete agreements to obtain Federal and State prison information to compare against the Airman Registry, identify matches and recommend enforcement action as appropriate to prevent safety threats to the NAS. ▪ Manage the Agency's Continuity of Operations Program, providing the minimum communications requirements for Executive Department and Agency headquarters and operating continuity facilities that support the continuation of the Agency National Essential Functions (NEFs). ▪ Maintain emergency operations network capability and ensure continued situational awareness of daily and emergency events. The planned capabilities include fully integrating the Washington Operations Center Complex (WOCC) and Cornerstone Regional Operations Centers (CROCs) with the Emergency Notification System

Function/Activity	FY 2017 Anticipated Accomplishments
	(ENS). ▪ Partner with other agencies to investigate and take appropriate actions to reduce the number of individuals who shine lasers at aircraft or who fly UAS contrary to Section 336 of the FAA Reauthorization Act of 2012.

Total Requested Discretionary Increase Requests:

Programs	Amount	FTP	FTE
ZAU Security Review	1,746	20	10
Insider Threat Detection and Mitigation (ITDMP)	1,796	3	2
Hazardous Materials Safety Program (HMSP)	648	5	3
Total	**$4,190**	**28**	**15**

Security Review (ZAU)

ASH is implementing recommendations from the ZAU security review that will require work associated with changing existing policies, processes, and training; and is not requesting supplemental funds to implement these recommendations. Funds are being requested for recommendations deemed significant that cannot be implemented without additional resources not currently included in ASH base. As part of the ZAU Security Review and NAS Resiliency Review, ASH has reevaluated the security levels and associated protective measures needed at critical NAS operations facilities. As a result of this reevaluation, ASH anticipates increasing the frequency and complexity of facility security assessments to properly reflect a facility's mission criticality. Additional funding ($827,000/5 FTE) is required to conduct these more frequent and complex assessments.

Also, new Federal Investigative Standards (FIS) went into effect in October 2014 that created the need for additional and more frequent reinvestigations for all positions other than those designated as low-risk. This change increased reinvestigation requirements from 14 percent to 50 percent of FAA employees and contractors and increases the workload for personnel security specialists by more than 100 percent. Additional resources are requested ($919,000/5 FTE) for additional staff to address the increased workload. Without these increases, ASH will not be able to increase inspection frequency and complexity, or comply with new FIS standards.

Insider Threat Detection and Mitigation Program (ITDMP)

The ITDMP funding request supports the program's continued development to meet the minimum standards for deterrence, detection and mitigation of threats from potential employee threats to national security or aviation safety. The additional resources ($1,796,000 / 2 FTE) will provide FAA with a minimum capability to analyze employee activity and behavior in order to identify potential threats and protect the FAA from malicious insider activity including an active shooter situation, employee fraud, and the unauthorized release of classified information by a trusted employee with access privileges for selfish motives. The FY 2017 request includes $1,500,000 (turnkey solution) to integrate network monitoring analysis (audit logs, browser activity, etc.) with a whole person behavioral monitoring approach (personnel actions, physical access, travel activities, etc.) to provide a complete picture of the person. Equipment and behavioral analysis software purchase will be one-time, but annual license fees are expected.

Hazardous Materials Safety Program

FAA forecasts indicate passenger growth will average 2.0 percent per year, and domestic cargo revenue ton miles alone will average 0.5 percent increase annually. With greater numbers of passengers and increases in cargo volume, there are increasing amounts and varieties of hazardous materials, including lithium batteries, onboard aircraft, resulting in a greater risk of fire due to that hazardous material. It is, therefore, critical that FAA's Hazardous Materials Safety Program has the capacity to:

- Complete its integration of Safety Management Systems principles in conducting oversight of large domestic air operators. At present, the HMSP has three specialists to coordinate activities with certificate management offices, but there are 81 Part 121 air operators and over 2,000 Part 135 air operators. Additional funding is requested ($648,000 / 3 FTEs) to complete coordination of certificate management activities for the Part 121 air operators and to begin coordination for the Part 135 air operators.
- Systematically analyze hazardous materials safety data to inform decisions based on risk analyses, and identify systemic issues and fixes according to SMS and risk-based decision-making principles.
- Produce and maintain updated outreach materials and safety promotion strategies for effectively educating stakeholders, including the public and industry, to the requirements, safeguards, and consequences of transporting hazardous materials by air – education and outreach are the best preventative measures against baggage and cargo fires caused by those unfamiliar with hazardous materials rules.

Recurrent training is required to ensure FAA maintains a hazardous materials safety workforce that is current on these complex regulations and standards for effective oversight, and that is prepared for future challenges posed by emerging regulatory, industry, and technological changes.

What Benefits will be provided to the American Public through this request?

The Office of Security and Hazardous Materials Safety (ASH) provides services to ensure and promote aviation safety and support national security both within the National Airspace System (NAS) and globally. We are responsible for the FAA's critical infrastructure protection, emergency operations, contingency planning, and the safe transportation of hazardous materials in air commerce. Protecting our critical infrastructure is a national and homeland security concern, which continues to demand a high level of attention. In recognition of the criticality of the NAS in our country's transportation infrastructure and economic health, ASH develops and implements policies to protect FAA employees, contractors, facilities, and assets, as well as the flying public. We are committed to continuously improving the safety and efficiency of flight, and continue to work with all of our partners to focus our experience, expertise, and new technology to ensure a safer and more secure global airspace. The requested funding and staff will further strengthen our ability to address threats that affect the safety and security of the flying public, FAA employees and contractors, facilities and information.

ASH Explanation of Funding Changes

	Dollars ($000)	FTE
Security and Hazardous Materials Safety (ASH)	**$7,922**	**35**
Overview: For FY 2017, ASH requests $107,161,000 and 532 FTEs to meet its mission. The FY 2017 request level reflects adjustments to base, other changes, discretionary adjustments, and a base transfer. This represents an increase of $7,922,000 over the FY 2016 enacted level.		
Adjustments to Base	**$2,962**	**19**
Annualization of FY 2016 Pay Raises: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.0 percent.	237	
Annualization of 2016 FTE: This increase provides for the annualized costs associated with FY 2016 new hires in ASH.	2,381	19
FY 2017 Pay Raises: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	876	
Two Less Compensable Days: This decrease represents two less compensable days in FY 2016 (260 days in FY 2017 vs. 262 days in FY 2016).	-532	
Other Changes	**$678**	**-**
Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's (DOT) Working Capital Fund (WCF) profile. These adjustments are being made to best align each office's resources within their expected WCF costs.	1,096	
Administrative Efficiencies: Security and Hazardous Materials Safety (ASH) will achieve administrative efficiencies through cost reductions and avoidance in various areas such as contractual services and supplies.	-418	
Discretionary Adjustments	**$4,190**	**15**
ZAU Security Review: This funding supports the changes needed to adjust and enhance facility and personnel security measures resulting from the comprehensive security review conducted after the 2014 Chicago Center fire. An additional $827,000 and five FTEs are requested to conduct additional facility assessments, and $919,000 and five FTEs are requested due to an increase in reinvestigations stemming from more stringent Federal Investigative Standards (FIS) requirements.	1,746	10
Insider Threat Detection and Mitigation Program (ITDMP): The request is for additional hardware, software, and staff to expand network monitoring to encompass the unclassified network and begin to incorporate behavioral analytics to merge network activities with behavioral indicators that could provide prelude to misconduct or malicious activity.	1,796	2
Hazardous Materials Safety Program (HMSP): The air transport of Hazmat continues to grow in volume and complexity. The FAA is concurrently transitioning its safety oversight processes that rely more heavily on data analysis and increased stakeholder coordination than direct oversight. Additional staff is being requested to address safety assurance and safety risk management issues.	648	3
Base Transfers	**$92**	**1**
Security and Hazardous Materials Safety Staffing (ATO to ASH): This request transfers funding $92,000 and 1FTP/1FTE from the Air Traffic Organization, Technical Operations Services (ATO/AJW) to the Office of Security and Hazardous Materials Safety (ASH).	92	1

(This page intentionally left blank)

INSERT TAB HERE:

STAFF OFFICES

Staff Offices
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$206,751**	**1,092**	**56**	**1,077**
Adjustments to Base	**$1,245**			
Annualization of FY 2016 Pay Raises 1.3%	520			
FY 2017 Pay Raises 1.6%	1,925			
Two Less Compensable Days	-1,200			
Other Changes	**$598**	**-3**		
Working Capital Fund	1,402			
Administrative Efficiencies	-804	-3		
Discretionary Adjustments	**$250**			
Unmanned Aircraft Systems (UAS) Integration	$250			
Base Transfers	**$257**	**1**		**1**
Civil Rights Staffing	257	1		1
FY 2017 Request	**$209,101**	**1,090**	**56**	**1,078**

(Page Intentionally Left Blank)

Executive Summary: **Staff Offices**

What is the request and what funds are currently spent on the program?

The request of $209,101,000 and 1,078 FTEs allows FAA Staff Offices to provide executive leadership, policy and planning, legal counsel, security services, and other administrative services in support of FAA's mission. The request includes base funding, adjustments to base, Working Capital Fund, discretionary adjustments and a base transfer. The base transfer reflects 1 FTE for Civil Rights Staffing (ATO to ACR).

In the FY 2017 budget request, Staff Offices have requested the following discretionary increase:

- Unmanned Aircraft Systems (UAS) Integration – Forecast of UAS Activity

What is the program and why is it necessary?

The Staff Offices of FAA include the Office of the Administrator, Chief Counsel and six assistant administrators who provide mission support services to the four lines of business, including legal counsel, economic trend analysis, diversity leadership, government and industry liaisons, communications, public relations and human resources management. A brief description of staff offices are outlined as follows:

- The Office of Audit and Evaluation performs audit and investigative review functions primarily for internal safety disclosures and concerns, including the FAA Whistleblower Protection Program.
- The Office of Civil Rights advises, represents, and assists the FAA Administrator on civil rights and equal opportunity matters.
- The Office of Government and Industry Affairs serves as the Administrator's principal adviser and representative on matters concerning relationships with the Congress, aviation industry groups, and other governmental organizations, developing and reviewing plans and strategies involving these groups to enhance aviation safety.
- The Office of Communications is responsible for the policy, direction, and management of the agency's communications programs for the news media and FAA's employees nationwide.
- The Human Resources Management organization provides human resource services to all operating lines of business and staff offices (LOB/SOs) at the headquarters and to all the FAA regions including the two centers and overseas.
- The Office of Policy, International Affairs, and Environment serves as the principle advisor to the Administrator on international matters.

Why do we want/need to fund the program at the requested level?

Staff Offices provide services and resources necessary for the operations of our business. Without these services, lines of business would not have the resources needed to meet their goals. From performing mission-critical services to receiving guidance and counsel on regulatory or legal issues, or managing annual appropriations, Staff Offices make a significant contribution to the mission of FAA. Reductions below the requested level would hinder our ability to provide key support services. Our request is the funding needed to continue supporting Agency lines of business.

What benefits will be provided to the American public through this request?

Through the leadership of the Administrator, FAA successfully manages the most complex and safest aviation system in the world. By executing their mission responsibilities and providing management, leadership, and oversight, the FAA's Staff Offices have contributed to the overall success of the FAA.

Budget Summary

Staff Offices
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	226,888	160,622	161,723	1,101
Program Costs	65,959	46,129	47,378	1,249
Total	**$292,847**	**$206,751**	**$209,101**	**$2,350**
FTE	**1,530**	**1,077**	**1,078**	**1**

The FY 2017 request of $209,101,000, 1,090 full-time permanent, and 1,078 full-time equivalent personnel supports the eight staff offices. This request also includes $1,402,000 in the Department of Transportation's Working Capital Fund, $250,000 in a discretionary increase and $257,000 in a base transfer for Civil Rights.

Discretionary Adjustments:

Program	Staff Office	Amount
Unmanned Aircraft Systems (UAS) Integration	APL	250
Total Discretionary Adjustments		**$250**

Office of the Administrator (AOA)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$4,079**	**20**	**4**	**24**
Adjustments to Base	**$27**			
Annualization of FY 2016 Pay Raises 1.3%	12			
FY 2017 Pay Raises 1.6%	42			
Two Less Compensable Days	-27			
Other Changes	**-$16**			
Administrative Efficiencies	-16			
FY 2017 Request	**$4,090**	**20**	**4**	**24**

Detailed Justification for – Office of the Administrator (AOA)

What Is The Request And What Funds Are Currently Spent On The Program?

**FY 2017 – Office of the Administrator (AOA) – Budget Request
($000)**

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	3,465	3,527	3,554	27
Program Costs	552	552	536	-16
Total	**$4,017**	**$4,079**	**$4,090**	**$11**
FTE	**22**	**24**	**24**	**-**

In FY 2017, the Administrator requests $4,090,000 and 24 FTE to meet its mission. This includes increases of $12,000 for the annualized cost of the FY 2016 pay raise; $42,000 for the FY 2017 pay raise; -$27,000 for the two less compensable days in FY 2017; and -$16,000 for administrative efficiencies.

AOA directs and controls the operations of the Federal Aviation Administration (FAA) and acts as principal adviser to the Office of the Secretary (OST) on civil aviation matters and air transportation. Throughout FY 2017, AOA will continue to lead FAA toward achieving the agency's performance goals and targets.

What Is This Program And Why Is It Necessary?

The Office of the Administrator leads the FAA in its mission to provide the safest, most efficient aerospace system in the world. This office is responsible for the overall planning, direction, coordination and control of FAA programs, and represents FAA in its work with the Department of Transportation and other agencies, the White House, Congress, the aviation community and the general public.

In leading FAA, the Administrator oversees the Agency's employees in maintaining, operating, and overseeing the largest and most complex aviation system in the world. The agency determines the regulatory and operational standards for the United States, and effectively sets the benchmark for aviation safety around the world.

In FY 2013, AOA established the Office of Strategic Initiatives Group (SIG). The SIG's Director leads a staff of senior level experts and analysts who assist with continuing development, implementation and documentation of the FAA's strategic initiatives as well as coordination with line of business office heads and other key stakeholders to achieve the metrics, targets and milestones associated with the initiatives.

Why Do We Want/Need To Fund The Program At The Requested Level?

The FAA has a strong track record of achieving the vast majority of the agency's performance goals and targets and the newly developed SIG will lead this effort.

What Benefits Will Be Provided To The American Public Through This Request?

Some of the benefits derived from this funding will allow the FAA to focus on its top strategic initiatives:

- **Risk-Based Decision Making:** Build on safety management principles to proactively address emerging safety risk by using consistent, data-informed approaches to make smarter, system-level, risk-based decisions.

- **NAS Initiative:** Lay the foundation for the NAS of the future by achieving prioritized NextGen benefits, integrating new user entrants, and delivering more efficient, streamlined services.

- **Global Leadership:** Improve safety, air traffic efficiency, and environmental sustainability across the globe through an integrated, data-driven approach that shapes global standards, enhances collaboration and harmonization, and better targets FAA resources and efforts.

- **Workforce of the Future:** Prepare FAA's human capital for the future, by identifying, recruiting, and training a workforce with the leadership, technical, and functional skills to ensure the U.S. has the world's safest and most productive aviation sector.

Office of Audit and Evaluation (AAE)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$3,254**	**20**		**20**
Adjustments to Base	**$21**			
Annualization of FY 2016 Pay Raises 1.3%	9			
FY 2017 Pay Raises 1.6%	35			
Two Less Compensable Days	-23			
Other Changes	**-$13**			
Administrative Efficiencies	-13			
FY 2017 Request	**$3,262**	**20**		**20**

Detailed Justification for – Office of Audit and Evaluation (AAE)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Office of Audit and Evaluation (AAE) – Budget Request
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	2,873	2,927	2,948	21
Program Costs	327	327	314	-13
Total	**$3,200**	**$3,254**	**$3,262**	**$8**
FTE	**19**	**20**	**20**	**-**

In FY 2017, the Office of Audit and Evaluation requests $3,262,000 and 20 FTE to meet its mission. This includes increases of $9,000 for the annualized cost of the FY 2016 pay raise; $35,000 for the FY 2017 pay raise; -$23,000 for the two less compensable days in FY 2017; and -$13,000 for administrative efficiencies.

The mission of the office primarily and directly supports the Departmental goal of increased safety, but also supports in a more generalized way the goal of building and enhancing our high performance work place. The FY 2017 funding will support the operation and management of consolidated safety hotlines and provide a centralized focus for internally and externally generated safety-related complaints, critical audits, and investigations. Additionally, the Office provides an impartial agency venue for investigation and early resolution of safety disclosures.

What Is This Program And Why Is It Necessary?

The Office of Audit and Evaluation has **two primary functions; safety audit and investigation** review and analysis; and **hotline operations** and reporting.

- The **audit and analysis** staff perform audit and investigative review functions primarily for internal safety disclosures and concerns, including the FAA Whistleblower Protection Program. It is also coordinates and evaluates for completeness FAA responses to DOT- OIG, GAO and OSC generated audits, investigations and evaluations.
- **Hotline operations** is a reporting and data function that provides for analysis of hotline submissions, coordination of AAE investigations, and reviews for completeness investigations conducted by appropriate FAA organizations. The Office also operates and manages several administrative and safety hotlines. While AAE coordinates and provides independent quality control evaluations of certain investigations conducted by the lines of business, the Office does not determine the technical merits of safety-related issues or make recommendations for resolution of particular safety-related cases. Such determinations remain the ultimate responsibility of the appropriate safety office.

Some of AAE's critical supporting activities include:

- Serving as primary interface and maintaining a continuous liaison with GAO, OSC, and the DOT OIG investigations/audit staffs concerning safety-related investigations.
- Recording, tracking, reviewing, and confirming implementation of FAA responses to DOT OIG, OSC, and GAO audits and investigations that are under the purview of AAE.
- Managing the Whistleblower Protection Program established under 49 U.S.C. § 42121.
- Analyzing data from the Safety Hotline, the Administrator's Hotline, and Whistleblower contributions to identify trends.
- Serving as an alternative point of contact for receipt of safety-related contributions or allegations of retaliation against whistleblowers in general.

- Conducting initial reviews of contributions and investigations received, including an immediate assessment (in consultation with appropriate parties), and review of responses for accuracy, thoroughness and internal consistency of handling.
- Assessing and reviewing investigations and resolutions of matters that come under its purview for fairness, impartiality and conformance with established processes; providing guidance to lines of business and staff office on how to conduct investigations thoroughly and impartially.
- Serving as a new venue to receive disclosures from FAA employees or former employees, certificate holders, related to possible violation of the an FAA regulation or order, acts or omissions that pose a high level of risk to aviation safety, or gross misconduct of agency employees involving a matter of aviation safety.

AAE has established itself as a viable forum for raising and addressing internal safety concerns, it has developed standards to measure its successes. Currently, the success of the program can be gauged by its ability to timely process hotline matters, complete investigations, validate the completeness of agency responses to identified safety concerns, and ensure agency compliance with corrective actions.

Why Do We Want / Need To Fund The Program At The Requested Level?

AAE has become a vital and effective organization productively addressing and resolving safety-related whistleblower disclosures and employee workplace conflicts. Significantly, the visibility and accomplishments of the AAE Office have generated a critical awareness and recognition that employees can bring their safety sensitive disclosures to an internal organization and have them objectively reviewed by an unbiased entity.

Anticipated FY 2017 accomplishments include:

- Complete an analysis of FY 2016 hotline data and whistleblower contributions by the end of the first quarter and prepare a report on significant items for the Administrator by the end of the second quarter.
- Monitor milestones so that 85 percent of corrective actions developed by agency offices in response to internal or external audits and investigations are met.
- Improve timeliness for FAA responses to GAO, OIG and OSC audits and investigations such that 90 percent are delivered in accordance with established schedules.
- Improve access portals for hotline submissions to provide more usable information and efficient processes for contributions and ensure that 90 percent of call-ins receive a "call-back" within 10 business days.
- Increase agency awareness of AAE's services and successfully provide a fair and impartial venue for investigation and early resolution of safety disclosures so that OSC investigations of FAA employee whistleblower disclosures are reduced by 20 percent.

AAE clearly demonstrates FAA's commitment to creating a strong internal safety culture firmly anchored in a robust, responsive, and formalized process for addressing safety issues raised by employees, conducting internal reviews, ensuring corrective action and protecting employees who report safety concerns. Although other organizations could be tasked to address such safety matters, an independent organization evokes the highest level of integrity and objectivity. Both are critical to the effectiveness of AAE.

AAE enhances agency accountability for internally identified safety concerns, whistle blower contributions, and employee workplace conflicts. Reductions to the requested funding level would significantly reduce its effectiveness and disrupt the progress the Office has made in generating awareness and recognition that employees can bring their safety sensitive disclosures to an internal entity and have them reviewed in an objective and non-threatening forum. The safety benefits of an effective internal reporting program are well-accepted. A disruption or reduction in funding would limit AAE's progress in developing this critical safety tool.

What Benefits Will Be Provided To The American Public Through This Request?

The direct beneficiaries of AAE's services are the agency and the flying public. AAE embodies FAA's commitment to a vibrant and evolving internal safety culture based on continuous review, evaluation, objective analysis and measured change. AAE provides agency employees and external stakeholders with an independent and highly visible forum to openly, safely and constructively raise, address and resolve safety complaints, concerns or whistleblower contributions.

Office of Civil Rights (ACR)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$11,968**	**80**	**4**	**80**
Adjustments to Base	**$77**			
Annualization of FY 2016 Pay Raises 1.3%	31			
FY 2017 Pay Raises 1.6%	119			
Two Less Compensable Days	-73			
Other Changes	**-$47**			
Administrative Efficiencies	-47			
Base Transfers	**$257**	**1**		**1**
Civil Rights Staffing	257	1		1
FY 2017 Request	**$12,255**	**81**	**4**	**81**

Detailed Justification for – Office of Civil Rights (ACR)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Office of Civil Rights (ACR)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	9,723	9,892	10,226	334
Program Costs	2,076	2,076	2,029	(47)
Total	**$11,799**	**$11,968**	**$12,255**	**$287**
FTE	**74**	**80**	**81**	**1**

The FY 2017 funding request of $12,255,000 including 81 full-time permanent and 81 full-time equivalent personnel allows ACR to help prevent and address discrimination by providing civil rights training, guidance, compliance, and oversight in the FAA workplace and at airports throughout the country. Current funds cover Civil Rights (CR) federal staff, contract support services, and Equal Employment Opportunity (EEO) counseling, audits, and training at Headquarters, Centers, Regions, Lines of Business (LOB) field facilities, as well as airports across the country. This request also includes $257,000 and 1 FTE as a base transfer from the Air Traffic Organization (ATO).

What is this Program and Why is it Necessary?

The FAA Office of Civil Rights (ACR) provides leadership and direction with regard to civil rights, diversity, and equal opportunity matters.

Internally, the ACR mission is to aid in the prevention of unlawful discrimination on the basis of race, color, national origin, sex, age, religion, sexual orientation, and individuals with disabilities employed by the FAA. The Office of Civil Rights works in conjunction with FAA managers and the Administrator to ensure EEO awareness and adherence to EEO policies and guidelines. FAA employees are trained in respectful and equitable treatment of one another and in turn, each FAA organization plays a role in the implementation of an effective EEO program where individuals are treated with equity and respect regardless of differences.

Externally, the ACR mission is to provide airport oversight with regard to civil rights laws and regulations. ACR works to ensure that all beneficiaries of federally assisted transportation programs are offered equal opportunity for participation and are free from discrimination. These efforts address airport compliance with the Americans with Disabilities Act (ADA), Title VI, Limited English Proficiency (LEP), Environmental Justice (EJ), and other civil rights regulations.

The key activities performed by ACR support the following DOT Strategic Initiatives:

- Empower and Innovate through FAA's People
- Deliver Benefits through Technology and Infrastructure

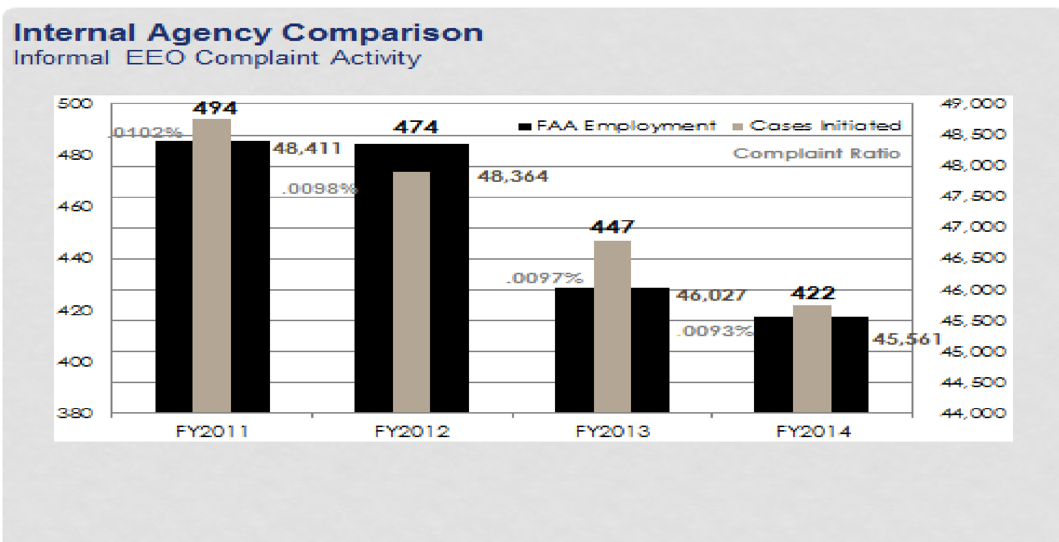
FY 2016 Anticipated Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
Internal Civil Rights Services ▪ EEO Complaint Services/Alternative Dispute Resolution Services ▪ Model EEO Program ▪ Diversity and Inclusion ▪ EEO Training	▪ Process 100 percent of the allegations and inquiries regarding EEO complaints by providing quality counseling, mediation and consulting services. ▪ Assist and provide resources for agency selecting officials to meet the goal of increasing the hiring of People With Targeted Disabilities (PWTD) for eligible positions to 3 percent by FY 2018. ▪ Assist the Agency in building a Model EEO Workplace through outreach, consultations, collaboration, and educational partnerships. ▪ Manage nationwide Special Emphasis Programs (SEPs) to foster a diverse applicant pool for FAA vacancies, promote EEO, and oversee the advancement and retention of a diverse workforce. ▪ Encourage the FAA workforce to engage in the Alternate Dispute Resolution (ADR) process as a method to resolve disputes in the EEO Complaint Process at the lowest possible level to avoid the cost, delay, and unpredictability of the traditional adjudicatory processes. ▪ Develop the annual EEO Plan in conjunction with FAA lines of business and staff offices (LOB/SO) to identify and eliminate EEO barriers and agency deficiencies. ▪ Assist Agency efforts to create a FAA culture in which managers and employees understand their role in creating and maintaining an inclusive workplace by providing training on EEO laws, FAA policies, and appropriate workplace behavior. ▪ Increase FAA managers and employees conflict resolution skills through the Conflict Coaching Program and reduce the number of EEO complaints that are filed in the agency by teaching how to use early intervention techniques.

External Civil Rights Services ▪ Disability Airport Compliance ▪ Airport Non-discrimination Compliance ▪ Disadvantaged Business Enterprise (DBE) Compliance	▪ Conduct DBE compliance reviews and ensure that small and disadvantaged business enterprises are able to compete with larger companies for airport construction projects and concessions. ▪ Adjudicate external complaints from the public and other customers. ▪ Maintain an online FAA dbE-connect system to allow DBEs to find relevant airport opportunities and allow airports to find certified DBEs in areas of work needed to support their DBE goals. ▪ Deliver training, technical assistance and consultations in order to increase knowledge in the areas of DBE/ACDBE, ADA/ 504 and Title VI/LEP/EJ at our nation's airports.

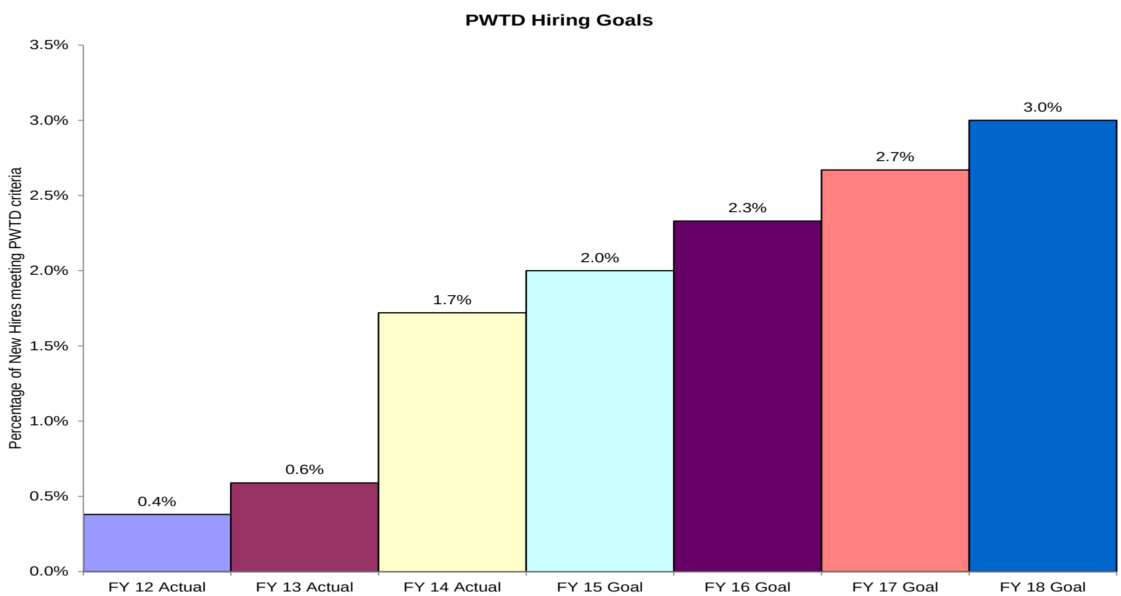
Over the past several years, ACR has taken a very proactive approach to conflict management. Alternative Dispute Resolution (ADR) is a means for employees and managers to resolve disputes before they become formal EEO complaints. ACR has helped to reduce the number of informal complaints by utilizing a robust EEO training program. The following chart illustrates the agency's level of informal complaint activity over a four-year span.

Figure 2 – Informal EEO Complaint Activity



ACR conducts numerous outreach activities related to the DOT goal to increase the representation of People with Targeted Disabilities (PWTD) in the workforce. The chart below illustrates the progress that FAA has made in the hiring of PWTD. The goal is to increase the hiring of these individuals by approximately 0.33 percent each year ultimately meeting the 3 percent mark by FY 2018.

Figure 3 – PWTD Hiring



Why Do We Want / Need To Fund The Program At The Requested Level?

EEO complaints can be very costly to FAA in terms of employee productivity as well as funding. ACR's mission is to prevent and address discrimination by providing civil rights training, guidance, compliance and oversight in our FAA workplace and at airports throughout the country. ACR takes actions that challenge, assist, and support our customers to create an environment where all are able to contribute meaningfully to the mission. ACR aids in the prevention of discrimination through the implementation of agency-wide EEO policies, practices, and procedures including a Model EEO Program that stresses the prevention of discrimination before it occurs.

In FY 2017, ACR will continue to provide guidance and support in numerous areas including:

- EEO Compliance
- Workforce Diversity
- Conflict Resolution
- Training

Anticipated FY 2017 Accomplishments:

Function/Activity	FY 2017 Anticipated Accomplishments
EEO Compliance	• Provide oversight regarding civil rights laws and regulations by administering the agency's Internal Civil Rights and the External Civil Rights (Airports) Programs. • Utilize information technology to increase compliance at airports in the areas of DBE/ACDBE, ADA/ 504 and Title VI/LEP/EJ. • Oversee the process for developing and reporting to the EEO Commission (EEOC) the Annual MD-715 EEO Plan and continue to monitor Agency accomplishments. • Conduct and follow up on MD-715 EEO Assessments.
Workforce Diversity	• Increase the effectiveness of the EEO Outreach Program to minority groups with lower than expected employment rates in the agency. • Conduct trend analysis to determine if there is any evidence of disparate treatment of applicants or employees based on race, sex, national origin, or other protected categories. • Manage, coordinate, and promote activities that support the Office of Personnel Management (OPM) Executive Order on Diversity and Inclusion.
Conflict Resolution	• Assist agency efforts to address discrimination by addressing EEO complaints through the National Intake Unit, EEO counseling, and EEO consultation services. • Provide an EEO discrimination process that can process 100 percent of the allegations and inquiries regarding EEO complaints by having adequate counseling, mediation and consulting services. • Continue to encourage the FAA workforce to engage in the ADR process as a method to resolve disputes in the EEO Complaint Process.
Training	▪ Develop, revise, track, and report on EEO training activities throughout FAA.

What Benefits Will Be Provided To The American Public Through This Request?

ACR provides leadership and direction with regard to civil rights, diversity, and Equal Employment Opportunity (EEO) matters. The ACR mission is to implement civil rights and EEO policies and operational programs to ensure their full and successful development in support of the FAA's mission to provide the safest, most efficient aerospace system in the world. ACR ensures the elimination of unlawful discrimination on the basis of race, color, national origin, sex, age, religion, sexual orientation, genetic information, and individuals with disabilities in federally operated and federally assisted transportation programs; that all beneficiaries and potential beneficiaries of these programs, including employees and job applicants are offered equal opportunities to participate in them; and a positive environment in the FAA by valuing, using, and managing the differences that individuals bring to the workplace.

ACR works to foster diversity and inclusion activities that lead to a healthy work environment that promotes diversity in all its dimensions and harmony across the FAA. Inclusion means a work environment where everyone has an opportunity to fully participate in creating an organizational success and where every person is valued for his or her distinctive skills, experiences, and perspectives. Inclusion is also about creating a global community where the FAA connects everyone and everything through our programs, our activities, our products, our services and our winning workforce. Inclusion also cultivates a culture that encourages collaboration, flexibility, and fairness to enable individuals to contribute to their full potential and further retention. ACR helps to develop structures and strategies to equip leaders with the ability to manage diversity, be accountable, measure results, refine approaches on the basis of such data, and institutionalize a culture of inclusion.

ACR is committed to providing a workplace that promotes equal opportunity, is free of harassment, and is an environment where employees can focus on productivity, not conflict. The FAA Office of Civil Rights has oversight of internal and external EEO policy, which needs to be properly funded and staffed to ensure we can maintain a proactive EEO program. The result of these efforts is a diverse and satisfied workforce that collaboratively helps to ensure the safety of the flying public.

Government and Industry Affairs (AGI)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$1,556**	**10**		**10**
Adjustments to Base	**$14**			
Annualization of FY 2016 Pay Raises 1.3%	5			
FY 2017 Pay Raises 1.6%	18			
Two Less Compensable Days	-9			
Other Changes	**-$6**			
Administrative Efficiencies	-6			
FY 2017 Request	**$1,564**	**10**		**10**

Detailed Justification for – Government and Industry Affairs (AGI)

What Is The Request And What Funds Are Currently Spent on the Program?

**FY 2017 – Government and Industry Affairs
($000)**

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	1,456	1,482	1,490	8
Program Costs	74	74	74	-
Total	**$1,530**	**$1,556**	**$1,564**	**$8**
FTE	**8**	**10**	**10**	**-**

The FY 2017 budget request of $1,564,000 and 10 FTEs will support the Office of Government and Industry Affairs program.

What is this Program and Why is it Necessary?

AGI represents the first impression and indeed, sometimes the only contact members of Congress and their staffs have with FAA. This customer-oriented office, small by comparison to most other FAA organizations, works directly for the Administrator and is the principal linkage between the agency and the legislative branch of government.

AGI works with other staff organizations to coordinate and present FAA's legislative message. AGI works with other organizations within FAA to facilitate their relations with Congress. AGI consistently monitors and gauges the interest and needs of the Members and leadership on Capitol Hill. This relationship also extends to coordinating our legislative initiatives and responses with the Department of Transportation.

This vigorous outreach is not limited to Congress. AGI also serves as liaison with the aviation industry, from manufacturers to carriers, and with other aviation related organizations. Additionally, AGI serves as the principal point of contact for state and local governments. The following core activities represent the FY 2017 budget request:

- Communicate to Congress on behalf of the Administrator and management board.
- Enhance AGI's daily interaction with LOB and SO, and senior management officials by proactively soliciting LOB and SO information sharing in order to improve communication on areas of interest or concern to Congress.
- Inform key members of Congress and their staff on FAA safety policies and initiatives.
- Manage the Reports to Congress program, and function as the agency's Report to Congress liaison with congressional authorizing and appropriations staffs to clarify definitions of congressional intent. Also manage the coordination process between FAA, OST, and OMB, and encourage timely LOB and SO responses to targeted deadlines.
- Assist in preparing agency officials for congressional meetings and briefings.
- Work in coordination with AGC on congressional hearings.
- Provide OST Governmental Affairs with factual, concise, and complete information from significant AGI congressional contacts and activities.
- Serve as focal point for congressional follow-up on written agency responses.
- Foster strong partnerships with key industry stakeholders.
- Meet with aviation industry representatives to strengthen industry relationships.
- Communicate the administration's position on key aviation issues.

Why Do We Want / Need To Fund The Program At The Requested Level?

FAA needs to have one office whose mission it is to provide high quality, timely communications to Congress. When we communicate well, the FAA gets heard. It is essential that public policy gets debated on its merits so that the best outcomes can result. Without this office, too much of the debate would be consumed by process instead of policy.

AGI seeks the resources to continue to improve the quality, timeliness, and usefulness of our core business functions and to continue to perform the following:

- Serves as FAA's focal point to coordinate agency actions relating to Congressional oversight of FAA programs;
- Manages the Reports to Congress program within the FAA. Serves as the FAA Reports Control Officer and is responsible for providing the DOT Congressional Reports Officer all information to disseminate to Congress and interested parties; approximately 13 reports were submitted to Congress in FY 2012;
- Coordinates with Departmental officials to ensure consistency in furthering policies relating to Congressional and intergovernmental relations issues;
- Keeps FAA Associate Administrators and the offices and services informed of Congressional and public concerns which may influence their operational responsibility;
- Coordinates all incoming Congressional Correspondence; and Congressional Hearings and Briefings;
- Ensures witnesses are well-prepared to answer questions at hearings

AGI solicits information from program offices within the Agency to better understand and communicate potential areas of interest or concern to the United States Congress. AGI strives for inter-agency coordination by providing Congress with timely and quality responses to all Congressional inquiries (i.e., briefings, calls, outreach events, etc.).

What Benefits will be provided to the American Public through this request?

AGI engages and fosters productive relationships with key members of Congress and Congressional Committees of jurisdiction to further awareness about and manage expectations surrounding FAA's principal mission—safety.

The work of this office enables the Administrator, Deputy Administrator, and Associate Administrators to effectively interact and communicate the policies and positions of the FAA before the United States Congress. Our established congressional relations are vital to advancing the aviation priorities of the Agency, Department, and the Administration.

Office of Communications (AOC)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$6,311**	**34**	**1**	**34**
Adjustments to Base	**$46**			
Annualization of FY 2016 Pay Raises 1.3%	18			
FY 2017 Pay Raises 1.6%	71			
Two Less Compensable Days	-43			
Other Changes	**-$24**			
Administrative Efficiencies	-24			
FY 2017 Request	**$6,333**	**34**	**1**	**34**

Detailed Justification for – Office of Communications (AOC)

What Is The Request And What Funds Are Currently Spent On The Program?

Office of Communications (AOC)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	5,861	5,969	6,015	46
Program Costs	342	342	318	-24
Total	**$6,203**	**$6,311**	**$6,333**	**$ 22**
FTE	**34**	**34**	**34**	-

The FY 2017 budget request for $6,333,000 and 34 FTEs will support the Office of Communications (AOC) support the FAA's communications programs for news media, stakeholders, and FAA employees.

What Is This Program And Why Is It Necessary?

The Office of Communications (AOC) supports the policy, direction, and management of the FAA's communications programs for news media, stakeholders, and FAA employees nationwide. AOC provides communication services for all FAA organizations as necessary to ensure delivery of critical information to the right person at the right time with the right method. AOC delivers it services through two major programs: Public Affairs and Corporate Communications.

Public Affairs

Public Affairs works closely with the FAA's lines of business and staff offices to ensure timely and accurate information is provided to the media and the public about FAA programs and activities. Public Affairs advise agency officials on communication strategies, media interviews and public appearances, and develop and implements communication strategies for the agency's key initiatives. Public Affairs also coordinate the activities of the regional public affairs offices.

Corporate Communications

Corporate Communications manages the internal and external web presence for the FAA, employee communications and employee engagement, social media platforms, multimedia (broadcast and video) services, and creative services. Corporate Communications also manages the DOT-wide IdeaHub platform, which enables employees to share ideas, participate in conversations, and support the FAA's safety mission. Corporate Communications also coordinate with the agency's lines of business, and staff and program offices to provide more than 46,000 FAA employees with pertinent, accurate, and timely information on agency programs and activities.

Function/Office	Anticipated FY2016 Accomplishments
Public Affairs	• Increase awareness and understanding of FAA safety, NextGen initiatives, unmanned aircraft systems (UAS), commercial space entrants, runway safety, airport operations, General Aviation safety, child safety, laser awareness, weather, and other issues through press conferences, media briefings, roundtables, direct outreach to reporters, press releases, websites, social media, and other communication channels. • Conduct public awareness campaigns about General Aviation safety and the authorized use of UAS. • Expand the use of Social Media to support critical agency messaging. • Support open government initiatives to make data available, improve online services, and increase collaboration with citizens, stakeholders, and other government agencies.
Corporate Communications	• Use a variety of internal communication vehicles to increase employee understanding of agency strategic goals, programs, and activities. Obtain feedback that helps the FAA meet those goals. • Deliver more than 7 million FAA safety and regulatory documents online instead distributing in print. • Upgrade the FAA Frequently Asked Questions knowledge database on the FAA to better address user self-service inquiries. • Deploy FAA.gov to a Content Management System (CMS), improving web management, content quality, and timeliness.

Why Do We Want/Need To Fund The Program At The Requested Level?

Requirements are constantly growing to provide more information to employees, the public, the media, and stakeholders through the Web, email, and Social Media. All of these groups expect unfettered and immediate access to and interaction with information provided by the FAA. AOC must continue to provide accurate critical information about FAA operations, safety oversight, efficiency initiatives and other programs to all of these groups as quickly as possible. As these requirements have grown, AOC has managed an extremely lean organization that has not grown.

For fiscal year 2015, FAA.gov generated more than 100 million views to our web content, and more than 26 million visits to the FAA.gov website, representing a 6% increase, since FY2014. Users downloaded more than 8 million documents from FAA.gov related to pre-flight safety procedures and planning, airmen/aircraft certification, aircraft mechanical records, airport safety regulations, and accident/incident data. MyFAA Website, our internal site, generated 32 million views of our content and 6 million visits. Our Social Media's reach has grown to 125 million over the last year. Over the last few years the FAA has seen a persistent increase in demand for secure access to critical aviation safety information via mobile devices. This AOC-led delivery of critical safety information to the right person at the right time with the right method is at the very core of FAA's mission to ensure safety of flight for all.

Function / Office	Anticipated FY2017 Accomplishments
Public Affairs	• Increase awareness and understanding of FAA safety, NextGen initiatives, unmanned aircraft systems (UAS), commercial space entrants, runway safety, airport operations, General Aviation safety, child safety, laser awareness, weather, and other issues through press conferences, media briefings, roundtables, direct outreach to reporters, press releases, websites, social media, and other communication channels. • Conduct public awareness campaigns about General Aviation safety and the authorized use of UAS. • Increase awareness of the FAA's role as a world leader on aviation issues. • Support open government initiatives to make data available, improve online services, and increase collaboration with citizens, stakeholders, and other government agencies.
Corporate Communications	• Use a variety of internal communication vehicles to increase employee understanding of agency strategic goals, programs, and activities. Obtain feedback that helps the FAA meet those goals. • Achieve an average ACSI customer satisfaction score of 75 or better on the FAA public website. • Further optimize FAA.gov for a better user experience on mobile platforms. • Ensure external website exceeds 90% compliance with 508 requirements and all DOT compliance goals.

What Benefits Will Be Provided To The American Public Through This Request?

With more than 98 million page visits a year, www.faa.gov provides a wealth of resources to the American public. Pilots, mechanics, and other members of the flying public consistently read our news, directives, hazardous materials information, and airworthiness information every second of every day of the year. The appetite for information has increased over the years, and now, more than one million subscribers opt to be auto-notified when our content is updated. Visits to the FAA's news content in 2015 increased by 32 percent over the previous year.

Readership and engagement have increased significantly through these communications channels. The reach of our social media channels grew exponentially, increasing followers by 69 percent over the last 11 months, reaching an organic audience of over 420,000 individuals with each social media post made. Social media allows the FAA to engage with members of the flying public as well as the aviation community on important safety, program updates, rulemaking updates and a variety of other aviation issues, as well as communicating breaking news. Information for Airport operations, General Aviation Safety, NextGen, and UAS are delivered via text, video, and graphical formats which members of the public expect to find via social channels. Other offices within the FAA have come to expect social media as a communications service that AOC provides for them which help convey important information about the agency programs.

With more than 45,000+ employees working in offices and in the field, around the country and abroad – the FAA intranet, employee news, daily broadcast, and audio/video production services are a vital part of ensuring employees are connected with the vision, mission and values of the agency. These vital communications vehicles ensure that employees are able to access information about everything from HR benefits to changes in compensation programs that may directly affect them. Strong internal communications generate a more engaged, productive, and loyal workforce.

Office of Chief Counsel (AGC)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$44,786**	**234**	**9**	**236**
Adjustments to Base	**$283**			
Annualization of FY 2016 Pay Raises 1.3%	124			
FY 2017 Pay Raises 1.6%	457			
Two Less Compensable Days	-298			
Other Changes	**$27**			
Working Capital Fund	200			
Administrative Efficiencies	-173			
FY 2017 Request	**$45,096**	**234**	**9**	**236**

Detailed Justification for – Office of Chief Counsel (AGC)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Office of Chief Counsel (AGC)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	37,431	38,127	38,410	283
Program Costs	6,812	6,659	6,686	27
Total	**$44,243**	**$44,786**	**$45,096**	**$310**
FTE	**236**	**236**	**236**	**-**

The Office of the Chief Counsel requests $45,096,000, 234 full-time permanent, and 236 full-time equivalents to enable AGC to provide necessary legal services to the FAA. The request includes $200,000 for Working Capital Fund. Funding at the FY 2017 requested level will provide necessary legal services, including representation, in support of significant FAA program responsibilities and functions.

This funding will go towards ensuring the FAA meets its mission obligations consistent with legal requirements and that agency action and employees are vigorously represented in administrative and judicial forums. The request will be deployed in a manner calculated to best provide timely and responsive legal services in support of the FAA's most critical program responsibilities.

What is this Program and Why is it Necessary?

The Office of the Chief Counsel provides mission critical legal services for each of the Department of Transportation (DOT) goal areas. Within the FAA, AGC is both a key partner to each line of business and staff office and an integral contributor to the success of every major agency program and function. Across every line of business and every agency program, AGC provides legal advice, reviews agency action for legal sufficiency and conformity, represents agency interests in various administrative and court forums, defends the agency's actions, and enhances risk management by proactively seeking to identify and mitigate risk. In addition, AGC is responsible for internal FAA adjudicative functions responsible for adjudicating bid protests and contract disputes, aviation civil penalties below a specified threshold, and challenges made to airport grant recipients compliance with their grants. This office also provides alternative dispute resolution services.

AGC's principal legal practice areas provide services in support of DOT goals in the following manner:
1) Enhancing Safety, through its activity in enforcing aviation safety rules, rulemaking, acquisition and commercial law, aircraft and other tort litigation; 2) maximizing Economic Competitiveness through its rulemaking activity, environmental legal services, airport legal services which support airport expansion and capacity, and acquisition of technologies that support increased capacity and efficiency; advancing global collaboration through international activity and harmonization of safety rules, enhancing Livable Communities and ensuring Environmental Sustainability through its rulemaking activity and environmental legal services; and 3) building Organizational Excellence by enhancing our high performing workforce, supporting numerous agency-wide strategic initiatives, and providing legal services in support of agency administrative functions including employment and labor law, ethics counsel, FOIA and Privacy Act services and legislative services.

Anticipated FY 2016 Accomplishments:

Function / Office	FY 2016 Anticipated Accomplishments
▪ **Employment**	▪ Provided representational legal services on all phases of administrative employment litigation before the EEOC and MSPB. Provided legal advice on Agency HR policy and labor related issues. Provided representational legal services on all phases of employment litigation in United States District Court, Court of Federal Claims and Court of Appeals with DOJ.
▪ **Regulations**	▪ Provided legal support leading to the publication of the Operation and Certification of Small Unmanned Aircraft Systems final rule; the Registration and Marking Requirements for Small Unmanned Aircraft final rule; Flight Simulation Training Device Qualification Standards for Extended Envelope and Adverse Weather Event Training final rule; and the Revision of Airworthiness Standards for Normal, Utility, Acrobatic, and Commuter Category Airplanes NPRM. ▪ Sent 85 percent of significant critical safety rules approved by the Rulemaking Council to DOT within 90 days of the planned date and issued 85 percent of the non-significant rules approved by the Council within 90 days of the scheduled date. ▪ Provided the regulated community with timely guidance in responses to public requests for interpretations of FAA regulations by responding to 70 percent of requests for interpretation within 120 days of receipt and provided timely legal review of grants and denials of exemptions generally within 30 days of receipt for 80 percent of the exemptions submitted. ▪ Completed 85 percent of critical safety rules within 90 days of the scheduled due date. ▪ Over 70 percent of public requests for interpretations were provided within 120 days. ▪ Within 30 days of receipt, provided legal concurrence or returned the document to program office with a detailed explanation of why document is not legally sufficient, for 80% of the exemptions submitted to AGC for review.
▪ **Enforcement**	▪ Assisted agency program offices with the implementation of the FAA Compliance Philosophy, which was adopted in 2015 and, among other things, focuses legal enforcement resources on the violators that pose the highest risk to the national airspace system. Provided legal review to program office revisions of voluntary reporting programs, including changes needed to correspond to the new philosophy. ▪ Promoted aviation safety by efficiently prosecuting enforcement actions for violations of the FAA's safety regulations and DOT's hazardous materials regulations in accordance with agency metrics, including by initiating 80% of all cases within 90 days of receipt. Despite adoption of the

	Compliance Philosophy, which was expected to result in a significant reduction of the number of legal enforcement cases that reduction has not occurred. ▪ Negotiated settlement of several violations of aviation safety regulations by a large aviation manufacturer and an air carrier that included in addition to significant civil penalties, systemic changes to their systems to avoid future violations and to improve their safety operations. ▪ With the first full year of operation of the National Enforcement Team, improved the quality, consistency and efficiency of the legal enforcement process. ▪ Revised FAA Order 2150.3, *Compliance and Enforcement Program*, to reflect fully the FAA Compliance Philosophy, incorporate statutory and regulatory changes, and enhance guidance to FAA personnel who have responsibilities under the compliance and enforcement program. ▪ Issued a notice proposing extensive changes to 14 C.F.R. Part 13, the agency's investigative and enforcement procedures to reflect statutory changes and to streamline case processing. ▪ Implemented the Pilot's Bill of Rights 2, which provides additional U.S. district court review of FAA certificate actions against airmen, including extensive training of a cadre of FAA attorneys in district court litigation.
▪ **Litigations**	▪ Provided representational legal services on all phases of tort litigation, investigations, claim processing and monitor and accurately reported on the agency's contingent liability.
▪ **Acquisitions & Fiscal Law**	▪ Provided the legal advice needed to keep major acquisitions systems that support the safe and efficient air transportation system within 10 percent of their cost and schedule baselines. Improved the efficiency of the legal reviews of acquisition and fiscal matters submitted to the office by 100% (from 10 days to 5 days on average).

Why Do We Want/Need To Fund The Program At The Requested Level?

AGC's funding is primarily for personnel costs and our staffing level drives the level of service we can provide to the agency.

Reductions to the requested funding level would affect our delivery of services and would have a compounding effect on the vast array of program offices that require legal services to meet agency mission, critical programs and strategic initiatives. A decline in the ability to provide timely legal services would slow down the FAA's response time on regulatory issues, enforcement cases, acquisitions, litigation and personnel cases and have an impact on the safety of the aviation community.

A reduction in funding could impair the agency ability to vigorously defend tort and personnel cases, thereby significantly increasing the government's exposure to loss. AGC litigation losses consistently have been small compared to its potential tort liability. Similarly, pending class action employment cases carry an exceeding large potential liability, but to date AGC attorneys have been provided the resources necessary to successfully defend the class actions. These cases are highly resource intensive, and given the size and nature of the agency's workforce, we anticipate the continued filing of such suits.

A reduction or disruption in AGC's ability to deliver timely legal services likely would impair efforts to accelerate development and implementation of the NextGen and air traffic control systems as well as related safety enhancements. Similarly a reduction would interfere with a variety of key agency initiatives requiring environmental reviews for airport development projects and airspace redesign efforts. If these programs are delayed due to a bottleneck in AGC, the safety and efficiency improvements these programs would provide for the traveling public will be similarly delayed.

Funding at the FY 2017 requested level will provide necessary legal services, including representation, in support of significant FAA program responsibilities and functions. Among the more significant are:

- Rulemaking, including critical safety rules and regulatory aspects of NextGen and the safe but also timely integration of new entrants into the National Airspace System (NAS). In particular, AGC has had to devote a steadily increasing amount of resources to aiding in the safe integration of Unmanned Aerial Systems (UAS). Just one UAS rulemaking project, for example, involved the substantial time of nine attorneys. More than 10% of the personnel of AGC are engaged in UAS matters, and the workload is expected to continue to increase.
- Enforcement of safety regulations.
- Acquisition of operational safety systems and equipment, including acquisition aspects of NextGen development, and compliance with commercial and fiscal requirements.
- Airports capacity enhancement and grants, environmental streamlining for airport projects, and environmental aspects of NextGen development.
- Personnel and labor matters.
- Key international agreements harmonization of safety requirements and safety assessments.
- International technical assistance agreements and safety assessments.
- Dispute resolution services and/or administrative adjudication of acquisition related disputes, and administration of the Civil Penalty Program; representation of agency interests and choice of actions before United States federal courts and various administrative forums, including the National Transportation Safety Board (NTSB), the Merit Systems Protection Board, and the EEO Commission.

FY 2017 Anticipated Accomplishments include:

Function / Office	FY 2017 Anticipated Accomplishments
▪ **Employment**	▪ Provide legal representation and legal counsel to Agency managers for litigation and advice matters.
▪ **Regulations**	▪ Supporting timely and efficient agency rulemaking activities by submitting to DOT 85 percent of significant ("A") rules approved by the Rulemaking Council within 90 days of the scheduled date and issuing 85 percent of certain non-significant rules approved by the Rulemaking Council within 90 days of the scheduled date. ▪ Responding to 70 percent of public requests for interpretations of regulations within 120 days of receipt. ▪ Within 30 days of receipt, provide legal concurrence or return document to program office with detailed explanation of why document is not legally sufficient for 80% of the exemptions submitted to AGC for review.
▪ **Enforcement**	▪ Promote aviation safety by efficiently prosecuting enforcement actions for violations of the FAA's safety regulations and DOT's hazardous materials regulations in accordance with agency metrics. ▪ Provide litigation support to the Department of Justice on cases now heard in federal district court as a result of the Pilot's Bill of Rights 2, or handle those cases in district court by delegation from DOJ. ▪ Work with program offices on evaluation of implementation of the Compliance Philosophy and make necessary changes to meet the intent of the philosophy. ▪ Provide training to FAA personnel with compliance and enforcement responsibilities on new FAA Order 2150.3C, *Compliance and Enforcement Program*. ▪ Issue a final rule adopting extensive changes to 14 C.F.R. Part 13, the agency's investigative and enforcement procedures to reflect statutory changes and to streamline case processing.
▪ **Acquisition & Fiscal Law**	▪ Completing legal review of all acquisition and fiscal matters submitted to the office within 5 days and ensuring that key acquisitions remain within 10% of their original cost, schedule and performance baselines.

What Benefits Will Be Provided To The American Public Through This Request?

AGC is a support organization that contributes to the overall success of FAA programs and functions that reside with the various lines of business and staff offices with programmatic responsibility. Generally AGC is not a program in the traditional sense and our contribution cannot be assessed through a single measure. Rather AGC contributes on many fronts to many programs to ensure overall that FAA actions are consistent with legal requirements, risks are defined and managed to the extent practicable, and the interests of the government and the flying public are strongly represented.

AGC acquisition attorneys provide key support in the development, acquisition, and deployment of NextGen air traffic control, and safety systems and technologies. The rulemaking attorneys play a critical role in establishing regulatory requirements and certification of new avionics equipment. The environmental attorneys are critical to ensuring environmental assessments are timely completed for new systems and airspace redesigns. The employment lawyers have a significant role in addressing the staffing and labor implications of a system where air traffic is managed rather than controlled.

The direct beneficiaries of our services are the agency organizations that have operational and programmatic responsibility for carrying out FAA's mission, and by extension, the goals of the Department of Transportation. More significantly, the flying public is the overarching beneficiary of the increased safety and efficiency of a modern air transportation system. AGC is a key partner supporting the agency's success in all of our various program areas.

Office of Policy, International Affairs, and Environment (APL)
($000)

Item Title	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$33,591**	**136**	**7**	**139**
Adjustments to Base	**$197**			
Annualization of FY 2016 Pay Raises 1.3%	79			
FY 2017 Pay Raises 1.6%	290			
Two Less Compensable Days	-172			
Other Changes	**-$130**			
Administrative Efficiencies	-130			
Discretionary Adjustments	**$250**			
Unmanned Aircraft Systems (UAS) Integration	250			
FY 2017 Request	**$33,908**	**136**	**7**	**139**

Detailed Justification for - Office of Policy, International Affairs, and Environment (APL)

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Office of Policy, International Affairs, and Environment (APL)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	23,792	24,200	24,397	197
Program Costs	9,391	9,391	9,511	120
Total	**$33,183**	**$33,591**	**$33,908**	**$317**
FTE	**131**	**139**	**139**	**-**

The FY 2017 budget request of $33,908,000, 136 full-time permanent, and 139 full-time equivalents allows FAA to identify, develop and implement the domestic and international policy and environmental goals of the agency. The funding request also includes a $250,000 discretionary increase request for Integrating Unmanned Aerial Systems (UAS) into the NAS by developing an in-house capability to generate a forecast of future UAS activity.

What is this Program and Why is it Necessary?

The Office of Policy, International Affairs, and Environment (APL) consists of the following offices:

Aviation Policy and Plans improves the FAA's effectiveness with corporate planning and performance management; makes coordinated and well-informed policy decisions for crosscutting and novel civil aerospace issues using independent economic, quantitative and qualitative analysis, information and tools; and positions the FAA for the future by identifying, researching, and projecting emerging issues and trends.

International Affairs is responsible for coordinating all of FAA's international efforts and advancing the nation's longstanding leadership on the international front including engaging in dialogue with counterparts across the world.

Environment and Energy is responsible for developing, recommending, coordinating, and implementing national and international standards, policy and guidance, research and technology goals, and analytical capabilities on aviation environmental and energy matters.

APL supports the Department of Transportation's (DOT) goals of Economic Competitiveness and Environmental Sustainability through multiple programs and projects designed to reduce aircraft noise and aviation emissions, minimize their impacts, increase fuel efficiency, and foster the continued development of competent civil aviation authorities worldwide to meet international standards. APL provides U.S. leadership on reducing global aviation's emissions footprint by working with the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) and other international partners in establishing a new carbon dioxide emissions standard for aircraft and a new particulate matter emissions standard for aircraft engines, and developing a global market-based measure to address greenhouse gas (GHG) emissions from international aviation.

APL coordinates the agency's reauthorization before Congress, and is responsible for national aviation policies and strategies including aviation activity forecasts, economic analyses, aircraft noise and emissions analyses and mitigation, environmental policy, and aviation insurance.

APL serves multiple international functions and is the principal advisor to the Administrator on international matters and management of the agency's international strategic outreach. As part of the Administration's

Global Leadership Initiative the FAA is very active in working with ICAO, International Air Transport Association (IATA) and international partners and organizations to develop global and domestic standards (e.g., global aircraft noise and engine emissions standards) and recommended practices.

FAA participates in international standards setting and harmonization activities in transportation, and engages in implementing programs that provide technical assistance for transportation capacity building to developing countries. Outreach efforts include cooperation and technical/operational exchanges to enhance safety, efficiency, environmental sustainability; development and coordination of international civil aviation policies, positions and standards based on U.S. systems, procedures and practices; provision of support to the U.S. Mission at ICAO; and technical assistance (over 1,500 cooperative agreements with 150 countries).

In the area of environment, APL is responsible for improving environmental protection and addressing energy and sustainability needs. APL is responsible for developing broad based approaches and coordinating agency responses to limit and reduce future aviation environmental impacts to levels that protect public health and welfare, ensure energy availability, and enhance sustainability of FAA operations. APL works closely with other Federal agencies on national and international policy, environmental and energy issues, as well as with industry partners, other civil aviation authorities, academia, non-governmental organizations, and community representatives.

- **FY 2016 Anticipated Accomplishments:**

Function/Office	FY 2016 Anticipated Accomplishments
Aviation Policy and Plans	• Identify and initiate resolution of NextGen policy issues as well as analyze capacity and congestion policy implications of NextGen near and mid-term improvements. • Improve FAA's effectiveness and continue to support implementation of the FAA's strategic initiatives by leading a streamlined and responsive corporate planning and performance management process for the agency. • Provide timely economic analysis to enable the agency to send critical safety rules to the Office of the Secretary of Transportation. • Implement congestion management solutions for congested areas including the New York area and conduct analysis of proposed infrastructure projects for air traffic and airport improvements. • Lead development of agency reauthorization proposals, facilitate implementation of FAA reauthorization statutory provisions, and analyze forecasts of the Aviation Trust Fund. • Support the Administrator by staffing the Management Advisory Council and other similar advisory bodies as directed by Congress. • Develop the FAA Aerospace Forecasts at the national level and the Terminal Area Forecasts at the airport level for the FAA and the aviation industry for use in NAS planning, staffing, rule-making, development, and investment analysis. • Update and evaluate the costs and benefits of the Federal Contract Tower airports, FAA towered airports and future airport applicants to the program.
International Affairs	▪ With other USG agencies, prepare, negotiate, manage, and conclude international agreements in support of the FAA's international activities. ▪ Advance FAA policies and programs through the fostering and maintenance of aviation relationships within the U.S. Government and with national, regional and multilateral aviation organizations. ▪ Promote U.S. and FAA aviation leadership development. ▪ Promote safety oversight activities in all regions and through the International Civil Aviation Organization (ICAO) to enhance the capabilities of Civil Aviation Authorities (CAAs), regional organizations, industry, and other stakeholders around the world. ▪ Promote global interoperability by working on research, validation

	and implementation of new concepts, systems, and procedures through maximizing resources to assist key countries and regional organizations to implement interoperable air traffic management (ATM) technologies and procedures. ▪ Coordinate FAA-wide efforts to support U.S. interests in ICAO global safety, efficiency, and environmental initiatives and programs. ▪ Serve as the Secretariat of the Interagency Group on International Aviation. ▪ Support the FAA's international decision making process for determining agency priority international technical assistance, training and other initiatives through available data and global drivers.
▪	▪
Environment and Energy	▪ Provide implementation guidance on the use of the Aviation Environmental Design Tool (AEDT) for demonstrating environmental compliance. ▪ Conduct analysis of research outcomes and explore options for potential revisions in community noise threshold levels. ▪ Coordinate U.S. positions to ICAO on a new aircraft CO_2 emissions standard and an emissions threshold associated with a new particulate matter emissions standard. ▪ Policies, methods and guidance materials for implementing the aircraft noise and aircraft/engine certification regulations and compliance oversight, including expanded delegation authority. ▪ Support international activities to address aviation emissions influence on climate, through ICAO and other venues. ▪ Develop and provide training and guidance to LOBs/SOs on FAA Order 1050.1F to improve our efficiency for meeting NEPA requirements and support NextGen implementation. ▪ Lead FAA's Greening Initiative, an agency-wide sustainability program focused on minimizing FAA's environmental footprint through greenhouse gas emissions reductions, sustainable buildings, energy and water efficiency, renewable energy use, vehicle fleet management, sustainable acquisition, waste management, and electronics stewardship. ▪ Coordinate the development of FAA's annual Strategic Sustainability Performance Plan and Greenhouse Gas and Sustainability Reports. ▪ Track, assess, and report FAA's sustainability performance. ▪ Assess NAS-wide environmental performance for exposure to significant noise and improved fuel efficiency. ▪ Explore operational procedures that can reduce noise, fuel, and emissions and quantify their environmental benefits.

Why Do We Want / Need To Fund The Program At The Requested Level?

To achieve the performance goals outlined in the FY 2017 budget request as well as the long-term goals outlined in the FAA Administrator's Strategic Initiatives, in particular Enhancing Global Leadership, we will maximize outcomes through the leveraging of partnerships, technology, and expertise. We will continue to achieve the goals of the Administration and the Department in connection with various domestic and international initiatives.

APL maintains three specific environmental targets that will be sustained with at the requested funding levels. These include:

- Noise Exposure: Reduce the number of people exposed to significant noise in terms of Day-Night Average Sound Level (DNL) of 65dB or greater around U.S. airports to less than 300,000 people in FY 2018.

- Carbon Neutral Growth: Track levels of carbon dioxide emissions associated with NAS-wide domestic commercial aircraft operations to ensure they do not exceed 2005 levels.
- Sustainable Jet Fuels: One billion gallons of sustainable jet fuel is used by aviation, by 2018.

Anticipated FY 2017 Accomplishments:

Function/Activity	FY 2017 Anticipated Accomplishments
Aviation Policy and Plans	▪ Analyze forecasts of Aviation Trust Fund revenues and expenditures. ▪ Lead development of agency reauthorization proposals, facilitate implementation of FAA reauthorization statutory provisions, and analyze forecasts of the Aviation Trust Fund. ▪ Identify and initiate resolution of NextGen policy issues as well as analyze capacity and congestion policy implications of NextGen near and mid-term improvements. ▪ Provide timely economic analysis to enable the agency to send critical safety rules to the Office of the Secretary of Transportation. ▪ Develop the FAA Aerospace Forecasts at the national level and the Terminal Area Forecasts at the airport level for the FAA and the aviation industry for use in NAS planning, staffing, rule-making, development, and investment analysis. ▪ Support the Administrator by staffing the Management Advisory Council and other similar advisory bodies as directed by Congress.
International Affairs	• Coordinate FAA-wide efforts to support U.S. aims regarding ICAO global safety, efficiency, and environmental initiatives and programs. • Advance FAA policies and programs through the fostering and maintenance of aviation relationships within the U.S. Government and with national, regional and multilateral aviation organizations. • With other USG agencies, prepare, negotiate, manage, and conclude international agreements in support of the FAA's international activities. • Promote safety oversight activities in all regions and through the International Civil Aviation Organization (ICAO) to enhance the capabilities of Civil Aviation Authorities (CAAs), regional organizations, industry, and other stakeholders around the world. • Support the FAA's international decision making process for determining agency priority international technical assistance, training and other initiatives through available data and global drivers.
Environment and Energy	▪ Support activities to reduce aviation's environmental impacts, including reducing the number of people exposed to significant aircraft noise, impacts associated with aviation emissions, and aviation's carbon dioxide (CO_2) emissions. ▪ Support activities to improve aviation fuel efficiency and augment the use of sustainable aviation fuels. ▪ Implement congestion management solutions while continually updating projections on which metropolitan areas will have the greatest impact on total system delays and developing options and recommendations to address. ▪ Implement FAA's revised National Environmental Policy Act (NEPA) implementation order 1050.F to ensure more efficient and effective implementation of NEPA across the agency. ▪ Ensure global interoperability of NextGen technologies and procedures by shaping international standards for efficiency. ▪ Develop guidance materials for implementing the aircraft noise and exhaust emissions certification regulations and expanded delegation authority to the extent possible. ▪ Support US Government and International Civil Aviation Organization

Function/Activity	FY 2017 Anticipated Accomplishments
	(ICAO) Committee on Aviation Environmental Protection (CAEP) activities to finalize development of a proposal for a Global Market-Based Measure (GMBM) to reduce international aviation greenhouse gas emissions, and plan for implementation of the GMBM post ICAO Assembly. ▪ Working with other federal agencies to develop and implement a National Alternative Jet Fuels R&D Strategy and Plan. ▪ Promulgation of aircraft noise regulations consistent with standards adopted by ICAO and the balanced approach to aircraft noise mitigation. ▪ Provide implementation guidance on the use of the Aviation Environmental Design Tool (AEDT) for demonstrating environmental compliance with the National Environmental Policy Act

Total requested Discretionary Increase Requests:

Programs	Amount	FTP	FTE
Unmanned Aerial Systems Integration	$250,000	-	-

Unmanned Aerial Systems (UAS) Integration:
Unmanned Aerial Systems (UAS) are expected to become critical components of the National Airspace System (NAS) in the future and the successful integration of these vehicles into the NAS is of great importance to a broad set of stakeholders. This request of $250,000 will allow APL to:

- Purchase contract support to assist with developing techniques, capabilities and analysis tools to generate forecasts of UAS activity that are critical for agency rulemaking.
- Develop an in-house independent forecast of future UAS activity that enhances agency planning important to a broad set of internal and external stakeholders.

What Benefits will be provided to the American Public through this request?

The American Public benefits from FAA's global leadership with increases in global aviation safety, efficiency, environmental sustainability, exports, and leverage to achieve broader international objectives. U.S. citizens travelling abroad, and flights between the U.S. and other countries, benefit from increased safety and operational efficiency due to FAA expertise and leadership in developing global regulations and standards. Worldwide acceptance of U.S. policies and regulatory approaches removes barriers for the U.S. aerospace industry, a vital component of the U.S. economy. Nothing supports these benefits more than the fact that the global aviation system moves more than 7.7 million people and more than 130 thousand tons of cargo to their destinations every day. To achieve these benefits and ensure the safety, efficiency and sustainability of global aviation, APL collaborates across the FAA as well as our domestic and international partners to ensure the U.S. will continue to be the gold standard for aviation.

Human Resources Management (AHR)
($000)

	Dollars	FTP	OTFTP	FTE
FY 2016 Enacted	**$101,206**	**558**	**31**	**534**
Adjustments to Base	**$580**			
Annualization of FY 2016 Pay Raises 1.3%	242			
FY 2017 Pay Raises 1.6%	893			
Two Less Compensable Days	-555			
Other Changes	**$807**	**-3**		
Working Capital Fund	1,202			
Administrative Efficiencies	-395	-3		
FY 2017 Request	**$102,593**	**552**	**31**	**534**

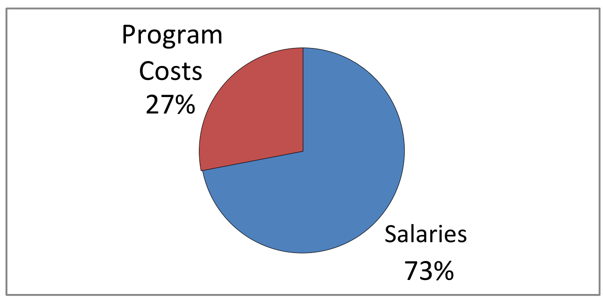
Detailed Justification for Human Resource Management (AHR)

What Is The Request And What Funds Are Currently Spent on the Program?

Office of Human Resource Management (AHR)
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY2016 – FY2017
Salaries and Expenses	73,053	74,498	74,683	185
Program Costs	26,947	26,708	27,910	1,202
Total	**$100,000**	**$101,206**	**$102,593**	**$1,387**
FTE	**533**	**534**	**534**	**-**

The FY 2017 budget request of $102,593 and 534 FTEs will support the Office of Human Resource Management (AHR) program. This request provides for salaries, benefits, and estimated non-pay AHR activities including implementing and maintaining comprehensive policies, procedures, and systems necessary for managing the FAA's most important asset: our People.

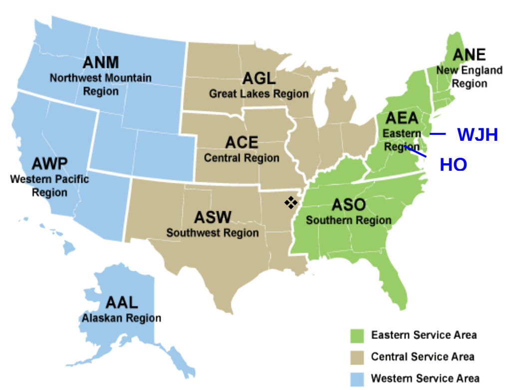


This includes increases of $580,000 for adjustments to base and an adjustment to the Working Capital Fund of $1,202,000.

What is the program and why is it necessary?

The FAA workforce is the backbone of the agency's success in providing the safest, most productive aviation sector, and efficient aerospace system in the world. The AHR request covers daily work in providing human resource services to the nearly 46,000 FAA employees.

Headquarters / 11 Regional Offices and Centers



AHR plans to continue the implementation of the Administration's flagship personnel policy reform initiative. We continue to fund the strategic management of human capital, which helps FAA ensure it has the skilled workforce needed to transform to NextGen. In FY 2017 we will:

- Continue implementing agency-wide leadership development programs to build a new generation of leaders and employees to achieve the FAA mission;
- Develop and implement a series of immediate and long-term strategies to improve the engagement, commitment and satisfaction of FAA's workforce, which is a significant factor in enabling the Department of Transportation (DOT) to advance the multi-modal transportation system of the future; and
- Implement a corporate strategy that fosters effective, positive, and collaborative labor management relations.

The Office of Human Resource Management continues to focus on five major areas in support of the FAA's Strategic vision:

- Develop a highly capable workforce with the necessary skills and competencies needed to help the FAA meet its current and future challenges;
- Attract and retain talented, high performing professional;
- Launch leadership development activities and tools grounded in FAA's strategic leadership capabilities, to support our current leaders while building a pipeline of future leaders;
- Achieve mission requirements through collaborative relationships between FAA and its labor partners;
- Position FAA as an employer of choice throughout the Federal Government through our mission, values, safety culture, and human capital practices.

The Office of Human Resource Management supports the DOT Strategic Plan goal of Organizational Excellence, specifically contributing toward initiatives that result in a diverse and collaborative DOT workforce. AHR provides a variety of critical services to FAA employees and supports Management efforts in a number of areas.

FY 2016 Anticipated Accomplishments:

Function/Office	FY 2016 Anticipated Accomplishments
The Office of Human Resource Services (AHF) Hiring operations to recruit, assess, hire, and develop the FAA workforce ▪ HR management and development consultation ▪ Strategic advice, recruitment and referral of qualified applicants ▪ Personnel pay administration ▪ Corporate onboarding ▪ Oversight and processing of personnel actions including the development of systems to support processing ▪ Processes and procedures to support position management	▪ Utilizing strategic HR services to forecast, recruit, and onboard the optimal number of FAA employees needed to execute the air traffic control and aviation safety missions ▪ Improving HR business processes by improving performance, enhancing use of technology, and streamlining policies, resulting in reduced overall costs in HR operational services ▪ Construct Succession Management implementation plan for full Executive cadre & senior level mission critical managers ▪ Recruit new talent and develop talent pipelines ▪ Position FAA as an attractive employer for prospective employees through a streamlined and easy to use process for applying to FAA jobs ▪ Improving FAA's classification systems to efficiently forecast the agency's talent needs, and ensure the agency's human resources are cost-effective and qualitative

Function / Office	FY 2016 Anticipated Accomplishments
The Office of Compensation, Benefits, and Worklife (AHB) Manages the FAA's employee benefit, retirement programs, compensation and worker's compensation programs ▪ Pre and post retirement counseling including providing retirement estimates ▪ Processing applications and providing counseling on survivor benefits, disability compensation, and changes to Federal Employees Health Benefits (FEHB), Federal Employees Group Life Insurance (FEGLI) and the Thrift Savings Plan (TSP ▪ Administer two distinct performance management systems, Valuing Performance (VP), and the Performance Management System (PMS). ▪ Manage the FAA and DOT's Office of Worker's Compensation Program (OWCP)	▪ Continued achievement of cost avoidance through facilitating return to duty and ensuring careful adjudication of claims of questionable veracity ▪ Containing our annual chargeback bill at a greater rate than the rest of government ▪ Timely submission of claim forms to DOL via transmission in WCIS and ECOMP ▪ Facilitating prompt payment of entitled benefits to injured employees ▪ Timely processing of retirement annuity estimates to enable FAA employees to plan accordingly and allow lines of business appropriate succession planning ▪ Timely processing of retirement applications to facilitate timely payment of entitled benefits ▪ Timely processing of enrollment elections to facilitate access to benefits
Function / Office	**FY 2016 Anticipated Accomplishments**
The Office of Labor and Employee Relations (AHL) ▪ Manages the relationships between FAA and the unions that represent its employees. Manages Labor relations with the eight unions (with a total of 36 bargaining units) which represent 34,800 (76%) the approximately 46,000 employees working at the FAA ▪ Represents the agency in all national and headquarters negotiations, and most regional negotiations ▪ Handles third party matters, such as unfair labor practices proceedings and arbitrations, at both the national and regional levels of recognition. Provides labor and employee relations training and guidance to management ▪ Provides advice and guidance on conduct and discipline; leave; drug and alcohol misuse; the medical inability to perform work; and unacceptable performance and performance improvement	▪ Providing day-to-day operational support and services to FAA managers on labor and employee relations ▪ Implementing a labor and employee relations (LER) strategy and preparing for upcoming major term negotiations with FAA unions, including potential conclusion of negotiations with the NATCA collective bargaining unit (CBA) ▪ Managing oversight and compliance of all bargaining with FAA unions. LER, in conjunction with ATO, implement training and revising guidelines to enhance accountability and clarify roles thereby ensuring compliance of all bargaining with FAA unions in accordance with FAA Order 3710.18, Internal Coordination Requirements for Negotiating Term and Mid-term Agreements with FAA Unions. ▪ Supporting employee engagement through continued collaboration with the unions ▪ Developing knowledge and skills of LER employees and FAA management through training

Function/Office	FY 2016 Anticipated Accomplishments
The Office of Talent Development (AHD) Manages the development of talent and leadership bench strength ▪ FAA Leadership & Learning Institute (FLLI) ▪ Enterprise Learning Management System (ELMS) ▪ Executive Development (EXD) ▪ Organizational Effectiveness (OE) ▪ Human Capital Planning (HCP)	▪ Align Leadership Capabilities with Talent Management Strategy and integrate cascading program components ▪ Continue to change the learning and delivery methodology of all FLLI course material to support performance management, FAA succession and retention programs, the workforce diversity and technology advancements ▪ Continue to evolve the design development, and delivery of management and executive curriculums ▪ Deliver leadership and management training courses to at least 1,400 FAA managers ▪ Design and deliver executive development workshops ▪ Facilitate strategic development team meetings with Executives and their leadership teams ▪ Provide learning services to all FAA employees through the Enterprise Learning Management System (eLMS) ▪ Conduct the annual Federal Employee Viewpoint (FedView) Survey ▪ Analyze, interpret, and report FedView and Best Places to Work results and metrics to agency stakeholders ▪ Conduct workshops on FedView results and action planning to improve capability of FAA organizations to address survey results ▪ Update the FAA Human Capital Plan to improve strategic management of the agency workforce ▪ Coordinate OMB human capital benchmarking data collection and results reporting
Function/Office	**FY 2016 Anticipated Accomplishments**
The Office of the Accountability Board (AHA) Provides oversight, and ensures that management is held accountable for responding to allegations of sexual harassment, misconduct of a sexual nature, and other allegations of harassment and misconduct ▪ Develop and deliver anti-harassment training ▪ Monitor management's timeliness in addressing allegations	▪ Foster a workplace free of harassment and inappropriate behavior through investigation and adjudicating allegations of employee misconduct ▪ Ensure 96% of allegations are addressed by management timely

Why do we want/need to fund the program at the requested level?

Funding at the requested level is critical to continue providing basic personnel services to all FAA employees. The non-pay costs within AHR's budget include systems like CASTLE for time and attendance and AVIATOR for on-line job application and processing. AHR also supports the FAA's learning management system, the Employee Assistance Program (EAP), the FAA's Accountability Board, and the Agency's worker's and unemployment compensation program, all of which are necessary for FAA's lines of business to be successful.

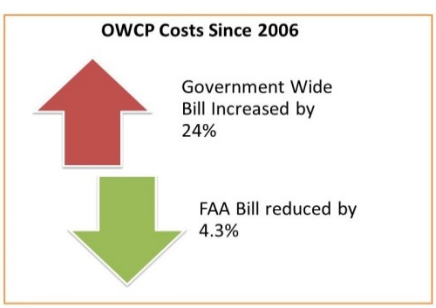
Most of the FAA's hiring efforts are for our safety organizations, with ATO and AVS being the most active. At the requested level, AHR will be able to support multiple recruiting events (e.g. virtual career fairs). This will maintain the FAA's ability to reach qualified candidates, and support DOT and FAA's goals of maintaining a diverse workforce, including veterans and persons with targeted disabilities. As more federal employees become eligible to retire in FY 2017 and beyond, the competition for talent will increase.

With an increasingly retirement eligible workforce, acquiring new talent and managing the talent pipeline from entry-level to senior management is a priority for the FAA. Due to projected attrition and air traffic requirements, the agency expects an unprecedented level of hiring for air traffic controllers over the next five fiscal years. In FY 2015, the agency hired approximately 1,400 air traffic controllers, including over 1,000 air traffic controller trainees. In FY 2016, FAA is projected to hire 1,619 air traffic controllers and over 1,700 in FY 2017 and in FY 2018. The pace of air traffic controller hiring will level out to approximately 1,200 in FY 2019 and maintain a steady state of approximately 900 – 1,000 thereafter to meet the demands of an aging workforce and increased operational requirements.

The **Human Resource Services Office** is required to recruit, assess, and hire a diverse workforce necessary to accomplish the FAA mission. In FY 2015, the HR Services Office posted over 5,000 vacancy announcements, issued over 7,800 referral certificates, and facilitated around 10,000 job offers, including over 5,000 job offers which resulted in over 1,400 air traffic controller new hires. The HR Services office is also responsible for ensuring the approximately 46,000 current FAA employees and new hires are paid correctly and personnel records are updated and maintained in accordance with federal HR regulations. In FY 2015, HR Services processed over 122,000 personnel actions, including pay actions, at an accuracy rate of 99 percent. The current landscape calls for recruiting and hiring processes that are efficient and effective and that strengthen the ability of the FAA to compete with other agencies and the private sector in attracting and hiring candidates for our positions. The HR Services Office improved hiring efficiency in FY 2015 by reducing the time to hire by 25 percent. In FY 2016 and beyond, HR Services will continue to build and modify recruiting and hiring processes to meet agency staffing goals using the most efficient and effective practices.

HR processed thousands of retirements and retirement annuity estimates in FY2015 (over 2000 retirement applications and over 4,800 annuity estimates), processed over 8,000 benefit actions, and responded to over 13,000 inquiries and 30,000 phone calls in FY 2015. They have supported the agency's decision to offer Voluntary Early Retirement Authority (VERA) and/or Voluntary Separation Incentive Payment (VSIP) to employees, processing over 1,100 annuity estimate requests and several hundred retirement applications over the last three years.

Since the FAA consolidated the **Workers' Compensation (OWCP) Program** into one program office, and subsequently provided servicing to the entire Department, AHR consistently contained our bill at a greater rate than the rest of government.



Despite built-in cost of living increases, AHR decreased the overall DOT workers' compensation bill by almost $550,000 in Chargeback Year (CY) 2015. This constitutes a 0.6 percent reduction. During the same time period, the government-wide bill increased by 3.2 percent. Since CY 2011, when we began managing the program for the entire Department, we have decreased our bill by 8.6 percent compared to a 10.6 percent increase government-wide.

Looking back further, we have consistently contained the FAA bill at a significantly greater rate than the rest of government. Since we began centrally managing the program for the entire FAA in CY 2006, we have *reduced the FAA bill by 4.5 percent* while the rest of government has seen a 25 percent increase. Had our bill increased at a comparable rate to the rest of government during this timeframe, we would have paid an additional $137 million in workers' compensation costs since CY 2006.

Funding at the requested level is critical to ensure we are able to provide the level of service expected by our injured workers and agency management, and that we are able to comply with all regulatory requirements. We maintain an active caseload of over 3,100 long term disability claims and received over 1,400 new cases during 2015 for a total of 4,500 cases Department wide.

The **Office of Labor and Employee Relations** programs are necessary in order to comply with Federal Labor Relations Statutes. The FAA has a large union presence on property. Nearly 34,800 (76 percent) of the approximately 46,000 employees working at the FAA are represented by unions. A total of eight different unions represent these various employees who are in 36 different bargaining units (i.e., groups of employees with an identifiable community of interests.) Several of these units bargain together with the FAA and as a result there are 19 separate collective bargaining agreements (CBAs) in place. Labor costs associated with CBAs are a large component of the FAA's funding. For example, the personnel compensation and benefits (PC&B) costs for FY15 for the air traffic controllers CBA was estimated over $2.8 billion. For all employees covered by a CBA, the PC&B costs were estimated over $5.588 billion.

In FY 2015, over 8,700 logged cases related to Labor and Employee Relations (LER) matters were worked by LER practitioners. This did not include potential cases and issues that were resolved through LER guidance and consultation to management. Additionally in FY 2015, the LER program delivered three internal training courses specializing in employee relations issues to enhance the knowledge and skills of LER practitioners. Also, management training was delivered throughout the year on various subjects including: Accountability Board training, grievance processing, conduct and discipline, etc.

In FY 2015, the **Accountability Board** processed 904 reported incidents of harassment. At a historic rate of growth averaging 12 percent (average since 2011) per year, it is estimated that the number of reported incidents will be projected at 1075 in FY 2016 and 1182 by FY 2017. In FY 2015, the Board developed training platforms that resulted in over 12,080 FAA employees, contractors, and managers receiving Accountability Board anti-harassment training. This training enables the Board to emphasize the agency's anti-harassment message and that strong leadership is the key to eliminating all forms of harassment and misconduct. Since the Board must conduct anti-harassment training on a yearly basis, training is projected to increase incrementally in FY 2016 and FY 2017 consistently with the projected number of reported allegations.

Anticipated FY 2017 Accomplishments:

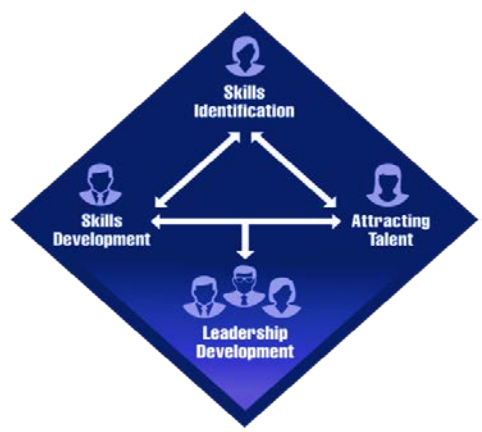
Function/Office	Anticipated FY 2017 Accomplishments
The Office of Human Resource Services (AHF)	▪ Workforce Planning ▪ Job Analysis and Position Descriptions ▪ Skills Identification and Assessments ▪ Staffing Advisory and Consultation ▪ Recruitment, Qualifications, and Placement (Staffing) ▪ Executive Staffing/Personnel Administration ▪ Diversity, Veterans, and Student Recruitment Programs ▪ Process Personnel and Payroll Transactions ▪ Personnel System Administration ▪ Corporate Onboarding ▪ Organizational Design Support

The Office of Compensation, Benefits and Worklife (AHB)	▪ Pre and post retirement counseling & benefit estimates ▪ Processing benefit applications and provision of counseling ▪ (Survivor benefits, disability compensation, Federal Health Benefits changes, FEGLI, and the Thrift Savings Plan) ▪ Administer two distinct performance management systems, Valuing Performance and the Performance Management System ▪ Administer the Office of Workers' Compensation Program for all of the DOT
The Office of Labor and Employee Relations (AHL)	▪ Administer labor/employee relations services across HQ and 11 Regional offices with eight unions (36 bargaining units 19 contracts) Represent the agency in all national and headquarters negotiations, and most regional negotiations ▪ Handle third party matters, such as unfair labor practice proceedings and arbitrations, at both the national and regional levels of recognition. Provide labor and employee relations training and guidance to management ▪ Provide management guidance for all FAA employees on conduct and discipline; leave; drug and alcohol misuse; medical incapacitation; and unacceptable performance/performance improvement
The Office of Talent Development (AHD)	▪ Leadership Development (Executives / Managers) ▪ Critical Skill Succession Planning and Execution ▪ Human Capital Research / Data and Trend Analysis ▪ Executive and Organizational Effectiveness ▪ Learning Management Systems ▪ Corporate Coaching and Facilitation ▪ Course / Curriculum Analysis and Development ▪ Public Outreach ▪ Talent Development Policy Administration ▪ Advanced Learning Technologies ▪ Learning Systems Support Organization
The Office of the Accountability Board (AHA)	▪ Develop and deliver anti-harassment training ▪ Monitor management's timeliness in addressing allegations

What benefits will be provided to the American public through this request?

Over the next several years, the FAA will be laying the foundation for the aerospace system of the future through the implementation of NextGen. Meeting this challenge is going to take the collective strength of its employees.

The Workforce of the Future Strategic Initiative (WI) is preparing the FAA's current and future workforce by identifying, recruiting, and developing a workforce with the leadership, technical and functional skills necessary to ensure the U.S. has the world's safest and most productive aviation sector. The four sub-initiatives Leadership Development, Skills Identification, Skills Development and Attracting Talent collectively address the transformative shift the agency requires to meet the needs of our changing industry.



The four WI sub-initiatives interact to prepare FAA's workforce for the future by identifying, recruiting, and training employees with skills and behaviors needed to meet FAA's mission.

The FAA safely guides approximately 25 million flights every year and oversees a system that transports 739 million passengers annually on U.S. carriers. The FAA forecasts that U.S. airlines will reach 1.14 billion passengers by 2035. The United States airline industry carried over 685 million passengers on domestic airlines in FY 2015. The core of FAA's mission is to provide the safest, most efficient aerospace system in the world. The FAA is currently in the midst of one of the largest transformations in its history as the agency undertakes a comprehensive overhaul of the national airspace system. The goal of the Next Generation Air Transportation System (NextGen) is to transform the entire national air transportation system to make air travel more convenient, dependable, and safer. Accomplishment of FAA's NextGen goals requires an enabling infrastructure of policies, procedures, technology, and a ready and capable workforce.

The FAA's greatest asset is its workforce. The dedication, professionalism, skill, and expertise of our past and present workforce have created this world-renowned agency. The FAA is poised to adapt to the changing aviation industry and empower the current and future workforce with the proper tools, knowledge, and leadership skills to be successful.

Staff Offices Explanation of Funding Changes

	Dollars ($000)	FTE
Staff Offices	**$2,350**	**1**
Overview: For FY 2017, the Staff Offices Assistant Administrators request $209,101,000 and 1,078 FTEs to meet their respective missions. The FY 2017 request level reflects adjustments to base, other changes, discretionary adjustments, and a base transfer. This represents an increase of $2,350,000 over the FY 2016 enacted level.		
Adjustments to Base	**$1,245**	**-**
Annualization of FY 2016 Pay Raises: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.0 percent.	520	
FY 2017 Pay Raises: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	1,925	
Two Less Compensable Days: This decrease represents two less compensable days in FY 2016 (260 days in FY 2017 vs. 262 days in FY 2016).	-1,200	
Other Changes	**$598**	**-**
Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's (DOT) Working Capital Fund (WCF) profile. These adjustments are being made to best align each office's resources within their expected WCF costs.	1,402	
Administrative Efficiencies: Staff Offices will achieve administrative efficiencies through cost reductions and avoidance in various areas such as contractual services and supplies.	-804	
Discretionary Adjustments	**$250**	**-**
Unmanned Aircraft System (UAS) Integration: The Office of Policy, International Affairs, and Environment (APL) supports the FAA initiative to integrate Unmanned Aerial Systems (UAS) into the NAS by developing an in-house capability to generate a forecast of future UAS activity. Contract support is needed to develop techniques, capabilities and analysis tools in order to generate forecasts of UAS activity that are critical for agency planning and rulemaking.	250	
Base Transfers	**$257**	**1**
Civil Rights Staffing (ATO to ACR): This request transfers funding $257,000 and 1FTP/1FTE from the Air Traffic Organization, Technical Operations Services (ATO/AJW) to the Office of Civil Rights (ACR).	257	1

(This page intentionally left blank)

INSERT TAB HERE:

3B. FACILITIES & EQUIPMENT

FACILITIES AND EQUIPMENT
(AIRPORT AND AIRWAY TRUST FUND)

For necessary expenses, not otherwise provided for, for acquisition, establishment, technical support services, improvement by contract or purchase, and hire of national airspace systems and experimental facilities and equipment, as authorized under part A of subtitle VII of title 49, United States Code, including initial acquisition of necessary sites by lease or grant; engineering and service testing, including construction of test facilities and acquisition of necessary sites by lease or grant; construction and furnishing of quarters and related accommodations for officers and employees of the Federal Aviation Administration stationed at remote localities where such accommodations are not available; and the purchase, lease, or transfer of aircraft from funds available under this heading, including aircraft for aviation regulation and certification; to be derived from the Airport and Airway Trust Fund, $2,838,000,000, of which $639,300,000 shall remain available until September 30, 2017, and $2,198,700,000 shall remain available until September 30, 2019: Provided, That there may be credited to this appropriation funds received from States, counties, municipalities, other public authorities, and private sources, for expenses incurred in the establishment, improvement, and modernization of national airspace systems: Provided further, That no later than March 31, the Secretary of Transportation shall transmit to the Congress an investment plan for the Federal Aviation Administration which includes funding for each budget line item for fiscal years 2018 through 2022, 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.

Program and Financing
(in millions of dollars)

Identification code: 69-8107-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Obligations by program activity:			
	Direct program:			
0001	Engineering, development, test and evaluation	271	206	133
0002	Procurement and modernization of (ATC) facilities and equipment	1,537	1,831	1,768
0003	Procurement and modernization of non-ATC facilities and equipment	176	175	221
0004	Mission support	223	226	250
0005	Personnel and related expenses	459	470	489
0006	Hurricane Sandy	3	.....	.....
0007	Sustain ADS-B Services and WAAS GEOs	.....	.....	150
0100	Subtotal, direct program	2,669	2,908	3,011
0799	Total Direct obligations	2,669	2,908	3,011
0801	Reimbursable program	84	89	90
0900	Total new obligations	2,753	2,997	3,101
	Budgetary resources available for obligation:			
1000	Unobligated balance brought forward, Oct 1	1,255	1,235	1,145
1021	Recoveries of prior year unpaid obligations	57	.....	.....
1050	Unobligated balance	1,312	1,235	1,145
	Budget authority (gross), detail:			
	Appropriations discretionary:			
1101	Appropriation (special or trust fund)	2,600	2,855	2,838
	Spending authority from offsetting collections, discretionary:			
1700	Collected	51	52	52
1701	Change in uncollected payment, Federal sources	30	.....	.....
1750	Spending auth from offsetting collections, disc (total)	81	52	52
1900	Budget authority (total)	2,681	2,907	2,890
1930	Total budgetary resources available	3,993	4,142	4,035
	Memorandum (non –add) entries:			
1940	Unobligated balance expiring	-5	.....	.....
	Special and non-revolving trust funds:			
1941	Unexpired Unobligated balance, end of year	1,235	1,145	934
1950	Other balances withdrawn and returned to unappropriated receipts	21	.....	.....
1951	Unobligated balance expiring	5	.....	.....
1952	Expired Unobligated balance, start of year	67	57	78
1953	Expired Unobligated balance, end of year	52	78	78
1954	Unobligated balance canceling	21	.....	.....
	Change in obligated balances:			
3000	Unpaid obligations, brought forward, Oct 1	1,534	1,528	1,738
3010	Obligations incurred, unexpired accounts	2,753	2,997	3,101
3011	Obligations incurred, expired accounts	5	.....	.....
3020	Outlays (gross)	-2,681	-2,787	-2,959
3040	Recoveries of prior year unpaid obligations, unexpired	-57	.....	.....
3041	Recoveries of prior year unpaid obligations, expired	-26	.....	.....
3050	Unpaid obligations, end of year	1,528	1,738	1,880
	Uncollected payments:			
3060	Uncollected pymts, Fed sources, brought forward, Oct 1	-59	-63	-63
3070	Change in uncollected pymts, Fed sources, unexpired	-30	.....	.....
3071	Change in uncollected pymts, Fed sources, expired	26	.....	.....
3090	Uncollected pymts, Fed sources, end of year	-63	-63	-63
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	1,475	1,465	1,675

Identification code: 69-8107-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
3200	Obligated balance, end of year	1,465	1,675	1,817
	Budget Authority and outlays, net:			
4000	Budget authority, gross	2,681	2,907	2,890
4010	Outlays from new discretionary authority	1,054	1,229	1,318
4011	Outlays from discretionary balances	1,627	1,558	1,641
4020	Outlays, gross (total)	2,681	2,787	2,959
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
4030	Federal sources	-28	-16	-16
4033	Non-Federal sources	-34	-36	-36
4040	Offsets against gross budget authority and outlays (total)	-62	-52	-52
	Additional offsets against gross budget authority only:			
4050	Change in uncollected pymts, Fed sources, unexpired	-30	. . . . .	. . . . .
4052	Offsetting collections credited to expired accounts	11	. . . . .	. . . . .
4060	Additional offsets against budget authority only (total)	-19	. . . . .	. . . . .
4070	Budget authority, net (discretionary)	2,600	2,855	2,838
4080	Outlay, net (discretionary)	2,619	2,735	2,907
4180	Budget authority, net (total)	2,600	2,855	2,838
4190	Outlay, net (total)	2,619	2,735	2,907

Funding in this account provides for the deployment of communications, navigation, surveillance, and related capabilities within the National Airspace System (NAS). This includes funding for several activities of the Next Generation Air Transportation System, a joint effort between the Department of Transportation, the National Aeronautics and Space Administration, and the Departments of Defense, Homeland Security, and Commerce to improve the safety, capacity, security, and environmental performance of the NAS. The funding request supports the Federal Aviation Administration's comprehensive plan for modernizing, maintaining, and improving air traffic control and airway facilities services.

Object Classification
(in millions of dollars)

Identification code: 69-8107-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	300	307	313
11.3	Other than full-time permanent	1	1	1
11.5	Other personnel compensation	9	8	8
11.9	Total personnel compensation	310	316	322
12.1	Civilian personnel benefits	92	97	99
13.0	Benefits for former personnel	. . . . .	. . . . .	. . . . .
21.0	Travel and transportation of persons	42	42	48
22.0	Transportation of things	2	3	3
23.2	Rental payments to others	38	50	50
23.3	Communications, utilities, and miscellaneous charges	41	51	62
25.1	Advisory and assistance services	1,552	1,610	1,699
25.2	Other services from non-federal sources	86	130	133
25.3	Other goods and services from federal sources	33	40	30
25.4	Operation and maintenance of facilities	76	93	95
25.5	Research and development contracts	1	2	. . . . .
25.6	Medical care	. . . . .	. . . . .	. . . . .
25.7	Operation and maintenance of equipment	63	84	80
25.8	Subsistence and support of persons	1	2	1
26.0	Supplies and materials	31	47	50

Identification code: 69-8107-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
31.0	Equipment	174	190	236
32.0	Land and structures	122	144	100
41.0	Grants, subsidies, and contributions	2	5	3
43.0	Interest and dividends	3	2	.....
44.0	Refunds	.....	.....	.....
99.0	Direct obligations	2,669	2,908	3,011
99.0	Reimbursable obligations	84	89	90
99.9	Total new obligations	2,753	2,997	3,101

Employment Summary

Identification code: 69-8107-0-7-402	FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
1001 Direct civilian full-time equivalent employment	2,619	2,629	2,655
2001 Reimbursable civilian full-time equivalent employment	68	68	68

EXHIBIT III-1

FACILITIES and EQUIPMENT
SUMMARY BY PROGRAM ACTIVITY
Appropriations, Obligations Limitations, and Exempt Obligations
($000)

	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Change FY 2016-2017
Engineering, Development, Test and Evaluation	177,937	156,050	146,960	-9,090
Air Traffic Control Facilities and Equipment	1,577,983	1,832,201	1,631,410	-200,791
Non-Air Traffic Control Facilities and Equipment	158,280	171,000	182,930	11,930
Facilities and Equipment Mission Support	225,800	225,700	237,400	11,700
Personnel and Related Expenses	460,000	470,049	489,000	18,951
Sustain ADS-B Services and WAAS GEOs			150,300	150,300
Total	2,600,000	2,855,000	2,838,000	-17,000
FTEs				
Direct	2,619	2,629	2,655	26
Reimbursable	68	68	68	0

Program and Performance Statement

This account provides funds for programs that improve operational efficiency, constrain costs, modernize automation and communication technology and systems, and deal with aging facilities. Particular emphasis is placed on en route and terminal air traffic control, satellite navigation and landing systems, and communications.

Funding is organized within the following activity areas of FAA:

Activity 1: Engineering, Development, Test and Evaluation

Activity 2: Procurement and Modernization of Air Traffic Control Facilities and Equipment

Activity 3: Procurement and Modernization of Non-Air Traffic Control Facilities and Equipment

Activity 4: Facilities and Equipment Mission Support

Activity 5: Personnel and Related Expenses

Activity 6: ADS-B Services and WAAS GEOs

EXHIBIT III-1a

FACILITIES and EQUIPMENT
SUMMARY ANALYSIS OF CHANGE FROM FY 2016 TO FY 2017
Appropriations, Obligations Limitations, and Exempt Obligations
($000)

Item	Change from FY 2016 to FY 2017 ($000)	Change from FY 2016 to FY 2017 (FTE)
FY 2016 (Enacted)	**$2,855,000**	**2,629**
Administrative Adjustments to Base:	4,663	10
Annualization of FY 2016 FTE	1,500	10
Annualization of FY 2016 Pay Raise	1,343	
FY 2017 Pay Raise	4,960	
Two Less Compensable Day	-3,140	
GSA Rent		
Working Capital Fund		
Non-Pay Inflation	24,417	
Subtotal, Adjustments to Base	**$29,080**	**10**
Program Reductions:		
Engineering, Development, Test and Evaluation	-10,651	
Air Traffic Control Facilities and Equipment	-219,113	
Non-Air Traffic Control Facilities and Equipment		
Facilities and Equipment Mission Support		
Personnel and Related Expenses		
ADS-B Services and WAAS GEOs		
Subtotal Program Reductions	**-$229,764**	**0**
New or Expanded Programs:		
Engineering, Development, Test and Evaluation		
Air Traffic Control Facilities and Equipment		
Non-Air Traffic Control Facilities and Equipment	10,220	
Facilities and Equipment Mission Support	9,443	
Personnel and Related Expenses	13,721	16
ADS-B Services and WAAS GEOs	150,300	
Subtotal New or Expanded Programs	**$183,684**	**16**
FY 2017 Request	**$2,838,000**	**2,655**

		Amount	Page
	Total, Activity 2	**$1,631,410,000**	

Activity 3, Procurement and Modernization of Non-Air Traffic Control Facilities and Equipment

a. Support Programs

b. Training, Equipment and Facilities

Activity 4, Facilities and Equipment Mission Support

a. System Support and Support Services

Activity 5, Personnel Compensation, Benefits, and Travel

Activity 6, Sustain ADS-B Services and WAAS GEOs

Executive Summary – Facilities and Equipment (F&E), Activity 1

What is the Request and What Funds are Currently Spent on the Program?

As NextGen has progressed over the last several years, more programs have transitioned into the implementation phase. NextGen's concept development and pre-implementation work builds off of the programs in the implementation phase and the pre-implementation activities align very closely with the intended end products. FAA is focusing these FY 2017 portfolio resources in a manner consistent with NextGen Advisory Committee (NAC) recommendations for prioritizing NextGen activities.

The Facilities and Equipment (F&E) Activity 1 program requests $146,960,000 for FY 2017, a decrease of $9,090,000 (5.8 percent) below the FY 2016 enacted level. The main reason for the decrease in funding requested under Activity 1 is the direct result of individual projects transitioning from pre-implementation work into viable programs that have been approved to proceed to the implementation phase of deployment. Programs that have advanced have been moved into Activity 2 Budget Line Items in anticipation of a Final Investment Decision (FID).

Of the request for FY 2017, $89,960,000 is requested to continue multiple basic and applied research efforts in support of future Next Generation Air Transportation System (NextGen) technologies and concepts. Included as a component of the NextGen applied research efforts are funds for the NextGen Integration and Evaluation Capability Laboratory and the Florida Testbed which are physically located at the William J. Hughes Technical Center (WJHTC) at Atlantic City, New Jersey and at the airport in Dayton, FL respectively. The remaining $57,000,000 is requested to support basic research activities under the Advanced Technology Development and Prototyping (ATDP) program and to sustain the facility and infrastructure at the WJHTC.

Key outputs and outcomes expected to be achieved in budget year with the requested resources:

- Funding will continue development and implementation of Precision Based Navigation (PBN) procedures, while ensuring safety
- The FY 2017 request will support Optimization of Airspace and Procedures in the Metroplex (OAPM) implementation at five locations
- Continued identification and maturation of Unmanned Airspace System (UAS) needs as they relate to Air Traffic systems and services; FAA will address operational requirements and establish procedures and policies to support the integration of UAS in the National Airspace System (NAS)
- Major Airspace Redesign will continue to serve as one of the FAA's primary efforts to modernize the Nation's airspace

What Is This Program And Why Is It Necessary?

Activity 1 includes pre-acquisition NextGen F&E programs, continuing basic research programs, and laboratory support for the Technical Center. 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. This includes the development of operational concepts and proof-of-concept systems and equipment and their demonstration in the laboratory and limited operational settings. Funding supports initial research through early development to concept demonstration, but ends prior to an investment decision for production and implementation across the NAS.

Activity 1 programs are undertaken to validate operational concepts and proof-of-concept systems and equipment prior to making decisions about moving forward on capital investments that will be deployed across the NAS. This means defining operational requirements and completing system engineering. Activity 1 also includes maintenance and upgrades of the laboratories and other infrastructure at the FAA Technical Center. Investment in these programs is made with the ultimate goal of modernizing and sustaining the NAS.

Some of the basic and applied research performed under Activity 1 includes:

- Technology research to prevent future runway incursions
- Airspace analysis for complementing F&E programs
- Various development projects needed to transition to the next level of F&E development
- Pre-implementation studies, requirements documentation, and initial investment analysis

These efforts contribute to the following DOT Strategic Goals:

- Safety: Improve public health and safety by reducing transportation related fatalities and injuries
- Economic Competitiveness: Promote Transportation policies and investments that bring lasting and equitable economic benefits to the Nation and its citizens
- Organizational Excellence: Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs

Why Do We Want / Need To Fund The Program At The Requested Level?

Activity 1 is comprised mainly of NextGen pre-implementation activities to support the investments that will ultimately result in the implementation of NextGen deliverables and services in the NAS. The remaining Activity 1 programs provide the supporting structure for researching, testing, and evaluating all systems that will be deployed or that require modifications in the NAS.

What Benefits Will Be Provided To The American Public Through This Request?

The objective of performing these activities is to support capital investment decision–making. Based on private sector and federal procurement best practices, FAA has learned that performing these activities helps to make better investment decisions and reduces risk in the acquisition phase of the system life cycle. To this end, FAA uses industry-benchmarked program management practices and processes. We also comply with guidelines outlined in the Project Management Body of Knowledge (PMBOK).

Efforts under Activity 1 show positive outcomes as individual projects reach maturity and are transferred to Activities 2 through 4 in the F&E Budget. Systems are fielded as a result of efforts at the Technical Center, and programs are slated for cancellation as a result of analysis during the pre-acquisition and research work.

Detailed Justification for - 1A01 Advanced Technology Development and Prototyping

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Advanced Technology Development and Prototyping
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Advanced Technology Development and Prototyping	$23,900	$18,300	$24,800	+$6,500

Note: PDARS Program moved to BLI 2E11 as program has moved to the Implementation Phase. FY 2015 and FY 2016 Numbers have been changed for comparability purposes.

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Runway Incursion Reduction Program (RIRP)	---	$2,000.0
B. Operations Concept Validation and Infrastructure Evolution	---	4,500.0
C. Major Airspace Redesign	---	4,600.0
D. Strategy and Evaluation	---	1,000.0
E. Dynamic Capital Planning	---	3,000.0
F. Operational Analysis and Reporting System (OARS)	---	3,000.0
G. Operations Network (OPSNET) Replacement	---	3,000.0
H. Operations Modeling Analysis and Data	---	2,000.0
I. In Service Engineering	---	1,700.0
Total	Various	$24,800.0

For FY 2017, a total of $24,800,000 is requested for the activities shown above.

The FAA's mission is to provide the safest and most efficient aerospace system in the world. To accomplish this mission, FAA's Advanced Technology Development and Prototyping program develops and validates technology and systems that support air traffic services. These initiatives support the requirements associated with the evolving air traffic system architecture and improvements in airport safety and capacity.

What Is This Program And Why Is It Necessary?

A. Runway Incursion Reduction Program (RIRP)

The RIRP conducts research, development, and operational evaluation of technologies to increase runway safety. Consistent with standing National Transportation Safety Board (NTSB) recommendations and initiatives, research emphasis will remain on technologies that provide for direct safety indications and alerts to pilots and air-crews at large airports as well as those that can be applied cost effectively at small to medium-sized 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 removal of the existing Low Cost Ground Surveillance (LCGS) Pilot sites, Runway Safety Assessment (RSA) studies and evaluation of the Small Airport Surveillance Sensor (SASS). When appropriate, investment analyses will be performed to support acquisition and implementation of selected solutions.

Runway Incursions (RI) are a leading safety concern of the FAA and this program helps to identify solutions that can aid in preventing them. The RIRP will pursue a strategy of "right site, right size" to identify candidate technologies that are best suited to a variety of airports in order to address the specific types of RI causal factors encountered at that site (e.g. converging runways, ground vehicle operations, taxiway/runway hotspots, wildlife, etc.).

Currently, the equipment removal and site restoration of the Low Cost Ground Surveillance (LCGS) prototype sites are funded under RIRP at the following LCGS sites: Spokane, Washington; Reno, Nevada; Long Beach, California; Manchester, New Hampshire; and San Jose, California. Additionally, the Small Airport Surveillance Sensor (SASS) prototype is being currently prototyped and evaluated at Hanscom Field, Massachusetts, with additional field testing to follow at other airport locations in the next three years.

The RIRP is focused on the prototyping and operational evaluation of emerging technologies designed to reduce the risk of runway incursions, thereby allowing the FAA to reduce risks associated with the acquisition of these new technologies into the National Airspace System (NAS) and allowing the FAA to continue to meet the goal of maintaining the rate of runway incursions at or below 20 per 1,000 events through FY 2018.

B. Operations Concept Validation and Infrastructure Evolution

Developing operational concepts is an Office of Management and Budget (OMB) recommended first step in developing an Enterprise Architecture. This program develops and validates operational concepts that are key to the FAA Air Traffic Management (ATM) modernization programs. This work includes developing and maintaining detailed second level concepts that support validation and requirements development. Second level concepts identify the personnel and functional changes necessary for the ATO to provide customer service in ways that increase productivity and reduce net cost. Recent work includes support to the Terminal Sequencing and Spacing (TSS) Operations Integration Assessment, and the development of the following: new Unmanned Aircraft Systems (UAS) operational scenarios for both mid-term and integration focus areas, ATO UAS Research Plan, shortfall analysis and operational scenarios for the improved use of Special Activity Airspace, and shortfall analysis and a Concept of Operations (CONOPs) for enterprise-based information display systems. This information helps the aviation community anticipate what changes are needed in aircraft equipment in order to operate with the new technology being implemented in the NAS and develop new procedures.

The Operational Concept efforts look at the changing roles and responsibilities of the Air Traffic workforce and the physical layout/footprint of ATM platforms within facilities to optimize the delivery of Air Navigation Service Provider services to derive the associated functional requirements imposed on the NAS infrastructure. Concept development includes preparing system specifications, roles and responsibilities, procedures, training, and certification requirements. These development and validation activities support NAS modernization through:

- Concept/Scenario Development
- Concept Validation
- Simulation and Analysis
- System Design
- Methods and Metric Development
- Technical Analysis
- Requirements Development

Concept development and validation is necessary to investigate specific concept elements, and to drive out operational and technical requirements and implications for human factors, training and procedures. This project assesses the interaction of changing roles and responsibilities of NAS service providers and pilots, airspace changes, procedural changes and new mechanized systems for distributing weather, traffic and other flight related information. This project tests the assumptions behind common situational awareness and distributed information processing and contributes to the FAA's support for the RTCA, a non-profit association that develops standards based on manufactures, government, and aviation operator inputs.

C. Major Airspace Redesign

This program supports increased efficiency and enhanced safety by funding the physical changes in facilities necessary to accommodate airspace redesign. Airspace redesign efforts seek to optimize Terminal, En Route, and Oceanic airspace. Redesign projects have taken on increased emphasis at both the national and regional levels to ensure that FAA is able to effectively manage the projected growth in demand at FAA facilities and airports.

Implementation of airspace redesign efforts frequently results in changes in the number and shape of operational positions or sectors, including changes to sector, area, or facility boundaries. Transition to a new configuration after airspace redesign is implemented requires changes in the supporting infrastructure. These infrastructure changes can include communication modifications such as changes in frequencies, connectivity of a radio site to the control facility, controller-to-controller connectivity; surveillance infrastructure modifications to ensure proper radar coverage; automation modifications to the ERAM data processing or flight data processing; inter-facility transmission modifications; additional consoles and communications backup needs; and modifications to the facility power and cabling.

Airspace Redesign is the FAA initiative that ensures all airspace related efficiency benefits facilitated by the Major Airspace Program, facility changes, and automation improvements are achieved. Major Airspace Redesign serves as one of the FAA's primary efforts to modernize the Nation's airspace. The purpose of this national initiative is to review, redesign and restructure airspace.
The FAA prioritizes candidate airspace redesign projects to determine which projects provide the most benefits and develops criteria for assessing a project's system-wide impact. Modernization of airspace through the Major Airspace Redesign Program is characterized by the migration from constrained ground based navigation to the freedom of a Required Navigation Performance (RNP) based system.

Demand/capacity imbalances in in Miami (ZMA) Oceanic and San Juan (ZSU) airspace have resulted in numerous Traffic Flow management initiatives that are needed to manage volume until more permanent airspace solutions can be implemented. A Tactical Operations Committee (TOC) was formed to study and identify infrastructure and airspace issues that need to be addressed to improve the safety, capacity and efficiency of operations in the Caribbean. FY 2017 funding will address many of the unique concerns associated with the Caribbean airspace addressed in the TOC report. A few primary issues from the report are listed below:

- Make Caribbean radars available to New York (ZNY) Air Route Traffic Control Center (ARTCC)
- Significant infrastructure gaps exist that impact industry and create workload on Air Traffic when facilities implement equipment outage contingency plans
- Ocean Caribbean sectors are the primary concern for traffic flow redesign
- No Electronic Terrain and Obstacle Data (Etod) available or the data is outdated
- Non-radar procedures with adjacent New York Oceanic and other Air Navigational Service Providers (ANSP's), (Hatti, Santo Domingo, Providenciales, Havana, Bahamas), require frequent and time consuming manual coordination

D. Strategy and Evaluation

The Strategy and Evaluation Program will continue the development and maintenance of the System Wide Analysis Capability (SWAC) and Airfield Delay Simulation Model (ADSIM+), which are fast-time simulation models of the NAS. These two simulation models support FAA cost-benefit analyses and trade-off studies.

At the enterprise-level (representing the entire air transportation system), a system-wide model is being developed to replace the existing 1980s-era model. This new system-wide model is required to analyze advanced Air Traffic Management (ATM) concepts and aid with NextGen program trade-off studies, investment analyses, and NAS performance analyses. SWAC capabilities and functionalities continue to be enhanced to aid investment decision making, and are used to support various benefit projection and analyses for the entire NextGen Organization, FAA's Program Management Office (PMO), Office of Performance Analysis, Office of Investment Planning and Analysis, Office of Environmental and Energy, and the Office of the Administrator.

To effectively perform analyses at specific airport locations, a new airport capacity model, known as ADSIM+, is being developed for use in analyzing new airport capacity-related projects. This model will facilitate rapid analysis of airport improvements, demand changes, and ATM technology insertions. In addition to being used by the Office of Systems Analysis and Modeling, the model is envisioned to be used by the Office of Performance Analysis for runway capacity studies, the Office of Investment Planning and Analysis for investment analyses, and the FAA's Office of Airports. The model will also be used by aviation consultants and the academic community, and provide a de facto standard for airport capacity analyses.

Together, these tools will support FAA senior leadership in making timely, effective, and informed decisions regarding investments, resource allocation, rulemaking, and help to justify these decisions to internal and external stakeholders.

E. Dynamic Capital Planning

The Dynamic Capital Planning tools and support will allow FAA to make optimal decisions based on best business practices. These tools and support will provide verification that disciplined management of capital programs continues to be carried out.

The project will allow the initial procurement of financial analysis tools and support to allow a better evaluation of programs through all phases of the acquisition life cycle. Focus areas that will be supported include: determining quantitative economic value and internal benefits validation for capital projects; milestone tracking and schedule modeling; performance measurement; auditing and trend analysis; earned value monitoring through program life cycle; field implementation planning; support for capital portfolio management and other oversight functions such as EVM, and post implementation analysis for corporate lessons learned results.

F. Operational Analysis and Reporting System (OARS)

OARS is an enterprise portal that provides a single access point to data and applications for safety analysis to support ATO's Proactive Safety Management and the Safety Management System (SMS). OARS will improve collection and analysis with improved consistency and accessibility to current safety information for a wide range of authorized users.

The ATO collects and analyzes safety data to make data-driven decisions in order to assess safety risk, determine repeatability, identify mitigations, and provide performance monitoring with minimal impact to operations. In support of the NextGen Implementation Plan, OARS is the proposed solution for Operational Improvement (OI) 109605, Improved Safety for NextGen Evolution, in order to analyze, assess, and mitigate NAS-wide safety risks with minimal impact to operations. OARS is accessed and viewed by users through an integrated enterprise portal for safety data distribution, fusion from multiple locations, and warehousing for a shared and consistent view of safety in the NAS.

OARS Phase 1 will automate and integrate safety data and risk analysis processes. This will increase capacity, efficiency and effectiveness, provide an integrated platform to facilitate technology transfer of existing analytics and prototypes, and improve consistency and accessibility of data and tools used for safety analyses. OARS will provide improved quality control and life-cycle maintenance through consolidation and reengineering of existing toolsets, a proactive and continuous (24/7) approach to risk analysis, assessment, treatment and assurance, and a deeper understanding of existing hazards, controls, and their interdependencies. This is critical as we continue to implement changes to NAS processes and systems (e.g. NextGen) in order to maintain the safety of the NAS.

The FAA's efforts to implement the transformational shift towards a risk-based safety management system produced a significant increase in the FAA's capability to capture safety events that may prove hazardous to the NAS. However, the FAA's capabilities to analyze and provide mitigating recommendations to the captured safety events have not been developed and enhanced at the same pace.

Due to the vast amount of unintegrated operational data and the limited capacity of available analytical tools, safety practitioners spend excessive time collecting data, manually extracting data from multiple systems, and manually redistributing data to multiple systems. In addition, the current suite of automated tools is not life-cycle sustainable and is difficult to enhance. Since daily safety information (e.g. reports, dashboards, analytics) based on current data is not available to safety practitioners and operational personnel, the time required to identify and address safety risks and operational trends, refine mitigation strategies, and provide meaningful safety assurance is increased.

G. Operations Network (OPSNET) Replacement

Operational Network (OPSNET) is the official collection and reporting system for NAS operations traffic count and flight delays. OPSNET Replacement will correct structural deficiencies with the legacy OPSNET reporting system while also providing enhancements.

OPSNET collects and feeds delay data to the Aviation System Performance Metrics (ASPM) system, which generates monthly FAA reports to the Department of Transportation (DOT). The analysis and resolution of flight delay issues is problematic because codes used to define different delays and delay-causes are ambiguous and lack needed granularity. Consequently, the standard codes that govern reports by the FAA and commercial airlines to DOT are different, and similarly the FAA codes differ from those employed by other ANSPs, like Eurocontrol. Additionally, data entry by operators may be inaccurate because the operator's workload may be trumped by higher priority operations.

OPSNET Replacement will redefine the delay and causal codes, will ensure harmonization with international codes, will replace manual data entry by operators with automated system data feeds, will improve daily reports to enable optimization of operations, and will provide metrics that benchmark performance levels and support determining the degree of success and contribution from new programs and enhancements comprising the NextGen investment.

An accurate understanding of system performance is critical to identifying areas for service improvement for the flying public. The legacy system is constrained by dependency on obsolete data definitions, inaccurate and inconsistent data entries, and difficulties in analyzing and cross-correlating data from multiple sources to resolve flight delay issues.

OPSNET replacement will be able to produce significantly better "Next-Day" reports for use internally by controllers to analyze prior operations and improve "Current-Day" services. Performance benchmarking and trend analysis of operations will be possible, enabling before and after comparison of the different NextGen programs/enhancements and measuring their relative degree of success and overall contribution to the FAA's overall goals.

H. Operational Modeling Analysis and Data

The Operational Modeling Analysis and Data program provides support for operational modeling and analysis activities within the Air Traffic Organization (ATO). The ATO manages the extraordinarily complex National Airspace System (NAS), and uses a variety of datasets and models of both the entire NAS and its component parts, such as individual airports, to understand NAS performance. Many operational units within the ATO model and analyze NAS data for operational and capital investment planning. This program will provide support to those units by funding the development of an analytics database that provides standardized operational events data on a per-flight basis. The initial analytics database will be based on currently available operational data. As new operational data becomes available, this program will evaluate and integrate the new data.

This program previously funded a study that reviewed FAA wide operational databases and operational analyses. The study identified a shortfall in analytical products available to FAA operations analysts. The study recommended that the FAA create a database to capture operational events associated with individual flights. The database will improve timeliness and reduce costs of operational analysis. Other programs will benefit from the products developed by this program because most strategic and planning activities rely upon data analysis or modeling.

I. In Service Engineering

In-service engineering allows for immediate response to emerging technology solutions. Funding is requested for ongoing engineering support of all prototyping efforts.

DOT Strategic Goals – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$24,800,000 is required to continue all activities within the ATDP budget line item. The requested funding will assist in maintaining important program milestones that have been established by the responsible program offices in order to implement innovations and to study technical outcomes of those innovations. Those milestones and objectives are incorporated into the FAA Business Plan Goals annually and are tracked by the FAA Performance Committee that meets monthly and reports to the FAA's Executive Committee.

What Benefits Will Be Provided To The American Public Through This Request?

A. Runway Incursion Reduction Program (RIRP)

The RIRP supports the FAA's mission of achieving the "Next Level of Safety;" through reduction of Aviation risk, through all phases of flight (gate-to-gate), reduction in the general aviation fatal accident rate, and ensuring that there are no fatal accidents on certificated airports.

The demonstration, evaluation and transition of mature runway safety technologies such as Runway Status Lights have been proven to reduce the incidence of high-hazard (Category A/B) runway incursions and ultimately reduce the risk of a runway collision at deployed airports. Early development, testing and maturation of such viable technologies by the RIRP results in the expedient delivery of runway safety benefits, which contributes to safer aviation from gate-to-gate.

The RIRP will continue its mission to develop these safety technologies that can then be applied at not just large airports, but also small-to-medium sized airports with commercial service throughout the NAS that have seen a recent uptick in the rate of runway incursions. This critical role played by the RIRP contributes to making aviation safer for the American public by reducing the risk of runway incursions at this next tier of airports in addition to the larger, primary airports within the NAS.

B. Operations Concept Validation and Infrastructure Evolution

This program uses a variety of validation techniques to explore, develop, and mature NAS operational concepts. The program undertakes research, study, and analysis to explore new opportunities for service delivery, solve problems with current operations, and define high level operational and performance requirements. The ATDP Operational Concept Validation program is doing the early concept research for advanced operational concepts to ensure they are well understood and are based on valid assumptions. Concepts such as High Altitude Airspace and Integrated Arrival Departure Airspace were researched and validated under this Program prior to transition to NextGen Pre-Implementation Programs to ensure the operational impacts were well understood and worthy of additional funding. Recently, concept validation activities related to Terminal Sequencing and Spacing, UAS operations, Special Activity Airspace management, and enterprise-based information display systems have been conducted.

C. Major Airspace Redesign

The airspace redesign projects are projected to deliver benefits realized through the reduction of restrictions, shorter flight distances, more fuel efficient routes, and reduced delays. Airspace Redesign will increase system efficiency by reducing limitations that the airspace places on the system. Congestion, complexity and limited departure points in the current airspace can result in restrictions, limiting airport throughput. Airspace redesign addresses large, complex, multi-facility changes impacting NAS performance. The most significant benefits will be in selected terminal airspace that would benefit from redesign. Airspace redesign will also provide internal FAA benefits. Without airspace redesign, sector splitting and growth in the number of sectors will be the only methods to manage complexity and congestion, increasing operations costs every year.

D. Strategy and Evaluation

This program will provide analytical and simulation tools capable of estimating the operational benefits of NextGen improvements, at the individual airport and system wide. Their widespread use will improve decision-making at FAA and throughout the aviation community. Initial versions of the functioning software have been delivered to the FAA; the capabilities and functionality continued to be enhanced; and the tools are being used to support various on-going analyses at the NAS-wide level as well as at target airports.

The capabilities of the new SWAC have been used to generate all publicly-released estimates of future NextGen benefits. The model will continue to be used in support of the NextGen Implementation Plan, with the addition that realized benefits will be modeled, as well as future benefits of past investments, to help quantify the entire value of NextGen. SWAC has been and is being used to support benefits analyses of various NextGen Programs. For example, the model has been used in support of the business case analysis for the Data Communication program for the En-Route domain. It is also currently being used to support the Satellite and Broadcast Services (SBS) Program Office, and to perform various financial and operational incentive studies.

E. Dynamic Capital Planning

The improved data will lead to better decisions on program implementation and improvements in ATO's performance. It will provide reliable data with an automated tracking and reporting system for F&E projects that will enable decision-makers enhanced use of agency resources. This program will help keep major acquisition programs on schedule and within cost by maximizing limited resources linked to budget information and processes. Managers and engineers will have up-to-date reliable data on F&E projects through the resource tracking program (RTP). Productivity is improved when we support a standardized project management process and have the application emulating current operating procedures.

F. Operational Analysis and Reporting System (OARS)

The American public will benefit from OARS through continued improvement in the safety of the NAS by increasing FAA effectiveness of analyzing safety data and providing proactive/predictive analytic capabilities, which will reduce the risk associated with undesirable events related to Air Traffic Control service provision.

G. Operations Network (OPSNET) Replacement

Benefits expected to accrue to the FAA and the public by implementing OPSNET Replacement include:

- Reduced airline operations cost through improved delay reporting and optimization of operations
- Improved understanding of the impact of existing and new capabilities on delay management through accurate delay benchmarking of performance metrics
- Safer and more efficient flight operations through reduced ATC workload by eliminating manual delay data entry into OPSNET

H. Operational Modeling Analysis and Data

The Operational Modeling Analysis and Data program provides cost avoidance benefits to the FAA because it will eliminate duplication by other programs. The analytics database will allow analyst and model developers to use a single source for operational data needs. The different data sources currently used will already be merged and inconsistencies reconciled. Therefore, reducing the time required to perform analysis and develop systems or component models.

This program also provides flight efficiency/delay reduction benefits to the National Airspace System user community because products produced by this effort will be used to identify when, where, and to what extent delay reduction efforts are needed. The products of this program will also be used to quantify flight efficiency/delay reduction efforts.

I. In Service Engineering

In-service engineering allows tactical distribution of resources in support of all prototyping efforts.

Detailed Justification for - 1A02 NAS Improvement of System Support Laboratory

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – NAS Improvement of System Support Laboratory
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
NAS Improvement of System Support Laboratory	$1,000	$1,000	$1,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Lifecycle Replacement of Infrastructure Items	1	$1,000.0

For FY 2017, $1,000,000 is requested for continued improvements to the laboratory systems and laboratory infrastructure in order to support National Airspace System (NAS) and NextGen programs. The FAA's centralized set of laboratories located at the William J Hughes Technical Center (WJHTC) provide virtually all FAA acquisition programs the infrastructure for research, development, testing, evaluation, and field support. It is necessary to upgrade and improve the supporting laboratory infrastructure and equipment to maintain a laboratory platform capable of supporting these programs.

The Laboratory Master Plan identifies the lifecycle replacement of infrastructure items that should be performed over a 20-year period. The Laboratory Services Division reevaluates the priority list of projects annually to validate needs and review emerging and/or urgent projects which may take priority over planned improvements. Additionally, some improvement projects may be implemented sooner than originally planned because an opportunity existed that would generate short- and long-term savings. For example, a new lab installation is an opportunity to repair raised flooring.

The Lifecycle Replacement of Infrastructure Items covers some of the on-going improvements, such as, transient voltage surge suppression (TVSS) upgrades, raised floor replacements, electrical distribution panel life-cycle replacements, power monitoring in electrical distribution panels, computer air conditioning (CAC) unit replacements, replacement of main lighting panels, and the computer room air conditioning (CRAC) monitoring system.

What Is This Program And Why Is It Necessary?

This program provides for the upgrade and enhancement of Technical Center's Air Traffic Control (ATC) laboratory facilities. The program improves FAA's centralized state-of-the-art laboratory environment supporting the implementation, testing, and integration of new NAS and NextGen systems prior to their delivery to the various FAA field sites.

It is necessary to modify, upgrade, and reorganize the WJHTC's laboratory infrastructure as F&E programs and their supporting systems are delivered, installed, and eventually removed. The laboratory infrastructure encompasses over 210,000 square feet of laboratory space in the main buildings, numerous outlying buildings, and remote sites.

A single, centralized support laboratory eliminates the cost of establishing and maintaining multiple laboratories for each project, program, Service Unit, and Line of Business. Everything needed to test systems in the NAS is in one location which enables integration and reduces the overall cost to the FAA and provides for efficiency and productivity gains.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want / Need To Fund The Program At The Requested Level?

$1,000,000 is required to continue improvements to the laboratory infrastructure that supports NAS programs. This requested funding level was validated by the Laboratory Master Plan and an annual re-evaluation by the Laboratory Services Division projects to determine the priority list that will ensure completion of activity targets.

What Benefits Will Be Provided To The American Public Through This Request?

The American public benefits by having their National Airspace System researched, developed, tested, and evaluated at the world class laboratories at the WJHTC. The goal of this program is to modernize the equipment and infrastructure necessary for FAA's centralized NAS laboratory facilities so that F&E programs can deliver products that result in a safe, reliable, and efficient NAS. The capabilities developed in these laboratories will reduce overall cost of NAS and NextGen development that will increase traveler safety and decrease travel times by reducing airspace congestions.

Detailed Justification for - 1A03 William J. Hughes Technical Center Facilities

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – William J. Hughes Technical Center Facilities
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
William J. Hughes Technical Center Facilities	$12,049	$19,050	$19,000	-$50

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Laboratory Support Services	---	$9,000.0
b. Hardware/Software Licenses and Maintenance Agreements	---	1,300.0
c. Laboratory Space and Infrastructure Consolidation	---	4,200.0
d. Laboratory Equipment Technology Refresh	---	2,200.0
e. Misc Supplies, Repair Parts, Fuel, Land Leases, Pilot Certifications	---	2,300.0
Total	1	$19,000.0

For FY 2017, $19,000,000 is requested to sustain and improve the Air Traffic Control NAS Laboratories and the integrated NAS platform, radar sites, simulation facilities, and flying laboratories with six test aircraft located at the William J. Hughes Technical Center in Atlantic City, NJ.

Laboratory Support Services:

- Infrastructure Engineering and Support including updating of laboratory areas to meet electrical power needs and modifications to existing structures to meet new requirements.
- Flight test support provides customizable flying laboratories to Surveillance Broadcast System (SBS), System Wide Information Management (SWIM), and Aircraft Collision Avoidance System (ACAS) to conduct necessary in-flight testing.
- Technical Services and Laboratory Networking provides an effective networking enterprise solution for the FAA and trusted partners to conduct joint test and evaluation activities.
- Configuration Management is utilized to track and control various equipment and systems during the transition of systems through the Acquisition Management System (AMS) lifecycle.
- Test and Simulation Services and Support provide high fidelity simulations to customers by providing live simulation operators and computer generated targets.

Hardware/Software Licenses and Maintenance Agreements:
Over 103 hardware and software licenses and maintenance agreements are required for the ATC NAS Laboratory equipment each year. Examples include Cisco maintenance, Lutron lighting maintenance, Uninterruptible Battery Supply (UPS) maintenance, AutoCAD License and annual subscription services, Linux, Red Hat, VT Mak, Tivoli Storage Management, Sun Studio, Aircraft Documentation Services, Navigational Database Services, DataLink subscription, etc.

Laboratory Space and Infrastructure Consolidation:
In 2015, the Laboratory Services Division developed a Space and Infrastructure Master Plan that provides for the reconfiguration of the main ATC laboratories encompassing 157,000 square feet. The key component of the plan is to segregate and consolidate operational systems within the laboratory space to provide continuity of operations for Priority 1 systems. The plan also provides for the reduction of electrolytes in the labs by isolating the equipment containing electrolytes. Through reconfiguration of the

laboratories, space will be more efficiently utilized freeing up room for new programs in the labs, such as expansion of the Unmanned Aircraft Systems (UAS) labs, Terminal Flight Data Manager, NAS Voice System, etc. The laboratory space and infrastructure consolidation is expected to be completed in FY 2020 and will improve the overall laboratory functions and infrastructure.

Laboratory Equipment Refresh:
It is imperative that equipment utilized in the laboratories is available for use and in proper operating order. The equipment refresh identifies life-cycle replacement of NAS supporting equipment. An extensive list of equipment replacement items is maintained and prioritized each year.

Miscellaneous:
Miscellaneous items include the land leases for the three radar sites, aircraft fuel in support of F&E flight testing, laboratory and aircraft equipment calibrations, laboratory communications, laboratory cabling, general supplies, pilot recertification and training, and diagnostic equipment.

What Is This Program And Why Is It Necessary?

This program sustains the FAA's centralized set of laboratories located at the William J. Hughes Technical Center where it is necessary to maintain these laboratory systems in configurations and capabilities that match field sites that currently exist or are planned for the future. These laboratories are the only location where it is possible to realistically simulate the NAS. Laboratory integration, test and evaluation activities result in procedures and systems that ensure a safe, secure, efficient, and seamless transition to NextGen. These activities require numerous test beds that can be configured to replicate desired field configuration and traffic scenario, thus providing stakeholders with an understanding of how upgraded systems will perform prior to operational deployment.

These test beds serve a second and equally important role by providing direct field support for Operational NAS systems. Problems identified at various field locations are quickly transmitted to the appropriate laboratory where solutions can be developed and tested by second level engineering personnel.

The Agency's test beds located at the Technical Center are used by virtually all acquisition programs for development, test, evaluation, integration, transition testing, and first and second level support to the field. Partnerships with other agencies include Department of Defense (DOD), Department of Homeland Security (DHS), and National Aeronautics and Space Administration (NASA). The Technical Center laboratories provide support through the Acquisition Management System (AMS) lifecycle from Concepts and Requirement Definition to In-service Decision.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$19,000,000 is required to sustain FAA's laboratory test beds and provide the funding to implement the laboratory space and infrastructure consolidation plan. A stable funding source to sustain the laboratories eliminates the need for each acquisition program to establish and sustain separate laboratory facilities to support their programs and fielded systems and minimizes FAA costs.

What Benefits Will Be Provided To The American Public through This Request?

The goal of this program is to sustain the FAA's centralized NAS laboratory facilities so that F&E programs can deliver products that result in a safe, reliable, and efficient NAS. The capabilities developed in these laboratories will reduce overall cost of NAS and NextGen development that will increase traveler safety and decrease travel times by reducing airspace congestions.

Detailed Justification for - 1A04 William J. Hughes Technical Center Infrastructure Sustainment

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – William J. Hughes Technical Center Infrastructure Sustainment
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
William J. Hughes Technical Center Infrastructure Sustainment	$12,200	$12,200	$12,200	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Building 316 Electrical Substation Replacement (Construction Phase 2/2)	---	$9,400.0
b. Central Utility Plant (CUP) Chiller Replacements (Design 2 and 3)	---	200.0
c. Cup Electrical Switchgear Replacement Design	---	300.0
d. Life Safety Improvements to Five Facilities (Construction Phase 1/2)	---	400.0
e. Mechanical Upgrades to Building 300 (Construction)	---	1,900.0
Total	1	$12,200.0

For FY 2017, $12,200,000 is requested to accomplish the following projects in support of the continued sustainment of the FAA's infrastructure at the William J. Hughes Technical Center (WJHTC):

a. Building 316 Electrical Substation Replacements (Construction Phase 2 of 2)

$9,400,000 is requested to replace three of the five substations in Building 316. The existing substation transformers are more than 20 to 25 years of age and have exceeded the industry lifecycle standard. This project will replace the existing dry type transformers with Cast coil (epoxy encapsulated electrical) cores which have a projected useful life of between 30 and 50 years. The project will also include:

- The reconfiguration of the building's primary electrical distribution system from a serial configuration (one after another) to a radial scheme, thereby improving electrical reliability and facilitating partial planned building electrical shutdowns and preventive maintenance activities
- The provision of an electrical switch house
- The inclusion of the new equipment into the WJHTC's existing electrical Power Monitoring and Control System (PMCS)

Installation of these new substations will improve the reliability of electrical power to not only the laboratory portion of Building 316 but to the WJHTC campus as well. The new substations will also have greater capacities, thus allowing for electrical system/equipment expansion, and will include self-healing networks, thereby enabling automatic electrical power restoration after power outages. Prior year funding supports the design for this project and the installation of two of the building's five substations (Substation Numbers 8 and 11) as well as the installation of the new switch house. This request will support costs associated with the installation of the building's remaining three substations (Substation Numbers 7, 9 and 10).

b. Central Utilities Plant (CUP) Chiller Replacements (Design of Nos. 2 and 3)

$200,000 is requested for the design effort to replace two of the three chillers in the CUP (Building 303). This project will replace two of three 1,000 ton centrifugal refrigeration machines in Building 303, the CUP at the WJHTC. These 1,000 ton centrifugal refrigeration machines provide chilled water for air conditioning to Buildings 300, 301 and 303, including the Building 300 laboratory area, which serves as the National Air Space (NAS) test bed and supports programs such as the Traffic Flow Management Production Center (TPC), FAA Telecommunications Infrastructure (FTI), and the Enterprise Data Centers that support FAA Information Technology (IT) operations. These machines have exceeded their useful life and require excessive maintenance and do not save energy. The new machines will tolerate a lower incoming condenser water temperature, enabling use of an energy saving, free-cooling option.

c. CUP Electrical Switchgear Replacement (Design)

$300,000 is requested for the design effort to replace the electrical switchgear in the CUP (Building 303). The project consists of the replacement of the medium voltage switchgear that supports the heating and cooling of Building 300 equipment. Building 300 is the Technical and Administrative building that house over 500,000 square feet of administrative office space and laboratories that support NAS Level 1, 2 and 3 equipment as well as the telecommunications room supporting the FTI.

The switchgear proposed for replacement was installed when Building 303 was constructed in 1965 and is comprised of parts that are no longer manufactured or supported. In addition, while the CUP is supported by two redundant power sources, the automatic source throw-over system is not functioning, requiring manual intervention in the event of power loss. The new switchgear will be connected to the campus PMCS for autonomous control, metering and status indication and will enable an automatic transfer in the event one power source is lost.

d. Life Safety Improvements to Five Facilities (Construction Phase 1 of 2)

$400,000 is requested for the installation of fire alarm system upgrades to two facilities, Building 27 (Integration/Interoperability Laboratory) and Building 28 (Human Factors Laboratory). The fire alarm systems in these facilities were installed over 20 years ago and have been discontinued. If any component of the current system fails, there are no readily available replacement parts. FAA spare parts to maintain these systems until FY 2017 have been obtained by utilizing salvaged working components from the FY 2015 - FY 2016 construction for the replacement of the Building 300 fire alarm system. An inoperable fire alarm system necessitates evacuation of the affected building, over 200 employees among these buildings or instituting a 24 hour fire watch at increased operating expense. The new fire alarm systems for these facilities will be designed to be compatible with the new fire alarm system scheduled for installation in Building 300 assuring interchangeability of components.

e. Mechanical Upgrades to Building 300 (Construction)

$1,900,000 is requested to replace Heating, Ventilation and Air Conditioning (HVAC) equipment in Building 300. This project was previously funded as part of the FY 2015 enacted budget for Building 300 but needed to be deferred to FY 2017 because of pressing needs to refurbish elevators in Building 300. Recurring elevator malfunctions resulted in repeated personnel entrapments and had to be corrected.

This equipment services various portions of a building encompassing approximately 500,000 square feet. The HVAC equipment is original to the building, is approximately 35 years old and has exceeded the useful life of 20 to 25 years. Some of the spare parts are no longer available. The project also entails the removal and replacement of associated ductwork, piping, valves, controls and other sub-components associated with the installation of the upgraded equipment. Installation of this new HVAC equipment will reduce maintenance and repair expenses currently associated with the existing equipment, provide safer, more reliable operation by the inclusion of new digital controls, provide two new AC units with a projected useful life of 25 to 30 years and increase energy efficiency.

What Is This Program And Why Is It Necessary?

The WJHTC owns and operates approximately 1.6 million square feet of test and evaluation, research and development, and administrative facilities, plus numerous project test sites. The current value of the buildings and infrastructure is in excess of $400 million. The WJHTC must keep the Central Utilities Plant (CUP), utility distribution systems, and the infrastructure supporting these facilities in operating order. The

WJHTC must also comply with International Building Codes, the National Fire Codes (NFC), the Americans with Disabilities Act (ADA) and current energy policies. Accordingly, these facilities require an annual program of capital improvements and modernization.

Infrastructure providing and sustaining a suitable, reliable environment (i.e. power, cooling, etc.) for the WJHTC's 24x7x365 operations is necessary to support mission crucial systems hosted at the WJHTC, such as Traffic Flow Management Production Center (TPC), FAA Telecommunications Infrastructure (FTI), and the Enterprise Data Centers that support FAA Information Technology (IT) operations. In addition to these operational systems, the WJHTC 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 National Air Space (NAS) systems (e.g., En Route Automation Modernization (ERAM), Standard Terminal Automation Replacement System (STARS), and Advanced Technologies and Oceanic Procedures (ATOP) so that they will perform in a proper environment and provide enhanced safety and reliability to the greater NAS/FAA system. Other facilities at the WJHTC support numerous Capital Investment Plan (CIP) projects affecting security, automation, communication, navigation and landing, and surveillance programs. The improvements made to the WJHTC facilities support the aforementioned projects as well as providing indirect support toward achieving the FAA's mission and its performance targets.

This program also provides indirect support to certain NextGen Research and Development (R&D) programs by sustaining the R&D facilities. Examples of these programs are the Fire Research and Safety Program, the Aircraft R&D Program, the Propulsion/Fuel Systems Program and the Flight Safety Program.

Finally, this program provides exterior infrastructure support to other governmental agencies residing at the WJHTC. These agencies include the Coast Guard, Federal Air Marshal Service, Transportation Security Laboratory, South Jersey Transportation Authority and the New Jersey Air National Guard.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$12,200,000 is required to replace electrical substations at Building 316, design the replacement of 2 of 3 chillers in the CUP (Building 303), design the replacement of electrical switchgear in the CUP (Building 303), install new fire alarm systems in Buildings 27 and 28, and install new HVAC equipment in Building 300.

This program decreases maintenance costs associated with the need to upkeep aging infrastructure components, decreases operating costs associated with the need to utilize existing energy inefficient systems and construction, and significantly decreases the risk of infrastructure failures occurring, supporting operations of the mission crucial systems.

What Benefits Will Be Provided To The American Public Through This Request?

Infrastructure sustainment at the WJHTC reduces expenses associated with ongoing operation and maintenance activities as well as the frequency of expenses associated with system replacement. System updates reduce energy consumption, and cost, on a per-square-foot basis, thus supporting current Federal Energy Management requirements for sustainability and energy consumption. This program incorporates best business practices and industry standards so that the taxpayer is assured that infrastructure improvements designed and constructed under this program are implemented in an efficient and consistent manner.

Detailed Justification for - 1A05 NextGen - Separation Management Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Separation Management Portfolio
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Separation Management Portfolio	$13,000	$31,500	$25,800	-$5,700

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ADS-B In Applications – Flight Deck Interval Management	---	$4,000.0
B. Modern Procedures	---	3,000.0
C. Alternate Positioning, Navigation and Timing	---	1,000.0
D. Wake Turbulence Re-Categorization	---	1,800.0
E. Oceanic Tactical Trajectory Management	---	500.0
F. Unmanned Aircraft System (UAS) Concept Validation/Requirement Dev	---	9,000.0
G. Separation Management Concepts and Analysis	---	1,500.0
H. Reduced Oceanic Separation	---	1,000.0
I. Separation Automation System Engineering	---	4,000.0
Total	Various	$25,800.0

The Separation Management portfolio conducts pre-implementation activities to reduce risk, and implementation activities supporting the safe and efficient separation of aircraft and other vehicles in the National Airspace System (NAS). Risk reduction activities may include validation of concepts or technologies; demonstration and integration of operational capabilities; and an understanding of the role of the human through cognitive engineering experiments. Separation Management evaluates and matures concepts and capabilities that focus on the enhancement of separation assurance through the use of both ground based automation and aircraft technology enhancements. Separation Management improvements will provide air traffic controllers with tools and procedures to separate aircraft with different kinds of navigation equipment and wake performance capabilities.

A. ADS-B In Applications – Flight Deck Interval Management

For FY 2017, $4,000,000 is requested to provide the following:

- Develop the following products in support of Interval Management – Spacing Arrivals, Approach, & Cruise (IM-S AA&C) Final Investment Decision (FID):
  - Business Case documentation
  - Implementation Strategy and Planning Document
  - Acquisition Program Baseline
- Complete revised draft of the RTCA Special Committee 186 (SC-186) navigation and communication integration requirements for Flight-deck based Interval Management (FIM) Minimum Operational Performance Standards (MOPS) v2 for Advanced Interval Management (A-IM)

B. Modern Procedures

For FY 2017, $3,000,000 is requested for prototyping for accuracy of aircraft trajectory modeling. FAA will use advanced Kinetic Vertical Modeling (KVM) techniques involving aircraft characteristics, accuracy of trajectory modeling when aircraft turns, and complete trajectory modeling based on runway assignment. The following capabilities and activities aim to enhance Separation Management automation and provide usable decision support tools that will allow controllers to more efficiently use available airspace by identifying potential conflicts or other complications on an aircraft's planned flight path and facilitate trajectory changes if advised:

- 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

C. Alternative Positioning Navigation and Timing (APNT)

For FY 2017, $1,000,000 is requested to provide the following:

- Complete "As-Is" system analysis of applicable ATM/Decision Support systems for airspace reconfiguration to meet demand constraints
- Complete knowledge elicitation report of existing automation/technical capabilities to dynamically reconfigure ATM automation infrastructure to meet operational needs

D. Wake Turbulence Re-Categorization (RECAT)

For FY 2017, $1,800,000 is requested to provide the following:

- Complete development of the RECAT Phase II Pair-Wise Static wake separation standards software adaptation and key site (TRACON/ATCT) training for implementation
- Initiate the feasibility description of dynamic wake separation standards (RECAT Phase III) 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 need for and benefits of the RECAT Phase III dynamic wake separation standards

E. Oceanic Tactical Trajectory Management

For FY 2017, $500,000 is requested to provide the following:

- Complete technology transfer package of trajectory coordination capabilities analyzed in the OTTM Benefits Analysis

F. UAS Concept Validation and Requirements Development

For FY 2017, $9,000,000 is requested to provide the following:

Program Management activities that include:
- Conduct Investment Analysis and Business Case development
- Finalize Spectrum Management Alternative Analysis
- Finalize command and control (C2) ground Infrastructure Alternative Analysis
  UAS C2 Solution Space Analysis activities:
- Continued analysis of the UAS C2 solution space
- Conduct Systems Engineering Trade Studies to determine most cost effective method for providing industry access to the UAS Command and Control allocated spectrum in the C and L band
- Identify FAA spectrum needs
  UAS Concept Maturation activities:

- Review and refine the UAS NAS Impact Analysis results based on revised projected service demands, results from FY 2016 Human-in-the-Loop (HITL) trials simulations, etc.
- Conduct HITL trials and simulations based on the UAS Concept Maturation Plan, identifying new operational requirements and potential concept maturation needs
- Develop preliminary Computer Human Interface (CHI) requirements documents
- Update preliminary functional analyses
- Update safety assessments
- Update operational requirements database
- Develop plans for HITL trials and simulations for the next round of concept validation in accordance with the UAS Concept Maturation Plan

G. Separation Management Concepts and Analysis

For FY 2017, $1,500,000 is requested to conduct concept validation and Human Factors evaluation of future Separation Management concepts:

- Vertical Conformance Verification (VCV) concept development and analysis will develop a reliable, repeatable, and verifiable method for obtaining and monitoring real-time aircraft vertical rate descent and climb. In addition, VCV will provide:
  - Improved vertical rate information will support FAA ability to safely monitor aircraft conformance to a defined and assigned vertical path which will enhance the efficiency of the use and assignment of transition airspace
  - Ultimately resulting in quantifiable improvements in airspace optimization and procedures

- Human Factors areas of interest focuses on performance engineering and analysis of future separation management capabilities that will provide:
  - The ability to more accurately monitor the climb and decent rate of aircraft resulting in both operational and system efficiency benefits
  - Assess human performance risks associated with the increasing number and types of automation and decision support tools being implemented simultaneously at any one workstation

H. Reduced Oceanic Separation

For FY 2017, $1,000,000 is requested to provide the following:

- Complete Test and Evaluation of ATOP upgrades to support the Initial Capability
- Conduct ICAO and FAA Safety Assessments
- Develop the following draft products in support of FY 2018 FID:
  - Final Program Requirements (fPR) Document
  - Enterprise Architecture Products
  - Business Case Documentation
  - Final Implementation Strategy and Planning Document (ISPD)
  - Acquisition Program Baseline (Execution Plan)

I. Separation Automation System Engineering

For FY 2017, $4,000,000 is requested for the capabilities listed below and the required engineering activities to validate them as both viable and necessary additions to the NAS across the En Route, Oceanic and Terminal domains. The continuous growth of aircraft movement both in the air and on the ground is projected to exceed the capacity of the current system, resulting in delays and gridlock. New ATC concepts and automation capabilities in the En Route, Terminal, and Oceanic domains will assist controllers in maintaining safe aircraft separation while optimizing the use of available system capacity. This program will focus on the following:

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

What Is This Program And Why Is It Necessary?

A. ADS-B In Applications – Flight Deck Interval Management

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

The Surveillance and Broadcast Services Office is maturing the requirements definition of a suite of ADS-B In IM applications and will pursue a series of Final Investment Decisions (FID) as each application or set of applications are deemed suitably defined for implementation. Pre-implementation activities and AMS milestones through FID for ADS-B In Applications – IM are funded under this program. Post FID implementation activities will be funded and executed under ADS-B NAS Wide Implementation - Future Segments. FID for the first set of ADS-B In Applications, IM-S AA&C is scheduled for the first quarter of FY 2018.

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

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

A-IM dependent runway, departure and oceanic operations, and other future concepts along with the associated avionics standards will be developed with RTCA and the user community. An Initial Investment Decision (IID) for ADS-B In A-IM is scheduled for the first quarter of FY 2019; and a FID for ADS-B In A-IM is scheduled for fourth quarter of FY 2020.

IM-S AA&C will utilize existing runways, air routes, and traffic flows more efficiently by reducing inter-aircraft spacing inaccuracies and buffers which translates to reduced delays [current and future (from projected increase in operations)]. A-IM applications are expected to introduce new air-to-air separation standards (which will also help to reduce delays).

B. Modern Procedures

Separation Management automation enhancements include concepts and technologies, performance enhancements to existing automation functions, deployment, and operational use of ERAM and predecessor systems (e.g., Host, User Request Evaluation Tool (URET), Display System Replacement (DSR), etc.) Pre-implementation activities include operational and technical risk reduction, and acquisition artifact development. Modern Procedures includes all Air Traffic Control (ATC) automation capabilities that assist controllers in maintaining safe aircraft separation while optimizing use of airspace capacity. This project will apply pre-implementation processes to define, prioritize, sequence, and transition to implementation of the Radar-Side (R-Side) and Data-Side (D-Side) controller capabilities and technology enhancements.

Categories of Modern Procedures automation enhancements to be addressed include:

- Radar Controller Position (R-side) Automation Capabilities
- Data Controller Position (D-side) Automation Capabilities
- Flight Data Display and Data Entry Capabilities
- Strategic Conflict Detection Improvements
- Automated Conflict Resolution
- Technical Performance and Trajectory Prediction Accuracy Enhancements

As demand has grown, especially in the airspace surrounding and between major metropolitan areas, the current fixed airspace routings and large separations limit airspace capacity and tactical management of major flows. En route congestion has become a major constraint on the system, as the inflexibility of the system to airspace adjustments makes tactical flow, in the face of demand, congestion, or major weather disturbances, difficult. Due to the limitations in automated prediction capability and voice communication, separation standards remain fixed and conservative, which restricts capacity to the overall system. Modern Procedures includes a series of automation upgrades and improvements in the strategic En Route conflict probe (CP), the tactical conflict alert (CA), and display enhancements. Developing new automation CP and CA algorithms, and changing the controller workstations to support the new information will:

- Increase NAS safety and efficiency,
- provide controller situational awareness on both R-side and D-side, and
- identify and apply efficient separation criteria during busy operations while decreasing controller workload.

C. Alternative Positioning Navigation and Timing (APNT)

The Alternative Positioning, Navigation, and Timing (APNT) program is conducting research into alternatives for providing a back-up for Global Positioning System (GPS) based position, navigation, and timing (PNT) services. GPS PNT services enable Performance-Based Navigation (PBN) and Automatic Dependent Surveillance Broadcast (ADS-B) services which are necessary for Trajectory-Based Operations (TBO), Area Navigation (RNAV), Required Navigation Performance (RNP), and other NextGen improvements. Presidential Policy Directive 21 (PPD-21) and National Security Presidential Directive 39 (NSPD-39) require that the FAA establish a resilient backup in the event of a GPS outage or interference event to maintain safety and security and prevent a significant economic impact in the NAS. The objective of the NextGen APNT program is to provide critical PNT services if GPS services become temporarily unavailable so that users can seamlessly continue RNAV and RNP operations to a safe landing.

The FAA currently relies on existing legacy systems including Very High Frequency Omnidirectional Range (VOR), Distance Measuring Equipment (DME) and Tactical Air Navigation (TACAN) as a back-up to GPS navigation, but these systems do not fully support RNAV, RNP or TBO. The NextGen APNT program will continue identifying operational requirements and concepts that could leverage alternatives to be evaluated.

D. Wake Turbulence Re-Categorization

The RECAT project develops wake separation standards that provide increased airspace and airport throughput capacity without aircraft equipage costs or runway expansions. This project has been part of a joint EUROCONTROL and FAA program that had reviewed the then required wake mitigation aircraft separations used in both the USA's and Europe's air traffic control processes and determined the those standards could be safely modified to increase the operational throughput capacity of airports and airspace that will have heavy operational demand in the NextGen era. Associated work is incorporating new aircraft (i.e. Boeing 787, Airbus A-350, Boeing 747-8 and others) in this ongoing development of safe but throughput capacity efficient wake separation standards.

The first output from this project has been the adoption and implementation of RECAT Phase I wake separation standards that were based on years of wake data collection by the NextGen - Wake Turbulence research project and were optimized for runway throughput capacity for airports that had a large percentage of Heavy wake category aircraft operating to and from the airports. In November 2012, RECAT's Phase I Six Category wake separation standards began use by FAA air traffic control at Memphis International Airport (MEM). Their use had an immediate impact on the operations of FedEx, the major user of MEM in the evenings and early mornings. FedEx saw their usual queues for departures shrink to near zero, taxi out times decreased by three to seven minutes depending on the runways being used and were able to send six additional departures per hour per MEM runway. FedEx also experienced faster transit through the MEM airspace resulting in two to six minutes decrease in transit time, saving 300 pounds of fuel per aircraft per minute.

Delta Air Lines saw similar gains when RECAT Phase I was implemented at the Hartsfield-Jackson Atlanta International Airport (ATL) in June 2014. Taxi times were reduced 30 seconds to 2 minutes and aircraft spent 30 seconds to 1 minute less time in the terminal airspace. Delta has equated these operating time reductions, in October 2014, to yearly cost savings to them of $14.8 million (low side) to $38.1 million (high side).

The RECAT Phase II of the project will finish development in FY 2017. Phase II standards will provide the runway throughput optimal wake separation standards/procedures for Core airports that have different fleet mixes than the airports that implemented and received benefit from the RECAT Phase I wake separation standards. It is expected that the use of the Phase II standards will increase the runway throughput capacity by seven percent to 10 percent for those Core airports, allowing more flights into and out of these airports during periods of peak air carrier operations. Also in FY 2017, the RECAT project will begin detail definition of the procedures and required supporting prototype decision support tools for the NextGen envisioned dynamic wake separation standards. This development will be based on the dynamic wake separation concept products of the R, E&D funded NextGen – Wake Turbulence research project.

E. Oceanic Tactical Trajectory Management

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. Oceanic Trajectory Management in Four Dimensions (OTM-4D) is the OTTM mid-term concept. 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 support more efficient trajectory management and that allow sharing additional information between the FAA and airspace users in a collaborative arrangement to improve the oceanic phase of flight.

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 flight 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.

The current flight data management system and the current navigation systems do not support the flexibility that is needed from both a planning and execution perspective. Trajectory management means that true 4-D trajectories can be exchanged and monitored, and the system can support the exchange of multiple alternative trajectories in both separation management and tactical flow. This requires a capability beyond that of the current flight plan, which was developed in an era of human only interpretation and planning. Trajectory management and full use of the airspace also requires that aircraft can navigate off fixed routes and that new routes can be developed and published with minimum distances between.

OTTM will conduct research and development to provide enhanced User Trajectory Planning through coordination capabilities. 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 flights entry into oceanic airspace about the likelihood of achieving that trajectory based on other oceanic flights intended trajectories. 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. These capabilities will improve flight planning and execution by strategically maximizing the performance of the aircraft and optimizing the use of the airspace.

F. UAS Concept Validation and Requirements Development

The UAS Concept Validation and Requirements Development Program conduct the overall analysis and planning for the development, integration, and subsequent implementation of emerging UAS enabling technologies. The program executes concept development, engineering analysis, and evaluation in support of mission analysis and investment analysis activities. This program also conducts shortfall analyses as part of service analysis and ensures the linkage of proposed solutions back to validated operational needs. This Program will continue to identify and mature concepts and capabilities to facilitate the safe and timely integration of UAS into the NAS.

UAS operations have increased dramatically in both the public and civil sectors. This proliferation consequently introduces greater operational risk and exposure to the users of the National Airspace System (NAS). As such, air traffic products, policies, and procedures must be reviewed and refined, or newly developed through supporting concept maturation work to permit safe UAS operations, alongside manned aircraft operations.

An essential element to UAS integration involves addressing UAS command and control (C2). The UAS program will identify and assess alternative business models and acquisition strategies to determine the best approach to implementing a governing framework for C2 business elements and Spectrum management. Advanced planning is essential to incorporate automation enhancements and develop necessary technology to support UAS integration needs. The need for new capabilities, mitigations, and verification and validation methods to enable safe UAS operations will require the development, integration, and implementation of emerging technologies. These new technologies may include communications, surveillance, and automation changes to support continued evolution of UAS in the NAS. Challenges associated with integrating UAS in the NAS include the inability of UAS to comply with traditional see and avoid requirements, unique communications needs, lost link procedures, and other issues which dictate that concept engineering activities address all aspects associated with UAS integration.

Successful integration of UAS into the NAS provides benefits to both public and civil users. Studies indicate benefits when UAS are used in missions related to agriculture, search and rescue, border protection and pipeline monitoring among other applications. These public and civil users, as well as the general public and commercial and general aviation (GA), benefit from the work being conducted under this Program since it leads to safe UAS integration.

G. Separation Management Concepts and Analysis

As NextGen evolves, precise trajectories will require accurate monitoring capability to maintain consistent or increasing levels of airspace efficiency and safety. Vertical Conformance Verification (VCV) studies the proposition that the transfer of real-time vertical rate information (to ATC from an aircraft) will better support the ability of ATC to monitor an aircraft's vertical conformance to the clearance.

Products developed by this program include: concepts of operations; reports documenting findings of fast-time and real-time concept validation studies; operational requirements associated with validated concepts; shortfall and benefits analyses; human performance analyses; and safety assessments. This program will support an increase in the effective throughput of the NAS by providing analysis and recommendations to NextGen procedures and policies that facilitate the balance between capacity and demand.

Research efforts to provide accurate and instantaneously verifiable vertical conformance information to ATC may yield the following benefits:

- Increasing the volume of usable airspace in congested areas
- Enhancing system efficiency by maximizing the benefit of RNP routing
- Decreasing ATC workload and frequency congestion
- Increased safety via enhanced situational awareness

H. Reduced Oceanic Separation

The Reduced Oceanic Separation (ROS) Program will increase the use of 30/30nm separation and potentially reduce separation to 15/15nm (or less) in Oceanic Flight Information Regions (FIRs). Oceanic and remote domestic airspace is different from the rest of the NAS due to current limitations in surveillance, navigation, and communication capabilities. Enhancing surveillance and communication capabilities can provide significant improvements to air navigation services by reducing separation minima for optimum routing or new air routes for increased airspace capacity. The performance of required communications, navigation, and surveillance equipment must be capable of providing the overall accuracy necessary for reducing separation standards. The ROS program will reexamine current limitations to reducing oceanic separation standards.

The program consists of two phases, detailed below:

- Reduced Oceanic Separation (ROS) Initial Capability – The procurement of oceanic service volumes through the SBS Program and ingesting and processing the space-based ADS-B data in the ATOP automation system for use in:
  - Separation Services: ADS-B reinforces ADS-C, and is used as another surveillance layer for providing 30/30 nautical mile (nm) separation services
  - Situational Awareness, and Search and Rescue
  - Reduced Oceanic Separation (ROS) Full Capability – Analysis of the FANS 1/A and Space-Based ADS-B options for reducing oceanic separation standards

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

A JRC Strategy Decision took place on July 15, 2015. Two approvals were granted at this meeting:

- Approval to use FY 2016 CIP funding to begin software development of ATOP enhancements, and the Program will proceed to a Final Investment Decision (FID) in the third quarter of FY 2016 to baseline the ROS Initial Capability concept
- Approval to seek an Initial Investment Decision (IID) and Final Investment Decision on the ROS Full Capability

I. Separation Automation System Engineering

Separation Automation System Engineering will refine and validate NextGen capabilities that will improve separation management automation tools for air traffic controllers (ATC) in the Oceanic, En Route and Terminal domains. It will reduce the risks inherent with introducing new technology and operational procedures using System Engineering analysis that examines the integrated use of proven techniques and equipment necessary to maintain safe separation. System engineering techniques such as analysis, simulation and modeling, part task analysis, and human-in-the-loop (HITL) simulations will identify, assess, and validate the impact of new technology and operational procedures on the NAS infrastructure. Throughout the product development lifecycle for NextGen Separation Automation systems, any required changes will be determined and specific products created to support the investment decision process for implementation of these changes.

This program will dramatically increase the effectiveness across automation platforms, and reduce the resources necessary to mature Separation Management capabilities for implementation handoff.

DOT Strategic Goals – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$25,800,000 is required to evaluate and mature concepts and capabilities that focus on the enhancement of separation assurance through the use of both ground based automation and aircraft technology enhancements. Separation Management improvements will provide air traffic controllers with tools and procedures to separate aircraft with different kinds of navigation equipment and wake performance capabilities. The program will enhance system capacity, efficiency, and ensure safe aircraft separation while reducing workload for controllers and flight crews.

What Benefits Will Be Provided To The American Public Through This Request?

Enhancements to Separation Management will provide controllers with tools and procedures to manage aircraft in a mixed environment of varying navigation equipment and wake performance capabilities. Separation management in the National Airspace System (NAS) can be accomplished procedurally and/or by using automation support. Through this request, both procedure and automation support will be enhanced, thus improving safety, increasing operational efficiency, and expanding current capabilities throughout the NAS. Separation management is performed in a different way in each of the domains. New wake turbulence categories will provide controllers with new guidance on how to procedurally apply wake turbulence separation criteria in certain situations, primarily for arrivals and departures, thus improving efficiency. The automation changes required will assist controllers in performing separation management for specific conditions and types of operations in their respective domains, improving both efficiency and safety. In general, capabilities in this portfolio will enhance aircraft separation assurance by safely reducing separation between aircraft, and as a result improve capacity, efficiency and safety in the National Airspace System.

Capacity - Capabilities in this portfolio will support an increase in capacity by increasing airport throughput as a result of closer spacing of flights accepted from TRACON airspace and managed on final approach. Automation capabilities will also enable air traffic controllers and pilot through reduced separation between aircrafts to manage increasing traffic levels in oceanic airspace.

Efficiency - This portfolio will provide improved efficiency through the introduction of capabilities that will enable more oceanic flights to ascend and descend to their preferred altitudes. Controllers will also be able to approve additional pilot requests for direct routes and more efficient altitudes.

Safety - This portfolio will provide controllers automated information about wake vortex separation requirements for any given aircraft pair, along with accurate wind data which will help predict more accurate and safer separation standards.

Detailed Justification for - 1A06 NextGen - Improved Surface Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2016 – Improved Surface Portfolio
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Improved Surface Portfolio	$0	$2,000	$2,000	$0

Note: TFDM Program moved to BLI 2B18 as program has moved to the Implementation Phase. FY 2015 and FY 2016 Numbers have been changed for comparability purposes.

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Surface Tactical Flow (STF)	---	2,000.0

The Improved Surface portfolio conducts pre-implementation activities to reduce risk and implementation activities supporting the TFDM System. The work will focus on the development of efficient traffic flow management and collaborative decision making on the surface by providing a key ground infrastructure program for NextGen mid-term operations. It provides all of the data and tools currently available to controllers, as well as emerging capabilities such as departure metering, virtual queuing, runway load balancing, Electronic Flight Data (EFD), and shared situational awareness of the surface traffic for all the Terminal Radar Approach Control (TRACON), Air Route Traffic Control Center (ARTCC), and Command Center. Improved surface operations are further supported by research efforts within this portfolio, which includes evaluating the benefits and viability of emerging tools, operational demonstrations, and cognitive engineering to better understand and mitigate impact to humans.

For FY 2017, $2,000,000 is requested to provide the following:

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

The project will continue evaluation of emerging concepts and perform risk reduction activities on technologies that will support future improvements for TFDM. Done in collaboration with NASA's ATD-2, these efforts will produce new improvements that will increase TFDM, Traffic Flow Management System (TFMS), and Time Based Flow Management (TBFM) connectivity and integration.

What Is This Program And Why Is It Necessary?

The goal of STF is to mature new surface capabilities that make air transportation safer and more reliable while improving the capacity of the NAS and reducing aviation's impact on the environment. The program:

- Identifies remaining surface shortfalls at the busiest airports
- Performs evaluation activities to mature emerging technologies and validate the capabilities to address the shortfalls

- Analyzes benefits of surface capabilities

This program provides guidelines for the development of a collaborative Surface Traffic Management (STM) system with 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. Surface Tactical Flow addresses and meets the rapidly changing needs of the aviation industry, by introducing innovative concepts and technologies in the air traffic system and conducts risk reduction activities for implementing programs.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The required funding is needed to support the collaboration between NASA, public/private industry partners, customers, and operators in the evaluation of surface technologies and decision support tools.

What Benefits Will Be Provided To The American Public Through This Request?

This portfolio focuses on gaining efficient flow and management of aircraft on the surface at selected metroplex airports and the complex terminal airspaces within the NAS. High density airports typically see higher demand for runway capacity, operate multiple runways, and have complex airspace and ground interactions in the arrival and departure phases of flight. The surface capabilities being researched and implemented in this portfolio are expected to improve both the efficiency of individual flights while optimizing runway throughput. This work will make travel safer for the traveling public, help reduce passenger delays leading to a better traveling experience, and contribute to less pollution.

Detailed Justification for - 1A07 NextGen – On Demand NAS Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – On Demand NAS Portfolio
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
On Demand NAS Portfolio	$6,000	$11,000	$8,500	-$2,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Flight Object	---	$2,000.0
B. Common Status and Structure Data	---	1,500.0
C. Flight Objects Exchange Services	---	3,000.0
D. Dynamic Airspace	---	1,000.0
E. Advanced Method	---	1,000.0
Total	Various	$8,500.0

The On Demand NAS Information (ODNI) portfolio conducts pre-implementation to reduce risk activities supporting the exchange of information between FAA and other National Air Space (NAS) users. The portfolio provides flight planners, Air Navigation Service Providers (ANSP) staff, and flight crews with consistent, complete, and easily processed information on changes of conditions in the NAS affecting safety, security, and efficiency. The ODNI portfolio examines concepts and matures capabilities through validation activities, demonstrations conducted with stakeholders, and human systems engineering to mitigate adverse impacts and to exchange information efficiently and securely between FAA and NAS users. Current tools in the NAS do not share objectives for flights, nor do they have a common picture of the structure and status of the NAS. The On Demand NAS services provided by NextGen will provide flight operators the necessary standardized information to plan and coordinate flights to the maximum extent possible.

A. Flight Object

For FY 2017, $2,000,000 is requested for continuation of work that identifies data elements critical to describing a flight in a standard format for Air Traffic Management (ATM) system information exchange and provides engineering development of the Flight Information eXchange Model (FIXM). FIXM is the standard format that a Flight Object message is sent between systems that allows more users to share flight information and coordinate on the various activities concerning a flight. This program also assists new users in adopting FIXM and recommends new data elements and changes to the FIXM Core and US specific extension. FY 2017 funded work will include:

- Accommodate maintenance updates to FIXM Core v4.0 to reflect corrections/modifications as a result of FF-ICE/1 Implementation Guidance and early user review
- Develop updated US Extension to support v4.0 maintenance release.
- Participate in the development of a FIXM NAS Implementation Strategy for transitioning from today's ATM environments to the full implementation of FIXM. This strategy will provide a projected overview on which NAS System will implement FIXM at what time frame. FIXM must ensure it is prepared to accommodate the systems to be transitioned.

- Conduct an assessment for the NAS FIXM messaging guideline for constructing and exchanging FIXM compliant messages for various NAS data exchanges

B. Common Status and Structure Data

For FY 2017, $1,500,000 is requested to fund work that focuses on the development of requirements for machine to machine information exchange using standard formats for aeronautical information. This program will work toward maturing the Aeronautical Information eXchange Model (AIXM) which is the internationally accepted standard for describing aeronautical information.

- $1,000,000 is requested to support an Investment Analysis Readiness Decision (IARD) for AIMM Segment 3 in the second quarter of FY2017
- $500,000 is requested to provide support for:
  - AIXM Standards Development – Identify and develop new data elements for inclusion in the next version of AIXM Core and/or US Extension
  - AIXM Collaboration – Collaborate with other ANSPs, airspace users, and industry via established coordination plans, AIXM configuration control board, and conferences to make certain that all organizations have participated in standards development

C. Flight Object Exchange Services

For FY 2017, $3,000,000 is requested to support the Flight Object Exchange Service (FOXS), which is envisioned to be the flight object management capability that will create a flight object message and determine the proper routing for that message to the various ATM systems and external users that require or want access to flight object messages. FY 2017 funding will include Engineering and investment analysis planning to incorporate FIXM changes into FOXS as well as supporting an Investment Analysis Readiness Decision (IARD) in FY 2017 for FOXS.

D. Dynamic Airspace

For FY 2017, $1,000,000 is requested to support Dynamic Airspace, which will provide a way to dynamically reconfigure ATM equipment and airspace sectors to better meet user demand and facility capabilities. It will also provide a method for transferring airspace sectors to adjacent facilities to balance demand with facility capabilities. FY 2017 work will include Planning for, execution of, and documenting the results of an initial Human in the Loop (HITL) simulation and updating the Concept of Operations, based on those findings.

E. Advanced Methods

Advanced Methods is a pre-implementation engineering analysis and requirements program that addresses shortfall areas identified by ATO programs and provides possible solutions to future ATM system work packages. Specifically Advanced Methods is focusing on addressing shortfall areas identified in the Traffic Flow Management (TFM) Shortfall Analysis which was coordinated with industry partners. The capabilities currently undergoing engineering analysis include Constraint Prediction, Monitoring and Alerting, Operational Response Development, and TFM System Performance Analysis. For FY 2017, $1,000,000 is requested to provide the following:

- Concept Validation Activities - Prototyping/Evaluations/HITLs/Reports for:
  - Monitoring and Alerting
  - TFM System Performance Analysis Capability

What Is This Program And Why Is It Necessary?

A. Flight Object

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.

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 an International data exchange standard for the Flight Object. The FIXM content is driven and managed by the International community and will be used globally. This data standard will support the improved exchange of flight information between systems across multiple domains (including both NAS and International systems) enabling increased operational efficiency and increased situational awareness. The FIXM core standard is released on a regular cycle, with updates to add/delete/modify data elements as necessary in every cycle. The FIXM extension that supports US NAS data elements is released on a 12 month cycle. 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).

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

To ensure that FIXM is compliant with the international standard known as Flight and Flow Information for a Collaborative Environment (FF-ICE/1) and the current NAS flight data needs, the messaging and data analysis activity has been focusing on traceability between FF-ICE/1 and FIXM Core, and NAS flight data interfaces and FIXM Core and US Extension. FF-ICE/1 traceability will identify potential data items to be reviewed by the development team. The NAS flight data interface analysis began with the ERAM flight data interfaces and continues with the STARS and ATOP flight data interfaces.

Since FIXM v4.0 will be FF-ICE/1 compliant, it is expected to be embraced globally as the new flight data standard. As such, the user base is expected to grow, bringing with it a larger need for user support. Additionally, the use of FIXM and the new FF-ICE/1 provisions defines the need for globally acceptable flight data messaging, which is being designed and coordinated starting in FY16. As the user base grows, so too is the need for FIXM maintenance updates to resolve newly discovered problems.

B. Common Status and Structure Data

The Common Status and Structure Data (CSSD) program will establish the requirements and information flows for the collection, management, and maintenance of aeronautical information in a digital format for machine to machine exchange. The common data and information services and integration activities enable improved flight planning and pilot briefing services, increased on-demand NAS operational performance information, and better airspace management using timely schedule information and a common awareness of Special Activity Airspace (SAA) status across the NAS. This program enables the FAA to improve situational awareness through improved access to aeronautical information. A common language is used so that external users (DoD, Airline Operations Centers, Flight Operation Centers, pilots) and Air Navigation Service Providers (ANSPs) can make more informed decisions and plans based on the most current information available with regard to planned airspace constraints (e.g. SAA etc.), airport configuration, static airspace constraints, and Notices to Airmen (NOTAMs) affecting the NAS.

Key elements of the CSSD program include:

- The Aeronautical Common Services (ACS) platform, implemented as part of Aeronautical Information Management Modernization (AIMM) Segment 2, will be used to ingest data from the authoritative databases, process and combine data from these multiple sources, and distribute the data via the System-Wide Information Management (SWIM) infrastructure. The combination of the ACS, SWIM network, and authoritative NAS databases will provide an enterprise level platform for accessing and delivering both (1) the authoritative data and/or (2) products created from multiple authoritative data sources.
- Capturing and maintaining digital information about flow constraints, reference data, and NAS status information affecting operations
- Publishing aeronautical status information digitally using international standards
- Providing value added services using aeronautical status information such as fused airspace, NOTAMs, and airport reference data in a common data model for improved flight planning and briefing services. Examples of value added services are: aeronautical information visualization/mapping, relational filtering (e.g. airspace affected by a given NOTAM, Standard Operating Procedures/Letter of Agreement (SOP/LOA) constraints affecting a given geographic location, and airspace affected by SAA Schedule and Status)
- Using the SAA schedule, status and legal description information to improve operational performance metrics calculations and forecasting of airspace system performance

Additionally, CSSD will focus on development of the Aeronautical Information Exchange Model (AIXM). AIXM is an international standard for the representation of aeronautical information for the aviation community. It is designed to enable the management and distribution of aeronautical information amongst systems, providing fully digital harmonized aeronautical environment to support air traffic operations both within the NAS and international airspaces. This program manages the evolution of AIXM, ensuring the applicable aeronautical data used by the ANSP is represented correctly in AIXM through development of the AIXM core and extension artifacts (conceptual model and XML schema), and consistent collaboration amongst FAA stakeholders and international aviation partners, such as other ANSPs and the flying community. By doing so, this program supports:

- Global harmonization and FAA leadership in the international arena, to include representing the FAA on the international AIXM Change Control Board
- The implementation of NextGen, as AIXM is the language that enables the exchange of aeronautical data (via the System Wide Information Management program) between data producers (e.g. NOTAM Distribution Service) and data consumers (e.g. Air Traffic Systems, Aircrew)
- Enhanced access to and management of aeronautical data by all aviation stakeholders

C. Flight Object Exchange Services

In addition to the FIXM standard, an automation to manage the ownership and exchange of flight data is required. Flight Object Exchange Services (FOXS) will establish the architecture and NAS interface changes to transition to a modernized flight data exchange automation infrastructure necessary to support NextGen capabilities. Flight data exchange based on the legacy flight plan is currently supported in the NAS but lacks the enhanced information about a flight that ANSP's can use to coordinate flight activities. FOXS will work with the existing NAS systems to analyze the needs and define a new, updated flight data automation infrastructure.

FOXS is intended to be the service used by the NAS for routing information to users to ensure real-time management, ownership, and exchange of the most up-to-date information on any flight and will serve as the authoritative source for all system information about that flight. FOXS will create a flight object for each proposed flight, and the flight object information will be updated throughout the entire lifecycle as the flight progresses from gate to gate. FOXS and authorized system clients will be able to create, modify, and delete flight object data and FOXS will manage, distribute, constitute, and reconstitute flight object data, to NAS and Non-NAS clients based upon event and time driven events.

From the ATM perspective, FOXS manages all information needed for planning system resources and ensuring safety of flight while providing the requested service to the extent possible in the dynamic ATC environment. Today's NAS Flight Data Infrastructure needs to be updated to meet the needs of emerging capabilities that require robust, dynamic, accessible and accurate data. Working with the existing NAS systems, FOXS will provide a new Flight Data Infrastructure that meets the needs of these emerging capabilities.

D. Dynamic Airspace

The Dynamic Airspace program will support contingency and business continuity operations by enabling the dynamic management of airspace during these events, leveraging and interacting with other resiliency initiatives that provide enterprise-level flexibility that can support dynamic airspace management, such as the NAS Voice Switch, Surveillance Interface Modernization, and Flight and Interfacility Data Interface. The program will develop the requirements, algorithms, and AMS artifacts necessary to enable air traffic managers to reconfigure airspace to better "match" projected demand and available capacity within and across facility boundaries. Today, the FAA lacks an automated means to enable the seamless and efficient reallocation of resources to manage these demand/capacity imbalances, (for example, during a weather-related congestion scenario), resulting in the sub-optimal use of existing resources while unnecessarily delaying aircraft in the NAS. This airspace reconfiguration capability will be flexible, so that it can be applied across time horizons of varying scale – from years to months to days to hours. It will allow the transfer of airspace from adjacent areas within a facility, as well as airspace from adjacent facilities to improve efficiency of operations.

E. Advanced Methods

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

Emerging TFM capabilities (e.g., Strategic Flow Management Application) will serve as the basis for a future AMS investment in TFM automation enhancements; Collaborative Air Traffic Management Technologies (CATMT) Work Package 5 (WP5). Along with baselined Traffic Flow Management System (TFMS) enhancements, the targeted AMS investment will provide new TFM functions to improve NAS traffic flow prediction and efficiency as well as overall system capacity.

Advanced Methods will identify automation and procedural enhancements to address strategic TFM shortfalls in the following areas: Constraint Prediction; Monitoring and Alerting; Operational Response Development; TFM System Performance Analysis Capability.

Why Do We Want / Need To Fund The Program At The Requested Level?

$8,500,000 is required to conduct pre-implementation activities that strive to reduce risk in the exchange of information between FAA and other NAS users. The portfolio will provide flight planners, Air Navigation Service Providers (ANSP) staff, and flight crews with consistent, complete, and easily processed information on changes of conditions in the NAS affecting safety, security, and efficiency. The portfolio will continue to examine and mature concepts for the exchange of information efficiently and securely between FAA and NAS users as well as to remain compliant with international standards.

What Benefits Will Be Provided To The American Public Through This Request?

The On Demand NAS portfolio encompasses information sharing within the NAS. The work supporting this portfolio has made great progress expediting the integration of new technologies within these domains. Below is an example of one success that was developed under this portfolio:

- Mini Global Demonstration – Advances in digital communication throughout the world have necessitated the establishment of information exchange standards to ensure interoperability. International Civil

Aviation Organization (ICAO) led the development of the Information Management (IM) roadmap, which was endorsed at the 2012 Air Navigation Conference (ANC 12). The IM roadmap lays a path to interoperability and is the establishment and adoption of the flight, aeronautical, and weather exchange standards. This demonstration included an expanded number of partners including AirServices Australia, Japan's Civil Aviation Bureau (JCAB), NAVCANADA, Lockheed, Harris, Boeing, and SESAR. The demonstration showcased the use of the latest standards enabling information exchange between operators flying across Flight Information Regions (FIRs) and ANSP's. This helped define requirements for the next version of the exchange standards (AIXM, FIXM and WXXM) and affected functional requirements for the next upgrade of the security infrastructure.

This portfolio should improve efficiency, minimize delays, and will provide benefits to the American Public in the areas of safety, capacity and efficiency, and cost avoidance. Planned benefits will include:

- The development of a standard set of flight information under the Flight Object program will benefit airlines by simplifying the flight planning process and providing information that will cross multiple ATC systems and domains with ease, leading to improvements in on-going traffic management initiatives and decision making.
- CSSD provides an increase in safety by increasing the amount of accurate, actionable information available to pilots, airlines and other NAS operators and by ensuring all NAS participants have a common, shared situational awareness which will reduce accidents that are attributable to pilot briefing errors, missing information, and violation of NAS flow constraints and restrictions.
- The FOXS program takes the global Extensible Markup Language (XML) standard developed in the Flight Object program and provides for the implementation and use of this in the NAS.
- Dynamic Airspace will maximize system efficiency through the reallocation of existing resources to address demand and capacity imbalances, as well as creating additional NAS agility in support of contingency operations, enabling an accelerated recovery to optimal operations following a system outage.
- Advanced Methods will provide increased safety and flight efficiency/delay reduction through its TFM enhancements.

Detailed Justification for - 1A08 NextGen – Improved Multiple Runway Operations (IMRO)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Improved Multiple Runway Operations (IMRO)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Improved Multiple Runway Operations (IMRO)	$5,500	$8,000	$6,500	-$1,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Wake Turbulence Mitigation for Arrivals	---	$1,500.0
B. Closely Spaced Parallel Runway Operations	---	2,000.0
C. Demonstration – Paired Approach	---	3,000.0
Total	Various	$6,500.0

The Improved Multiple Runway Operations (IMRO) portfolio conducts pre-implementation activities to reduce risk in support of multiple runway operations. The IMRO Portfolio improves runway access through the use of improved technology, updated standards, safety analysis, and modifications to air traffic monitoring tools and operating procedures that will enable more arrival and departure operations. Improving runway access equates to reduced delays that occur now when demand exceeds the capability of the airport's runways.

Use of capabilities supported by Wake Turbulence Mitigation for Arrivals (WTMA), Closely Spaced Parallel Runway Operations (CSPO), and the Paired Approach Demonstration projects allows more runway operations per hour while maintaining safety, without the major capital investment and time delay of building additional runways. Evaluating and maturing these concepts and capabilities include validation activities; demonstration and integration of operational capabilities; and an understanding of the role of the human through cognitive engineering experiments.

A. Wake Turbulence Mitigation for Arrivals

For FY 2017, $1,500,000 is requested to provide the following:

- Airport specific 7110.308A modifications for the use of its WTMA procedure (WTMA-P) at Detroit Metropolitan Airport (DTW) along with on-site controller training and support to ATC with its initial use of WTMA-P
- Required procedure development, safety risk documentation and training package development as needed in support for the fielding of the Automated Terminal Proximity Alert – Phase 2 (ATPA-P2) controller decision support tool as part of the Terminal Work Package 1 (TWP 1) STARS software release
- High level design of terminal controller WTMA interval monitoring decision support tool to be used in conjunction with the CSPO Flight Deck Interval Management procedures - to insure aircraft on parallel approach are within the defined "wake safe" interval
- Development of "real time" airport approach corridor wind forecast capability to provide approach controller "wake safe" information needed to clear aircraft for the closely spaced parallel runway (CSPR) flight deck interval managed approach procedure

B. Closely Spaced Parallel Runway Operations (CSPO)

For FY 2017, $2,000,000 is requested to provide the following:

- Perform analysis of data collected in Paired Approach (PA) to CAT I minima human in the loop (HITL) simulations and provide technical report.
- Conduct analysis to assess potential separation reductions for Simultaneous Approaches using High Update Rate surveillance.
- Perform functional analysis and requirements development data collection through the use of human in the loop simulations assessing CSPO departure concept feasibility
- Analyze the results of modeling and flight test evaluations for simultaneous independent, dependent and paired approach operations to enable the development of threat logic for collision avoidance using closely spaced parallel operations

C. Demonstrations – Paired Approach

The Paired Approach demonstration will conduct risk reduction and early prototyping activities to validate capabilities using ADS-B and Flight Deck Interval Management (FIM) – Defined Interval (DI). For FY 2017, $3,000,000 is requested to provide the following:

- Complete safety assessment for flight demonstration
- Complete prototype demonstration cockpit avionics and ground ATC tools (as needed)
- Finalize requirements for demonstration of Paired Approach for CAT I capability

What Is This Program And Why Is It Necessary?

A. Wake Turbulence Mitigation for Arrivals

This project develops air traffic control wake separation approach procedures, decision support tool capabilities and associated prototypes (e.g. ATPA-P2) as possible enablers to safely meet the NAS Users demand for the FAA to handle more flights while minimizing delays and providing more efficient flight routing. The WTMA project takes the air traffic control wake mitigation arrival concepts developed by the NextGen – Wake Turbulence research program and evaluates them via prototyping and simulations. These concepts are assessed for flight safety and expected throughput capacity benefit to the users of the NAS. Outputs of the program are procedures, related FAA Safety Management System documentation, demonstration/evaluation of the procedures (and accompanying decision support tool (DST) if required), requirements/documentation and initial training for implementing an ATC procedure at airports that would benefit from its arrival throughput enhancing capability.

In FY 2017, this project will provide the detail procedures, modifications to ATC Orders, and associated Safety Management System analyses that are required to field the ATPA-P2 decision support tool as part of TWP 1. ATPA-P2 will provide controllers a visual display of the required wake mitigation minimum separations to be applied during WTMA-P and other ATC parallel runway approach operations. Providing ATPA-Phase 2 to approach controllers allows them to better manage the airport approach stream and allowing a 1% to 2% increase in airport runway throughput capacity. Use of WTMA-P being implemented at DTW will allow ATC to use reduced wake separations in its dependent Closely Spaced Parallel Runway (CSPR) approach operations even if the lead aircraft of the dependent pair is a Boeing 757 or Heavy wake category aircraft. Without WTMA-P, Detroit would remain restricted to allowing only small or large wake category aircraft to be the lead in a dependent pair. WTMA-S, when developed as the DST for controllers to clear aircraft for a "wake safe" flight deck interval managed approach, will deliver aircraft to an airport's CSPRs during instrument flight rule (IFR) conditions - at separations approaching those used during visual flight rule separations. An airport's IFR runway throughput capacity will increase as more aircraft become equipped for flight deck interval management.

B. Closely Spaced Parallel Runway Operations

Closely Spaced Parallel Operations (CSPO) is the simultaneous approach of aircraft pairs into airports with single and multiple parallel runways that are closely spaced (runways that are less than 4,300 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 3,600 feet or greater. If High Update Rate (HUR) surveillance is used, independent approaches can be conducted to runways separated by at least 3,400 feet, or in some cases, 3,000 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 2,500 feet or more. Dependent staggered approaches to runways separated by less than 2,500 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 2,500 feet and 4,300 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 for closely spaced parallel arrivals and departures.

C. Demonstrations – Paired Approach

The Paired Approach will demonstrate how satellite surveillance of aircraft (ADS-B) and pilot tools, called flight-deck interval management (FIM), can be combined to conduct simultaneous instrument approaches in all weather conditions to runways that are closely spaced and parallel to each other. The trailing aircraft participating in the dependent pair would be spaced such that it is sufficiently separated with respect to collision risk with the lead aircraft, while staying ahead of the risk for a potential encounter with the wake of the lead aircraft (maximum wake-safe separation between aircraft to be supplied by simulated wake rear gate decision support tool). This demonstration would address operations for very closely spaced parallel runways, such as San Francisco runways 28L and 28R (750 feet between centerlines) or Newark runways 4L and 4R (950 feet between centerlines). The Paired Approach demonstration will utilize steps taken by the CSPO Program to provide initial assessment of this concept and completion of a revised Concept of Operations.

This demonstration is planned as a multiple year activity, with FY 2016 activities focusing on demonstration planning and preparation and the follow on years focusing on the completion of required safety analyses and the demonstration execution. This demonstration is expected to show benefits such as increased airport arrival throughput capacity rates, less time spent in the air maneuvering for a final approach, fuel savings for the airlines, and reduced emissions for the environment.

Why Do We Want/Need To Fund The Program At The Requested Level?

$6,500,000 is required to conduct pre-implementation activities to reduce risk in support of multiple runway operations. Use of capabilities supported by Wake Turbulence Mitigation for Arrivals (WTMA) Closely Spaced Parallel Runway Operations (CSPO) and the Paired Approach Demonstration projects allows more runway operations per hour while maintaining safety, without the major capital investment and time delay of building additional runways.

The Portfolio improves runway access through the use of improved technology, updated standards, safety analysis, and modifications to air traffic monitoring tools and operating procedures that will enable more arrival and departure operations. Improving runway access equates to reduced delays that occur now when demand exceeds the capability of the airport's runways.

CSPO and WTMA funding at the requested level fulfills FAA's external commitments to tier 1 NextGen Advisory Committee (NAC) priorities.

What Benefits Will Be Provided To The American Public Through This Request?

The IMRO portfolio encompasses the majority of the terminal operation areas and airports within the NAS.

Benefits to NAS users include:

- WTMA allows for increased airport arrival throughput capacity by reducing wake separations imposed on aircraft following behind Boeing 757 or Heavy wake category aircraft when landing on an airports set of closely spaced parallel runways spaced less than 2,500 feet apart. Additional airport throughput provides for fewer flight delays and potential for increased passenger choice of flights from the airport.
- CSPO procedures for simultaneous independent, dependent, and paired approaches will improve airport throughput during CSPR operations in less than visual conditions and will result in more capacity and fewer delays.
- The Paired Approach demonstration will refine the PA concept and procedure to better enable increased efficiency and improved quality of service during IMC conditions after procedure authorization and implementation.

Detailed Justification for - 1A09 NextGen – NAS Infrastructure Portfolio

What Is The Request And What Funds Are Currently Spend On The Program?

FY 2017 – NAS Infrastructure Portfolio
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
NAS Infrastructure Portfolio	$14,480	$11,000	$17,660	+$6,660

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Weather Observation Improvements	---	$1,500.0
B. Weather Forecast Improvements	---	1,160.0
C. NextGen Navigation Engineering	---	1,000.0
D. New Air Traffic Management (ATM) Requirements	---	8,000.0
E. Surface/Tower/Terminal Systems Engineering	---	500.0
F. NextGen Distance Measurement Equipment (DME)	---	5,000.0
G. Information Management	---	500.0
Total	Various	$17,660.0

The NAS Infrastructure portfolio conducts pre-implementation activities to reduce risk for aviation weather-related and cross-cutting engineering issues. This portfolio provides the research, development, and analysis of portfolio capabilities such as validation activities, human system engineering, and demonstrations. Work with this portfolio addresses aviation weather-related issues by supporting the improvement of (1) air traffic management (ATM) decision-making during adverse weather conditions, (2) weather forecasting in the transformed NAS, and (3) existing weather infrastructure.

Surface/Tower/Terminal Systems Engineering, NextGen Navigation Engineering, New ATM Requirements, NextGen DME, and Information Management conduct analysis to develop solutions that can apply across the NAS domain.

A. Weather Observation Improvements

This program manages 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. For FY 2017, $1,500,000 is requested to:

- Support decision-making during adverse wind conditions, initiate assessment of market technologies and maturing research and development programs for potential adverse wind mitigating applications
- Initiate system engineering activities for terminal-area adverse winds useful segment

B. Weather Forecast Improvements

This program addresses both the need to improve weather predictions and how to make best use of that information. For FY 2017, $1,160,000 is requested and includes the following work:

- ATM-Weather Integration – TFM Alerting Concept Development

    - Expand automated Threshold Event (TE) Identification and Alerting analysis to Core 30 airports #2 and #3
    - Explore methods of weather alerting for traffic managers
    - Conduct Human-In The Loop (HITL) tests with simulated alerting systems for airport and en route events

- International Harmonization
    - In coordination with EURO CONTROL, complete development of reports and presentations on requirements and standards for the provision and dissemination of meteorological information for international air navigation to International Civil Aviation Organization (ICAO) panels and operations groups
    - Complete US position on "draft" Amendment 78 to ICAO Annex 3 (Amendment 78 changes the recommendation for the exchange of meteorological information in a digital form to a requirement.)
    - Complete annual report on US differences with ICAO Standards and Recommended Practices (SARPs) for Meteorology
    - Complete draft Aviation System Block Upgrade Module for Meteorology 2023-2038, for inclusion in the ICAO Global Air Navigation Plan

C. NextGen Navigation Engineering

This program supports the NextGen goal to increase NAS efficiency and capacity and increase access to airports through innovation. For FY 2017, $1,000,000 is requested to provide the following:

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

D. New Air Traffic Management (ATM) Requirements

This program identifies new opportunities to improve the efficiency and effectiveness of air traffic management operations. For FY 2017, $8,000,000 is requested to provide the following:

- New Radar Requirements (Surveillance and Weather)
    - Finalize Multi-function Phased Array Radar (MPAR) performance requirements and draft detailed MPAR advanced technology demonstrator test and evaluation plan
- Enterprise Information Protocol and Exchange Standards
    - Initiate assessment of Flight Information eXchange Model (FIXM) compliance with ICAO Reference Model and develop a plan to reach ICAO compliance
    - Initiate Quality Assurance and Quality Control Validation for Weather information eXchange Model (WXXM)
- Future Collision Avoidance System (CAS)
    - Document ACAS Xu system requirements specifications for non-cooperative collision avoidance capability
    - Prepare Phase II report that validates collision avoidance interoperability criteria for RTCA SC-228
- Weather Transition
    - Perform engineering studies and analysis translating weather information into operational impacts
    - Develop and validate weather requirements for NWS to improve forecasts in support of FAA operational decision making
- Synchronization of Air/Ground Procedures
    - Initiate documentation of air/ground procedures standards with user community, develop project plan for trials, and develop a validation report for air/ground procedure synchronization
- Advanced Air/Ground Communications
    - Conduct and document prototype testing of L-band Communications systems
    - Draft test plan for satellite-based NextGen and SESAR requirements including Push-to-Talk communications with international community
    - Draft initial test plans of satellite-based Push-to-Talk communications standards with the international community and develop a test report to document the performance

- Initiate Internet Protocol Suite (IPS) analysis to support the development of Minimum Operational Performance Specifications and International Civil Aviation Organization Standards and Recommended Practices (SARPS). These Standards will support the implementation of Future Communications Systems to support NextGen Requirements

E. Surface/Tower/Terminal Systems Engineering

This program is an early stage developmental program to refine and validate Terminal NextGen concepts. For FY 2017, $500,000 is requested to provide concept engineering for Terminal Airspace/Route Demand and Capacity Modeling. Activities include:

- Initiate concept engineering activities for Terminal Airspace/Route Demand and Capacity Modeling

F. NextGen DME

This program covers EnRoute and Terminal domains to provide support for performance based operations. For FY 2017, $5,000,000 is requested to provide the following:

- Conduct and Validate (Flight Test) Frequency/Spectrum Gap analysis
- Initiate procurement activities

G. Information Management

This program addresses issues that arise when an agency moves from managing and sharing information in a legacy environment, which is controlled through a physical connection, into a network environment. For FY 2017, $500,000 is requested to provide the following:

- Develop Plan for the migration of NER (NAS Enterprise Repository) prototype to FAA Cloud Services in a production environment. Plan will include the transition of Information Management data, execution capabilities, software projects, and the various services and tools that comprise the Information Management system and will address funding and organizational requirements to ensure sustainment of Information Management system

What Is This Program And Why Is It Necessary?

A. Weather Observation Improvements

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.

In FY 2017 the program will continue to focus on ground observations in the terminal area. As the winter weather work package concludes, the program will address terminal wind observing shortfalls. Collaboration with key agency stakeholders indicates wind-related shortfalls must be categorized after first obtaining a better understanding regarding how wind adversely impacts certain airport operations. With this information technical maturity activities will involve instigating the potential to optimize existing wind measuring equipment, the need for additional wind sensing capabilities, and the technical and operational risk mitigation activities associated with various solution-oriented options. This project will perform shortfall analysis and technical evaluations to prioritize which wind impacts can be mitigated in the near term with greatest return on investment in terms of both safety and capacity. 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).

B. Weather Forecast Improvements

The Weather Forecast Improvements (WFI) program addresses both the need to improve weather predictions and how to make best use of that information. High demand, high complexity NAS operations make many weather-constrained traffic management problems difficult to define and even harder to resolve. Even the most seasoned decision makers are challenged by the numerous elements that go into the decision making process during a weather-constraining event. There is currently very little automation to assist decision makers with identifying, analyzing, and developing mitigation strategies for weather-constrained airports and airspace.

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

The program will also develop the necessary policies and guidance in the provision of aeronautical meteorological services under U.S. commitments to the International Civil Aviation Organization (ICAO).

C. NextGen Navigation Engineering

FY 2017 NextGen Navigation Engineering activities include:

<u>RNAV DME-DME:</u>
This program addresses current DME infrastructure-related issues required to enable Precision Based Navigation (PBN), and will allow expansion of NextGen Required Navigation (RNAV) benefits by redefining the service volume of DMEs to support properly equipped aircraft that are not equipped with Inertial Reference Unit (IRU). This is essential to the NextGen goal of implementing NAS-wide PBN because NAS passenger and cargo flow depends upon the regional jets to bring passengers and cargo to the major hubs. Having only the carriers capable of RNAV does not completely enable NAS operations for full PBN operations.

D. New Air Traffic Management (ATM) Requirements

The New ATM Requirements activities include the research and development of procedures, tools, and systems in support of operational improvements that will increase the number of arrivals and departures at major airports. Activities under this project include:

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

<u>Enterprise Information Protocol and Exchange Standards:</u>
This project addresses the need for harmonizing protocols and standards for enterprise information use both internally and with external agency partners, including the Department of Defense, the National Weather Service and international partners. This research will identify the shortfalls in moving from direct data sharing to a network environment. It includes protocols for enterprise information, criteria for managing and developing incremental versions for exchange standards, and conformance monitoring techniques. After this analysis is complete, the activities will shift to development and implementation of baseline

versions of exchange models, and continued conformance monitoring to ensure compliance. Enterprise information protocol and exchange standards are necessary to coordinate information standards work and achieve global harmonization of standards and protocols, especially as they relate to engagement with Open Geospatial Consortium and harmonization with ICAO standards.

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

Weather Transition:
The Weather Transition program performs Concept Maturity and Technical Development (CMTD) activities. The program manages the development, testing and evaluation of prototypes and operational demonstrations for the purpose of defining, managing, and refining requirements and appropriate operational use concepts. Finally, it also conducts validation of aviation weather information performance requirements using modeling/simulation and other techniques. Weather Transition will manage appropriate activities to include: (a) development, validation, and allocation of aviation requirements for weather; (b) analysis of current FAA weather-related services and operational needs to develop initial operational concepts to satisfy those needs and determine which concepts should continue to be developed; and (c) creation, testing and evaluation of prototypes and operational demonstrations for the purpose of defining and refining operational use concepts.

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

Advanced Air/Ground Communications:
In partnership with international partners, this project will evaluate advanced communications standards such as L-band Digital Aeronautical Communication System (LDACS) and next generation satellite-based communication for operational usage. This activity will also evaluate new communications technologies including the Internet Protocol Suite and the Multi-mode Radio to support new capabilities such as Push-to-Talk in remote areas and the capability for these links to alleviate spectrum congestion issues and to meet the more stringent NextGen performance requirements.

E. Surface/Tower/Terminal Systems Engineering

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 the 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 Program Management Organization as they develop the final system configuration.

Previous concept engineering and program management activities executed by the Surface/Tower/Terminal Systems Engineering program supported the development of Terminal Work Package 1 that is found under the Terminal Automation Program Budget Line Item. Potential shortfalls beyond those addressed in Terminal WP1 include: demand/capacity imbalances that lead to air traffic delay; operator workload and operational complexities that lead to airspace inefficiencies; high reliance on manual processes that limit workflow and reduce airspace utilization; and lack of coordination between stakeholders that constrains decision making.

This project will provide enhanced opportunity for TRACON personnel to support greater air traffic throughput while enhancing safety. These capabilities apply to all levels of TRACON facilities and will support NextGen advances across the NAS. This effort includes TRACONs that are slated to receive the suite of NextGen tools as well as those TRACONs which may not receive the entire suite of NextGen tools.

F. NextGen DME

This NextGen DME program covers En Route and Terminal domains to provide support for performance based operations. It will provide the signal in space to fill the coverage gaps and eliminate the redundancy requirements for new GPS/RNAV/RNP procedures. The NextGen DME program will allow continued utilization of RNAV and RNP operations by commercial operators maintaining NAS efficiency during GPS outages.

Presidential Policy Directive 21 (PPD-21) and National Security Presidential Directive 39 (NSPD-39) require the FAA establish a resilient backup in the event of a GPS outage or interference event to maintain safety and security and prevent a significant economic impact in the NAS. The objective of the NextGen DME program is to provide PBN services if GPS becomes temporarily unavailable so commercial users can seamlessly continue RNAV and RNP operations.

G. Information Management

The Information Management program addresses issues that arise when an agency moves from managing and sharing information in a legacy environment, which is controlled through a physical connection, into a network environment, which only requires a simple subscription. The Information Management program is required to seek out sources of duplication of data storage and find ways to reduce or eliminate them; look for ways to share common data enhancement by sharing algorithms, actual code and whenever possible reusable components; and to align data and information management with the FAA's strategic goal of risk based decision making.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. Weather Observation Improvements

Weather Observation Improvements will initiate systems engineering activities for a useful segment that addresses terminal-area adverse winds.

B. Weather Forecast Improvements

Weather Forecast Improvements will continue weather integration assessments in support of future CATM, TBFM, and STBO work packages; generate products in support of Wx-FAC analysis; complete work toward the US position on ICAO Amendment 78 to Annex 3; and complete additional NAS EA updates.

C. NextGen Navigation Engineering

NextGen Navigation Engineering will complete RNAV DME-DME spectrum and the acquisition management activities for NextGen DME. The RNAV DME-DME activities focus on the integration of DME-only facilities into NAS operations.

D. New Air Traffic Management (ATM) Requirements

New ATM Requirements will continue activities in support of New Radar Requirements, Enterprise Information Protocol and Exchange Standards, Future CAS, Weather Transition, Synchronization of Air/Ground Procedures, and Advanced Air/Ground Procedures.

New Radar Requirements requires funding to continue concept work that will mature MPAR research through the finalization of performance requirements and development of a detailed advanced technology demonstrator (ATD) test and evaluation plan.

Enterprise Information Protocol and Exchange Standards must maintain and update information protocols and exchange standards.

Future CAS requires funding to continue concept work to further develop system requirements for the Unmanned Aircraft System (UAS) user class by finalizing requirements for a non-cooperative collision avoidance capability and preparing the Phase II report that validates collision avoidance interoperability criteria for RTCA SC-228.

Weather Transition requires funding to continue the (a) development and validation of weather requirements for NWS and (b) analysis and translation of weather information into operational impacts.

Synchronization of Air/Ground Procedures must continue to evaluate methods for ground systems to communicate procedures to aircraft by validating air/ground procedure synchronization.

Advanced Air/Ground Procedures requires funding to continue the evaluation of LDACS through prototype testing, and continue the evaluation of satellite-based communication through the testing of satellite-based Push-to-Talk communications standards with the international community.

E. Surface/Tower/Terminal Systems Engineering

Funding is requested at the target level to improve terminal airspace/route demand and modeling capabilities in the TRACON. The funding will improve modeling and predicting of demand and capacity in the terminal environment.

F. NextGen DME

NextGen DME requires funding to validate the site locations, verify signal in space measurements, conduct spectrum frequency analysis, and initiate procurement activities.

G. Information Management

Funding is requested to complete the governance and transition planning for both the Information Management System and its data. The funding will leverage FAA Cloud Services and will ensure the efficient use of the Federal Telecommunications Infrastructure (FTI) and System Wide Information Management (SWIM) as conduits of information for NextGen.

What Benefits Will Be Provided To The American Public Through This Request?

A. Weather Observation Improvements

Adverse terminal winds have been identified by the NTSB as a condition that factors in over 50 percent of all weather related incidents. Furthermore modern wind observing technologies may yield several economic benefits included, but not limited to, equipment consolidation, improved situational awareness, and improved weather forecast initialization (specifically in areas of runway orientation management). NextGen, acting in concert with key users and stakeholders, will identify the observation shortfalls related to adverse terminal winds, further focus program efforts on identifying the highest priority shortfalls and locations of greatest impact that can be mitigated in the near-term, interact with industry to study best-value and best-cost options available, and validate that any technologies are sufficient for a NextGen-enabled NAS.

B. Weather Forecast Improvements

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.

Mitigating airborne holding and unanticipated deviations/diversions, improved weather forecast timeliness and accuracy will contribute to safer terminal and en route air traffic operations. Improved weather forecast will enhance air traffic controllers' ability to: (1) provide more precise and timely information about hazardous weather to pilots and: (2) more quickly respond to pilot requests for hazardous weather avoidance. Additionally, weather forecast improvements and effective integration of weather information into traffic management initiatives (by ATMs, pilots, FOCs, etc.), will assist in more proactive planning of NAS operations around terminal and en route weather hazards.

C. NextGen Navigation Engineering

The NextGen Navigation Engineering program will provide the following benefits to the American public:

- Redefine service volume to support expansion of RNAV benefits to regional and high-end business jets
- Potential for an increase in Class A and Class B airspace
- Fewer diverts, delays, and cancellations during low visibility conditions
- Increased throughput in choke point areas, such as the New York/New Jersey area
- U.S. economic benefit in that cargo and passengers keep moving whereas today they do not as flights are under a ground stop, delayed, diverted, or cancelled

D. New Air Traffic Management (ATM) Requirements

The New ATM Requirements program will provide the following benefits to the American Public:

- Reduction of weather-sourced and other off-nominal delays due to integration of weather data into automated trajectory management systems
- Deliver benefits through technology of insertion, right sizing the surveillance infrastructure
- Increase flight efficiency through: integration of weather into automated trajectory management systems to support increased situational awareness during flight planning and execution; synchronization of Air/Ground procedures and communication

E. Surface/Tower/Terminal Systems Engineering

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. Implementing these capabilities will reduce excess flying miles, associated delays and negative environmental impact.

F. NextGen DME

The NextGen DME program will provide the following benefits to the American Public:

- FAA gains an RNAV/RNP backup to GPS in the event of a GPS outage
- Airspace users will benefit from increased flight efficiency and will be able to continue flying RNAV/RNP routes and optimized profile descents. This supports their energy savings through reduced noise and emissions
- Expansion of RNAV benefits to regional and high-end general aviation

- Improves DME network to ensure operational availability of RNAV operations across the NAS

G. Information Management

Implementation of the Information Management Program will allow information to be shared at a level of service in order to enable the NAS to more efficiently manage resources. Specifically, this program will:

- Make correlated data available for a broader group of analysts, so that tax payer dollars will be spent more effectively in exploring safety and efficiency related concerns
- Make certain kinds of analysis more routine, and hence improve decision making and trade space analysis capabilities
- Make rapid adjustments to deployed systems more realistic, with faster post operational analysis

Detailed Justification for - 1A10 NextGen – Laboratory Support Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

**FY 2017 – LaboratorySupport Portfolio
($000)**

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Laboratory Support Portfolio	$13,000	$10,000	$12,000	+$2,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. NextGen Laboratories - NIEC	---	$4,200.0
b. NextGen Laboratories – FTB	---	7,300.0
c. Operational Performance	---	500.0
Total	Various	$12,000.0

The NextGen Laboratories (NIEC and FTB) enable research activities that support pre-implementation and risk reduction activities by providing a platform to conduct validation, modeling, and demonstrations. The work conducted under NextGen Operational Assessment Performance (OAP) updates the NextGen Segment Implementation Plan as well as analyzes and reports on the successful and timely delivery of NextGen capabilities and milestones that have been implemented. In association with the research activities conducted under this portfolio, the FAA will evaluate operational performance of NextGen technologies and procedures. The annual NextGen Segment Implementation Plan (NSIP) will be completed in concert with this work and will provide information on; operational capabilities planned for implementation, projected benefits, system dependencies, criteria for success, integration challenges for implementation, follow-on activities, and deployment progress reporting.

a. NextGen Integration and Evaluation Capability (NIEC):

For FY 2017, $4,500,000 is requested to provide the following:

- Maintain and enhance existing systems
- Licenses and technology refresh of NIEC equipment
- Perform upgrades to support NextGen demonstration and simulation activities
- Enhance the air ground data communication capabilities between the Air Traffic Controller positions and the cockpit simulator

b. Florida Test Bed (FTB):

For FY 2017, $7,500,000 is requested to provide the following:

- Maintain and enhance existing facilities and systems
- Licenses and technology refresh of FTB equipment
- Perform upgrades to support NextGen demonstration activities
- Add airport surface automation system to the tower environment
- Add security and business rules on Noise Exposure Map infrastructure and to DOD/Defense Research Engineering Network (DREN) for increasing the fidelity of the messaging systems
- Add automated capability to provide adaptation data and system build updates for keeping the FTB systems synchronized with live flight data

What Is This Program And Why Is It Necessary?

The NextGen – Laboratory Support Portfolio focuses on evaluating future concepts and technologies to support technical transfer to the implementing organizations, promoting industry involvement, and identifying implementation challenges and research areas. This work supports the infrastructure needed to complete those demonstrations and studies, measures performance impacts of NextGen capabilities, reports progress in the performance of implemented capabilities at specific locations, as well as updates the NSIP.

a. **NextGen Integration and Evaluation Capability (NIEC) Laboratory:** The NIEC is a facility located at the William J. Hughes Technical Center (WJHTC) in Atlantic City, New Jersey. It serves as a research center to support the exploration, integration, and evaluation of NextGen concepts through simulation activities. The NIEC provides a real-time, flexible, NextGen-capable environment that allows for early evaluations, concept development, and validations through Human-in-the-Loop simulations and demonstrations. This program will continue to explore integration, development, and operations analysis capabilities. Systems will be integrated to support Computer Human Interface (CHI) studies to measure and validate human performance, usability, workload, and safety indications. The program will include the development and validation of prototypes and analysis capabilities which will support the definition of NextGen requirements while researching possible solutions to challenges posed by integrating NextGen technology.

b. **Florida Test Bed:** The Florida Test Bed is a facility located at the Embry Riddle Aeronautical University in Daytona Beach, Florida. It supports the integration of new and emerging technologies into the National Airspace System (NAS) through demonstrations and evaluations. These activities cultivate government, academia, and industry partnerships through collaboration. One of the main purposes of the Florida Test Bed is to provide an open-access location for industry, users, and vendors to demonstrate new capabilities and harness NAS architecture solutions. The Florida Test Bed will also support integrated demonstrations and large-scale modeling and simulation.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$12,000,000 is required to continue execution of work within the NextGen – Laboratory Support Portfolio. This portfolio provides a robust platform where early-stage NextGen concepts can be integrated, demonstrated, and evaluated. These sites provide the FAA and industry an agile environment for the rapid integration of new and emerging technologies. It also promotes contributions and R&D investment from industry and leverages industry's capabilities, resulting in cost avoidance to the FAA and accelerated NextGen development.

What Benefits Will Be Provided To The American Public Through This Request?

The American public benefits by having an efficient and flexible platform to support the development of NextGen. Concept demonstrations are conducted to evaluate future concepts and ensure that foundational technologies are developed and integrated with emerging technologies, procedures, and embedded automation systems. To conduct these demonstrations, the FAA requires an environment for the evaluation of NextGen concepts and technologies that will not affect day-to-day air traffic operations. The use of this platform supports NextGen demonstrations to be conducted at an early stage without affecting the National Airspace System (NAS). This reduces risk 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.

Detailed Justification for - 1A11 NextGen – Performance Based Navigation (PBN) and Metroplex Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Performance Based Navigation (PBN) and Metroplex Portfolio ($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Performance Based Navigation (PBN) and Metroplex Portfolio	$26,500	$13,000	$17,500	+$4,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. NextGen Performance Base Navigation (PBN) Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP)	7	$15,000.0
B. Concept Development Integrated NAS Design/Procedures Planning	---	2,500.0
Total	Various	$17,500.0

The PBN portfolio conducts pre-implementation and implementation activities supporting PBN concepts and capabilities. PBN uses Area Navigation (RNAV) and Required Navigation Performance (RNP) to improve access and flexibility in the National Airspace System (NAS) with the goal of providing the most efficient aircraft routes from departure runway to arrival runway while also enabling right-sizing of conventional procedures and navigation infrastructure. PBN defines the performance requirements for routes and procedures that enable aircraft to navigate with greater precision and accuracy. It provides a basis for designing and implementing new flight paths, redesigning airspace, and providing safe obstacle clearance. Progressive stages of PBN capabilities include the safe implementation of more closely spaced flight paths for departure, arrival and approach. Evaluating and maturing these concepts and capabilities include validation activities; demonstration and integration of operational capabilities; and an understanding of the role of the human through cognitive engineering experiments to support the development of an effective training approach.

A. NextGen PBN – Metroplex RNAV/RNP

For FY 2017, $15,000,000 is requested to support work that includes the following:

- Initiate the Evaluation Phase at two Metroplex locations (e.g., Las Vegas and Florida)
- Complete the Evaluation Phase at one Metroplex location (e.g., Denver)
- Initiate the Implementation Phase of one Metroplex location (e.g. Southern California).
- Complete the Implementation Phase at one Metroplex location (e.g., Cleveland/Detroit)
- Complete the Post Implementation Reviews at two Metroplex locations (e.g., Atlanta, Charlotte)
- Utilize PBN Strategy to establish criteria and implementation approach for NAS deployment of near- and mid-term Strategy goals at Metroplex environments
- Complete operational and cost benefit analysis of Strategy deployment at Metroplex locations

B. Concept Development Integrated National Airspace Design and Procedures Planning (INDP)

For FY 2017, $2,500,000 is requested to support work that includes the following:

- Initiate Established on RNP (EoR) Modeling and Simulation (M&S) for Independent operations
- Conduct initial implementation of EoR scenarios at a developmental site to validate independent duals EoR operations
- Complete Safety Risk Management (SRM) artifacts to support Widely Spaced separation standard change to allow for EoR operations in the NAS
- Conduct operational analysis of an intelligent offloading algorithm, utilizing PBN routes/procedures, to assess intelligent sorting mechanism for optimal trajectory utilization and improve performance in the NAS traffic management system
- Develop and demonstrate NAS-wide training modules to enable the implementation of EoR operations at eligible facilities

What Is This Program And Why Is It Necessary?

A. NextGen PBN – Metroplex RNAV/RNP

This program will develop procedures at Metroplexes to improve airspace efficiency. The Airspace Optimization Group continues to integrate airspace design and associated activities, including traffic flow analysis, arrival and departure route design, and procedures optimization. This project will continue optimizing airspace use and associated procedures development in Metroplexes by:

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

The Metroplex program executes this work via projects for Metropolitan areas that encompass - a geographical volume of airspace that includes one or more of the core airports as well as surrounding regional airports. For example, the North Texas Metroplex includes Dallas/Fort-Worth (DFW) as well as Dallas Love Field (DAL), and other satellite airports while the Florida Metroplex site includes Orlando (MCO), Miami (MIA), Tampa (TPA), Fort Lauderdale (FLL) and other regional airports.

In 2010, the NextGen Advisory Committee and the NextGen Management Board prioritized a list of 21 candidate Metroplex sites; 12 of which have been approved for implementation. Three of these sites are NextGen Advisory Committee (NAC) NextGen Integration Work Group (NIWG) Implementation Commitments: Northern California, Atlanta, and Charlotte. Metroplex will continue assessment of its processes and opportunities going forward. This will provide the quantitative and qualitative parameters for identification and prioritization of future locations. Denver was recently added while Boston, Memphis, and Chicago were indefinitely postponed. Each Metroplex site follows a standard five phase process. The first phase is the Study phase, followed by the Design phase, the Evaluation phase, the Implementation phase, and concluding with the Post-Implementation phase. All phases include industry representation. The details of the work accomplished during these phases are as follows:

- <u>Study and Scoping:</u> Study teams identify issues and propose potential solutions through facility and industry interface meetings. The result of this phase is a set of conceptual designs, with a high-level assessment of benefits, costs, and risks.
- <u>Design and Procedure Development:</u> Detailed Integrated Airspace and Procedures design work is conducted. The work conducted in this phase uses the results of the study teams and is conducted by a Design and Implementation (D&I) team. When appropriate and justified, Human-in-the-Loop simulations and other design analyses are performed.
- <u>Evaluation:</u> The second stage conducted by the D&I team and include operational modeling, Safety Management System analyses, and environmental reviews. If analyses are conducted during the Design Phase, they may carry over into the Evaluation Phase.
- <u>Implementation and Training:</u> This is the final stage of of the Metroplex process conducted by the D&I team. This phase includes all steps required for implementation of the Metroplex project including

flight inspections, publishing procedures, planning and executing training. Industry representation is achieved using lead carrier representatives.

- Post Implementation Review and Modifications: This stage reviews the implemented airspace and procedures changes to determine if they have delivered desired benefits and/or caused other impacts. Modifications or refinements may be made to better achieve the desired benefits or address unforeseen impacts.

B. Concept Development Integrated National Airspace Design and Procedures Planning (INDP)

The INDP program supports multiple NextGen initiatives, as well as, NextGen Advisory Committee (NAC) NextGen Integration Work Group (NIWG) Commitments, and integrates industry and agency efforts to maximize utility of aircraft capabilities. The primary focus of the program is to conduct design, safety analysis, and implementation of various procedures in an effort to provide shorter, repeatable and stabilized paths to the runway for qualified aircraft. This program provides rule changes to the current Air Traffic Controllers (ATC) separation standards, described in the FAA Order for Air Traffic Control (JO 7110.65), for using EoR Instrument Approach Procedures (IAPs) across the NAS. EoR is expected to provide opportunities for increased efficiency including reduced track length, fuel burn, environmental footprint, stabilized approaches and noise exposure. Furthermore, EoR may be able to provide opportunities for increased capacity via reduced standard separation. Concept development to discover systemic advantages of PBN as well as human factors analysis to support PBN will be conducted.

This program enables concept development activities to validate changes to current air traffic management operations and foster increased system capacity, efficiency, and throughput. It will also ensure that future concepts are feasible across the NSAS and will realize expected benefits at multiple airport locations. Additionally, this program enables human factors research to ensure that the safety of the NAAS is maintained by properly integrating new procedures and technologies through Human Factors best practices.

DOT Strategic Goal - Economic Competitiveness.

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

Metroplex program funding will allow for expedited design and publication of PBN procedures and their integration. The NextGen Metroplex initiatives were jointly prioritized by the FAA and Industry. This project has been identified by Congress and the Government Accounting Office (GAO) as essential for the modernization of the NAS. The Metroplex project will deliver benefits to the users through improvement to the safety and efficiency of their operations and to the community in general through environmental improvements and reduced carbon emissions.

The INDP program will utilize safety cases for those EoR approach scenarios to begin an initial implementation at developmental site(s) in order to validate the EoR operational concept. The program will initiate the modeling and safety analysis for new EoR Independent and Dependent approach scenarios, and it will provide Human Factors Integration expertise to ensure the proper implementation and training for NextGen systems and procedures that will ensure safety and efficiency.

What Benefits Will Be Provided To The American Public Through This Request?

The PBN portfolio allows more efficient use of airspace and optimized arrivals and departures. Metroplex solutions may include changes to airspace structure to support the optimized procedures. Specific operational changes include removing level-offs on arrivals, de-conflicting traffic flows, adding new high-altitude PBN routes, and realigning airspace to support the new procedures. INDP enables EoR operations to result in the improved utilization of aircraft's RNP capabilities to fly shorter, repeatable and stabilized paths to runway, as well as systemic advantage for the NAS and conducting human factor analysis to support advancement of PBN.

Metroplex optimization benefits indicate that the Metroplex program will reduce aircraft CO2 emissions by 363 thousand metric tons and fuel consumption by 36 million gallons in one year alone. These benefits are expected to generate $104 million per year in savings for aircraft operators, the traveling public, and the FAA. EoR is expected to provide benefits to the American public for increased overall flight efficiency including: reduced track length, fuel burn, environmental footprint, and noise exposure.

Executive Summary – Facilities and Equipment, Activity 2

What is the Request and What Funds are Currently Spent on the Program?

The Facilities and Equipment (F&E) Activity 2 program is requesting $1,631,410,000 for FY 2017, a decrease of $200,791,000 (11 percent) below the FY 2016 enacted level. The main reason for the reduction is the movement of leased satellite subscription services, totaling $150,300,000, for ADS-B and WAAS out of Activity 2 and into a new Activity 6 Budget Line Item.

The Activity 2 funding request is needed for the following programs:

- $567,720,000 is requested for NextGen technologies, tools, and systems
- $1,063,690,000 is requested for legacy systems, buildings, infrastructure, and sustaining a safe infrastructure adequate for ATC services in the NAS

The funding for Activity 2 programs and initiatives is used for modernization of air traffic control facilities, systems, and equipment. They support infrastructure upgrades, system replacements, and technology refresh at manned and unmanned facilities to sustain:

- Ground-based radar
- Communications
- Automation
- Navigation
- Landing
- Other ATC systems and support equipment

The FY 2017 Budget for Facilities and Equipment includes two main priority areas, which are predominantly funded in Activity 2. NextGen is a priority, but the second priority is sustaining the current systems that NextGen is built on. FAA has a multi-billion maintenance backlog for programs areas included in the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan.

NextGen:

The Budget includes funding for the following NextGen Programs and key programs, upon which NextGen is dependent:

- Automatic Dependent Surveillance Broadcast (ADS-B) will continue implementation of baseline applications. The national deployment of over 630 ADS-B ground stations was completed in 2014, and the requested FY 2017 funding will allow for the continued execution of ATC Separation Services, In Trail Procedures, Airport Surface Surveillance Capability (ASSC), and NAS-wide deployment of Ground Interval Management (GIM).

- In the FY 2017 President's Budget the performance based service fees for ADS-B infrastructure that is owned and operated by the prime contractor were differentiated from the core ADS-B program and requested in a separate Activity 6 account.
-
- ERAM – The Core En Route Automation Modernization (ERAM) program was completed in the second quarter of FY 2015. No F&E funding for the Core ERAM program is requested in FY 2017. ERAM System Enhancements and Technology Refresh will introduce new capabilities under a NextGen Mid-Term acquisition baseline. ERAM Technology Refresh efforts are needed to perform critical component replacements as necessary in order to ensure En route's continued supportability and security.

- FAA will begin software development and hardware engineering activities for the Tower Flight Data Manager (TFDM), which is a key ground infrastructure program for NextGen operations in the areas of flight planning; push back, taxi and departure; descent and approach; and landing, taxi and arrival

- TAMR – To support NextGen's mid-term goals, the Terminal Automation Modernization/Replacement (TAMR Phase 3) program will continue full scale deployment of the Standard Terminal Automation Replacement System (STARS) hardware and software to continue the convergence to a single Terminal Automation platform. The FY 2017 Budget funding will be used for:
  - Segment 1 will complete Initial Operating Capability (IOC) at the eleventh, and final, site.
  - Segment 2 - to achieve IOC at 29 sites, for a cumulative total of 55 sites, Install hardware and complete Contractor Acceptance Inspection (CAI) at 29 operational sites and to procure 12 additional systems.

Sustainment of NAS Infrastructure:

$464 million is requested to advance the state of good repair for FAA infrastructure facilities. This undertaking targets funding at the following Activity 2 BLIs:

- 2A04 Air Route Traffic Control Centers (ARTCCs) and Combined Center Radar Approach Control Facility (CERAP) Building Improvements/Plant Improvements
- 2A07 Air Traffic Control En Route Radar Facilities Improvements
- 2B06 Terminal Air Traffic Control Facilities – Replace
- 2B07 Terminal Air Traffic Control Facilities - Improve
- 2B09 National Airspace Systems (NAS) Facilities Occupational Health and Safety Administration (OSHA) and Environmental Standards Compliance
- 2E01 Fuel Storage Tanks
- 2E02 Unstaffed Infrastructure Sustainment
- 2E06 Facilities Decommissioning
- 2E07 Electrical Power Systems – Sustain/Support
- 2E08 Energy Management Compliance

This infrastructure funding, under the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan (SSP) Portfolio of Programs, will improve and maintain the Facility Condition Index (FCI) ratings at FAA facilities that provide the backbone for the National Airspace Systems (NAS) and functionality. While the request represents a shift to re-invest resources in critical infrastructure, the deferred maintenance backlog is so large that additional incremental increases for these facilities are necessary in order to reduce FAA operational risk. Funding the programs in this strategy will improve and maintain the facility condition index ratings at FAA facilities that provide the backbone for the NAS, and by extension, the backbone of NextGen. FAA is focused on improving conditions at facilities and for National Airspace (NAS) Infrastructure.

Funding in FY 2017 is requested for Communication, Navigation/Landing, and Surveillance Air Traffic Control (ATC) systems infrastructure. These systems allow the National Airspace System (NAS) to operate at the highest safety standards and provide airline operators and general aviation the dependable ATC services they require. Providing continued safe and expected services to these users requires sustainment of the aging systems infrastructure. The inventory of radio's supporting terminal communications is between 40 to 50 years old, voice switches used to communicate between pilots and air traffic controllers are 17 to 22 years of age, and on-airport radars are 15 to 20 years old. Of the 1200 Instrument Landing Systems in operation today, 125 are over 25 years old. Majority of these systems are required to support advanced NextGen capabilities or to provide redundant and safety backup capabilities in the event of satellite service disruptions.

Additional key outputs that will be delivered with the requested budget include:

- The Data Communications (Data Comm) program funding will support the development of Segment 1 Phase 1 (S1P1) and Segment 1 Phase 2 (S1P2) Initial and Full En Route Services work. Data Comm S1P1 includes Departure Clearance (DCL) service in the tower environment and will continue to be implemented in FY 2017. S1P2 includes enhancements to En Route services and will be implemented beginning in FY 2019.

- Major focus of the WAAS program will be on the 5th GEO satellite integration and payload development, test and launch of the 6th GEO, upgrading the WAAS Telecommunications Subsystem (TCS) and operationally deploying the equipment. Procedure feasibility studies, procedure design, procedure development, flight inspection, and surveys for 25 WAAS procedures are planned in FY 2017.

- Funding is requested to address Runway Safety Area (RSA) projects of varying size and complexity that are identified for completion prior to December 31, 2018. The funding being requested will allow the procurement of NavAids systems and the completion of the remaining 293 RSA improvements. 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.

- On September 26, 2014 the Chicago Air Route Traffic Control Center declared "ATC-zero" and was the direct result of criminal destruction of major operational capabilities. Extensive reviews have been completed by FAA and concentrated on prevention of future events and contingency planning that focused on responses to event situations and mitigation of the problems to the greatest extent possible. The FY 2017 budget includes funding for these measures under the Flight and Interfacility Data Interface (FIDI) and Surveillance Interface Modernization (SIM). The work to be accomplished with the FY 2017 funding will address near term activities that will modernize flight data interfaces with principal NAS Air Traffic Control Systems and Equipment. This work will achieve flexible Internet Protocol (IP) addressable interfaces over a secure network that will eliminate the problem of point to point serial interfaces. In addition, the FAA will purchase a spare FAA Telecommunication Infrastructure (FTI) system to replace the spare one that was installed at the Chicago ARTCC. These projects will ensure that critical communication links can be rerouted to other FAA facilities as necessary and that restoration of the telecommunications infrastructure equipment at one facility can be guaranteed in the event that the equipment is destroyed.

What Is This Program And Why Is It Necessary?

Activity 2 supports major systems acquisitions and facilities infrastructure programs in the implementation phase. These programs and initiatives fund the procurement and modernization of air traffic control facilities and equipment, including all funding related to the acquisition of air traffic control facilities, navigation and landing aids, surveillance equipment and facilities, automation systems, and communications systems and equipment. Activity 2 programs provide funding for control equipment and agency-owned aircraft that are used for flight inspections and other activities.

With this funding, we continue to ensure that current operational facilities and equipment deliver reliable and accurate services until investments in new technologies are ready to deliver the operational improvements needed for enhanced safety and future growth.

Over the past five years, FAA has met the following goals:

- Operational availability for the nation's busiest airports
- Daily airport capacity
- Major acquisition system cost and schedule performance

Typical Activity 2 programs include:

- Upgrades to existing equipment
- Acquiring production systems to replace existing systems, extend serviceable life, or technology refresh system components
- Deploying systems for installation or transition to operational status
- Deploying new, satellite-based technologies such as Automatic Dependent Surveillance-Broadcast (ADS-B) and Wide Area Augmentation Systems (WAAS)
- Deploying communications infrastructure to provide surveillance and navigation services
- Replacing or modernizing manned and unmanned ATC facilities
- Replacing or modernizing automation, communications, navigation, surveillance/weather infrastructure, systems, and equipment
- Decommissioning and disposal of the systems and facilities that have been replaced

These programs are necessary to modernize and sustain the NAS, as well as provide the foundational infrastructure, technologies, and capabilities required for the NextGen System. The demands for ATC services expected by the year 2020 will be constrained unless targeted investments in system upgrades and new technologies are implemented. At the same time, we must develop the standards, procedures, and safety protocols needed for implementing these investments.

Aviation is a major driver of our nation's economy, impacting all sectors of business and directly contributing $1.3 trillion and 11 million jobs to the U.S. economy. A vibrant aviation system, supported by a high-performance aviation infrastructure, increases capacity at our large metropolitan airports, improves access to small and remote communities, meets passenger demand for travel, supports a thriving tourist industry, and enables strong American business development.

Activity 2 efforts contribute to the following DOT Strategic Goals:

- Safety: Improve public health and safety by reducing transportation related fatalities and injuries
- Economic Competitiveness: Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens
- Organizational Excellence: Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs

Why Do We Want / Need To Fund The Program At The Requested Level?

The required funding level will minimize risk to near-term NextGen deliverables. In addition, the requested level enables funding for other, non–NextGen investments at levels that enable FAA to sustain ATC safety and services expected by the public, the military and other stakeholders.

What Benefits Will Be Provided To The American Public Through This Request?

The procurement and modernization of the nation's air traffic control system was first highlighted in 1980 with the publication of the first NAS Modernization Plan. Since that time, FAA has replaced old technologies with new systems that perform required functions better and more efficiently. During this period, aviation services were extended to new, small and medium-sized localities through the expanded deployment of updated air traffic control technologies, equipment, and infrastructure at these locations. FAA has efficiently operated and maintained these services through increased funding in Activity 2 programs and initiatives.

FAA has met most of the cost and schedule goals for the programs within Activity 2. Lessons that were learned during the deployment of ERAM were applied to TAMR Phase 3 and prompted FAA adjustments in the areas of schedule formulation, testing processes, and user expectation management. Activity 2 programs also contribute to the success of other Flight Plan metrics, including runway incursion reduction, ATC system operational availability, and NAS on-time arrivals.

Detailed Justification for - **2A01 En Route Automation Modernization (ERAM) System Enhancements and Technology Refresh**

What Is The Request And What Funds Are Currently Spend On The Program?

FY 2017 – En Route Automation Modernization (ERAM) - System Enhancements and Technology Refresh
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ERAM System Enhancements and Technology Refresh	$45,200	$79,400	$78,000	-$1,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ERAM System Enhancements Future Segments		
a. Program Management	---	$1,000.0
b. System Engineering Studies and Analyses	---	5,000.0
c. Solution Development and Hardware Procurement	---	64,000.0
Total	Various	$70,000.0
B. ERAM Sector Enhancements		
a. Program Management	---	$2,000.0
b. System Engineering	---	6,000.0
Total	Various	$8,000.0

A. ERAM System Enhancements Future Segments

For FY 2017, $70,000,000 is requested for "ERAM System Enhancements Future Segment". This funding will be used for continuing technology refresh activities including:

- Engineering studies, prototyping and analyses to determine the best technical and operations solution for high priority Tech Refresh items identified by Technical Operations and other stakeholders
- Begin software development for new operating system
- Critical hardware refresh at operational sites
- Hardware upgrade in ERAM test labs to support technology refresh testing and validation activities

B. ERAM Sector Enhancements

For FY 2017, $8,000,000 is requested for "ERAM Sector Enhancements". This funding will be used to:

- Continue systems engineering and design of the first block of ERAM Sector Enhancements
- Conduct design reviews for the first block of ERAM Sector Enhancements

What Is This Program And Why Is It Necessary?

This budget request consists of two projects: The "ERAM System Enhancements Future Segment" project and the "ERAM Sector Enhancements" project. Each project has its own investment analysis, requirements, decision timelines, and implementation schedules. Each of these projects' unique requirements were approved by the appropriate investment decision bodies and contain capabilities satisfying the needs of multiple en route stakeholders; however, the genesis of each programs' requirements differ.

The current scope of the ERAM System Enhancements Future Segment project is to satisfy high priority technology refresh needs. The ERAM System Enhancements and Technology Refresh efforts beyond FY 2017 through ERAM's service life are needed in order to meet user identified needs, and to perform critical component replacements as necessary to ensure the continued supportability, safety, and security of the FAA Air Traffic Control infrastructure.

The ERAM Sector Enhancements project provides enhancements and capabilities beyond core ERAM functionality. The ERAM Sector Enhancements are composed of enhancements for En Route sector controller teams to support increased sector operation efficiency and effectiveness.

A. ERAM System Enhancements Future Segment

For the ERAM System Enhancements Future Segment, FY 2017 is the first year of a multi-year investment. A Joint Resources Council (JRC) Final Investment Decision (FID) is planned for FY 2016, at which time the technology refresh scope and associated program constraints will be baselined. Program requirements are being gathered and the prioritizations of technology refresh needs are on-going. The technology refresh will be based on an analysis of en route's software and hardware potential obsolescence. Technology refresh is critically necessary because much of ERAM's infrastructure hardware was procured during 2006, and critical components are no longer in production and support/repair services are no longer viable, resulting in spare component levels projections below levels needed to maintain ERAM system redundancy and availability. ERAM components known to be approaching the end of required sparing levels include the processor, video card, and display used in the radar controller position workstation, the processor and video card used in the maintenance and control workstation (MCW), and the processors used in the data position workstation.

B. ERAM Sector Enhancements

The FAA approved an Investment Analysis Readiness Decision (IARD) for ERAM Sector Enhancements in July 2014 and projects a FID in the fourth quarter of FY 2016. FY 2017 is the planned first year of a multi-year solution implementation effort. System engineering and design of the first block of ERAM Sector Enhancements and conduct of design reviews for the first block of ERAM Sector Enhancements will take place in FY 2017. Sector Enhancements received its name as a result of the requirements to improve the coordinated efforts of the air traffic controller sector team.

ERAM Sector Enhancements provides software enhancements for the En Route sector controller team. In FY 2017 ERAM Sector Enhancements will continue the systems engineering and design of improvements to en route automation and procedures, building upon existing ERAM capabilities and leveraging previous NextGen pre-implementation activities.

ERAM Sector Enhancements are composed of the following capabilities which provide enhancements for En Route sector controller teams to support increased sector operation efficiency and effectiveness:

- Improve the Flight Plan Trajectory Modeling to consistently identify the next sector for handoff and flight data distribution.
- Improve the accuracy of Aircraft (AC) Trajectory Modeling.
- Improve Conflict Probe through better representation of the adherence bound to minimize false alerts and to apply a 3-nautical mile (NM) separation standard and wake turbulence procedure (whichever is larger) in the 3-NM separation airspace and transition airspace.
- Provide Conflict Probe at the Radar Controller's display (R-Side) to facilitate the use of Conflict Probe information, especially when the sector is staffed with one controller.
- Improve controller access to modern aircraft flight data and equipage information that is available in

the International Civil Aviation Organization (ICAO) flight plan.
- Improve the processing of Unmanned Aircraft System (UAS) flight information, including routes, aircraft types, and performance characteristics.
- Expand the automated coordination of flight data and aircraft control with the Canadian, Cuban, and Dominican Republic Air Navigation Service Providers (ANSPs).
- Improve the ability of Air Route Traffic Control Center (ARTCC) support personnel to efficiently and dynamically change adaptation data.
- Provide maintenance support at the Monitor and Control (M&C) workstation.

Why Do We Want / Need To Fund The Program At The Requested Level?

The core ERAM system became operational at all 20 CONUS Air Route Traffic Control Centers (ARTCCs) at the end of the second quarter of FY 2015. The ERAM System Enhancements Future Segment is needed to sustain the system. The equipment is in critical need of technology refresh for reliability, maintainability, and availability of the ERAM system.

ERAM Sector Enhancements will build upon the deployed ERAM system to harness full potential for operational effectiveness. Some of these capabilities have been matured and prototyped in research and development under NextGen Portfolio Programs and are expected to provide tangible positive operational results.

What Benefits Will Be Provided To The American Public Through This Request?

A. ERAM System Enhancements Future Segment

The primary objective of this project is to sustain the ERAM system as specified by refreshing equipment that is approaching end-of-life and hardware discontinued by the manufacturer. Sustainment of safety critical Air Traffic operations' reliability, maintainability and availability (RMA) as well as a much lower system life cycle costs are expected outcomes of this investment. The primary performance metrics will continue to consist of the same ERAM contractual criteria for software acceptance such as change request pass rates, and test releases and site operational releases.

B. ERAM Sector Enhancements

The ERAM Sector Enhancements improve trajectory management by improving air traffic management efficiency and effectiveness and reducing the potential for operational errors.

Detailed Justification for - 2A02 En Route Communications Gateway (ECG)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – En Route Communications Gateway (ECG)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
En Route Communications Gateway (ECG)	$6,600	$2,650	$2,650	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Equipment Replacement and Program Support Services	---	$2,000.0
B. In-Service Engineering	---	650.0
Total	Various	$2,650.0

For FY 2017, $2,650,000 is requested for equipment replacement, engineering services, and program support services for the ECG. In addition, the request will support in-service engineering work that provides an immediate response to emerging technology solutions.

What Is This Program And Why Is It Necessary?

The ECG system is a computer system that formats and conveys critical air traffic data to the En Route Automation Modernization (ERAM) System and the Enhanced Backup Surveillance (EBUS) System at the Air Route Traffic Control Centers (ARTCC's). ECG increases the capacity and expandability of the NAS by enabling the current automation systems to use new surveillance technology. ECG introduces new interface standards and data formats which are required for compatibility with International Civil Aviation Organization (ICAO) standards and adds capacity to process data from additional remote equipment such as radars. The ECG provides the automation system capacity and expandability to support anticipated increases in air traffic and changes in the operational environment. The ECG was a prerequisite to deploying the ERAM software and hardware.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The required funding will provide technology refresh and maintain the ECG systems to support integration of ERAM. ECG is a baselined program and is currently engaged in requirements validation, software development, and testing as part of a technology refresh effort.

The ECG Operational Analysis (OA) Report measures the performance of the ECG investment against an established set of cost, schedule, and performance parameters. The OA provides metrics associated with monitoring the fielded system performance. The results and recommendations of this report can benefit existing services provided by the ECG system as well as enhancing the capabilities of the ECG system to support emerging needs. The report covers all operationally fielded ECG systems, and spans the period from the first ECG site declaring Operational Readiness Demonstration (ORD) through March 31, 2015. This represents 74,424 days of continuous ECG operation.

- The ECG system has experienced no operational outage to date and as such has achieved an Operational Availability of 1
- Most Line Replaceable Units are experiencing failure rates well within their performance expectations

The ECG system is meeting and exceeding the benefits estimated in the ECG Investment Analysis Report and continues to be the Preferred Solution.

What Benefits Will Be Provided To The American Public Through This Request?

As discussed above, ECG is one interdependent piece of FAA automation systems that provides the foundation for FAA's air traffic control system.

Detailed Justification for - 2A03 Next Generation Weather Radar (NEXRAD)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Next Generation Weather Radar (NEXRAD)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Next Generation Weather Radar (NEXRAD)	$7,100	$6,500	$6,300	-$200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. NEXRAD Product Improvement (NPI)	---	$900.0
b. Procure Technology Refresh Hardware	---	175.0
c. Contract Support	---	600.0
d. Equipment SLEP	---	2,255.0
e. Facility SLEP Avtivities	---	725.0
f. MIT/LL NEXRAD Algorithms	---	1,645.0
Total	Various	$6,300.0

For FY 2017, $6,300,000 is requested to support National Weather Service's (NWS) NEXRAD technology refresh planning and procurement efforts. The FAA funding share for NEXRAD Product Improvement (NPI) is an annual requirement as established in the Tri-Agency Memorandum of Agreement (MOA) between the Department of Transportation (FAA), Department of Defense (USAF), and the Department of Commerce (NWS).

What Is This Program And Why Is It Necessary?

NEXRAD is a long - range weather radar that detects, analyzes, and transmits weather information for use by the Air Traffic Control (ATC) System Command Center (ATCSCC), En Route, Terminal, and Flight Service Facilities. NEXRAD detects, processes, and distributes for display, hazardous and routine weather information which are processed by FAA's Weather and Radar Processor (WARP), Integrated Terminal Weather System (ITWS), and the Corridor Integrated Weather System (CIWS) systems.

The Office of Management and Budget (OMB) directed NEXRAD to be a joint program between Departments of Transportation, Defense, and Commerce, with National Weather Service as the lead. The NWS is the agency responsible for the overall coordination of the development and implementation of the system upgrades. Agencies share developmental costs in proportion to the number of systems fielded by each agency.

Originally installed between 1990 and 1996 with an economic service life of 20 years, there are currently 160 operational NEXRAD systems in the United States and overseas, jointly operated and maintained by the Tri-Agency partners. By FY 2015 the average age of NEXRAD will have reached the end of its economic life. A major SLEP is required to extend NEXRAD's service life to 2030, when it can be replaced by a newer technology. The FAA's NEXRAD SLEP program will provide the means to fund the FAA's share of the overall NEXRAD mission, and to ensure that FAA priorities are included in the planning for NEXRAD sustainment and improvement.

The NEXRAD SLEP has four main purposes:

- Along with its Tri-Agency partners, the FAA will provide support for product improvements to the legacy NEXRAD program in accordance with the MOA. In addition to annual cost-share requirements for NPI Science Evolution and infrastructure support, the FAA will be required to fund a pro rata share of allocated technology refresh costs.
- NEXRAD's obsolete radar video processor will lose vendor support after 2015, and will be the first SLEP activity undertaken. The other radar components that need to be refurbished include the radar transmitter and the radar pedestal. These three SLEP activities will be managed by the Radar Operations Center (ROC), and managed by the NWS.
- The FAA will refurbish NEXRAD physical facilities, which includes most of their towers, radomes, access roadways, and shelters. These SLEP projects will be managed by the NEXRAD Program Office, with coordination through the Service Areas (Western with 11 sites and Eastern with one site).
- The FAA will continue to invest in FAA-specific algorithms that improve NEXRAD weather products for use in aviation applications. In parallel with the recently concluded acquisition of Dual Polarization technology for their NEXRAD platforms, the NEXRAD program has been developing algorithms that use Dual Polarization products to discern and display in real time, incidences of in-flight icing and hail.

The FAA owns and operates 12 NEXRADs, located in Alaska (seven), Hawaii (four), and Puerto Rico (one).

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$6,300,000 is required to fund the FAA's continuing commitment to NEXRAD sustainment and product improvement, in accordance with the Tri-Agency MOA. The MOA, originally implemented in 1980, was renewed in January 2012 for a 10-year period. The MOA, which is essentially a contract among the participating members of the Tri-Agency, was signed by the FAA's Vice President of Technical Operations. The requested funding also continues providing project oversight and subject matter expertise that has made the program work successfully to date.

What Benefits Will Be Provided To The American Public Through This Request?

NEXRAD has been successfully operating in the CONUS, and in the NAS, since 1996. NEXRAD systems have increased aviation safety with the accurate and timely detection of hazardous aviation weather conditions. Weather related arrival and departure delays have been reduced, thus allowing aviation fuel consumption savings. While Dual Polarization technology, which provides a two dimensional view of precipitation, has been utilized in the commercial weather radar community for over 20 years, it is only now being introduced onto the NEXRAD platform. Dual Polarization will only provide incremental improvements in overall data quality over the present day NEXRAD but the introduction of the in-flight icing and hail detection algorithms will provide features that enhance aviation safety and detection of weather conditions while aircraft are aloft.

Detailed Justification for - 2A04 Air Route Control Center (ARTCC) and Combined Control Facility (CCF) Building Improvements

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Air Route Control Center (ARTCC) and Combined Control Facility (CCF) Building Improvements
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ARTCC/CCF Building Improvments	$59,000	$74,200	$74,870	+$670

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ARTCC Facility Modernization and Sustainment	7	$71,900.0
B. Atlanta NAS Enterprise Management Center (NEMC) Building Expansion	1	670.0
C. In-Service Engineering	---	2,300.0
Total	Various	$74,870.0

For FY 2017, $72,570,000 is requested to continue ARTCC modernization and sustainment projects and for design of the NEMC Building Expansion. Air Route Traffic Control Center (ARTCC) and Combined Control Facility (CCF) Building Improvements is one of the 14 programs included in the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan (SSP) Portfolio of Programs. Major construction projects will replace obsolete plant equipment and provide improved work areas. These projects will include asbestos abatement, replacement of mechanical/electrical systems, and the installation of fire detection and protection upgrades as well as interior architectural construction. All facilities will also receive smaller mission sustainment projects to mitigate the risk to operations associated with infrastructure failures. Also requested, is $2,300,000 for in-service engineering activities.

Specific mission critical and local sustainment projects will also be accomplished at each facility to replace obsolete equipment and infrastructure to support the air traffic control (ATC) mission, operation of the facility, and maintain the facility in an acceptable condition. En Route Facilities developed the FY 2017 and the out-year facility maintenance project prioritization using a methodology and approach consistent with the current Air Traffic Control Facilities project prioritization model. The FY 2017 request was developed by the evaluation of critical facility factors including: direct operational requirements, safety factors, indirect operational requirements, facility condition index value per site, and facility seismic factors. In addition, facility-specific operational requirements such as employee safety, physical security, mission criticality, environmental requirements, and risk factors were important factors in determining which projects should be funded.

Major Modernization projects planned for FY 2017 include:

Construction

- Control Wing Basement (CWB)/Major Mechanical Systems (MMS)– Seattle, Los Angeles, Atlanta, and Salt Lake City ARTCCs
- Building Automation Controls System Replacement– Anchorage, and Indianapolis ARTCCs

Design

- Building Automation Controls System Replacement–Atlanta, Guam, and Minneapolis ARTCCs

The following is a brief description of the major modernization projects and the NEMC Facility Expansion:

- **Control Wing Basement**–This project renovates portions of the control wing basement. It primarily consists of replacing old and obsolete mechanical and electrical systems throughout the control wing necessary to support the NAS equipment located in these areas. Existing fire detection and suppression systems will be maintained, and modified as necessary. FAA will install architectural and building finishes to modernize space that has not been renovated in 50 years and will support NAS operations and mission support functions. Structural and architectural upgrades will be provided to meet current building codes. Upon completion of this project, the space will continue to be in use to house NAS systems.
- **Major Mechanical Systems**–This project rebuilds or replaces the ARTCC chillers and cooling towers along with associated mechanical systems such as piping, pumps, fans, filters, and controls.
- **Building Automation Controls System Replacements**–This project replaces the aging Direct Digital Control Systems (DDCS) that monitors and controls the facility environmental systems, such as heating, ventilation, air conditioning equipment, chillers, cooling towers, pumps, air handlers, and computer room air conditioners, as well as monitoring water leak detection systems. The new "BACnet" (a communications protocol for building automation and control networks) replacement system will be an open communication standard protocol that was developed by ASHRAE (founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment), specifically for building automation and control networks. This project will provide standardization of Building Automation Control Systems at all FAA En Route Facilities.
- **NEMC Facility Expansion-**The Atlanta NEMC hosts FAA national Air Traffic enterprise capabilities (e.g. Weather Processing and Dissemination, Flight Plan Processing and Delivery, Network Security Gateways). Currently the NEMC facility has significant space, cooling and environmental deficiencies that if left unresolved can result in catastrophic NAS failures. Further, the facility cannot accommodate future systems due to these constraints. The expansion consists of adding space and resolving the environmental deficiencies that impact the systems housed in the facility.

What Is This Program And Why Is It Necessary?

The Air Route Traffic Control Center ARTCC and Combined Control Facility (CCF) Building Improvements program is an ongoing multi-year facility modernization and sustainment program that addresses physical plant requirements for the FAA's 21 ARTCC's as well as the CERAP facilities at San Juan and Guam. These facilities were originally constructed approximately 50 years ago and expanded in phases since then. This program supports the FAA's mission by providing efficient, reliable and safe work environments for En Route ATC operations. This program replaces obsolete equipment.

The Air Route Traffic Control Center ARTCC and Combined Control Facility (CCF) Building Improvements program is necessary to support ATC operational requirements, to reduce the risk of ATC delays caused by infrastructure failures, and to minimize future capital liabilities associated with infrastructure failures. Many of the systems have exceeded their life expectancies and are at risk of failure. The importance of these facilities cannot be overstated and is shown in the following example: in September 2014 a fire at the Chicago ARTCC required an evacuation of the Air Traffic Control Room. The facility was completely shut down for 18 days while the facility was restored. This facility provides air traffic control services covering 91,000 square miles of airspace, and handled approximately 115,000 aircraft for the same period the previous year. Air traffic services needed to be diverted to other facilities in addition to their normal operations.

Roof leaks, pipe failures and malfunctioning heating, ventilation and air conditioning (HVAC) equipment can contribute to equipment failures, mold growth, and adversely affect the health of employees within these facilities. The presence of asbestos fireproofing continues to pose a risk to maintenance personnel and significantly increases costs associated with maintenance or repair activities. Fire protection systems must be added in some areas of the buildings to meet building codes and structural upgrades are also necessary at ARTCC's in seismic areas.

DOT Strategic Goal–Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want / Need To Fund The Program At The Requested Level?

$74,870,000 is required to reduce the risk of infrastructure failures that could affect ATC Operations and will therefore decrease operational liabilities. Funding at the requested level will result in a decrease to the deferred maintenance backlog and improve the condition of the facilities, decreasing the risk to operations. Studies have shown that the liability potential is four times that for each dollar of infrastructure sustainment backlog and the FY 2017 projects are expected to constrain this risk.

What Benefits Will Be Provided To The American Public Through This Request?

Any building/building systems failure may have a direct impact to air traffic operations. Over the past seven years this program has been able to reduce the national backlog by approximately $30 million. The associated reduction in out-year capital liabilities is approximately $120 million.

Operations risks have been mitigated by focusing sustain projects on the most crucial failure modes. Personnel and life safety risks have been reduced through asbestos abatement and fire protection projects. Indoor air quality and mold risks have been reduced through roofing, piping, and HVAC projects. Space utilization has been improved by providing more efficient configurations in office areas.

Detailed Justification for - 2A05 Air Traffic Management (ATM)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Air Traffic Management (ATM)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Air Traffic Management (ATM)	$5,729	$13,700	$20,000	+$6,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. TFM Infrastructure Field/Remote Site Technology Refresh	---	$15,300.0
B. Commercial Space Integration into the NAS	---	2,000.0
C. TFM Service Enhancements	---	1,000.0
D. In-Service Engineering	---	1,700.0
Total	Various	$20,000.0

The Traffic Flow Management System (TFMS) is the automation backbone for the Air Traffic Control System Command Center (ATCSCC) and the nationwide Traffic Management Units that assist the ATCSCC in strategic planning and management of air traffic. For FY 2017, $20,000,000 is requested to support the following activities:

- **A. TFM Infrastructure Field/Remote Site Technology Refresh:** $15,300,000 is requested to complete site surveys, engineering analysis and begin the hardware procurement for remote site hardware replacement.
- **B. Commercial Space Integration:** $2,000,000 is requested to advance the National Airspace System (NAS) Program through the Investment Analysis phase of the Acquisition Management System (AMS).
- **C. TFM Service Enhancements:** $1,000,000 is requested to conduct operational analysis, engineering analysis, solution development and solution implementation activities.
- **D. In-Service Engineering:** $1,700,000 is requested to advance activities to allow for immediate response to emerging technology solutions.

What Is This Program And Why Is It Necessary?

TFMS is the nation's primary source for capturing and disseminating flight information across the aviation community. The automation and communication mechanisms provided by the TFMS support the decision-making process used to adjust flight schedules and/or routes as necessary. When the National Airspace System (NAS) is impacted by severe weather, congestion, and/or outages, the TFMS has unique capabilities to predict chokepoints and facilitate the collaboration and execution of mitigation initiatives with stakeholders, using common information displays and tools, to minimize NAS delays.

A. TFM Field/Remote Site Technology Refresh

The program will provide a replace-in-kind technology refresh of the TFMS hardware used by the Traffic Flow Managers in the field, at more than 88 TFM equipped FAA facilities around the country. These facilities include: Air Route Traffic Control Centers (ARTCCs), Terminal Radar Approach Control Facilities (TRACONs), Air Traffic Control Towers (ATCTs), the ATCSCC facility, FAA Regional Offices, the FAA test facility located at the William J. Hughes Technical Center (WJHTC), and Prime TFM vendor test facilities. The FAA must maintain mission essential TFM operations at these facilities. The TFMS provides direct mission support to the FAA by ensuring efficient flow of air traffic through the NAS and is the primary tool used by Traffic Flow Units in the field.

The TFMS hardware is no longer produced and will not be supported by the hardware vendor after 2014. The TFM system exceeds the current hardware specifications and as a result, is experiencing performance degradation. Performance degradation forecasts have not taken into account the planned Collaborative Air Traffic Management Technologies (CATMT) Work Packages (WP) 2 and 3 functionality, which will utilize the same hardware, and thereby increasing utilization and risk of accelerated performance degradation. The TFMS technology refresh improves performance by replacing the hardware providing the central data processing capability for the TFMS. This will maintain operational availability, avoid hardware obsolescence, and avoid increased cost of maintenance and performance degradation.

B. Commercial Space Integration into the NAS

In FY 2014, the Office of Commercial Space Transportation (AST) supported 22 commercial launches and reentries, an increase in activity of more than 15 percent over the previous year. A comparable level of activity is expected in FY 2015. Many of the planned missions will include aspects that have never been undertaken, presenting an unprecedented level of complexity. Planning and execution challenges are making it increasingly difficult for the FAA to manage the growing volume of operations in the NAS without significant disruptions to both space and air operators. During a commercial space launch or reentry, the AST and the Air Traffic Organization (ATO) rely on rudimentary tools to monitor and manage the operation. This work is manual in nature, time consuming, and error prone, and it limits the FAA's ability to respond to dynamic conditions. Interfaces for the ingest of space vehicle data into existing NAS systems do not exist, so a small team transfers data across tools and networks verbally and on paper, enters the data by hand, and completes multiple checks to minimize the potential for error. As it is so resource intensive, the team struggles to keep pace with the increasing commercial space operations tempo.

AST, in collaboration with NextGen and ATO System Operations and Mission Support, is developing prototype automation solutions that will enable a "reduce, respond, release" approach to safely minimizing the effects of these operations on NAS efficiency and capacity without impeding industry progress. Prior to an operation, analysts will use enhanced safety analysis tools to safely reduce the amount of airspace that must be closed to other users. During an operation, space data integration solutions will display a vehicle's position on traffic management tools relative to pre-determined aircraft hazard areas. This capability will allow traffic managers to effectively respond to off-nominal scenarios. During normal operations, traffic managers will be able to dynamically modify these areas to release airspace that is no longer at risk as the mission progresses. Post-mission statistics will be gathered and examined that will quantify the reduction in effort required in planning and the gains in efficiency realized during the operation. These metrics will be applied to the mission analysis that will facilitate an IARD and eventual deployment and broad application of these automation solutions.

C. TFM Service Enhancements

This program will support operational analysis, engineering analysis, solution development, and solution implementation activities designed to improve the delivery of TFM services. The scope of these NAS enhancements are limited to operational changes that do not require significant capital investments (e.g. achieving a FID) or involve significant systems complexity, interdependencies, and NAS operational changes. The identification, management, documentation, and overall governance of these NAS changes will be articulated in an ATO Standard Operating Procedure and coordinated with applicable stakeholders.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. TFM Field/Remote Site Technology Refresh

Funding is required to conduct engineering analysis, site surveys and begin hardware procurement for the remote sites technology refresh. TFMS is the platform for the NextGen CATMT enhancements.

B. Commercial Space Integration into the NAS

Funding for the Commercial Space Integration into the NAS Program at the required level allows the FAA to evolve past the processes employed today of working on a mission-by-mission basis to identify and implement case-by-case planning and operational strategies. This program will introduce processes, procedures, and automated systems that will be significantly enhanced, allowing the FAA to identify multiple, complex constraints much earlier in the process and work them in parallel, maximizing the opportunity to address them in a way that best benefits the NAS.

C. TFM Service Enhancements

Funding is also required to improve efficiency of Traffic Management Initiatives such as Airspace Flow Programs, Ground Delay Programs and Ground Stops. More efficient traffic management initiatives, strategies, and better use of resource capability will result in higher throughput, less delay, and savings in airline operating cost. The funds will be used to conduct operational analysis, engineering analysis, solution development, and solution implementation activities for Traffic Flow Management service enhancements. Candidate enhancement areas for FY 2017 include:

- Enhanced Data Exchange with Users
- Improved NAS State Awareness
- Improved integration of surface data
- Display Traffic Management Initiative (TMI) data from NTML directly on the Traffic Situation Display (TSD)

What Benefits Will Be Provided To The American Public Through This Request?

A. TFM Field/Remote Site Technology Refresh

The TFMS Remote Site technology refresh is a hardware replacement of the operational hardware used by the TFM in the field. Once implemented, this will resolve hardware obsolescence, avoid system performance degradation and avoid impact on other programs. The TFMS performs today and provides benefits through the CATMT applications to improve capacity to minimize avoidable delays. The technology refresh program will allow TFM to maintain its ability to provide proven delay reducing services to the flying public and will reduce the cost of providing delay reductions and increase the lifecycle of the system hardware.

B. Commercial Space Integration into the NAS

Many benefits will be derived from the Commercial Space Integration into the NAS Program. They include safety, flight efficiency, and cost savings. This program will enhance the current level of safety by automating resource intensive, layered approaches, improving planning processes through advanced insight into complex constraints, and reducing the potential for human error. It will allow NAS performance and capacity to keep pace with current and future demand, reducing delays and reroutes while increasing launch and reentry opportunities for each space flight. Additional benefits include the development of airspace management processes and procedures for transition from special operations to routine operations, reduced FAA long-term costs and decreased costs to NAS users that would be passed down to the public.

C. TFM Service Enhancements

Funding is also required to improve efficiency of Traffic Management Initiatives such as Airspace Flow Programs, Ground Delay Programs and Ground Stops. More efficient traffic management initiatives, strategies, and better use of resource capability will result in higher throughput, less delay, and savings in airline operating cost. The funds will be used to conduct operational analysis, engineering analysis, solution development, and solution implementation activities for Traffic Flow Management service enhancements. Candidate enhancement areas for FY 2017 include:

- Enhanced Data Exchange with Users
- Improved NAS State Awareness
- Improved integration of surface data
- Display Traffic Management Initiative (TMI) data from NTML directly on the Traffic Situation Display (TSD)

Detailed Justification for - 2A06 Air/Ground Communications Infrastructure

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Air/Ground Communications Infrastructure
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Air/Ground Communications Infrastructure	$3,900	$11,750	$8,750	-$3,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Communications Facilities Enhancement (CFE) Expansion	11	$7,000.0
B. Radio Control Equipment (RCE) - Sustain	---	1,000.0
C. In-Service Engineering	---	750.0
Total	Various	$8,750.0

For FY 2017, $7,000,000 is requested to initiate 11 new CFE expansion/relocation sites, procure replacement radios, equipment racks, antennas, towers, and site preparation. The 11 FY 2017 sites are:

- Blackstone, VA Relocate Remote Center Air Ground (RCAG)
- Salt Lake City, UT Establish new RCAG
- Cape Blanco, OR Relocate Remote Communications Outlet (RCO)
- Anchorage, AK Establish new Remote Transmitter Receiver (RTR)
- Fort Worth, TX Relocate RCAG
- Tunica, MS Establish RTR
- Fort Worth, TX Install VHF channel to existing RCAG
- Amarillo, TX Install UHF channel at existing Air Traffic Control Tower (ATCT)
- Amarillo, TX Install VHF channel at existing RTR
- Frozen Calf, AK Replace Self Sustaining Outlet (SSO)
- White Hills, AK Convert SSO to RCO

For FY 2017, $1,000,000 is requested for RCE obsolescence study, supportability of repair facility, and RCE attrition support for NAS growth until NextGen requirements have been fully deployed.

Also requested is $750,000 for in-service engineering activities.

What Is This Program And Why Is It Necessary?

A. Communications Facilities Enhancement/Expansion (CFE)

The CFE program provides new communications facilities and equipment. The program also improves and/or relocates current communication facilities to meet new demands. In addition to providing funding for improvements to RCAGs, Back-Up Emergency Communications Facilities (BUECs), RTRs, and RCOs, the CFE program has identified the need to help sustain critical communication in very remote areas in Alaska by either replacement or refurbishment of SSOs.

B. Radio Control Equipment (RCE)

This program replaces radio signaling and tone control equipment. The equipment is located at all air route traffic control centers, remote center air/ground communications facilities, air traffic control facilities, remote transmitter receiver sites, flight service stations and remote control outlets.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The CFE program maintains and increases air traffic capacity by ensuring the availability of equipment and facilities that are essential components in pilot and controller communications. The required funding for CFE also covers engineering and technical services/support to mitigate RFI events that occur in the NAS on a continuous basis.

Efficient flight patterns reduce aircraft operations and maintenance costs for the airline industry. New communications equipment will lower periodic and correctional maintenance costs associated with the old and technically obsolete equipment in the field.

What Benefits Will Be Provided To The American Public Through This Request?

Air/Ground Communications Infrastructure will replace aging and increasingly unreliable equipment and communications facilities which will significantly improve safety. In addition, Air/Ground Communications Infrastructure will establish new communications facilities. New communications equipment will lower periodic and correctional maintenance costs associated with the old and technically obsolete equipment in the field and as a result will reduce maintenance cost.

Detailed Justification for - 2A07 Air Traffic Control En Route Radar Facilities Improvements

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Air Traffic Control En Route Radar Facilities Improvements
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Air Traffic Control En Route Radar Facilities Improvements	$5,100	$5,810	$5,800	-$10

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Long Range Radar (LRR) Improvements Infrastructure Upgrades/Sustain	35	$5,150.0
B. In-Service Engineering	---	650.0
Total	Various	$5,800.0

The LRR Facilities Improvements program addresses the infrastructure requirements of the FAA-owned surveillance facilities serving the National Airspace System (NAS). This program is one of the programs included in the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan (SSP). For FY 2017, $5,800,000 is requested to sustain approximately 35 facilities that are in poor condition (i.e. Facility Condition Index below .9).

The scope of the Long Range Radar (LRR) infrastructure sustainment program includes system upgrade and/or replacement of electrical, mechanical, lightning protection, fire detection, facility security, building structural components, and facility access.

What Is This Program And Why Is It Necessary?

The NAS currently has 157 Long Range Radar (LRR) surveillance facilities that provide aircraft position information to FAA En Route control centers for air traffic control (ATC), and to the Department of Defense and Homeland Security for security monitoring of the NAS.

About 80 percent of the LRR inventory is older than 30 years. Sixty-six of these sites were established in the early 1950's and have reached the end of their useful life. Records from the NAS Performance Analysis System showed approximately 780 hours of En Route surveillance service outages experienced in FY 2014 were attributable to infrastructure failures and deficiencies. The ATC En Route LRR surveillance equipment will need to be operational at least through year 2025. Due to the age of these facilities, infrastructure maintenance and upgrades are urgently required at all of these sites.

The NAS requires reliable and continuous operation of surveillance equipment. The repairs, improvements, and modernization to existing infrastructure will enable the facilities to meet current operational, environmental, and safety needs. It will extend the service life of facilities, and most importantly, reduce the chance of outages that often cause air traffic delays and impact the requirement for continuous monitoring of the NAS.

The existing air surveillance infrastructure has shortfalls that must be addressed sequentially for the system to continuously meet the users' needs into the future. The immediate need is to ensure that current air surveillance capabilities do not further degrade while planning and implementing longer-term solutions.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$5,800,000 is required to make repairs to the facilities that are in poor condition and have greatest impact to the NAS. This funding level will extend the service life and lower the risk of NAS outages from occurring. Evidence shows up to ten-fold savings if properly funded sustainment programs are instituted. The required funding level will enable a proactive approach to facilities management and lifecycle.

What Benefits Will Be Provided To The American Public Through This Request?

The planned infrastructure sustainment projects upon completion will provide greater efficiency and reduce operating costs in en route ATC and facility maintenance operations. The facility condition index (FCI) for LRR facility inventory has been improving to about 82 percent in FY 2015. The goal of the LRR infrastructure sustainment program is to reach 90 percent FCI by 2025.

Air Route Surveillance Radar (ARSR) equipment availability has continued in an upward trend (99 percent availability) as a direct result of the LRR Infrastructure Improvements made under this program. The LRR Infrastructure program helps LRR facilities continue to meet operational, environmental, and safety needs, well beyond their expected useful life. Without this program, infrastructure failures will result, causing surveillance equipment failures that directly impact the NAS and ultimately the flying public.

Detailed Justification for - 2A08 Voice Switch and Control System (VSCS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Voice Switch and Control System (VSCS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Voice Switch and Control System (VSCS)	$13,800	$9,900	$11,300	+$1,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. VSCS Sustainment Activities	---	$5,265.0
b. Engineering Analysis	---	3,000.0
c. Program Management	---	750.0
d. Contractor Support	---	2,285.0
Total	Various	$11,300.0

For FY 2017, $11,300,000 is requested to continue VSCS Technology Refresh Phase 3 activities including Local Area Network (LAN) Transceiver Retrofit, system failure analysis and improvement studies, and Fiber Optic Tie Trunk (FOTT) Power Supply Retrofit.

Ongoing tasks for the program include engineering analysis, LAN Transceiver Retrofit, Ground to Ground Switch Node Reduction, and FOTT Power Supply Retrofitting.

What Is This Program And Why Is It Necessary?

The 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. It is essential that controllers be able to 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 40 to 60 active air traffic control workstations at each of the 21 En Route Centers.

The VSCS technology refresh program supports the FAA Strategic Priority of sustaining operational availability by improving system reliability of en route communications for both the current and future operations by replacing and upgrading components of the obsolete, non-supportable elements of the VSCS hardware and software in all 21 En Route Air Route Traffic Control Centers (ARTCCs). The technology refresh program is required to 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.

The VSCS is the existing legacy En Route voice switch system in the NAS, and it will have to remain operational until the full deployment of the NextGen NAS Voice System (NVS), which is currently planned for 2025.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$11,300,000 is required to ensure continued operation of VSCS, which is a Safety-Critical thread necessary to safely maintain Aircraft Separation in the National Airspace System (NAS). On average, 10 percent of failed units will not be able to be repaired by the Depot and sent back to a field site for use in the NAS, resulting in sustainability issues if spares are not supplemented. Requested funding will ensure the availability of Air Traffic Control (ATC) Communications in the En Route environment. The requested funding will:

- Prevent Continued decline of VSCS availability; it is currently below the Safety-Critical NAS Services requirement of 0.99999 (National Airspace System [NAS] Requirements Document NAS-RD-2013: Reliability, Maintainability, and Availability [RMA] Section 3.3).
- Allow Failure rate growth to remain constant instead of increasing. Technology refresh is necessary in order to retrofit or replace high-failure-rate items that have impacts both to system availability and sustainability.

What Benefits Will Be Provided To The American Public Through This Request?

The primary benefit of the VSCS technology refresh program is cost avoidance by reducing obsolescence and maintaining availability. VSCS is an integral part of a functional En Route air traffic control system; it provides the following qualitative benefits; Reliable access for many different ATC radios; Ability for ATC personnel to communicate with each other and coordinate work in the ARTCCs; and Reliable and maintainable voice communication switching in En-Route ATC facilities.

Detailed Justification for - 2A09 Oceanic Automation System

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Oceanic Automation System
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Oceanic Automation System	$3,508	$20,000	$24,000	+$4,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Advanced Technologies and Oceanic Procedures (ATOP) Technology Refresh		
a. Oceanic Automation System (OAS) Prime Contract	---	$21,600.0
b. Program Management	---	1,400.0
Total	Various	$23,000.0
B. Oceanic Service Enhancements	---	$500.0
C. Oceanic Separation Standards Development and Analysis	---	$500.0

A. ATOP Technology Refresh

For FY 2017, $23,000,000 is requested to allow the ATOP Program Office to continue the technology refresh of the ATOP system. The investment is a full system technology refresh program that will address the continued evolution of the oceanic capabilities and services. This funding will further define the detailed engineering requirements for refreshing the hardware and the operating system (AIX to Linux), and to initiate the procurement for those items needed for technology refresh. This will allow for improved performance for the ATOP system to support NextGen, Surveillance Broadcast Services (SBS), and other National Airspace System (NAS) system improvements required in the oceanic domain and improved system supportability and lower maintenance cost.

B. Oceanic Service Enhancements

For FY 2017, $500,000 is requested for the Oceanic Service Enhancements. The investment supports a category of requirements that address necessary and unplanned changes. These sudden needs are the result of operational changes like airspace re-designs for modifying or adding new sectors and International Civil Aviation Organization (ICAO) mandates that are small in nature and must be addressed quickly. The funding will be directed for the operational analysis, engineering analysis, solution development, and solution implementation activities for ATOP system enhancements designed to improve the delivery of oceanic domain services.

C. Oceanic Separation Standards Development and Analysis

For FY 2017, $500,000 is requested for the Oceanic Separation Standards Development and Analysis Program. The funding will be used for the development of ICAO Separation and Airspace Safety Panel (SASP) technical information and to support regional implementations of reduced aircraft separation standards and procedures in compliance with ICAO standards and recommended practices (SARPs). This work will include the use of data-driven mathematical models and simulation studies to support the development of new aircraft separation minima and procedures. Results of the mathematical analyses and simulation studies will be presented to the ICAO SASP and regional groups as working papers.

What Is This Program And Why Is It Necessary?

From 2005 to 2007, the ATOP program replaced the original oceanic air traffic control system, updated procedures, and modernized the Oakland, New York, and Anchorage Air Route Traffic Control Centers (ARTCCs), which house the oceanic automation systems. A support system was installed at the William J. Hughes Technical Center (WJHTC). ATOP fully integrates flight and radar data processing, detects conflicts between aircraft, provides data link and surveillance capabilities, and automates the previous manual processes for oceanic air traffic control.

A. ATOP Technology Refresh

The technology refresh of the ATOP system is envisioned to provide compatible technology upgrades and/or replacement of the hardware at the three Oceanic Centers and the WJHTC. Based on both system supportability and the additional functionality to be integrated into the ATOP system during the FY 2018 to 2023 timeframe through the ATOP Enhancement program, it is critical to begin this technology refresh starting in FY 2016.

The ATOP technology refresh program will support maintaining the ATOP systems at the 99.7 percent availability or higher with the installation of refreshed equipment and an operating system starting in FY 2018. The ATOP technology refresh will be measured by ensuring the equipment replacement is performed on schedule per the program baseline and appropriate measurements will be taken to ensure the operational availability levels are met or exceeded by this improvement to the ATOP infrastructure.

The following items are the shortfalls which will be addressed by this technical refresh program:

- Degraded system response times due to spike processing for system functions such as weather forecast updates and high weather-related traffic loads at New York Center (ZNY)
- Limited ability to process increased surveillance tracks from additional radar sources and Automated Dependent Surveillance – Broadcasting (ADS-B) data
- Inability to store required amount of System Analysis and Recording (SAR), playback data, and security related events to meet required FAA standards/policy
- Lack of vendor support from IBM and Microsoft for obsolete operating systems (i.e., AIX 5.3 and Windows XP)
- Potential increased lifecycle costs to maintain proprietary system components

B. Oceanic Service Enhancements

The Oceanic Services Enhancements support operational analysis, engineering analysis, solution development, and solution implementation activities designed to improve the delivery of domain services. The scope of these NAS enhancements is limited to operational changes that do not require significant capital investments. The identification, management, documentation, and overall governance of these NAS changes will be articulated in an ATO domain service enhancement Standard Operating Procedure (SOP) and coordinated with applicable stakeholders.

C. Oceanic Separation Standards Development and Analysis

The Oceanic Separation Standards Development and Analysis Program will provide specialized technical expertise to the International Civil Aviation Organization (ICAO) Separation and Airspace Safety Panel (SASP), and help to form FAA-recommended standards for ICAO regional planning groups in the North Atlantic and Asia Pacific regions, where the U.S. is responsible for significant delegated international airspace. This program will contribute towards the development and implementation of separation minima and procedures in the form of data-driven safety studies, mathematical modeling, and collision risk estimation.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The current baseline funding for the oceanic automation system was completed in FY 2015. At this time there are no plans to retire the current oceanic automation system.

A. ATOP Technology Refresh

Funding for ATOP technology refresh will define engineering requirements for refreshing the hardware and operating system and will initiate the procurement for those items needed for technology refresh. The technology refresh will address performance and data storage limitations maintenance and logistics costs and address end-of life operating system. The modifications are necessary to support planned NextGen and other NAS system requirements.

B. Oceanic Service Enhancements

The Oceanic Service Enhancements program will support operational analysis, engineering analysis, solution development, and solution implementation activities designed to improve the delivery of oceanic domain services. These small but critical enhancements are identified by current operations, and support FAA and/or ICAO changes.

There are no viable alternatives in the near future (FY 2016 through 2025) other than the development of a new oceanic ATC system to replace the ATOP system. This would be both expensive and unnecessary since the current ATOP system with enhancements will be able to meet the future requirements of the FAA at considerably lower cost than a total system replacement.

C. Oceanic Separation Standards Development and Analysis

The Oceanic Separation Standards Development and Analysis Program will enable the FAA to support the implementation of reduced separation minima and procedures in oceanic airspace. The program supports activities in ICAO technical panels, regional planning groups, and on multi-year implementation projects.

This Program supports FAA's Global Leadership position in the area of separation standards development and implementation. The ICAO North Atlantic Region is in the midst of executing several new separation minima reduction and procedure initiatives, and this program is essential to allowing the FAA to support these efforts.

What Benefits Will Be Provided To The American Public Through This Request?

The Oceanic Automation System (OAS) improvements will provide the following benefits:

User Benefits

- Technology Refresh will provide:
  - A more stable and capable oceanic air traffic control system

- Oceanic Service Enhancements will provide:
  - Program conducts analyses to support separation standard reductions that will provide: improved coordination, data link, special use airspace, and user request capabilities that support more optimum flight profiles

- Oceanic Separation Standards Development and Analysis
  - Improved global system safety and reduced training and equipage costs though internationally coordinated separation reductions

- Increased flight efficiency and flight planning flexibility which contribute to shorter flight time
- Decreased fuel burn due to increased availability of optimum flight profiles

FAA Benefits

- Technology Refresh will provide:
    - Improved performance and capacity to support integration of planned NAS and NextGen improvements
    - Increased data storage through expanded enterprise data storage solution
    - Reduced lifecycle hardware support costs by replacing nine-year-old components with state-of the-art components
    - Reduced supportability risk by replacing end-of-life operating systems and aging hardware components

- Oceanic Service Enhancements will provide:
    - Increased ATC efficiency and improved target levels of safety though the implementation of high priority ATOP functional enhancements

- Oceanic Separation Standards Development and Analysis Program conducts analyses that will provide:
    - Compliance with international safety requirements for new technologies planned for use in the oceanic domain
    - Improved decision support tools for controllers that will increase ATC service delivery capability and data-driven decision making

Detailed Justification for - 2A10 Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)	$40,000	$43,600	$50,500	+$6,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Nexcom Segment 2 Phase 1		
a. Program Management	---	$4,000.0
b. Engineering Support	---	3,300.0
c. Hardware/Software	---	26,700.0
d. Logistics	---	1,000.0
e. Implementation	---	15,000.0
f. Independent Operational Assessment (IOA) formerly IOT&E	---	500.0
Total	Various	$50,500.0

For FY 2017, $50,500,000 is requested for NEXCOM Segment 2 Phase 1 to install 2,700 Very High Frequency (VHF) and Ultra High Frequency (UHF) radios (receivers and transmitters) at 160 terminal and flight services facilities. The request also includes $500,000 for Independent Operational Assessment (IOA), formerly known as Independent Operational Test and Evaluation (IOT&E) activities to support NEXCOM.

What Is This Program And Why Is It Necessary?

NEXCOM will modernize the existing Air/Ground voice communication system using the limited available radio frequency spectrum more efficiently. NEXCOM will provide the operational flexibility and Voice over Internet Protocol (VoIP) capability required for NextGen. The two segments below are delivering the same capability, but were separated into two different implementation phases for both affordability and deployment reasons.

- Segment 2 Phase 1 (2009 - 2018) will deploy 12,000 VHF and UHF radios that will service the high-density terminal areas and the flight service operations
- Segment 2 Phase 2 (2019 - 2024) will deploy 23,040 VHF and UHF radios that will service the high-density terminal areas and the flight service operations

The existing VHF analog controller-to-pilot communications system lacks the capacity and flexibility to accommodate future growth in air traffic. Congestion reduction is at risk due to the lack of available air traffic control radio spectrum in high-density areas. The continuous growth in air traffic and the introduction of new services has driven a proportional demand (approximately four percent per year) for air/ground communication frequency assignments. The system is beyond its estimated life-cycle and is increasingly expensive to maintain. Air/ground communication is the most fundamental and safety important element of the Air Traffic Control (ATC) system supporting all phases of flight for En Route, Terminal, and Flight Service operational environments. There are approximately 60,000 analog radio units installed at over 3,000 sites.

NEXCOM will meet the new and growing demands for air transportation services; accommodate the growing number of sectors and services; utilize VHF spectrum required for voice communications more efficiently and make the recovered spectrum available for Data Communications (a future NextGen initiative, Budget Line Item 2A19); and improve reliability and reduce the growth of maintenance costs by replacing aging air/ground communications equipment with new digital equipment.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

NEXCOM Segment 2 site implementation is on schedule to complete the Acquisition Program Baseline (APB) milestone of Initial Operational Capability (IOC) at 450 sites for Phase 1 in FY 2018.

What Benefits Will Be Provided To The American Public Through This Request?

NEXCOM Segment 1a, predecessor to Segment 2 Phase 1, was completed successfully in FY 2013. That segment deployed 25,000 radios into 1,200 remote facilities with no schedule variance and less than one percent cost variance. NEXCOM Segment 2 Phase 1 has met the Acquisition Program Baseline (APB) milestones which will lead to on time equipment deployment in NAS. The program has incorporated product features that address FAA user concerns about operational suitability. The programs carefully executed taxpayer dollars.

The table below shows currently measured radio equipment performance goals.

Metric Description	Frequency	Unit of Measure	FY 2014 Target	Most Recent Actual	Metric Status *	Updated Date of Most Recent Actual *
Provide cumulative Mean Time Between Failure for NexCom Very High Frequency radios.	Semi-Annual	Hours	45,000	76,000	Met	03-31-2014
Provide Mean Time Between Depot Returns for NexCom Very High Frequency Radio receivers.	Semi-Annual	Hours	35,000	79,000	Met	03-31-2014
Provide failure rate per year for NexCom Very High Frequency radio receivers.	Semi-Annual	Percentage	3	1.68	Met	03-31-2014
Number of NexCom Very High Frequency radios (receivers and transmitters) returned to Ops stock.	Monthly	Number	1,050	993	Met	03-31-2014
Number of NexCom Ultra High Frequency radios (receivers and transmitters) returned to Ops stock.	Monthly	Number	500	291	Met	03-31-2014

Detailed Justification for - 2A11 System-Wide Information Management (SWIM)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – System-Wide Information Management (SWIM)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
System-Wide Information Management (SWIM)	$60,261	$37,400	$28,800	-$8,600

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. SWIM Segment 2B		
a. Enterprise Service Monitoring (ESM) Phase 2 Software Develop/Testing	---	$7,200.0
b. Identity and Access Management (IAM) Software Development	---	3,400.0
c. NAS Common Reference (NCR) Software Development	---	3,500.0
d. SWIM Terminal Data Distribution System Release 4/5 Software Develop	---	7,300.0
e. SOA Suitability Assessment, Sys Specification Develop/Gov. Support	---	3,600.0
Total	Various	$25,000.0
B. Common Support Services, Phase 1 – Weather		
a. Prime Development Contract (Hardware and Software)	---	$2,447.3
b. Program Support	---	483.1
c. Telecommunications	---	183.3
d. Test and Evaluation	---	186.3
Total	Various	$3,300.0
C. Independent Operational Assessment (IOA) formerly IOT&E	---	500.0

For FY 2017, $25,000,000 is requested for Segment 2B. This will cover the development, configuration, test and operational implementation of the following SWIM Service Oriented Architecture infrastructure services:

- Enterprise Service Monitoring (ESM)
- Identity and Access Management (IAM) Phase 2
- NAS Common Reference
- SWIM Terminal Data Distribution System Phase 2 (Release 4.0 and beyond)

$3,300,000 is requested for development of the operational system including: continuation of CSS-Wx solution implementation activities, software development, and site survey activities.

Currently, SWIM funding has been used to support:

- SWIM Terminal Data Distribution System (STDDS) system engineering, testing, deployment, second level engineering of STDDS Release 3.1 and 3.2 and interfacing the data acquired by STDDS to SWIM/ National Airspace System (NAS) Enterprise Messaging Service (NEMS)
- SWIM NAS Service Registry and Repository (NSRR), COTS and Wiki support

- SWIM Flight Data Publication Service (SFDPS) Phase 1 Software updates, system testing, deployment, second level engineering and interfacing the data acquired by SFDPS to SWIM/NEMS
- Purchasing and Deploying SWIM NEMS Nodes for the following Air Route Traffic Control Centers: Anchorage (ZAN), Oakland (ZOA), Jacksonville (ZJX), New York (ZNY), Denver (ZDV), Memphis (ZME), Indianapolis (ZID), and Houston (ZHU)
- Developing Segment 2A Core Capabilities
- On-ramping National Airspace System (NAS) Mission Services

$500,000 is also requested to support IOA activities. This work was formerly known as Independent Operational Test and Evaluation (IOT&E).

What Is This Program And Why Is It Necessary?

A. SWIM Segment 2B

The SWIM program is an information management and data sharing system for Next Generation Air Transportation System (NextGen). SWIM provides policies and standards to support data management, secure its integrity, and control its access and use. The initial phase of SWIM, Segment 1, included capabilities that were selected based upon the needs of various data communities, maturity of concepts of use, and the ability of existing programs to accommodate development of these SWIM capabilities within their existing program plans. In SWIM Segment 2A, the program continues to provide governance, standards, and software to NAS programs. SWIM is also implementing enterprise messaging via the NEMS for new service providers and facilitating the transition by Segment 1 SIPs to using the NEMS. Continued funding for these SWIM accomplishments are being transitioned to operations and maintenance in FY 2017.

SWIM Segment 2B is working towards the Joint Resource Council (JRC) Final Investment Decision (FID) in August 2015. SWIM Segment 2B plans to continue improve the FAA's ability to manage the efficient flow of information through the National Airspace System (NAS). Segment 2B includes additional capabilities to strengthen the overall NAS information system security posture and is leveraging the NAS Integrated Systems Engineering Framework (ISEF) version 3.2 to specify SWIM capabilities and responsibilities consistent with an enterprise-level functional architecture. Segment 2B will continue on-ramping of programs onto the NEMS. NAS Common Reference (NCR) will focus on the development of efficient Net-Centric Operations (NCO) for ATM situational awareness, geospatial awareness, data correlation, and support services. NAS enterprise IAM capability will facilitate interoperability of security controls with NextGen partners. STDDS is a NAS-EA Support Services system that has the capability to support various mission services in the terminal mission services area.

SWIM will reduce the number and types of unique interfaces, reduce redundancy of information and better facilitate information-sharing, improve predictability and operational decision-making, and reduce cost of service. The improved coordination that SWIM will provide allows 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 with other agencies.

Today's hard-wired infrastructure and systems cannot readily support the addition of new data, systems, data users, and/or decision makers as NextGen requires. Each of these interfaces is custom designed, developed, managed, and maintained individually at a significant cost to the FAA. NextGen relies upon a new decision construct that brings more data, systems, customers, and service providers into the process. Data will be needed at more places, for more purposes, in a timely manner, and in common formats and structures to ensure consistent use. These new "data customers" need to be accommodated by providing the governance and policy that tells them how to connect to existing, open interfaces instead of designing, developing, testing, and implementing new ones from scratch. Network technology and data management software must use commercial equipment and current industry standards, to reduce developmental and upgrade cost and simplifying maintenance. SWIM contributes to meeting the following NextGen objectives:

- Expand System Capacity - The projected increase of demand on the air traffic system exceeds current or projected growth in FAA resources. Information management is a key to providing increased capacity and efficiency in the NAS. SWIM will enable information to be readily shared and used by all

NAS participants. With more widespread use of better data, SWIM will improve strategic planning and trajectory management to allow better use of existing capacity en route.

- Increase Predictability - SWIM will improve coordination to allow transition from tactical conflict management to strategic trajectory-based operations. SWIM will also provide the potential to increase machine-to-machine interchange supporting and disseminating decisions rather than the current man-to-man interactions. SWIM increases the likelihood that similar decisions will be consistent by enabling them to be based on the same data.
- Reduce Costs for Aviation - SWIM will help to reduce infrastructure costs by reducing the number and types of interfaces, systems, and potentially, facilities. Initially, SWIM will provide a common network capability, reducing operation and maintenance costs of the hundreds of current interfaces. New systems will interface with SWIM, saving future development costs. Ultimately, redundant sources of data will no longer be needed and can be decommissioned.
- Shared situational awareness - SWIM will help to provide shared situational awareness so that all appropriate parties are privy to the same complete set of information.
- Collaborative Decision Making - SWIM will enable collaborative decision-making by providing all parties access to the same information where they can make real-time decisions and reach agreements quickly.

B. Common Support Services, Phase 1 – Weather

CSS-Wx will be the FAA's common support services capability for weather and 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 SWIM. 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 be the FAA's single provider of aviation weather data, consolidating several legacy weather dissemination systems, and will provide weather information for integration into NextGen enhanced decision support tools (DSTs). CSS-Wx will also be scalable to facilitate the addition of new users and new systems. The CSS-Wx system is scheduled to achieve Initial Operating Capability (IOC) in FY 2019.

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 IT Web Services, and other weather sources, available to FAA and NAS users for input into collaborative decision-making. A Final Investment Decision (FID) occurred on March 18, 2015 and a Prime Contract was awarded in April 2015. The CSS-Wx program is now in the FAA's Solution Implementation Phase.

Based on Operations Network (OPSNET), which is the official source of NAS air traffic operations and delay data, 68 percent of air traffic delays over 15 minutes for 2003 - 2012 were due to weather. In addition, 73 percent of delayed flights and 86 percent of delay minutes for CY 2010 - 2012 have weather as the primary cause. Weather also impacts safety. Weather was cited as a cause or factor in over 20 percent of the accidents investigated by the National Transportation Safety Board (NTSB) in 2007 - 2009.

Weather products currently being provided by the National Weather Service (NWS), combined with recent improvements to FAA's air traffic management tools, have significantly increased the size and geographic distribution requirements for weather information within the FAA network. In today's NAS, gaps and inefficiencies in today's weather dissemination system results in weather information not being utilized effectively or at all. Different decision makers currently have access to different weather information. CSS-Wx will utilize open international data standards and access to aviation weather information for input into the FAA's collaborative decision-making tools for the NAS.

CSS-Wx will resolve the issue of multiple interfaces, inflexible and inefficient information data management, unique data types and point-to-point information exchange. Implementation of this capability will provide cost savings, improvement of capacity, efficiency and safety in adverse weather.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$25,000,000 is required for the development of SWIM Segment 2B. For FY 2017, SWIM funding will be used to:

- Complete Final System Design Documents and Development Testing for Strong Authentication using digital certificates for internal connections between SWIM and NAS systems (IAM Phase 2).
- Complete Final System Design Documents for Surface Movement Event Service (SMES) enhancements, including additional data coverage of airport non-movement areas, and Request/Response service, including reconstitution for Terminal Automation Information Service (TAIS) service (STDDS Release 4/5).
- Complete ESM Phase 2 Operational Testing at WJHTC, which enables ESM to accept status messages from a Communication, Information & Network Programs SWIM Producer (APB Milestone).
- Complete Service Oriented Architecture (SOA) suitability assessments for NAS programs entering the FAA investment analysis process in 2017.

$3,300,000 is required for the development contract for the CSS-Wx System. The development contract will include the necessary software development. Included in the request, is funding for Program Support (e.g. Program Management, Engineering Support, Integrated Logistics Support), Telecommunications and Test and Evaluation (T&E) support.

$500,000 is required to support IOA activities.

What Benefits Will Be Provided To The American Public Through This Request?

SWIM represents the steps that FAA is taking to reduce costs while providing better service to:

- Change system interfaces to support network messaging, reducing the cost of testing and maintaining each individual interface (currently a major cost driver and resource load for NAS systems).
- Provide the flexibility to provide information to new systems and locations without adding custom interfaces. This will significantly reduce the marginal cost of adding new system interfaces.
- Provide common interfaces that facilitate spontaneously adding new users and applications, for purposes of continuity of operations.
- Enable the decommissioning of legacy weather data dissemination systems, which will reduce the rising operations and maintenance costs.
- Develop/implement open international standards to format and exchange digital weather data to ensure harmonization and ease of future enhancement and implementation. The FAA is also leading the world with EUROCONTROL in developing the Weather Exchange Model (WXXM), which is the emerging worldwide standard for the exchange of weather data. The goal is to provide access to weather data tailored to each user's needs. This enables access by all decision support tools. External consumers such as Airline Operations Centers will also be able to access the weather information in the new formats

Detailed Justification for - 2A12 ADS-B NAS Wide Implementation

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – ADS-B NAS Wide Implementation
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ADS-B NAS Wide Implementation	$254,700	$184,600	$31,100	-$153,500

Note: Subscription costs for this program, in the amount of $123,700,000 have been moved under the Activity 6 section of the budget in FY 2017.

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ADS - B NAS Wide Implementation - Baseline Services and Applications		
a. Program Management	---	$13,875.0
b. Baseline Services	38	11,911.0
c. Exelis Non-Subscription Costs	---	1,514.0
d. In Trail Procedures (ITP)	3	400.0
e. Independent Operational Assessment (IOA) formerly IOT&E	---	400.0
Total	Various	$28,100.0
B. ADS - B NAS Wide Implementation – Future Segments		
a. Program Management	---	$750.0
b. System Engineering	---	2,250.0
Total	Various	$3,000.0

The Automatic Dependent Surveillance – Broadcast (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 and pilot advisory services.

A. ADS-B NAS Wide Implementation - Baseline Services and Applications

For FY 2017, $28,100,000 is requested to provide for the continued implementation of the following 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

The funding will allow for the continued execution of In Trail Procedures (ITP), and Airport Surface Surveillance Capability (ASSC). Also included in the request is funding to support Independent Operational Assessment (IOA), which was formerly known as Independent Operational Test and Evaluation (IOT&E), for ADS-B activities.

The anticipated FY 2017 accomplishments for ADS-B Baseline Services and Applications are as follows:

- Achieve Initial Operating Capability (IOC) of Terminal Air Traffic Control (ATC) Separation Services at 34 sites (114 of 160 complete)
- Complete ASSC Site Acceptance Test (SAT) in Cleveland (CLE)
- Complete Service Volume (SV) design at three ASSC sites
- Achieve ATOP Oceanic In Trail Procedures operational at Oakland, New York and Anchorage Centers (Acquisition Program Baseline (APB) Milestone)

B. ADS-B NAS Wide Implementation – Future Segments

For FY 2017, $3,000,000 is requested to initiate implementation activities for ADS-B In Applications Interval Management – Spacing (IM-S) Arrivals, Approach, and Cruise (AA&C).

The anticipated FY 2017 accomplishments for ADS-B In Future Segments are as follows:

- Begin Preliminary Design and Preliminary Design Review for En Route Automation Modernization (ERAM), Standard Terminal Automation Replacement System (STARS), and Time Based Flow Management (TBFM)

Pre-Implementation activities and Acquisition Management System (AMS) milestones through Final Investment Decision (FID) for ADS-B In Applications are funded under ADS-B In Applications Flight Interval Management, which is included under the Separation Management Portfolio (1A05). This project supports the implementation activities from FY 2017 and beyond.

What Is This Program And Why Is It Necessary?

A. ADS-B NAS Wide Implementation - Baseline Services and Applications

ADS-B is a cornerstone technology for NextGen. This new system promises to significantly reduce delays and enhance safety by using aircraft broadcasted position based on the aircraft's navigation system calculation using the Global Navigation Satellite System (GNSS) or other navigation inputs, instead of position information from traditional radar.

ADS-B is an advanced surveillance technology that provides highly accurate and more comprehensive surveillance information. Aircraft position (longitude, latitude, altitude, and time) is determined using the GNSS, and/or an internal inertial navigational reference system, or other navigation aids. The aircraft's ADS-B equipment processes this position information along with other flight parameters for a periodic broadcast transmission, typically once a second, to airborne and ground-based ADS-B receivers. The information will be used to display aircraft position on En Route and Terminal Automation Systems such as Common Automated Radar Tracking System (CARTS), STARS, Microprocessor En Route Automated Radar Tracking System (Micro EARTS), ERAM, and Advanced Technologies and Oceanic Procedures (ATOP).

ADS-B NAS Wide Implementation supports the FAA mission and helps accomplish agency goals to increase economic competitiveness and safety. Activities influence the performance metrics for Average Daily Airport Capacity and NAS On-Time Arrivals. ADS-B Out is considered a foundational program for NextGen.

The following investments and capabilities have a significant dependency on the successful implementation of ADS-B:

- Terminal Automation Modernization Replacement (TAMR)
- Airport Surface Detection Equipment (ASDE)
- Time Based Flow Management (TBFM)
- Separation Management Portfolio Runway Status Lights (RWSL)

ADS-B has a significant dependence on the successful implementation of the following investments and capabilities:

- Advance Technologies and Oceanic Procedures (ATOP)
- En Route Automation Modernization (ERAM)
- Time Based Flow Management (TBFM)
- Standard Terminal Automation Replacement System (STARS)
- Airport Surface Detection Equipment (ASDE-X)
- Terminal Automation Modernization Replacement (TAMR)

B. ADS-B NAS Wide Implementation – Future Segments

ADS-B In Applications – Interval Management (IM) consists of a set of ground and flight-deck capabilities and procedures that are used in combination by air traffic controllers and flight crews to more efficiently and precisely manage spacing between aircraft. IM 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. Changes to ERAM, STARS, and TBFM automation systems will be needed to support the initiation and monitoring of IM operations.

Deployment of these Applications is in direct response to industry's request for the FAA to invest in the necessary ground automation. The FAA chartered the ADS-B In Aviation Rulemaking Committee (ARC) in June 2010 to provide a forum for the U.S. aviation community to recommend a strategy for incorporating ADS-B In technologies into the NAS. The ARC recommended focusing on ten key applications; Flight-deck based Interval Management - Spacing (now called IM-S AA&C), was number two on the list. Because IM needs both ground and airborne system enhancements, progress to deploying concurrently is key to the program's success. Currently the ground system development is behind as compared to the avionics requirements development. The funding in FY 2017 will ensure the ground automation development continues making progress. Additionally, at the time of the FAA's investment in ADS-B Out, industry understood that many of the benefits airlines would realize would be achieved through an investment in ADS-B In Applications.

DOT Strategic Goals – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. ADS-B NAS Wide Implementation - Baseline Services and Applications

The national deployment of ADS-B radio stations in FY 2014 served as the entrance criteria for stakeholders to accelerate the installation of ADS-B Out avionics that meet the performance requirements of 14 CFR §91.227. This will allow for the ADS-B capability to deliver the benefits identified in the business case.

Operation and maintenance of Wide Area Multilateration in select en route and terminal environments will continue. In Trail Procedures implementation will also continue.

$28,100,000 is required to maintain the ADS-B schedule for ITP and ASSC. The funding will also support all of the NextGen programs with ADS-B interdependencies in addition to the national roll-out for ADS-B implementation in the NAS and subsequent avionics equipage. This will increase equipage rates and the identified program baseline benefits.

B. ADS-B NAS Wide Implementation – Future Segments

$3,000,000 is required to maintain the schedule to deploy these key ADS-B In applications throughout the NAS. The funding in FY 2017 supports the initiation of implementation work to deploy IM NAS-wide.

What Benefits Will Be Provided To The American Public Through This Request?

A. ADS-B NAS Wide Implementation - Baseline Services and Applications

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, and reduced cancellations 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 $3.2 billion in capacity and efficiency benefits.

The 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 increasing the manageable volume of traffic.

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. Expected benefits include reduced delays and fuel burn, and consistent, low variance relative spacing between paired aircraft which will improve arrival capacity.

Airport Surface Surveillance Capability (ASSC) is a surface multilateration system that enhances the situational awareness for controllers located in the Air Traffic Control Tower (ATCT). ASSC consists of a multilateration subsystem, multi-processor subsystem, data distribution subsystem, tower display subsystem and a maintenance subsystem. ASSC receives surveillance data from ADS-B and terminal ASR to provide a comprehensive airport approach and surface surveillance picture. Expected benefits include improved safety on the airport surface and improved airport surface surveillance to enhance controller, pilot and vehicle operator situational awareness.

B. ADS-B NAS Wide Implementation – Future Segments

IM-S AA&C will utilize existing runways, air routes, and traffic flows more efficiently by reducing inter-aircraft spacing inaccuracies and buffers which translates to reduced delays [current and future (from projected increase in operations)]. A-IM applications are expected to introduce new air-to-air separation standards (which will also help to reduce delays).

Detailed Justification for - 2A13 Windshear Detection Service (WDS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Windshear Detection Service (WDS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Windshear Detection Service (WDS)	$4,300	$5,200	$4,500	-$700

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Wind Measuring Equipment (WME) Development	---	$1,500.0
b. Weather Systems Processor (WSP) Production	---	1,150.0
c. Low Level Windshear Alerting System (LLWAS)/WME Pole Procurement	---	1,000.0
d. Contractor Support	---	300.0
e. MIT/LL WSP Technical Support	---	350.0
f. Misc. Equipment Acquisition	---	200.0
Total	Various	$4,500.0

For FY 2017 $4,500,000 is requested to complete initial WME/LLWAS site upgrade, complete 50 percent WSP site upgrades and 50 percent WME site upgrade. Funding for the Wind Shear Detection Services (WSDS) Work Package 1 (WP1) program is consistent with the program's Joint Resources Council (JRC) approved Acquisition Program Baseline (APB) and will be used to execute the technology refresh of these legacy windshear detection systems currently deployed in the National Air Space (NAS), and fund the contractor support necessary to integrate the replacement hardware into existing software platforms.

This funding will enable the hardware production necessary to begin deployment and meet the APB milestones of first WME and LLWAS sites to be installed by the end of October 2016.

The WSDS WP1 work performed in FY 2017 will result in the following key outcomes:

- Reduced risk of WSP outages due to deployment of new processor
- Resolution of National Telecommunications and Information Administration (NTIA) narrowband compliance issues at LLWAS-Relocation and Sustainment (RS) sites due to deployment of compliant radio

What Is This Program And Why Is It Necessary?

Windshear Detection Services (WSDS) Work Package 1 (WP1) is a portfolio program consisting of legacy windshear detection systems currently deployed in the NAS. The program will address obsolescence of the legacy systems WSP, LLWAS, and 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 40 LLWAS- RS systems currently deployed in the NAS.

The program will accomplish several key milestones by the end of FY 2017:

- Acquire Production Units for WSP RVP7 Replacement
- LLWAS Pole Procurement and Installation
- WME Hardware Procurement
- WME Hardware Installation by Engineering Services

The systems that are part of the WSDS WP1 portfolio alert controllers of dangerous wind shear events that are detected in approach and departure corridors. Since the deployment of these systems in the late 1980s to early 1990s, no major windshear related incidents have occurred in the NAS. WDS WP1 will resolve system obsolescence to ensure that Air Traffic Controllers will continue to receive the windshear alerts necessary to maintain the safety of the NAS.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$4,500,000 is required to address pressing obsolescence and un-supportability issues plaguing LLWAS, WME, and WSP. This funding is needed to resolve the LLWAS Radio Frequency (RF) modem obsolescence issue where only a small quantity is available in the Depot. Additionally, of the 34 WSP sites, eight are currently running on spare radar video processors. It is essential that the FAA acquire the necessary upgrades to prevent system outages and the resulting loss of service.

What Benefits Will Be Provided To The American Public Through This Request?

The projects contained within the WDS portfolio contribute significantly to the overall safety of the NAS by preventing windshear related aircraft accidents. The WDS project intends to sustain the level of service provided by these legacy ground-based systems to Air Traffic Controllers and by extension, the flying public. WDS WP1 systems are deployed at commercial airports and provide increased aviation safety through the accurate and timely detection of hazardous aviation weather conditions. Operational benefits of these components include real-time detection of windshear, microbursts, gust fronts, wind shifts as well as prediction of wind changes that allow improved airfield efficiency when making runway changes.

Detailed Justification for - 2A14 Collaborative Air Traffic Management (CATM) Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Collaborative Air Traffic Management Portfolio
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Collaborative Air Traffic Management (CATM) Portfolio	$13,491	$14,770	$13,820	-$950

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Strategic Flow Management Application	---	$2,000.0
B. Strategic Flow Management Engineering Enhancements	---	1,820.0
C. Collaborative Air Traffic Management Technology – Work Package 4	---	10,000.0
Total	Various	$13,820.0

The Collaborative Air Traffic Management (CATM) portfolio conducts pre-implementation activities to reduce risk and implementation activities supporting the Traffic Flow Management System. Collaborative Air Traffic Management coordinates flight and flow decision-making by flight planners and FAA traffic managers to improve overall efficiency of the National Airspace System (NAS), provides greater flexibility to the flight planners, and makes the best use of available airspace and airport capacity. The overall philosophy driving the delivery of CATM services is to accommodate user preferences to the maximum extent possible. Traffic managers impose Traffic Management Initiatives (TMI) to account for congestion, weather, special activity airspace or other constraints. TMIs are the means by which traffic managers manage constraints. These initiatives can alter users' flight plans. The impact of TMIs can be reduced by tailoring flow management actions to specific flights.

CATM services are targeted to deliver a combination of increased information on the users' preferred alternative routes, enhance tools for assessing the impact of rerouting decisions, and improved communications and display of instructions to controllers in order to accommodate user preferences to the maximum extent possible.

Evaluating and maturing these concepts and capabilities include validation activities; demonstration and integration of operational capabilities; and development of an understanding of the role of the human through cognitive engineering experiments.

A. Flow Control Management – Strategic Flow Management Application

For FY 2017, $2,000,000 is requested to provide the following:

- Plan for, execute, and document the results of two Human in the Loop Simulations
- Updated Strategic Flow Management Application (SFMA) capability ConOps to support targeted AMS investment artifact generation
- Updated SFMA preliminary requirements to support targeted AMS investment artifact generation

B. Flow Control Management – Strategic Flow Management Engineering Enhancements

For FY 2017, $1,820,000 is requested to provide the following:

- Products in support of the Concept and Requirements Definition Readiness Decision (CRDRD) for targeted AMS investment:
  - Preliminary Shortfalls Analysis
  - Concept and Requirements Definition (CRD) Plan
- Products/Activities in support of the Investment Analysis Readiness Decision (IARD) for targeted AMS investment:
  - Shortfall Analysis/Quantification
  - Solution Concept of Operation
  - Functional Analysis Document

C. Collaborative Air Traffic Management Technology – Work Package 4

For FY 2017, $10,000,000 is requested to:

- Complete the transition activities to the new TFM-2 contractor
- Begin the system engineering, design, and development activities for the Joint Resources Council (JRC) (September 2015 FID) selected WP4 capabilities from improved demand predictions (IDP), integrated TMI modeling (ITM), airport acceptance rate decision support (AARDS), arrival route status and impact (ARSI), and integrated departure route planner (IDRP)

What Is This Program And Why Is It Necessary?

A. Flow Control Management – Strategic Flow Management Application

The Strategic Flow Management Application (SFMA) program will analyze and identify remaining operational shortfalls and gaps for rerouting of flights after the implementation of Airborne Reroute Automation (ABRR), Collaborative Trajectory Options Program (CTOP), and Data Communications (Data Comm). The SFMA program will improve air traffic management operations in the time horizon between 20 to 90 minutes, for both airborne and pre-departure flights before flights will intercept constraints. SFMA will provide traffic managers and controllers with automated capabilities and integrated tools for flight-specific trajectory modifications, of which the solution will address a wide range of input factors, including weather impact, sector capacity, special activity airspace (SAA), NAS equipment outage, operator preference, and metering time assignment. The trajectory modifications will include reroutes, attitude changes, and ground delays. In addition, SFMA will provide complex and flexible trajectory modifications and leverage Data Comm capabilities to execute clearances for these complex trajectory modifications. Furthermore, SFMA will identify available capacity and develop trajectory to reduce delays for flights when constraints diminish or evolve differently than predicted.

Current TFMS automation provides limited functionality to help traffic managers and controllers conduct efficient tactical rerouting of airborne flights in collaboration with Flight Operations Center (FOC)/Airline Operational Control Center (AOC). As the conditions that served as the basis for original route filing change, airborne flights may require subsequent trajectory amendments to avoid convective weather. Today, due to a lack of flight-specific weather impact detection, airborne flights needing reroutes often do not get moved until they've reached the impacted sector. Such close-in rerouting is more workload intensive than rerouting flights in upstream sectors. As a preventative measure, Airspace Flow Program (AFP) rates and playbook reroutes are often implemented more conservatively than necessary. Additionally, tactical reroutes are often planned and executed without collaboration with FOCs/AOCs, or full awareness of the effects they may have on existing TBFM metering initiatives. The SFMA program will develop automaton capabilities and integrated tools to mitigate these shortfalls, so that traffic managers and controllers can generate, deliver, and execute the trajectory revisions for airborne and pre-departure flights more efficiently and effectively.

B. Flow Control Management – Strategic Flow Management Engineering Enhancements

The Strategic Flow Management Engineering Enhancement program (SFMEE) will support future work packages for Traffic Flow Management (TFM) enhancements. The concept engineering work for the individual capabilities that comprise these future work packages will be conducted primarily through the Strategic Flow Management Application (SFMA) and Advanced Methods (AM) programs. The SFMEE program will be responsible for using the capability-level concept engineering artifacts developed in SFMA and AM to develop the full suite of future CATM work package AMS artifacts, for CRDRD, IARD to Final Investment Decision (FID).

The fundamental goal of TFM is to manage the flow of air traffic to minimize delays and congestion due to system stressors such as weather or equipment outages. Today's operations could be more efficient by establishing strategic plans for mitigating delay and capacity issues. Strategic plans may also provide some predictability to support future decisions.

C. Collaborative Air Traffic Management Technology – Work Package 4

The CATM-T WP4 program proposes a series of software projects designed to deliver improvements on existing capabilities and new modeling functions for TFMS. The primary function of TFMS is to enable improved traffic flows by supporting operational decision making with real-time demand and capacity estimates. TFMS currently lacks important demand and capacity data, is only partly integrated with other key traffic flow support systems, and therefore provides incomplete views of traffic status for use across a wide range of stakeholders. The shortfalls identified below will be addressed to the maximum extent possible as funded by CATM-T WP4:

- Erroneous alerts presented to En Route Supervisors of traffic exceeding Sector Capacity thresholds, causing inefficiencies in sector planning with direct impact on air operations. The estimated error in these alerts drives an additional $31.3 million in consequent avoidable annual expenses for airlines and passengers.
- Lost time and less-than-optimal decisions made by Controllers, Supervisors, Traffic Managers, and in airport operations in estimating the loss of capacity in the face of adverse weather, and then in negotiating traffic flow management actions (reducing arrival rates) in response to these losses, or in response to high air traffic volumes.
- Inaccurate surface weather predictions delivered to TFMS, which result in errors in capacity planning and in managing arrival rates at destination airports. These planning errors in turn lead to errors in the execution of ground stops and ground delays at the origination airports that feed traffic to these destinations.
- Follow-on, cascading effects from failure to estimate demand properly; these can result in delivery of an excessive number of aircraft to a given NAS element (route, fix, airspace sector, or airport) with no warning, prompting the need for controllers to resort to extraordinary re-routes or traffic vectoring in response.

The CATM-T WP4 program, upon receiving a Final Investment Decision (FID) by the FAA JRC, will seek to address these shortfalls.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

SFMEE requires funding to develop and deliver the products in support of CRDRD for a targeted AMS investment so the program can achieve CRDRD by the end of FY 2017. SFMEE will also utilize this funding to develop the products in support of IARD.

SFMA is necessary to the overall operations for delivery of CATM services in NextGen. The program will provide capabilities and tools to manage flight-specific trajectory modifications for airborne and pre-departure flights. The capabilities and tools developed by SFMA will take equity into consideration when determining how to move flights to/from NAS resources with constrained capacity. The tools will provide more efficient reroutes and provide a more structured traffic flow, so that the capacity of a given airspace increases to meet demand, and delay and unnecessary flying time are reduced. SFMA requires funding to continue the concept engineering work for the capabilities that will be included within the future targeted AMS investment. SFMA will use the funding to plan, develop and conduct HITL evaluations and to update the capability ConOps and preliminary requirements.

CATM-T WP4 contains user requested software enhancement to TFMS. The capabilities developed by WP4 will help to improve the management of demand and capacity imbalances in the NAS. The capabilities will minimize the over constraint demand in TFMS and assure efficient operations once constrained. CATM-T WP4 requires funding to continue the system engineering and development work of the WP4 capabilities.

What Benefits Will Be Provided To The American Public Through This Request?

Collaborative Air Traffic Management coordinates flight and flow decision-making by flight planners and FAA traffic managers to: improve overall efficiency, provide greater flexibility to flight planners, and make the best use of available airspace and airport capacity. Traffic managers impose Traffic Management Initiatives (TMIs) to account for congestion, weather, special activity airspace, or other constraints. The TMIs are the means by which traffic managers manage constraints. These initiatives can alter users' flight plans. The impact of TMIs can be reduced by tailoring flow management actions to specific flights. This can be done through a combination of increased information on the users' preferred alternative routes; enhanced tools for assessing the impact of rerouting decisions; and improved communications and display of instructions to the controllers who must implement the initiatives.

TFMS is the nation's primary source for capturing and disseminating flight information across the aviation community. The automation and communication mechanisms provided by TFMS, support the decision-making process used to adjust flight schedules and/or routes as necessary. When the NAS is impacted by severe weather, congestion, and/or outages, TFMS has unique capabilities to predict chokepoints and facilitate the collaboration and execution of mitigation initiatives with stakeholders, using common information displays and tools, to minimize NAS delays.

Collaborative Air Traffic Management provides capabilities to improve TFMS system-wide, as well as, at the tactical or location-based level. The CATM capabilities will coordinate flight and flow decision-making by flight planners and FAA traffic managers to improve the following:

Capacity
- Fewer En Route capacity constraints are imposed as congestion is resolved through tailored incremental congestion responses. This will enhance on-time performance and reduce passenger delay
- Automated congestion resolution tools match user preferences to airspace with available capacity

Flexibility
- Increases user route flexibility through negotiated trajectories for congestion resolutions
- Simplifies Integrated Departure Route Planning decision support relieving departure queue and reduces surface delays
- Facilitates the ability of local traffic managers to balance workload even on days when there are no major impacts from severe weather
- Enables improved/optimal runway assignments considering airspace configuration changes

Efficiency
- Increase aggregate flight efficiency by factoring individual flight trajectories into the congestion solution
- Reduce arrival delay by identifying opportunities for reopening arrival airspace
- Advance forecast of impact and clearing enables decision to hold arrivals at higher altitudes or on the ground, reducing fuel burn and terminal congestion
- Optimize flight trajectory before take-off (pre-departure) or entry into oceanic airspace (pre-oceanic) to reduce fuel consumption and environmental impact of oceanic flights

A. Flow Control Management – Strategic Flow Management Application

SFMA develops automation enhancements for future capabilities allowing for improved efficiency of NAS capacity and efficiency of airborne and pre-departure flights, reducing flight delays. SFMA will generate tailored trajectory revision for each individual airborne or pre-departure flight; therefore, it is expected to reduce more flight delays. In addition, SFMA will identify opportunities to use reopening of airspace to reduce delay when constraints diminish or evolve differently than expected. Furthermore, SFMA capabilities will leverage Data Comm, and help traffic managers and controllers generate, deliver and execute more precise and more direct reroutes for airborne flights; thus, it will further improve efficiency of NAS capacity and further reduce unnecessary flying time, flight delays, and fuel consumption.

B. Flow Control Management – Strategic Flow Management Engineering Enhancements

SFMEE will conduct concept and requirements integration and investment analysis for the components of CATM work packages. The concept engineering work conducted within the Advanced Methods and SFMA programs will lead to a set of capabilities that will be included in the future work packages.

C. Collaborative Air Traffic Management Technology – Work Package 4

The expected benefits provided by CATM-T WP4 include:

- Improve efficiency of Traffic Management Initiatives, such as: Airspace Flow Programs, Collaborative Trajectory Options Programs, Ground Delay Programs, and Ground Stops due to improved demand predictions and integrated TMI modeling capabilities in CATM-T WP4
- Reduce costly diversions and airborne holding associated with severe convective weather, wind, and ceiling and visibility events on arrivals to specific airports
- Improve departure route and fix management for busy metroplexes

All of the above qualitative benefits will result in airline direct operating cost savings and savings associated with passenger value of time.

Detailed Justification for - 2A15 Time Based Flow Management (TBFM) Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Time Based Flow Management (TBFM) Portfolio
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Time Based Flow Management (TBFM) Portfolio	$21,000	$42,600	$50,600	+$8,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Time Based Flow Management (TBFM) – Work Package 3 (WP3)	---	$45,600.0
B. Time Based Flow Management (TBFM) – Technology Refresh	---	4,000.0
C. Time Based Flow Management (TBFM) – Work Package 4 (WP4)	---	1,000.0
Total	Various	$50,600.0

The Time-Based Flow Management (TBFM) portfolio conducts pre-implementation to implementation activities supporting TBFM initiatives in the NAS. The capabilities enhance system efficiency by leveraging the TBFM decision-support tool, a system that is already deployed to all Continental United States (CONUS) Air Route Traffic Control Center (ARTCCs). Evaluating and maturing these concepts and capabilities include validation activities; demonstration and integration of operational capabilities; and an understanding of the role of the human through cognitive engineering experiments. Improvements in TBFM's core Time-Based Metering (TBM) capability an expansion of TBFM and its departure capabilities to additional locations will enhance efficiency and optimize demand and capacity. TBFM technology refresh will replace the current equipment that was deployed in 2012 and will begin to reach its end of service life by 2017.

A. Time Based Flow Management (TBFM) WP3

For FY 2017, $45,600,000 is requested to provide the following:

- Complete factory acceptance testing (FAT) for TSAS. (APB milestone)
- Conduct Terminal Sequencing and Spacing (TSAS) Software development
- Conduct Integrated Test planning
- Begin Site Surveys
- Begin Integrated Departure/Arrival Capability (IDAC) hardware procurement

B. Time Based Flow Management Technology Refresh

For FY 2017, $4,000,000 is requested to provide the followings:

- Initiate the following products in support of the FID:
  - Requirements document
  - Business Case
  - Implementation Strategy and Planning Document
  - Acquisition Program Baseline
- Prepare Engineering Analysis for replacement Hardware.

C. Time Based Flow Management (TBFM) Work Package 4

For FY 2017, $1,000,000 is requested to provide the following:

- Update and expand previously developed products in support of an IARD as required:
    - Enterprise Architecture products
    - Safety Documentation
    - Preliminary Logistics Plan
    - Range of Alternatives

What Is This Program And Why Is It Necessary?

A. Time Based Flow Management (TBFM) WP3

TBFM WP3 capability maximizes traffic flow and airport usage by improving flow management into and out of the busy metropolitan airspaces and corresponding airports. Essentially this helps solve the problem of getting the right aircraft to the right runway, in the right order and time, to minimize its individual impact on the system and maximize the use of these airports. Thus, operations can achieve maximum throughput while facilitating efficient arrival and departure. TBFM currently focuses on the tactical metering of traffic flows in the En Route cruise environment. This improvement of metering accuracy also removes obstacles to the implementation of Performance-Based Navigation (PBN), an important NextGen Advisory Committee (NAC) priority. TBFM WP3 will improve upon the existing TBFM system by extending the functions of TBM into the terminal environment. TBFM WP3 leverages the integration of Terminal Automation Modernization and Replacement (TAMR) and ARTCC En Route Automation Modernization (ERAM) with Terminal Sequencing and Spacing (TSAS).

TBFM WP3 is a follow-on phase of TBFM WP2 that will implement additional NextGen concepts, such as:

- TSAS which will provide efficient sequencing and runway assignment by extending time based metering to the runway
- Expansion of IDAC to additional locations which will increase efficiency of departure operations

The design, development and deployment of these concepts will occur during the 2015 - 2022 timeframe.

B. Time Based Flow Management Technology Refresh

TBFM technology refresh will replace-in-kind TBFM operational hardware deployed in 2012 - 2013 with new equipment in the FY2018 - 2019 timeframe to enable TBFM to continue to provide NAS efficiency benefits. The current hardware is pushing end of life in 2017 with most components becoming depleted in 2018. In 2018, the program will be forced to do multiple tech refreshes for each component if this system tech refresh is not approved. The current operational availability metric in the OMB 300 is 99.95 percent. The Program Office will not be able to meet this metric in future years if the Tech Refresh is not supported in the 2017 timeframe.

Additionally, this technology reafresh is interdependent to the procurement of hardware within TBFM Work Package 3. One common hardware baseline will reduce the cost of engineering assessment and logistics support. Without this hardware replacement, maintenance costs of the TBFM system will increase and new enhancements in WP3 may be delayed.

C. Time Based Flow Management (TBFM) WP4

TBFM WP4 will build on existing TBFM capabilities and further expand upon their benefits. The following capabilities and associated benefits are targeted for TBFM WP4:

- Path Stretch: An automation-based, lateral advisory that will enable aircraft to absorb assigned delay (laterally) while continuing to execute an optimized profile descent (OPD). This will enhance flight efficiency, reduce emissions and noise, and increase system predictability.

- Fleet Prioritization: Dynamically incorporate, and where feasible, use airspace user preferences when assigning time-based metering slots and associated delay. This will improve collaborative decision making and user efficiency.
- Weather Source Migration: Obtain weather data, via SWIM, from the FAA's Common Support Service-Weather system. This will decrease FAA operating costs while minimizing future costs associated with incorporating new weather products into TBFM.
- IDAC Expansion: Deploy IDAC to additional sites, beyond the sites that will receive IDAC via TBFM WP2 and WP3. This geographical expansion will reduce departure release coordination time/effort, improve flight efficiency, and enhance system predictability.
- TSAS Expansion: Deploy TSAS to additional sites, beyond the sites that will receive TSAS via TBFM WP3. This geographical expansion will improve flight efficiency and system predictability at additional locations in the NAS while enabling Performance Based Navigation (PBN) operations.
- TSAS Improvements: Improved management of TSAS operations through the use of a dynamic dashboard to alert Traffic Management Coordinators of operational trends that may warrant adjustments to TSAS parameters and operations; and the through the use of a TBFM-system wide "what if" aid that will improve the tactical management of arrival operations. These improvements will optimize the use of TSAS and in turn, further ensure that aircraft can fly OPDs while optimizing arrival throughput.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. Time Based Flow Management (TBFM) WP3

The FY 2017 funding request is needed to enable TBFM WP3 to develop software, conduct integrated testing of initial TSAS software, and conduct IDAC and TSAS site surveys.

B. Time Based Flow Management Technology Refresh

In FY 2017 the technology program will develop the AMS artifact in support of the Final Investment Decision (FID) and begin engineering analysis for replacement of obsolete hardware to avoid costly maintenance and system down times.

C. Time Based Flow Management (TBFM) WP4

TBFM WP4 capabilities will leverage the existing TBFM platform to improve flight efficiency, enable PBN operations, and enhance system predictability.

What Benefits Will Be Provided To The American Public Through This Request?

The TBFM WP3 capabilities described above will enable an increase in arrivals and departures in areas where demand for runway capacity is high as well as close proximity airports with potential interference to airspace/approach. TBFM will also increase efficiency by allowing aircraft to fly Performance-Based Navigation (PBN) operations down to approach. With TBFM implementation, the public will experience fewer delays, reduced carbon emissions, and less airport noise. TBFM technology refresh will reduce maintenance costs of the existing hardware and continue sustainment of the TBFM system.

Detailed Justification for - **2A16 ATC Beacon Interrogator (ATCBI) Model 6 – Technology Refresh**

What is the Request and What Funds are Currently Spent on the Program?

FY 2017 – ATC Beacon Interrogator (ATCBI) Model 6 – Technology Refresh
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ATC Beacon Interrogator (ATCBI) Model 6 – Technology Refresh	$0	$1,000	$1,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($1,000)
Engineering/Logistics Analysis	---	$1,000.0

For FY 2017, $1,000,000 is requested to complete supportability analysis to verify NAS requirements continue to be met and to continue investment analysis activities in support of Investment Analysis Readiness Decision (IARD) by June 2017. The funding will continue development of the Initial Business Case Analysis Report (BCAR) and Initial Implementation Strategy and Planning Document (ISPD).

Ongoing activities have included performing a sustainability analysis in support of investment analysis. The ATCBI-6 program plans to complete Final Investment Decision (FID) by December 2018.

What Is This Program And Why Is It Necessary?

The ATCBI-6 technology refresh Program will replace and upgrade obsolete ATCBI-6 Original Equipment Manufacturer (OEM) unique and Commercial Off-The-Shelf (COTS) hardware and software to ensure the continued reliable and cost effective operation of the radar system through its designated lifecycle. The original ATCBI-6 program procured 139 Monopulse Secondary Surveillance Radar (MSSR) with Selective Interrogation to replace old ATCBI- 4/5's operational beacons, and seven support systems for training, testing, logistics, and operational support. The ATCBI-6 was deployed into the NAS at 132 locations from 2001 through July 2014. The ATCBI-6 program commissioned the first system in FY 2002 and commissioned the last system in the United States in FY 2013. The final site, Freeport, Bahamas, was commissioned in July 2014. The ATCBI-6 is a cooperative surveillance system and provides air traffic controllers with selective interrogation capability that significantly improves the accuracy of aircraft position and altitude data provided to ATC automation systems. Additionally, the ATCBI-6, in conjunction with a co-located primary Long Range Radar, provides back-up Center Radar Approach (CENRAP) surveillance service to numerous Terminal Radar Approach Control (TRACON) facilities in the event terminal radar services are lost.

The ATCBI-6 Technology Refresh program will ensure that all operational and support ATCBI-6 systems continue to meet all performance and availability requirements. It will identify and address any potential requirements to maintain system sustainability, operational availability and reduce life cycle cost until the planned deployment of the Next Generation Backup Surveillance Capability (NBSC) System, in accordance with the FAA's Enterprise Architecture (Surveillance) Road Map.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$1,000,000 is required to continue a supportability analysis to verify NAS requirements continue to be met and develop artifacts required for the Investment Analysis, including completion of the preliminary Program Requirements Document and Initial Implementation Strategy and Planning Document (ISPD) in support of IARD by June 2017, and to achieve Final Investment Decision (FID) by December 2018. The required funding will enhance FAA ability to meet IARD by June 2017 and decrease cost to maintain aging systems.

What Benefits Will Be Provided To The American Public Through This Request?

The anticipated benefits for this technology refresh program include operational maintenance cost control, maintain system/service availability, and ensure a reliable system/service that supports safety, flight efficiency and environmental benefits of the original ATCBI-6 program.

Detailed Justification for - 2A17 Next Generation Weather Processor (NWP) Work Package 1 (WP1)

What is the Request and What Funds are Currently Spent on the Program?

FY 2017 – Next Generation Weather Processor (NWP) Work Package 1
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Next Generation Weather Processor (NWP) (WP1)	$23,320	$7,000	$27,800	+$20,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Prime Development Contract (Hardware and Software)	---	$22,661.6
b. Program Management and System Engineering	---	4,388.4
c. Test and Evaluation	---	750.0
Total	Various	$27,800.0

For FY 2017, $27,800,000 is requested to provide the following:

- Complete NWP Work Package 1 (WP1) Critical Design Review (CDR)
- Software Development for NWP WP1

The NWP program achieved a successful Final Investment Decision (FID) on March 18, 2015, awarded a Prime Contract in April 2015, and is now in the Solution Implementation Phase.

What Is This Program And Why Is It Necessary?

The goal of the 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 WP1 uses information from the FAA and National Oceanic and Atmospheric Administration (NOAA) radar and sensors and NOAA forecast models. NWP WP1 uses sophisticated algorithms to create aviation-specific current and predicted weather information. NWP WP1 creates value-added weather information that will be available via the Common Support Services-Weather (CSS-Wx) system. It will perform weather translation necessary to enable the use of weather information by automated decision-support tools (DSTs). NWP WP1 will also provide improved aviation safety related windshear and microburst products. Collectively these features will help reduce rising operations and maintenance costs by consolidating the following systems, funded under separate Budget Line Items (BLIs), 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
- Integrated Terminal Weather System (ITWS), which is funded under 2B19: Provides weather information to terminal air traffic supervisors and controllers

Weather information is needed for air traffic management (ATM) and flight operations decisions. Current aviation weather processing infrastructure and abilities are inadequate to meet real-time needs of ATM

DSTs, operational decision-makers, and NextGen. Existing aviation weather products lack the spatial resolution and time accuracy needed for decisions involving key weather phenomena impacting aviation. Current legacy information is in unusable form for integrated use in ATM DSTs for the potential impacts on aircraft. Aviation weather products for the same phenomena impacting aviation operations are often inconsistent, redundant, or are not accurate. Current legacy processing are closed architectural systems and incompatible with one another. Legacy weather infrastructure is too limited and unable to ingest and process observation, forecast, and modeling data to meet high-quality products with a longer time horizon. Existing legacy software is inefficient, difficult to modify, and unable or incompatible to serve users across multiple domains.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$27,800,000 is required to continue work for the NWP WP1 and achieve the Initial Operating Capability (IOC) milestone on-time. As stated above, NWP WP1 provides a weather processing platform that will replace the existing (aging) FAA weather processor systems and will also provide new capabilities to meet the anticipated needs of DSTs and operational decision makers in the NextGen era. Overall, NWP WP1 will provide the following benefits:

- Transition to operations of reliable, high resolution products of aviation-relevant weather that meet the needs of users and their DSTs
- Generate Weather information in a form useable by ATM DSTs such as indices that indicate the severity of weather conditions for various parameters (e.g., convection) and the impact of the conditions on various aircraft types and configurations
- Scalable and expandable processor architecture serving multiple domains with capacity to support the intensive processing demands of advanced applications
- Portable, non-proprietary, open software applications to subsume legacy functionality and meet NextGen requirements
- Probabilistic weather information with regard to specific airspaces

What Benefits Will Be Provided To The American Public Through This Request?

NWP produces aviation-relevant weather products that meet the needs of users and decision-support tools. When combined with the optimization of weather observations, improved predictions, probabilistic predictions, and translation into direct airspace constraints, users will be able to identify the best routes to fly for their aircraft type, flight plan and flying preferences, and for traffic flow management to optimize the airspace capacity given the weather constraints and demand reducing airline operating costs (e.g. fuel) and passenger delays.

The Corridor Integrated Weather System (CIWS) Prototype has undergone extensive user demonstrations/evaluation. It has been evaluated and found to provide accurate results over a two-hour period. Prototype users have attested to its effectiveness in support of strategic planning. Similarly, the 0 - 8 hour prototype product has achieved highly positive user evaluation. The NWP Program has hardened the code and produced documentation associated with the legacy prototypes as part of a Government Furnished Information (GFI) package.

Detailed Justification for - 2A18 Airborne Collision Avoidance System X (ACAS X)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Airborne Collision Avoidance System X (ACAS X)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Airborne Collision Avoidance System X (ACAS X)	$12,000	$10,800	$8,900	-$1,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Airborne Collision Avoidance System X (ACAS X)	---	$8,900.0

For FY 2017, $8,900,000 is requested to support ongoing standards development activities of ACAS X - Xa and Xo variants within joint RTCA Special Committee 147 and The European Organization for Civil Aviation Equipment Working Group 75 (RTCA SC-147/EUROCAE WG-75) forums. Efforts in 2017 will be focused on the Operational Evaluation (OpEval) Assessment and validation of the system which include ACAS Xa and ACAS Xo (Traffic Advisory -Only) operational approval for active in-flight testing and data collections for analysis to contribute to the maturation of the ACAS Xa/Xo Minimum Operational Performance Standards (MOPS) documentation. Additional efforts include the progression of safety and hazard analysis mitigations into an ACAS X System Safety Hazard Analysis report.

Funding activities include:

- $1,000,000 for Requirements Substantiation, Justification and Traceability; Maturation of ACAS Xa/Xo MOPS Documentation; and Program Management Support
- $1,155,000 for Safety Risk Management and Advanced Stress Testing; Operational Outreach (Focus Groups; pilots, controllers, etc.)
- $2,900,000 for System Validation and Verification Testing; Test Suite Development
- $3,845,000 for System Logic Optimization and Tuning; Operational Validation and Suitability Assessment of System Performance; and Operational Evaluation Execution

What Is This Program And Why Is It Necessary?

The ACAS-X is being developed to meet future collision avoidance requirements. 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.

DOT Strategic Goals – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

As reflected in RTCA DO-337, Recommendations for Future Collision Avoidance Systems (published March 21, 2012), an improved future collision avoidance system is required to facilitate NextGen procedures and applications (i.e., continuous descent approaches (CDA), curved Required Navigation Performance (RNP) approaches, closely spaced parallel runways approaches, aircraft-based merging and spacing, closer parallel en route operations, lateral passing maneuvers in non-radar airspace) and to compensate for issues in existing TCAS performance (i.e., nuisance alert rate).

The required funds will resolve the TCAS conflicts with everyday normal operations (i.e., 50 percent of RAs a result of 500 ft Instrument Flight Rule (IFR)/Visual Flight Rule (VFR) separation). The ability to execute envisioned NextGen reduced separation operations will be maximized. The opportunity to leverage the current 2020 ADS-B out equipage mandate, as a means to minimize potential future operator implementation costs will be promoted. The development of collision avoidance capability for UAS platforms, as a means to ensure forward/backward compatibility with existing TCAS systems, will be enhanced. Finally, recommendations from the Automatic Dependent Surveillance Broadcast (ADS-B) Aviation Rulemaking Committee (ARC), Certification Authority Software Team (CAST), Aircraft Electronics Association (AEA), Special Committee (SC)-147, Single European Sky Air Traffic Management Research (SESAR) to address TCAS performance shortfalls, as they pertain to near-term operations, will be addressed.

What Benefits Will Be Provided To The American Public Through This Request?

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 the system performance and safety analysis shows that ACAS X could produce 54 percent fewer alerts and be over 50 percent safer than existing TCAS II v7.1 logic.

Increased Efficiency - ACAS Xa produced 34 percent fewer total RAs as compared to TCAS II during simulation assessment of its safety logic assuming perfect compliance in the Pilot response model. Unnecessary RAs related to 500 feet Visual Flight Rule (VFR)/ Instrument Flight Rule (IFR) encounters were down 52 percent for ACAS Xa. All types of aircraft (Major/regional carrier, business jets and helicopters) experienced a reduction of 41 percent in RAs generated in Class B, C and D airspace. ACAS Xa consistently generated RAs of shorter duration than TCAS II.

Increased Safety - Simulation results based on the U.S. Encounter Model indicate that ACAS Xa increases safety by 52 percent as compared to TCAS v7.1 for the unequipped Mode C intruder case (Monte Carlo simulations of approximately 0.5 million encounters). ACAS Xa reduced the induced component of risk (risk of collision because of maneuver suggested by TCAS) by 35 percent and unresolved component (such as mitigate pre-existing risk) by 55 percent.

Comparison of the risk ratio for TCAS II and ACAS Xo for CSPO operations indicated that ACAS Xo is approximately 72 percent safer than TCAS II. For the available dataset, ACAS Xo had 64 percent lesser number nuisance alerts as compared to TCAS II.

Designed for NextGen Environment - NextGen operational concepts will reduce spacing between aircraft, such as three nautical mile separation En Route and closely spaced parallel operations. TCAS II in its current form would alert too frequently to be useful in these situations.

Adapts to New Surveillance Technologies - NextGen makes extensive use of new surveillance sources, including satellite-based navigation and advanced ADS-B functionality. TCAS II relies solely on transponders but ACAS X will take advantage of the new surveillance sources**.**

Qualitative benefits include an increase in trust for ACAS X (due to trust in RAs), reduction in workload for pilot and ATC, faster and less expensive implementation of updates to ACAS X in the field, conducting operations (e.g. CSPO) under Instrument Meteorological Conditions (IMC) and increased flexibility to modify airspace more frequently.

Detailed Justification for - 2A19 Data Communications in Support of NextGen

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Data Communications in Support of NextGen
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Data Communications in Support of NextGen	$150,340	$234,900	$232,000	-$7,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Segment 1 Phase 1 (S1P1)		
a. Program Management	---	$6,044.6
b. Systems Engineering	---	344.8
c. Data Comm Test	---	1,751.3
d. DCL Service Implementation	---	287.9
e. Tower Data Link Service (TDLS)	---	792.8
f. En Route	---	1,484.7
g. Data Comm Integrated Services (DCIS)	---	12,459.4
h. Data Comm Network Service (DCNS)	---	23,703.7
i. Avionics Equipage Initiative	---	27,930.8
j. Independent Operational Assessment (IOA) formerly IOT&E	---	600.0
Total (S1P1)	Various	$75,400.0
B. Segment 1 Phase 2 (S1P2) Initial En Route Services		
a. Program Management	---	$7,356.5
b. Systems Engineering	---	6,869.9
c. Data Comm Test	---	3,998.2
d. Operations	---	2,289.3
e. En Route Service Implementation	---	4,508.8
f. En Route	---	93,250.9
g. Data Comm Integrated Services (DCIS)	---	15,837.9
h. Data Comm Network Service (DCNS)	---	3,419.8
i. FAA Telecom Infrastructure	---	1,148.7
j. Tower Data Link Service (TDLS)	---	2,420.0
Total (S1P2) Initial	Various	$141,100.0
C. Segment 1 Phase 2 (S1P2) Full En Route Services	---	$15,500.0

In FY 2017, $232,000,000 is requested for the Data Communications (Data Comm) program. This funding supports the development of Segment 1 Phase 1 (S1P1) and Segment 1 Phase 2 (S1P2) Initial and Full En Route Services work. Data Comm S1P1 includes Departure Clearance (DCL) service in the tower environment and will continue to be implemented in FY 2017. S1P2 includes enhancements to En Route services and will be implemented beginning in FY 2019.

The requested funding for S1P1 and S1P2 Initial and Full En Route Services is also intended to support RTCA Task Force 5 Recommendations 16, 17, 39, 44, and 42, as well as the September 2013 NextGen Advisory Committee (NAC) prioritization report, and the October 2014 NAC NextGen Integration Working Group (NIWG) Activity Prioritization report.

A. Segment 1 Phase 1 (S1P1)

Data Comm is requesting a total of $75,400,000 for S1P1 in FY 2017, of which $600,000 is for Independent Operational Assessment formerly known as Independent Operational Test and Evaluation (IOT&E). This funding will enable continued implementation of the Departure Clearance Service.

This request also funds the Data Comm Avionics Equipage Initiative, which will result in 400-500 aircraft getting equipped with FANS 1/A and VHF Data Link Mode 2 (VDL-2) avionics in FY 2017. Funding is also required to provide for Data Comm training of controllers and technicians as well as the continued deployment and operation of the Data Comm Network Service (DCNS) air-ground communications infrastructure.

Other activities include funding for the En Route Automation Modernization (ERAM) and Tower Data Link Services (TDLS) program office support, as well as management of the Data Comm program.

S1P1 milestones include:

- Complete deployment of DCL services to 15 of 56 airports – FY 2017
- Complete deployment of DCL services to 30 of 56 airports – FY 2018
- Complete deployment of DCL Services to all 56 airports – FY 2019
- Achieve last site IOC for Tower Services (APB milestone) – FY 2019

B. Segment 1 Phase 2 (S1P2) Initial En Route Services

For FY 2017, Data Comm is requesting $141,100,000 for S1P2 Initial En Route Services. This funding will enable the continuation of ERAM enhancements required to deliver Initial En Route Services. In FY 2017, development activities will include testing and deployment of the National Single Data Authority (NSDA) log-on capability, as well as the completion of development and coding of most of the Initial Services suite. Funding will also be used to support the TDLS enhancements to accommodate the NSDA capability.

Funding is required to order DCNS to support the En Route airspace. Funding is also needed for program management, program control, operations and contract management support as well as second-level engineering test support. S1P2 Initial En Route Services milestones include:

- Complete high level system design – FY 2016
- ERAM Data Comm contract definitization (APB Milestone) – FY 2016
- Contractor detailed design complete (APB Milestone) – FY 2017
- Complete developmental testing and evaluation (APB Milestone) - FY 2018
- Deliver ERAM software to test and evaluation site – FY 2018
- Order DCNS service volume for S1P2 Initial En Route service key site (APB Milestone) – FY 2018
- Complete Operational Evaluation – FY 2019
- Achieve IOC for En Route Services (APB Milestone) – FY 2019
- Achieve ISD for En Route Services (APB Milestone) – FY 2021

C. Segment 1 Phase 2 (S1P2) Full En Route Services

For FY 2017, Data Comm is requesting $15,500,000 for S1P2 Full En Route Services. The funding will allow the ERAM prime vendor to start decomposing government requirements for the ERAM-Data Comm software modifications into detailed specifications, as well as provide system engineering and program management functions. Additionally, funding is required to meet program planning objectives in FY 2017 which include starting software high-level and detailed design, as well as additional systems engineering activities and tech ops and air traffic controller training planning.

S1P2 Full milestones include:

- Achieve Final Investment Decision (FID) for Full En Route Services – FY 2016
- Complete high level requirements and design – FY 2017
- Start detailed design – FY 2017
- Start software development for Full En Route Services – FY 2018
- Complete detailed design – FY 2019
- Complete In-process Design Review – FY 2019
- Complete software development for Full En Route Services – FY 2020
- Complete testing for Full En Route Services – FY 2020

What Is This Program And Why Is It Necessary?

The Data Comm program will provide data communications between Air Traffic Control (ATC) facilities and aircraft and will serve as an enabler for the NextGen operational improvements. Data Comm Segment 1 will deliver the initial set of Data Comm services integrated with automation support tools, which provides NAS benefits and lays the foundation for a data-driven NAS. Data Comm Segment 2 will enable more advanced NextGen operations, which would not be possible using existing avionics.

Data Comm is needed to bridge the gap between current voice-only ATC and the data-intensive NextGen. Data Comm will enable air traffic controller efficiency improvements and will permit capacity growth without requisite cost growth associated with equipment and maintenance. Data Comm is comprised of automation enhancements for ATC message generation and exchange (hardware and software) and the communications data link between ground and airborne users. Current analog voice communications contribute to operational errors due to miscommunications, stolen clearances, and delayed messages due to frequency congestion. In FY 2004 and FY 2005, approximately 20 percent of En Route operational errors were voice communication related. Of those, 30 percent of the high severity operational errors were deemed to be communications related. Data Comm will significantly reduce communications related operational errors and improve the safety of air travel. Segment 1 will lay the foundation for a data-driven NAS.

The capacity and productivity of the NAS will be improved by Data Comm. Initially, Data Comm will be used in conjunction with the current traffic control strategies as well as planned strategies such as traffic flow management (TFM) re-routes. Data Comm will increase controller efficiency by automating routine exchanges. As controllers become more productive, tower and En Route capacity will grow without the need to assign additional resources. This increase in traffic handling ability has a direct correlation to reduced delays and increased efficiency. Recent benefits analysis suggests airline operations will benefit from reduced gate delay and taxi times, improved on-time performance and the opportunity to expand flight schedules. The busiest airport clearance delivery positions at Core 30 airports will see the most dramatic benefit.

Services at the Tower (S1P1) will improve operations in the following manner:

- Improve recovery from service disruptions, mitigate propagated delay, improve schedule reliability, and enable NextGen capabilities
- Improve communication accuracy and safety with digital communication (i.e., reduced read/hear back errors, reduced loss of communications events)
- Reduce controller and pilot workload
- Reduce environmental impact due to less fuel burn and emissions
- Direct operating cost savings from reduced delay enabled by reduced communication time for revised departure clearances

Services in En Route (S1P2) will improve operations in the following manner:

- Improve flight efficiency due to improved controller and flight crew efficiency by providing automated information exchange
- Improve rerouting capabilities

- More efficient routes for aircraft
- Decrease congestion on voice channels and provide an alternative communications capability
- Improve NAS capacity and reduced delays associated with congestion and weather
- Improve communication accuracy and safety with digital communication (i.e., reduced read/hear back errors, reduced loss of communications events)
- Reduce environmental impact due to less fuel burn and emissions
- Direct operating cost savings from increased throughput/efficiency realized through reduced delays and improved communications
- Direct operating cost savings from reduced distance flown enabled by more precise airborne re-routes

Services provided by Data Comm are conservatively estimated to save operators more than $10 billion over the 30-year lifecycle of the program and save the FAA approximately $1 billion in operating costs.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The Data Comm program funds continued deployment of S1P1 tower services in FY 2017. These activities include field familiarization, testing and deployment of ERAM software and TDLS software with Data Comm enhancements, training, ground telecommunications upgrades and installations, network service, avionics equipage, outreach to industry, and integration and engineering services. These activities are augmented by program management, operations, and systems engineering support.

Funding for Data Comm S1P2 will enable software engineering for the ERAM system to accommodate enhancements for En Route data communications. Additional activities include network engineering to deploy the Data Communications Network Service to En Route airspace, spectrum bandwidth clearing for En Route airspace, and Data Communications Integrated Services (DCIS) integration and engineering services. These activities are augmented by program management and systems engineering support.

What Benefits Will Be Provided To The American Public Through This Request?

Data Comm will reduce operational errors associated with communications, enhancing the safety and efficiency of the NAS. Data Comm will also reduce environmental impact due to less fuel burn and emissions. The program will improve NAS capacity and reduced delays resulting in estimated passenger time savings of over $16 million over the program life cycle.

Detailed Justification for - 2A20 Offshore Automation

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 –Offshore Automation
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Offshore Automation	$0	$0	$3,000	+$3,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Program Management and Contract Support	---	$300.0
b. Technical Analyses and Documentation	4	1,700.0
c. Engineering and Site Analyses	---	1,000.0
Total	Various	$3,000.0

For FY 2017, $3,000,000 is requested to complete investment and technical analyses activities for the eventual replacement of the current Offshore Automation systems at four facilities with existing National Airspace System (NAS) baseline automation system(s). The facilities are:

- Anchorage Air Route Traffic Control Center (ARTCC) (ZAN)
- Honolulu Control Facility (HCF), a core 30 airport facility
- Guam Combined En Route/Radar Approach Facility (CERAP) (ZUA)
- San Juan CERAP (ZSU)

The $3,000,000 requested will support Investment Analysis (IA) documentation; a quantified Shortfall Analysis and Functional Analysis document; the development of a concept of operations solution; the development of the program requirements, integrated schedule, and cost estimate; a safety assessment; an integrated logistics plan; and the manufacture of Enterprise Architecture (EA) products. In addition, Engineering and site analyses funding are requested to compare NAS baseline automation systems in the continental US with the systems at these four sites and to identify any unique operating characteristics at these facilities.

What Is This Program And Why Is It Necessary?

This program will conduct the necessary investment and technical analyses to identify solutions to replace these Offshore Automation systems, followed by the implementation of these solutions. They will be replaced with existing systems that are in the NAS baseline which will help reduce sustainment costs, improve the delivery of air traffic services, enhance NAS interoperability, and support NextGen capabilities. The replacement of these systems is expected to be phased, based on the relative priority in sustaining their functional capabilities.

These four sites currently use a variety of unique and in some cases outdated automation platforms to support the provision of air traffic services, in contrast with existing standard automation NAS baseline platforms maintained in CONUS sites that are under consideration as replacements. These systems are; ERAM, STARS, and the Advanced Technologies & Oceanic Procedures (ATOP). As a result, the lifecycle costs to sustain these unique platforms (e.g. maintenance, logistics, and training) are becoming prohibitive.

Additionally, each of these unique systems has inherent functional limitations, resulting in increased controller workload and suboptimal air traffic service provisioning. Further, any potential benefits that could be accrued in deploying NextGen capabilities to these sites will not be realized, as the costs to adapt the new capabilities onto these unique and in some cases outdated platforms are prohibitive.

At these sites the air traffic functional requirements are being met by the following systems: Micro En Route Automated Radar Tracking System (Micro-EARTS), Offshore Flight Data Processing System (OFDPS), Flight Data Processor 2000 (FDP 2000) and/or system patches that connect to CONUS facilities. Advanced Technologies and Oceanic Procedures (ATOP) is utilized currently only in ZAN ARTCC to support Oceanic operations.

Anchorage ARTCC uses FDP-2000 which is a server-based technology. It was developed and is maintained in-house by Anchorage personnel, and the number of system-knowledgeable personnel is decreasing. This will increase the difficulty of making routine software enhancements and hardware upgrades, increasing the risk of failure and cost of maintenance. The server hardware is obsolete and parts of this system are no longer covered by a maintenance contract.

Honolulu Control Facility, a core 30 airport facility, uses the Offshore Flight Data Processing System (OFDPS) which is a host-based Flight Data Processor (FDP) running software on 1970s-1990s era IBM mainframe equipment. The entire logistics string, including maintenance and training, depends on the Host Computer System (HCS). With the decommissioning of Host planned over the next year, the support costs to maintain this system will greatly increase.

Guam CERAP has a Flight Data Input-Output (FDIO) feed from the OFDPS system at the Honolulu Control Facility. When the Honolulu facility takes OFDPS down for maintenance, it also cuts service to the Guam facility. One of the most significant impacts that results from this configuration is the time difference between Guam and Honolulu. This time difference creates the potential for HCF to cut service to Guam during Guam's high traffic period, disrupting operational service and potentially creating a safety sensitive situation.

San Juan has a flight data connection from the ERAM system at the Miami ARTCC using a special software patch. Certain command functions are also made eligible by this software modification which supports En Route functionality at ZSU. As a result of this arrangement, the Miami Center must make any airspace or sector changes for ZSU which often results in delays for those changes being realized at the San Juan facility. Additionally, flight information for incoming flights may not get to San Juan controllers in a timely manner due to data loss during ERAM system maintenance, user filing errors, or lack of communication between National Data Interchange Network (NADIN)/Aeronautical Information System Replacement (AISR) and the Miami ARTCC. Inaccurate and time delayed flight information can result in increased manual coordination and controller workload, disrupting operational service and potentially creating a safety sensitive situation. In addition, the ERAM system does not have an interface into the Micro-EARTS system, so data is not exchanged between the Radar Data Processor (RDP) and Surveillance Data Processor (SDP) system for ZSU.

All offshore sites currently rely on Micro-EARTS to a certain extent for radar (surveillance) data processing. Micro-EARTS is also responsible for ingesting the weather radar feeds, such as Next Generation Weather Radar (NEXRAD). Traditionally, Micro-EARTS has only limited flight plan data exchange with the CONUS systems, therefore many functions available at other En Route centers are not available to the offshore sites such as, FLAT tracking, conformance monitoring, route displays, and trackball reroute.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want / Need To Fund The Program At The Requested Level?

Replacing the automation systems at Anchorage, Honolulu, San Juan, and Guam with NAS baseline system(s) will:

- Improve NAS interoperability and reduces cost
- Allow for standardized site training consistent with other CONUS facilities
- Eliminate these unique local systems
- Resolve end of the life issues
- Provide sustainable platforms
- Extend NextGen capabilities to these sites and align with NextGen goals
- Provide efficient and safer systems, and reduce the operational risk associated with attempting to sustain these systems

What Benefits Will Be Provided To The American Public Through This Request?

The American Public would benefit from reduced federal costs for maintenance and enhanced reliability and safety of the automation systems at these four offshore facilities, which in turn will enhance the delivery of safe and efficient air traffic services at these locations.

Detailed Justification for - 2B01 Airport Surface Detection Equipment – Model X (ASDE-X) Technology Refresh (TR) and Disposition

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Airport Surface Detection Equipment – Model X (ASDE-X) – Technology Refresh and Disposition
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ASDE-X Technology Refresh (TR) and Disposition	$5,436	$13,500	$8,400	-$5,100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ASDE-X Technology Refresh and Disposition		
a. Hardware/Software Engineering Services	35	$5,934.0
b. Program Management	---	1,716.0
c. Second Level Engineering	---	750.0
Total	Various	$8,400.0

For FY 2017, $8,400,000 is requested to complete the ASDE-X TR Processor Upgrade, continue installation of the Universal Access Transceiver Receiver (UATR) Upgrade at the ASDE-X sites and investigate new or emerging obsolescence issues associated with the ASDE-X. The ASDE-X team completed a study in FY 2012 to determine the equipment and software that needed to be upgraded, updated, or replaced as part of the ASDE-X technology refresh effort.

The approved projects include:

- Obsolescence/Spare Parts Procurement – This project increases 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 – This project replaces the obsolete ASDE-X processors with Linux based processors running applications updated via the Airport Surface Surveillance Capability (ASSC) Program.
- Universal Access Transceiver Receiver (UATR) Upgrade – This project modifies the existing UATR in each remote unit (RU) to the updated UATR2 to address existing UATR performance shortfalls.

Ongoing work includes: software development and porting to a Linux Operating System (OS); purchase of UATR2 boards and obsolete parts;, completion of installation of the ASDE-X processor replacement project; continued installation of the UATR Upgrade; and engineering activities for the UATR Upgrade as well as new or emerging obsolescence issues.

What Is This Program And Why Is It Necessary?

ASDE-X is a surface surveillance system that provides air traffic controllers with a visual representation of the traffic situation on the airport movement area and arrival corridors. It improves the controller's ability to maintain awareness of the operational environment and to anticipate contingencies. ASDE-X Safety Logic

(AXSL) uses surveillance information from ASDE-X to determine if the current and projected positions and movement characteristics of tracked aircraft and vehicles present a potential collision situation. Visual and audible alerts are provided to air traffic controllers when safety logic predicts a collision.

The first ASDE-X system was delivered in 2002 and the final system was installed in 2011. Some of the equipment has reached the end of its life and is no longer supportable. The ASDE-X technology refresh program provides for the replacement and upgrade of hardware 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).

The ASDE-X technology refresh program will maintain the safety and efficiency benefits attained during ASDE-X system deployment. By replacing obsolete and high failure items, the technology refresh effort will maintain the current levels of system availability and reliability. The UATR Upgrade will ensure adequate system performance as airport environments change with increased ADS-B traffic. If ASDE-X systems are not operational, safety and efficiency benefits realized during system deployment will be lost.

The ASDE-X systems provide both safety and efficiency benefits. The primary benefit, increased safety, is achieved by providing air traffic controllers with improved situational awareness. This results in a reduction of the number of Category A and B runway incursions and accidents. Additionally, the improved surveillance capacity allows for more efficient coordination and communication with aircraft, improved mobility, reduced taxi times and delays, and consequently lower costs for aviation providers and customers.

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.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related facilities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$8,400,000 is required to complete the ASDE-X TR Processor Upgrade, continue installation of the Universal Access Transceiver Receiver (UATR) Upgrade at the 35 ASDE-X sites and investigate new or emerging obsolescence issues associated with the ASDE-X. The ASDE-X Technology Refresh program will decrease system outages, and the Runway Status Light Systems are dependent on receiving data from ASDE-X.

What Benefits Will Be Provided To The American Public Through This Request?

The ASDE-X technology refresh program will be considered successful if after the implementation of technology refresh equipment, the ASDE-X system reliability and availability numbers continue to meet the system specification and requirements especially as the system continues to age.

The program will be deemed a success if the number of Category A and B runway incursions is maintained at the current levels or further reduced.

Detailed Justification for - 2B02 Terminal Doppler Weather Radar (TDWR) – Provide

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Terminal Doppler Weather Radar (TDWR) – Provide
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Terminal Doppler Weather Radar (TDWR) – Provide	$1,900	$4,900	$5,000	+$100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Solution Implementation with Second Level Engineering	---	$3,380.0
b. FAA Logistical Support	---	500.0
c. FAA Power Engineering Group Support	---	620.0
d. Contract Support	---	500.0
Total	Various	$5,000.0

For FY 2017, $5,000,000 is required to support the following activities and/or tasks associated with the TDWR Service Life Extension Program (SLEP) Phase 2 sustainment projects:

- Software Testing and Integration
- First Article Testing
- Operational Testing
- Procurement of Modification kits and Equipment
- Installation of Modification Kits

These efforts involve logistical support, second level engineering support and contract support to develop required documentation and provide adequate testing.

What Is This Program And Why Is It Necessary?

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 is facing serious obsolescence issues and must be updated to preclude an adverse, potentially disastrous, impact to the current aviation weather safety initiatives.

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 Main Customers**. The TDWR Service Life Extension Program serves 46 major airports by providing weather data to the Integrated Terminal Weather System (ITWS) which disseminates wind-shear products based on TDWR data to major Air Traffic Control Towers (ATCTs) and to over one thousand airline dispatchers among seven airline companies.

- **TDWRs Primary FAA Interfaces**. Nine TDWRs receive windshear and airport wind information from the Low-Level Windshear Alert System-Network Expansion (LLWAS-NE++) system. TDWR integrates

LLWAS-NE data with its own detections to provide enhanced wind shear protection services at those nine airports. At the 37 airports with no LLWAS-NE, the TDWR receives airport wind data from the Wind Measurement Equipment (WME) or from the Automated Surface Observing System (ASOS). TDWR is also a major weather source for the Corridor Integrated Weather System (CIWS) which further integrates a suite of weather decision aids for en route aviation facilities in the U.S.

- **TDWR Serves Other Federal Agencies and The General Public**. TDWR provides weather radar data to 34 NWS forecast offices. The TDWR data complements the other radar and non-radar sensor data available to the local Weather Forecast Office (WFO) allowing them to prepare better local forecasts, alerts, warnings and additional products and services provided to the FAA and the general public by National Oceanic and Atmospheric Administration (NOAA) and NWS. The four TDWRs in the Washington, DC area provide data to the Urban Shield Wind Dispersion Project that is operated by the Pentagon Force Protection Agency.

The TDWR system has been in service since 1994. It is comprised of a substantial number of proprietary software and hardware components, many of which have become obsolete and present significant supportability problems that worsen with time. Without the SLEP, TDWR outages will become more numerous and lengthy, and support costs will rise faster than with the SLEP.

The previous TDWR SLEP project funding will end in FY 2015 and all projects will be completed by the end of FY 2017. These initial SLEP projects addressed the antenna drive systems, out of date computer processor systems, and several other assemblies which needed to be upgraded and modernized. TDWR SLEP Phase 2 will address other TDWR systems that have deteriorated due to aging, and have become obsolete or unsupportable.

Without TDWR SLEP Phase 2, all TDWR systems would experience an increasing number and duration of unplanned outages that, if occurring during hazardous weather, could result in an Aircraft Accident and loss of life.

DOT Strategic Goal - Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$5,000,000 is required to execute contracts for the projects planned to address the obsolescence issues, high failure issues, and aging issues for the TDWR and its component systems. TDWR SLEP Phase 2 follows on the previous TDWR SLEP with the intention of maintaining or increasing the reliability of the TDWR systems. This amount of funding for SLEP Phase 2 is required to initiate projects that will allow the TDWR availability rate to remain the same or increase.

What Benefits Will Be Provided To The American Public Through This Request?

TDWR SLEP Phase 2 follows the efforts accomplished under the initial SLEP program. The last windshear related accident at a TDWR protected airport occurred at Charlotte/Douglas International Airport on July 2, 1994 before its TDWR was installed and operational (Aircraft Accident Report (AAR 95-03)). In addition, weather related delays have been reduced, allowing savings in aviation fuel consumption.

Operational benefits of the system include the real-time detection of microburst, gust fronts, wind shifts, and precipitation, as well as prediction of wind changes that allow improved airfield efficiency when making runway changes. The program will continue to deploy improvements that will lower TDWR operations costs and improve its reliability.

Thus far, the SLEP has eliminated outages due to antenna gear failure, and maintained service availability by replacing parts of the system that are difficult to maintain and support.

Also, the FAA has an agreement with the National Weather Service to provide TDWR data. This information is further distributed to non-governmental organizations and companies such as Weather Underground (http://www.wunderground.com). This provides easy access by the public and other interested parties to TDWR information over the Internet.

Detailed Justification for - **2B03 Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)**

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1) ($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)	$50,700	$81,100	$64,200	-$16,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Task	Locations/ Quantity	Estimated Cost ($000)
A. TAMR Phase 1		
a. Software Design and Development	---	$6,000.0
b. G-4 Hardware Procurement	12	14,500.0
c. Site Preparation, Deployment and Installation	11	18,600.0
d. Logistics	---	1,400.0
e. Program Management Support	---	6,300.0
f. FTI	---	2,000.0
g. Prime Vendor Program Management Support	---	5,900.0
h. System Engineering (COTS/CAS)	---	9,500.0
Total	Various	$64,200.0

For FY 2017, $64,200,000 is requested for the continuation of STARS technology refresh and software enhancements. Software enhancements are necessary to implement required security and safety enhancements, and new functionality upgrades needed for enhanced performance and capacity in support of NextGen initiatives. These include additional tracker changes and priority Software Trouble Reports (STRs). The funding will continue to provide for program, system engineering, and technical support.

In addition, this funding is also requested for the replacement of the Sun Ultra 5 processors. The program will conduct site surveys, site prep and deployment at 11 sites and 12 hardware procurements for the G-1 to G-4 technology. In addition to the site specific activities, Commercial off the Shelf/Commercially Available Software (COTS/CAS) technology refresh sustainment engineering efforts will continue. This request also funds the program's non-prime support/activities that include Program Management, Systems Engineering, Risk Management, Financial Management, Deployment and Project Administration.

What Is This Program And Why Is It Necessary?

STARS is a joint Department of Defense (DoD) and FAA program to modernize terminal air traffic control automation systems.

The STARS program funded replacement of the automated radar processing and display systems at 47 TRACONs and their associated Air Traffic Control Towers with Ultra-5 processors and Sony 2K displays (1996 – 2005). The program is currently in a technology refresh cycle. Air traffic controllers use STARS automation and displays to ensure the safe separation of military and civilian aircraft within the nation's airspace. This investment is part of a phased approach to modernizing the terminal air traffic control equipment. Currently the program updates existing TRACONs and towers with state-of-the-art systems featuring, current processor technology, large-screen, high-resolution, LCD displays, and is expandable to accommodate future air traffic growth and new hardware and software. STARS addresses technology, mobility, and security gaps with the existing systems.

The current scope of the TAMR Phase 1 program is to technologically refresh and enhance those systems already deployed. To sustain operations, STARS requires technology refresh and software enhancements. A brief discussion of both initiatives follows below:

Technology Refresh: As in any COTS based system, an aggressive hardware technology refresh program is essential. Planning for it enables identification and qualification of affected components before they become inoperable due to obsolescence. For example, the processor currently used in STARS is no longer available from the manufacturer. The consequences of obsolescence have collateral implications in the areas of engineering, training, maintenance and many other disciplines.

Terminal (Software) Enhancements: Funding for Terminal Enhancements addresses issues identified by controllers, stakeholders, and operating facilities personnel. This project funds required security enhancements, corrective and perfective changes to enhance system performance and functionality. Enhancements include addressing evolving safety requirements (e.g. Minimum Safe Altitude Warning system and Conflict Alert) and upgrading interfaces with other systems (surveillance, centers, oceanic). Regular reviews of system performance identify and prioritize issues and schedule the work to be completed in any fiscal year. Software changes that are needed to address changes in hardware are done under this program to support the STARS technology refresh activities, and/or the upgrades needed for enhanced performance and capacity.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

STARS is essential to provide safe separation of arrival and departure aircraft in the terminal area of the national airspace system. The STARS system is fully digital and capable of tracking all aircraft within the defined terminal airspace using available FAA or DOD surveillance products, including Automatic Dependent Surveillance Broadcast (ADS-B). This system provides functions equivalent to or better than those accomplished by the existing terminal automation systems along with enhanced security. The STARS infrastructure can be expanded and extended to meet increased traffic demands and accommodate the introduction of new automation functions necessary for improved safety, efficiency, and capacity.

Replacing the original Ultra-5 processors, that have reached their end of maintenance, provides technology refresh for continued STARS terminal services. Replacing the original Sony 2K CRT (Cathode Ray Tube), that have degraded display capability, provides air traffic controllers with high definition displays.

To enable completion of the Ultra 5 replacement, qualification of a new processor, began in FY 2009 and continued into FY 2010 – FY 2011. Procurement and replacement of the first block of replacement processors occurred in FY 2011. This enabled current system availability to be maintained and allowed STARS to support proposed NextGen capabilities as they were/are fielded. The new generation of processors will also enable STARS to move into a more open architecture providing benefits in increased Mean Time Between Failure (MTBF) and potentially lower overall system operating costs.

$64,200,000 is required to support the continued high operational availability of STARS by incorporating software enhancements/refinements and hardware technology refresh. In addition, STARS supports the automation infrastructure on which to build future NextGen (ADS-B) operational initiatives.

What Benefits Will Be Provided To The American Public Through This Request?

The STARS platform is a currently operational vital link in the nation's air traffic control system. Over the past five years, the average equipment availability for STARS is 99.9996 percent. This program will fund the technology refresh activities at 47 operational STARS sites.

Detailed Justification for - 2B04 Terminal Automation Modernization/Replacement Program (TAMR Phase 3)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Terminal Automation Modernization/Replacement Program (TAMR Phase 3)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Terminal Automation Modernization/Replacement Program (TAMR Phase 3)	$146,150	$159,350	$108,900	-$50,450

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. TAMR Phase 3 Segment 1		
a. Solution Implementation	15	$500.0
b. Program Management	---	250.0
c. Implementation/Decommissioning	---	250.0
Total	Various	$1,000.0
B. TAMR Phase 3 Segment 2		
a. Prime Contractor	30	$69,206.0
b. Site Prep	---	2,734.0
c. Disposition	---	299.0
d. Headquarters Program Management	29	9,302.0
e. Test and Evaluation	---	1,587.0
f. Telecommunications	---	2,003.0
g. Logistics	---	241.0
h. Second Level Engineering	---	8,748.0
i. ASR-8 Digitizers	12	3,480.0
Total	Various	$97,600.0
C. TAMR Phase 3 Segment 1 Enhancements		
a. Prime Mission Hardware	---	694.5
b. Prime Mission Software	---	3,775.2
c. Prime Infrastructure	---	3,236.7
d. Headquarters Program Management	---	119.9
e. Test and Evaluation	---	1,683.5
f. Implementation Support	---	490.2
Total	Various	$10,000.0
D. Independent Operational Assessment (IOA) formerly IOT&E	---	$300.0

For FY 2017, $108,900,000 is requested for TAMR Phase 3, which includes $1,000,000 to continue the development and testing of STARS software for Segment 1. TAMR Phase 3 Segment 2 is requesting $97,600,000 for hardware procurement, testing, site preparation, and equipment installation of the STARS ELITE system. An additional $10,000,000 is requested to provide new software and hardware requirements (post ORD) enhancements that are not a part of the Segment 1 or Segment 2 baselines. In addition $300,000 is requested for Independent Operational Assessment formerly known as Independent Operational Testing and Evaluation (IOT&E).

What Is This Program And Why Is It Necessary?

Terminal automation systems are essential for controllers to manage the operations at our nation's busiest airports. The automation systems rely on information from radar and weather sensors, along with flight plan information for each aircraft to inform controllers of the aircraft's location and intended path of flight enabling them to safely and efficiently maintain aircraft separation at or near airports. The TAMR program provides a phased approach to modernizing the automation systems at the FAA's Terminal Radar Approach Control (TRACON) facilities and associated Airport Traffic Control Towers (ATCT) throughout the NAS.

TAMR Phase 3 addresses the modernization/replacement of Common Automated Radar Terminal System (ARTS) (CARTS) automation systems at 108 TRACONs and associated ATCT facilities with STARS to meet NextGen mid-term goals. System configurations to be replaced include 11 ARTS IIIE, 91 ARTS IIE and six ARTS IE. The FAA will continue to sustain the automation systems at these sites while monitoring system performance to identify any deterioration in service.

A. Segment 1

On December 21, 2011 the TAMR Phase 3 Segment 1 Program received a Final Investment Decision from the JRC to replace 11 ARTS IIIE automation systems and associated ATCT with STARS in support of ADS-B and to enable convergence to a single Terminal Automation hardware and software platform by 2017.

The requested funds will be used as follows:

- Complete Initial Operating Capability (IOC) at 11th site (11th site IOC: Acquisition Program Baseline (APB) date, October 2016)
- Achieve continuous operations and ORD at 7th-10th sites

The ARTS IIIE automation systems have commercial-off-the-shelf (COTS) hardware that is either aging or approaching the end of its useful life and will need to undergo technology refresh in order to support Automatic Dependent Surveillance Broadcast (ADS-B) services in the NAS. The 11 ARTS IIIE automation systems must be modernized. Their size and importance to the NAS will not allow them to continue to operate with current functionalities indefinitely. These systems were installed or upgraded to their current configuration in the 2000 - 2008 timeframe.

Additionally, the decision was made to converge terminal automation systems to a single terminal automation platform to avoid dual software development costs and resolve hardware supportability issues.

B. Segment 2

The TAMR Phase 3 Segment 2 program will replace 91 ARTS IIEs and six ARTS IEs and associated ATCT facilities with STARS and will complete the convergence to a single Terminal Automation hardware and software platform by 2019. The Segment 2 program Final Investment Decision (FID) was approved by the JRC on September 19, 2012.

The requested funding will be used as follows:

- Complete IOC at 34th ARTS IIE site (APB milestone)
- Achieve IOC at 29 sites, for a cumulative total of 55 sites
- Install hardware and complete Contractor Acceptance Inspection (CAI) at 29 operational sites

- Procure 12 additional systems

The ARTS IIE sites have hardware that is aging, beyond its useful life, and must be replaced to support ADS-B services in the NAS. The 91 ARTS IIE sites must be modernized. These systems were installed in the 1970s, with processors upgraded to their current configuration in the 2000 – 2002 timeframe. Additionally, the ARTS IIEs, due to lack of processing speed and capacity, are suffering from software stability issues. Without resolution, these sites risk significant decreases in system availability and with that, increased safety risk.

The ARTS IEs will be replaced to complete the convergence to a single terminal automation system.

C. Segment 1 (Post-ORD) Enhancements

The Phase 3 System Enhancements consist of both hardware and software additions to STARS systems that are deployed to replace ARTS IE, IIE, and IIIE systems. The hardware includes additions of small quantities of items that are already part of the STARS Baseline (no new capability) that have been requested by sites via the Needs Assessment Program (NAP) and approved by the FAA Mission Support Organization. The software capabilities are those requested by Phase 3 sites and approved by Mission Support needed to provide capabilities existing in ARTS at the time of transition to STARS. They represent no new capabilities to the NAS, but may be new capabilities to STARS, or may be perfective or corrective changes to existing STARS functionality. As validated enhancements are identified, prioritized, and approved, the TAMR Program Office will use existing, mature processes for the engineering, design, development, testing, integration and delivery of these hardware and software additions to Phase 3 sites.

DOT Strategic Goals - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$108,900,000 is required to complete the activities associated with the baselined program. Funding at the required level will result in maintaining the program schedule as planned, decreased operational and maintenance costs to support terminal automation systems in the NAS, allowing the FAA to meet ADS-B and NextGen Segment Bravo operational enhancements, and completion of the convergence to a single terminal automation system.

What Benefits Will Be Provided To The American Public Through This Request?

By replacing the 11 ARTS IIIE, the 91 ARTS IIE, and six ARTS IE automation systems with a STARS solution it is expected that the system will have the same availability as the current STARS solution. STARS is operational at 60 terminal sites, and over the past five years, the average equipment availability for STARS is 99.9996 percent.

Quantitative benefits (cost avoidance) expected include: cost avoidance to maintain aging equipment; maintaining a single software baseline versus two software baselines; lifecycle benefits of common displays and processors; and common hardware for re-use and expansions. Qualitative benefits are expected to enhance controller's situational awareness and lessen risk through efficiency and commonality.

The TAMR program will replace and/or upgrade the existing automation to a state-of-the-art digital, radar and flight data processing and display system, providing new air traffic control workstations and backroom automation equipment to enable safe control of airplanes, continued service and support of ADS-B services in the NAS.

Detailed Justification for - 2B05 Terminal Automation Program

What Is The Request And What Funds Are Current Spent On The Program?

FY 2017 – Terminal Automation Program
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Terminal Automation Program	$1,600	$7,700	$7,700	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Flight Data Input/Output (FDIO) Replacement		
a. Technology Refresh Implementation	1,400	$1,806.6
b. Program Management	---	584.4
c. System Engineering	---	309.0
Total	Various	$2,700.0
B. Terminal Work Package 1		
a. Program Management	---	$1,500.0
b. Operational Requirements Tracking and Validation	---	500.0
c. Systems Engineering	---	1,000.0
d. Test Planning and Support	---	250.0
e. Requirements and Functional Development, Software Design and Development (Vendor)	---	1,750.0
Total	Various	$5,000.0

A. Flight Data Input/Output (FDIO) Replacement

For FY 2017, $2,700,000 is requested to continue the procurement of hardware and software that will be used to replace obsolete or end of life equipment currently in the field, to fund program management support to procure and install replacement Flight Data Input/Output (FDIO) system components at FAA and DoD ATC facilities, and all related logistics activity needed for the issuance, receipt and transportation of procured components. Replacement components to be procured consist of printers and FDIO-Gateway equipment and related software updates that may be needed. Logistics activity would consist of keyboards, terminal servers, monitors, printers, and FDIO-G items. In 2017, it is estimated that 600+ printers will be procured and the 800+ printers procured in previous years will be installed.

B. Terminal Work Package 1

For FY 2017, $5,000,000 is requested to finalize the detailed requirement for Terminal Automation enhancements established at FID. System Engineering activities include analysis, evaluation, and assessments to develop detailed requirements for changes to Terminal/TRACON automation as well as identifying procedure changes needed to support automation changes within the TRACON domain. Investment activities include finalizing the Business Case Analysis as a result of the detailed requirements development. The activities conducted in support of Terminal Work Package 1 development will reduce technical risk, quantify benefits, support alternatives development and identify safety concerns.

What Is This Program And Why Is It Necessary?

A. Flight Data Input/Output (FDIO) Replacement

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 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 program is based on a five 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. This 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 replacement of FDIO system equipment serves to enhance the capability and sustain system operational availability at the required levels. Also provided is a common IP infrastructure to support future En Route Automation Modernization (ERAM) and System Wide Information Management (SWIM) architectures.

B. Terminal Work Package 1

The Terminal Work Package 1 investment is the next useful segment for the STARS platform, building upon previous investments designed to consolidate to one terminal automation platform. Its objective is to develop and implement capabilities necessary to enable trajectory-based operations in the terminal environment, as envisioned by NextGen. The current TRACON domain service is hindered during periods of adverse weather events and increased traffic. Today's air traffic control and traffic management decision support tools (DSTs) have significant limitations in the efficient transfer of flight information and constraint information between systems, facilities, controllers, pilots, and airport operators.

Terminal Work Package 1 will consist of a suite of software capabilities planned to be implemented on existing systems in the Terminal domain, as well as associated procedures, with Standard Terminal Automation Replacement Program (STARS) as the primary display platform. It will address outstanding operational needs in the Terminal environment not part of the Terminal Automation Modernization Replacement (TAMR) program baseline. The Terminal Work Package 1 primary areas of focus are:

- Access and augmented management of flight data, delay, and aircraft information at the control position, and the ability to pass flight data to another controller
- Enhanced inter/intra-facility coordination
  - Enhanced communication methods between control positions
  - Improved information sharing between facilities
- Tactical Separation Management for the TRACON radar controller working arrivals, departures and overflights
  - Improved merging and tactical separation management
  - Enhanced conflict alerting for complex routes and separation requirements

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. Flight Data Input/Output (FDIO) Replacement

FDIO Components that were procured and replaced between 1998 - 2007 have again reached end-of-life or have become obsolete. Thus, to ensure the operational availability and that FDIO can adhere to the latest security requirements, the funding is needed to obtain components that adhere to the latest technology changes.

B. Terminal Work Package 1

The required funding will finalize the Business Case Analysis and develop detailed program requirements to provide enhancements to the existing Automation platforms within the TRACON environment. Terminal Work Package 1 will result in improved efficiency and productivity with the addition of new operational capabilities and is the next useful segment for the STARS platform.

What Benefits Will Be Provided To The American Public Through This Request?

A. Flight Data Input/Output (FDIO) Replacement

The American Public benefits can be demonstrated by a decrease in FDIO maintenance costs, improved operational effectiveness, and increased security. As newer technology is introduced, this equipment can be upgraded to meet the latest security requirements. Moreover, as the printers are replaced there will be a decrease in operating costs associated with the print head. As demonstrated by the NAS Performance Analysis System (NASPAS), FDIO has sustained an adjusted operational availability of over 99 percent for the reportable facilities that support the Nation's busiest airports through FY 2013. Continued replacement of FDIO components as they reach end-of-life or become obsolete ensures that the FDIO system can meet operational and security requirements.

B. Terminal Work Package 1

The enhancements to TRACON operations supported by Terminal Work Package 1 will result in benefits to both the FAA and the users. The changes introduced will provide TRACON controllers the support they need to offer an enhanced level of service. Users will experience cost savings due to a more efficient, more predictable service being provided by FAA.

Benefits will be fully determined as part of Investment Analysis activities. Some initial qualitative benefits that may be realized through implementation of Terminal Work Package 1 capabilities include:

- Increased efficiency of air traffic in the terminal domain and subsequent increases in air traffic capacity
- Increased aircraft flight track and schedule predictability
- Decreased controller workload
- Enhanced safety
- Increased ability to recover missed opportunities for efficiencies in the terminal domain

Detailed Justification for - 2B06 Terminal Airport Traffic Control Facilities – Replace

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Terminal Airport Traffic Control Facilities – Replace
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Terminal Airport Traffic Control Facilities – Replace	$52,600	$45,500	$58,800	+$13,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Segment 1 - Advance Requirements and Other Direct Costs	---	$8,200.0
b. Segment 2 - Land Acquisition/Site Prep/Design	2	28,200.0
c. Segment 4 – Equipment and Utilities Installation	1	22,400.0
Total	Various	$58,800.0

Terminal Airport Traffic Control Facilities–Replace is one of the programs included in the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan (SSP). Funding the programs in this strategy will improve and maintain the facility condition index ratings at FAA facilities that provide the backbone for the NAS, and by extension, the backbone of NextGen. The FAA is seeking funding to purchase land for one site, Design starts at three sites, and purchase long lead equipment and utility installation at one site.

Air Traffic Control Tower (ATCT) and Terminal Radar Approach Control (TRACON) replacement 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. The FAA has a prioritized listing of all NAS Terminal sites and continues to conduct ongoing studies that determine if and when the FAA has a need to replace the ATCT due to siting, size, and unacceptable physical conditions. From that list, the FAA will then initiate siting and design studies, and ultimately construction of the facilities with the greatest need.

Segment 1 funding, in the amount of $8,200,000, is requested in FY 2017 to support advance requirements definition and program management costs for planning and overseeing the program. Activities supported under Segment 1 include the evaluation of unique operational and maintenance requirements that impact ATCT/TRACON Facilities, the development of business cases, mock-ups of the airport facility terminal integration laboratory to assist with evaluation of the attributes of proposed airport sites, actual site selection, and other advance engineering considerations.

Segment 2 funding, which encompasses the design phase of an ATCT/TRACON replacement project, is requested in the amount of $28,200,000 in FY 2017 for two sites. The real estate acquisition/site preparation and design for Teterboro, NJ (TEB) $12,000,000; Designs are scheduled for replacing the existing N90 TRACON $16,200,000.

Segment 4 funding in the amount of $22,400,000 is requested in FY 2017 to procure equipment and utilities installation at facilities that are currently nearing the end of facility construction. Equipment planned for purchase and installation includes: automation systems, airport surveillance connectivity, engine generators, voice switches, and FAA Telecommunications Infrastructure (FTI). The facility slated for Segment 4 funding is Charlotte, NC (CLT) for $22,400,000.

Replace Terminal Air Traffic Control Facilities:

Segment Description	FY 2017 ($M)
Advanced Requirements - Segment 1	**8.2**
Advanced Requirements Definition/Program Management	8.2
Land Acquisition/Site Prep/Design - Segment 2	**28.2**
Teterboro, NJ (TEB)	12.0
Replacing N90 TRACON	16.2
Equipment and Utilities Installation - Segment 4	**22.4**
Charlotte, NC Tower/TRACON (CLT)	22.4
Total	**58.8**

What Is This Program And Why Is It Necessary?

The FAA provides air traffic control services from more than 500 ATCT and TRACON facilities. Under this program, the FAA evaluates which buildings need to be replaced, sustained, or modernized (especially relative to other facilities across the country) to ensure an acceptable level of building condition and to meet current and future operational requirements. The average age of ATCTs in the FAA portfolio is 33 years, and the average age of a TRACON is 26 years. There are facilities that are 65 years old. In some cases, ATCTs and TRACONs built 20 years ago do not meet today's Occupational Safety and Health Administration, operational, and building requirements. The facilities also may not have been built to meet today's technological needs and, while some facilities can be modernized or sustained, replacement may be the most cost beneficial method for the FAA to meet operational needs and conform to current building codes and design standards.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$58,800,000 is required to ensure continued progress on construction, real estate acquisition/site prep, and disposition activities. The required funding will ensure the continuation efforts of replacing aging terminal facilities and will maintain the program schedule.

What Benefits Will Be Provided To The American Public Through This Request?

The benefits provided by the Terminal Air Traffic Control Facilities – Replace program include:

- Eliminating Line of Sight issues, thus increasing efficiency with safety
- Providing adequate space for all approved operational and support positions to enhance efficiency at the ATCT/TRACON
- Providing adequate space and infrastructure for new modern equipment and systems to facilitate the transition to NextGen
- Reducing the high cost of maintaining old and outdated buildings
- Increasing the overall facility condition index of Terminal Facilities by providing new buildings that meet modern codes

These benefits are instrumental in providing efficiency and effectiveness, which in turn will produce cost savings to the taxpayers.

Detailed Justification for - 2B07 ATCT/Terminal Radar Approach Control (TRACON) Facilities - Improve

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – ATCT/Terminal Radar Approach Control (TRACON) Facilities – Improve ($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ATCT/Terminal Radar Approach Control (TRACON) Facilities – Improve	$45,040	$58,990	$47,720	-$11,270

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ATCT/TRACON Modernization		
a. Initiate Modernization, Improvements, and Repairs System Engr. Condition Assessments. Configuration Mgmt. Risk Mgmt.	---	$41,510.0
b. Facility Planning and Program Support	---	1,510.0
c. In-Service Engineering	---	2,300.0
Total	Various	$45,320.0
B. Facility Realignment	---	$2,400.0

For FY 2017, $47,720,000 is requested for the following:

A. ATCT/TRACON Modernization: $45,320,000 is requested to initiate modifications, improvements, and repairs to ATCT/TRACON facilities. Funding will also support system engineering, configuration management, facility planning, facility condition assessments and program support services, and in-service engineering activities to promote the improvements.

Airport Traffic Control Tower (ATCT)/TRACON Facilities–Improve is one of the programs included in FAA's Air Traffic Control (ATC) Facilities Sustainment Strategic Plan.

B. Facility Realignment: $2,400,000 is requested to develop and present preliminary findings of FY 2017 analysis to ATO and FAA leadership in preparation for a report containing the FY 2017 recommendations of the Administrator on realignment and consolidation of facilities and services. The report may also include any public comments received after the report is published in the Federal Register for comments.

What Is This Program And Why Is It Necessary?

The ATCT/TRACON Terminal Facilities Improvement program includes projects that will enable facilities to maintain current operational, environmental, and safety needs in lieu of replacing or relocating the entire facility. This effort will result in a smooth and orderly transition of new equipment into the FAA's terminal facilities. This will also improve the operational efficiency and environment of equipment within ATCT/TRACON facilities. These upgrades and improvements to terminal facilities support the NAS modernization strategy to achieve efficient aerospace systems and operations.

The FAA must continually upgrade and improve aging terminal facilities and equipment to provide an acceptable level of service and to meet current and future operational requirements. Upgrades and improvements include replacing obsolete equipment (such as tower cab consoles) and rehabilitating administrative and equipment space due to facility expansion. Facility expansion includes adding operational positions, training space, base building construction, and environmental equipment, accessibility, structural and electrical upgrades.

Facility improvements must incorporate new requirements for relocated or replaced equipment with minimal impact to existing operations. The power and heating, ventilation, and air conditioning (HVAC) systems at many terminal facilities must be upgraded to handle both the new and old equipment during the in-service change-out. A successful transition of improvement projects is vital. In many towers, there is no room for additional equipment; therefore, base buildings must be temporarily expanded.

The program funds an average of 50 sustainment projects each year. Sustainment is defined as activities to continue the NAS/terminal service capability by modifying, repairing and replacing, and reconfiguring. Routine and ongoing maintenance activities are not funded from this program. The sustainment projects include many sites throughout the NAS and will consist of efforts such as:

- Waterproofing–replace/repair of building envelope components (e.g., siding, roof, windows, fascia's, eaves, gutters, downspouts, soffits)
- 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)
- 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)–(e.g., establishment of new access road/parking, major replacement of access road/parking lot, refurbishment of facility grounds, replacement of curbs, walkways, step, railing)
- Interior Finishes–replacement/repair of interior finishes in administrative areas (e.g., doors, carpets, floor and ceiling tiles, stairs, handrails, catwalks, and reconfiguration of administrative areas)

The $2,400,000 requested will fund in-depth facility realignment of all the components of a subset of the roughly 500 ATCT facilities to perform a qualitative evaluation and generate prioritized lists of locations for investing in replacement, sustainment or building modernization efforts. The rough order of magnitude construction cost estimates are then generated for modernizing the existing facility and upgrading it into compliance with current codes and FAA Orders and standards, to the extent feasible.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$47,720,000 is required to initiate modifications, improvements, repair ATCT/TRACON facilities and for facility realignment. The required funding level will assist in the reduction of the current FAA backlog of deferred maintenance and life cycle requirements. This reduction will enhance life safety for employees and will decrease operational risks and maintenance costs.

What Benefits Will Be Provided To The American Public Through This Request?

The benefits of the ATCT/TRACON Terminal Facilities–Improve program will make repairs to structures that facilitate the movement of Air Traffic and increase the overall Facility Condition Index of Terminal Facilities by providing buildings that meet modern codes.

Detailed Justification for - 2B08 Terminal Voice Switch Replacement (TVSR)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Terminal Voice Switch Replacement (TVSR)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Terminal Voice Switch Replacement (TVSR)	$2,000	$6,000	$6,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Interim Voice Switch Replacement (IVSR) Procurement	6	$2,124.3
b. Prime Contractor IVSR Program Management and Tech Support	---	434.4
c. Prime Contractor Legacy Terminal Voice Switches Program Management	---	455.7
d. Prime Contractor Voice Switch By-Pass (VSBP) Program Management	---	70.2
e. Contractor Support Engineering, Program Management, Logistics	---	2,343.0
f. Legacy Terminal Voice Switch Recovery and Refurbishments	---	310.6
g. Site Preparation	---	261.8
Total	Various	$6,000.0

For FY 2017, $6,000,000 is requested to procure, test, deliver and install six terminal voice switch systems and refurbish and/or cannibalize associated legacy systems for spare parts to mitigate supportability risk of terminal legacy voice switches.

Currently available funding is being used to recover available legacy terminal voice switch assets and to enable existing Terminal Voice Switch Replacement (TVSR) contract vehicles to remain active. This is allowing the program to maintain the infrastructure needed to procure Terminal voice switches that are required for new Terminal facilities.

What Is This Program And Why Is It Necessary?

The ongoing Terminal Voice Switch Replacement (TVSR) program involves replacing the aging, obsolete voice switches in Air Traffic Control Towers (ATCTs) and TRACONs. Terminal voice switching systems provide key equipment used to direct and control voice communications. This allows the Terminal air traffic controllers to select the various communications paths and direct the communications to desired locations. The controller can communicate with another controller position at his/her own facility or another air traffic control (ATC) facility, with aircraft (via radio) and with other locations as required. Voice switching is the mechanism that facilitates communications between Air Traffic Control and the pilots.

The TVSR program ensures that controllers continue to have reliable voice communications in the Terminal environment. The program consisted of several multiyear equipment contracts for voice switches, including: Small Tower Voice Switches (STVS), Enhanced Terminal Voice Switches (ETVS), Rapid Deployment Voice Switches (RDVS) model IIA, Voice Switch By-Pass System (VSBP), Interim Voice Switch Replacement (IVSR), and the Conference Control System (CCS-W) in the Air Traffic Control Command Center in Warrenton, VA. Of these contracts, IVSR is the only voice switch currently in production and is the only contract vehicle available to the FAA to procure voice switch equipment for new or modernized Terminal facilities.

The TVSR program has been successful by replacing the older populated integrated digital voice switching systems in ATCT and TRACON facilities that provide non-blocking voice communication between the air traffic control operator positions, radio channels, and interphone land lines throughout the NAS for both FAA and Department of Defense (DoD) sites located in the contiguous United States (CONUS) and outside the contiguous United States (OCONUS). Many of the older STVS systems are currently being replaced under the TVSR program. Replaced voice switches are then recovered for refurbishment or cannibalized for spare parts to restock the logistics depot to support sustainment efforts.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The TVSR program will ensure that controllers continue to have reliable communications in the Terminal environment. FY 2017 funding will allow for the continued replacement and sustainment of Terminal voice switches in the NAS. TVSR will need to remain active until a few years after its successor, National Airspace System (NAS) Voice System (NVS), has its In-Service Decision (ISD), which is currently scheduled for 2020. As the legacy Terminal voice switches are replaced, they are recovered, refurbished and/or cannibalized for spare parts to help mitigate Diminishing Manufacturing Sources and Material Shortages (DMSMS) issues as vendors discontinue support for parts that are unique to the FAA voice switches. This will help maintain Operational Availability and reduce increased parts costs for special production lines to support our antiquated equipment. Since IVSRs are planned to primarily replace legacy Small Tower Voice Switch (STVS) systems, this will help mitigate two immediate concerns:

- Critical Replenishment of Small Tower Voice Switch (STVS) Operator Interfaces and Position Panels. The FAA Logistics Center (FAALC) currently has a two month depot supply.
- Provide sufficient depot spares of the STVS Mitel Chip, a critical component which is not repairable or currently manufactured. A dramatic increase in failures is expected as a part of the generic reliability bathtub curve that applies to all new FAA procured and installed systems. There are currently 156 STVS systems in use and have started the End of Life (EOL) stage. As the majority of the STVS' were installed during 1994 - 1996, their median In-Service age will be 22 years in FY 2017, and 25 years in FY 2020 when NVS is scheduled to have its ISD. Terminal Voice Switches are not intended to last beyond 25 years even with a technology refresh.

What Benefits Will Be Provided To The American Public Through This Request?

TVSR provides voice switches to Terminal facilities throughout the National Airspace System (NAS) with three main benefits to the American Public:

- **Safety**: The TVSR program provides reliable voice communications in support of air traffic Terminal operations. The reliability of communications from controller to controller and controllers and pilots is vital to a safe air traffic control system. By providing an essential element of FAA's communications network, TVSR supports the safety of our transportation system.
- **Delay Reduction**: In the Terminal environment, full voice switch failure typically means that the backup Voice Switch By-Pass (VSBP) system is then used to immediately clear the airspace until the voice switch becomes operational again, thus reducing delays.
- **Cost Avoidance**: The TVSR program reduces operational costs by reducing the current annual maintenance cost for legacy switches, reducing annual support costs, and reducing man-year costs associated with greater reliability.

Detailed Justification for - 2B09 NAS Facilities Occupational Safety and Health Administration (OSHA) and Environmental Standards Compliance

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – NAS Facilities Occupational Safety and Health Administration (OSHA) and Environmental Standards Compliance

($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
NAS Facilities OSHA and Environmental Standards Compliance	$40,000	$39,600	$42,700	+$3,100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Arc Flash Assessment	100	$8,292.5
b. Fire and Life Safety	25	7,736.7
c. Fall Protection Systems	280	7,898.3
d. Contract Support for Service Areas (SESAS) Initiative	---	10,000.0
e. Environmental Compliance Comprehensive Evaluations	9	890.0
f. EOSH Training	---	1,170.0
g. Special Program Initiatives	---	2,182.5
h. Program Management	---	4,530.0
Total	Various	$42,700.0

For FY 2017, $42,700,000 is requested to conduct risk management initiatives that safeguard FAA personnel from occupational hazards and minimize the impact of Air Traffic Organization (ATO) activities on the environment. The EOSH Program efforts ensure employee health and safety and environmental protection initiatives are founded upon and promote compliance with regulations, internal/external standards, and Collective Bargaining Agreements.

What Is This Program And Why Is It Necessary?

The Air Traffic Organization (ATO) NAS Facilities OSHA and Environmental Standards Compliance (EOSH) Program was established as the focal point for supporting ATO compliance with a compendium of published safety and environmental protection standards. These standards are generated from both internal and external sources. The standards are broadly segregated into three categories:

Regulation (standards established under applicable codes of law, for example, the Federal Resource Conservation and Recovery Act (RCRA) or State Occupational and Safety Health Acts)
Agreement (standards established though FAA executive approval, for example, inter-agency or CBU agreements, DASHO directives, or FAA orders and notices)
Mandate (standards dictated by authorization or consensus, for example, an executive order or a National Fire Protection Association (NFPA) code)

FAA must effectively manage environmental and safety risks in order to ensure that new acquisitions, installations, and modifications maintain compliance with regulations and do not introduce new hazards. EOSH has identified common safety and environmental protection areas and assigned EOSH risk manager leads that focus on the mitigation of specific risks. Each Risk Management Area (RMA) has a set of standards under which specific safety and environmental protection risk management activities are required. The broad array of FAA operations and risk matrices has required EOSH to establish RMAs with specialties ranging from hazardous waste and materials management to safe drinking water provisions and fire life safety for our buildings.

EOSH RMAs are integral through the lifecycle of ATO operations. EOSH risk manager leads consult in the planning phases of retrofitted and new construction efforts to mitigate and even completely engineer out risks at the earliest possible point. EOSH RMAs devise, develop, and publish orders, policies, procedures, and practices that promote cultural risk management. For operational facilities, EOSH RMAs assist in job hazard analyses to identify actual and potential risks associated with FAA personnel work activities. EOSH RMAs provide training materials and other learning opportunities to ensure that our employees understand the risks and how to apply the corresponding mitigation techniques developed. The EOSH program manages safety and environmental protection databases and performs data analysis to identify, track, and mitigate emerging or recurrent risk concerns. EOSH SMEs and specialists provide expertise in the proper disposition of waste and materials to include records retention requirements. This cradle-to-grave risk management approach ensures that the Agency commitment to occupational safety and health and protection of the environment is clear during all NAS operations.

EOSH Program risk management efforts:

- Protect employees and the environment
- Prevent damage and loss of FAA resources
- Preserve the NAS mission by limiting interruptions
- Promote a culture of safety and environmental responsibility

DOT Strategic Goal – Organizational Excellence
- Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs.

Why Do We Want/Need To Fund The Program At The Requested Level?

Non-compliance with Federal, State, and local environmental, safety, health, legal, and other requirements imposes significant liabilities on the FAA in the form of personnel injury or loss, interruptions to NAS operations, violations of bargaining unit agreements, post-incident response actions (such as costly cleanups), and a decrease in employee morale. Until the FAA achieves full safety and environmental protection standards compliance, identifiable and addressable risks will continue to threaten the safety of our personnel, the integrity of our neighboring communities, and the continuity of NAS operations.

Failing to achieve a fully compliant safety and environmental protection culture also incurs short- and long-term financial impacts for the agency. Employee injuries directly impact not only the injured worker (lost time and productivity), but also require the cost and time commitments associated with first and second-level responders. These incidents generate unplanned workload for post-incident investigatory and administrative personnel, and create personnel backfill requirements to achieve the continuing mission. Costs are amplified when the seriousness of the injury or incident increases.

Approximately 80 safety and environmental protection-related incidents occur monthly across the NAS with associated personnel, operational, and financial impacts. Data analysis and trending are used to disclose a training deficit that must be addressed or identify a work practice that is creating unnecessary risk. Post-incident investigations also often expose previously unidentified risks that must be rapidly mitigated when they arise. These unplanned mitigation costs are then borne at the expense of competing planned safety and environmental projects. Planned projects are delayed, and the attendant costs escalate.

$42,700,000 is required to continue implementing nationally directed technical compliance programs designed to fully address federal, state, and local environmental and safety regulations and binding commitments. Within the ATO, the EOSH Program Office directs these programs in close collaboration with the service areas and service centers to ensure the safety and health of FAA employees.

What Benefits Will Be Provided To The American Public Through This Request?

The result of these activities is to identify and reduce or eliminate occupational hazards and environmental liabilities present in FAA operations through a combination of compliance policies and procedures, continuous hazard identification and monitoring, targeted training, deployment of protective measures, and hazard abatement activities. Through these efforts, occupational safety and environmental risks are reduced, resulting in a safer, healthier workforce, reduced employee injuries and associated costs, a strong agency compliance posture, and reduced impacts to FAA operations.

Detailed Justification for – **2B10 Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)**

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Airport Surveillance Radar (ASR-9) Service Life Extension Program (SLEP)	$13,600	$3,800	$4,500	+$700

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Implementation	106	$1,200.0
b. Program Management	---	1,800.0
c. In Service Engineering	---	1,000.0
Total	Various	$4,500.0

For FY 2017, $3,000,000 is requested to continue the ASR-9 Service Life Extension Program (SLEP) Phase 2 for installation of 40 Digital Remote Surveillance Communication Interface Processor (SCIP) Replacements (DRSRs) and 66 Transmitter Backplanes. Also requested for FY 2017 is $1,000,000 for In-Service Engineering activities to allow for immediate response to emerging technology solutions.

ASR-9 SLEP Phase 2 Final Investment Decision (FID) was June 27, 2012 with the anticipated completion date of September 2019. On-going activities include:

- Program Management
- Installation of 40 DRSRs
- Installation of 66 Transmitter Backplanes
- Logistics Support

What Is This Program And Why Is It Necessary?

ASR-9 SLEP Phase 2 will consist of implementing modifications to the aging ASR-9 radar systems and peripheral equipment to sustain primary surveillance in terminal airspace through 2025. The sustainment of the ASR-9 aligns with the NAS Enterprise Architecture Surveillance Roadmap Decision Points[1], and the Surveillance and Broadcast Services (SBS)/Automatic Dependent Surveillance Broadcast (ADS-B) backup strategy.[2] Based on this strategy, ASR-9 systems will remain in service through 2025.

ASR-9 terminal service provides for maintenance of separation standards, reduces aircraft delays, and improves safety at congested airports. During instrument meteorological conditions the radar provides air traffic controllers' information that allows closer aircraft operations and increases air traffic arrival and departure operations. This program reduces the risk of unscheduled outages and ensures the continuation

[1] https://nasea.faa.gov/products/roadmap/main/display/7/tab/dps/
[2] https://nasea.faa.gov/products/roadmap/main/display/7/tab/assumptions/

of maximum service capabilities. In addition, this program will reduce the overall lifecycle operation costs by improving system reliability and maintainability.

The ASR-9 SLEP will mitigate issues of obsolescence, reliability and maintainability, and lifecycle costs for:

- ASR-9 Communications Infrastructure: The legacy Remote Surveillance Communications Interface Processor (RSCIP) is expensive, obsolete, and is not available in sufficient quantities to meet future TRACON expansions and/or consolidations. The DRSR will remove unnecessary assemblies, reducing power consumption and reclaiming stock for future use, where applicable.
- ASR-9 Control and Monitoring Infrastructure: The ASR-9 Transmitter Backplane provides the interface between four major circuit cards (control and monitoring [C&M]) that control the transmitter and provide C&M functions to site technicians. The backplane uses a wire-wrap based architecture to support important signal distributions, which couple with 21 ribbon cable assemblies to interface to various C&M components in support of system functions. A customizable transmitter backplane is required to expand transmitter C&M and reduce system outages and downtime.
- ASR-9 Depot Replenishment: ASR-9 SLEP Phase 2 will replenish the FAA Logistics Center inventory spares of Power Meters, Spectrum Analyzers, and ASR-9 Processor Augmentation Card (9PAC).
- Air Route Traffic Control Center (ARTCC) Radar Data Access Point (RDAP): ARTCC RDAP will replace the ARTCC Enroute Radar Intelligence Tool (ERIT) due to the antiquated architecture and outdated components. The ARTCC ERIT is no longer supportable.

Interdependencies:

- Next Generation Surveillance and Weather Radar Capability (NSWRC) is currently in investment analysis with an FID scheduled for December 2019. Replacement of systems will need to be considered in the scope as the investment analysis process proceeds to FID for ASR-9 SLEP Phase 3.
- The ASR-9 provides radar aircraft tracks to the Standard Terminal Automation Replacement System (STARS) and common ARTS for processing and presentation to the air traffic controllers.
- The Integrated Terminal Weather System (ITWS) uses the six-level weather feed from the ASR-9 weather channel to compile weather reports for the terminal area.
- The Weather Systems Processor (WSP) also uses the six-level weather data from the ASR-9 to detect wind shear and gust fronts and improves hazardous weather awareness for ATC.

The ASR-9 data is provided under Memoranda of Agreements (MOAs) to the Departments of Defense (DoD) and Homeland Security (DHS) through the Defense Radar Program and to the Department of Treasury and National Weather Service (NWS) through separate agreements. DoD uses ASR-9 surveillance data to monitor and detect non-transponder equipped "intruders" in terminal airspace. ASR-9 SLEP Phase 2 will reduce the overall lifecycle operation costs by improving system reliability and maintainability.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The ASR-9 was procured in the mid-1980s and fielded between 1989 and 1994. The system is expected to remain operational until 2025, but the radar systems are becoming difficult to maintain. The system hosts hardware and software architectures which 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 at the required 99.9 percent operational level.

The requested funding level will result in installation of the 40 DRSRs and 66 Transmitter Backplanes which will continue multiple configurations in the NAS for a longer period of time. The funding reduction will also reduce the risk of unscheduled outages, performance deterioration, and parts obsolescence. In addition, the overall lifecycle operational costs will continue to decrease.

What Benefits Will Be Provided To The American Public Through This Request?

Extending the service life of the ASR-9 system will reduce outages that are due to performance deterioration and parts obsolescence. If realized, ASR-9 outages are a significant contributor to aircraft arrival and departure delays at major airports throughout the United States. Furthermore, the ASR-9 service life extension will increase equipment and service availability. The success of the program will be measured by analysis of ASR-9 outages attributable to system components affected by this modification, air traffic delays due to these outages, and related demand for spare parts.

ASR-9 SLEP Phase 2 is the continuation of a phased strategy to provide a service life extension of the ASR-9 systems at the highest traffic airports. Phase 1B was completed in October 2010 (four months ahead of schedule). Phase 2 of ASR-9 SLEP is in the solution implementation phase.

Detailed Justification for – 2B11 Terminal Digital Radar (ASR-11) Technology Refresh and Mobile Airport Surveillance Radar (MASR)

What Is The Request And What Funds Are Currently Spent On the Program?

**FY 2017 – Terminal Digital Radar (ASR-11) Technology Refresh and Mobile Airport Surveillance Radar (MASR)
($000)**

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Terminal Digital Radar (ASR-11) Technology Refresh and Mobile Airport Surveillance Radar (MASR)	$21,100	$9,900	$6,100	-$3,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ASR-11 Technology Refresh, Segment 2		
a. Prime Mission Product	---	$827.0
b. Program Management	---	518.0
c. System Engineering	---	766.0
d. Test and Evaluation	---	443.0
e. Integrated Logistics Support	---	480.0
f. Implementation	74	466.0
Total	Various	$3,500.0
B. Mobile Airport Surveillance Radar (MASR)		
a. Program Management	---	$378.0
b. System Engineering	---	857.0
c. System Production	2	1,365.0
Total	Various	$2,600.0

For FY 2017, $6,100,000 is requested to fund work for the ASR-11 Technology Refresh, Segment 2 and the Mobile Airport Surveillance Radar (MASR).

A. ASR-11 Technology Refresh, Segment 2

The FY 2017, $3,500,000 is requested to continue the implementation in support of the Site Control Data Interface/Operator Maintenance Terminal (SCDI/OMT) replacement and provide Program Management, System Engineering, and Second Level Engineering Support. This funding will also support an In-Service Decision for SCDI/OMT by December 2016.

The Segment 2 Final Investment Decision (FID) was received in December 2013. Ongoing activities have included: Procurement of Uninterruptable Power Supply (UPS) Capacitor kits at 50 sites by September 2016, completion of Employee Occupational Safety and Health (EOSH) implementation at 74 sites by May 2017, completion of SCDI installation at 10 sites by September 2017, and Prime contractor funding to continue efforts associated with the SCDI/OMT replacement.

B. Mobile Airport Surveillance Radar (MASR)

For FY 2017, $2,600,000 is requested in order to complete the Mobile ASR-11 In-Service Decision by December 2016. In addition, funding will be required for the close-out of the program and acquisition of life cycle support requirements.

The MASR Program received the Final Investment Decision (FID) to proceed in June 2012. Ongoing activities have included: completion of refurbishments of two ASR-9/Mode-S Systems in March 2015, completion of procurement of two Mobile ASR-11 systems in December 2014, and Prime contractor funding for Mobile ASR-11 procurement.

What Is This Program And Why Is It Necessary?

A. ASR-11 Technology Refresh, Segment 2

The ASR-11 surveillance capabilities provide air traffic personnel with coverage performance suitable for air traffic control of aircraft arrivals and departures at airports throughout the United States. These capabilities permit safe and efficient movement of aircraft in and out of airport terminal areas allowing air carriers to maximize their resources without compromising the safety of air traffic services.

Technology refresh of the system will allow the Airport Surveillance Radar, Model-11 (ASR-11) to continue to provide terminal surveillance of aircraft in support of FAA and Department of Defense (DoD) air traffic control (ATC) operational needs throughout its intended service life. More specifically the program will address shortfalls created by SCDI/OMT, UPS capacitor replacement, and Employee Occupational Safety and Health (EOSH) safety issues and will ensure continued reliable and cost effective operation of the radar system through its designated lifecycle.

B. Mobile Airport Surveillance Radar (MASR)

The MASR capability will eliminate long-term surveillance outages resulting from airport modernization and construction projects that require planned in-service radar relocations, temporary radar service needs and emergency operations in a dense or complex airspace. Airport modernization and construction often requires the terminal radar to be relocated, which would cause a multi-month outage if not augmented by other systems. Large-scale radar catastrophic failures, while rare, also pose a particularly significant challenge since the deployed radars are no longer manufactured. The MASR system capability would bridge this gap and provide seamless transition from the existing legacy radar system to the permanent system that will continue to provide terminal surveillance service.

This performance shortfall will be addressed by procuring a terminal surveillance capability that can be deployed within known, short-duration timeframes and is compatible with any airport traffic control towers (ATCT), Terminal Radar Approach Control (TRACON) facilities, Air Route Traffic Control Centers (ARTCC), and their associated automation systems. Loss of primary and secondary surveillance products, due to either catastrophic events or long term outages, would have a definite impact on Federal Aviation Administration (FAA) mission capabilities, specifically in the areas of controller situation awareness, safety, capacity, and industry vitality. The MASR system can be transported by truck, rail, or ship, and installed, and certified operational in as few as five days from the initial incident.

This proposed system architecture is a reusable, service-oriented capability with an emphasis on providing the terminal surveillance service efficiently and quickly. The program goal is to have interfaces for power, mechanical, data, and remote monitoring and control defined to be interoperable with all currently deployed ASR-8, ASR-9 and ASR-11 terminal radars and their associated automation interfaces.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. ASR-11 Technology Refresh, Segment 2

$3,500,000 is required to continue software development and implementation in support of SCDI/OMT replacement, and will provide funds for Program Management, System Engineering, and Second Level Engineering. At the requested funding level, the ASR-11 Technology Refresh Segment 2 in FY 2017 will fulfill its primary mission of providing terminal radar service to the National Airspace System (NAS) and reduce SCDI and UPS obsolescence issues related to future service reductions and/or outages.

B. Mobile Airport Surveillance Radar (MASR)

$2,600,000 is required for the MASR to complete Mobile ASR-11 In-Service Decision by December 2016. This funding will be required for close-out of the program and include life cycle support requirements. At the requested funding level, the MASR program will be fully implemented by December 2016 which coordinates the independent planned in-service relocation activities at several airports.

What Benefits Will Be Provided To The American Public Through This Request?

A. ASR-11 Technology Refresh, Segment 2

The Acquisition Program Baseline for the ASR-11 Technology Refresh Segment 2 began in FY 2014 and has been managed within the established cost and schedule baseline. This program ensures continued safe terminal radar service for the flying public by addressing the most urgent obsolescence issues.

B. Mobile Airport Surveillance Radar (MASR)

The MASR supports the FAA Strategic Priority to deliver benefits through technology and infrastructure. The MASR will eliminate an existing shortfall, which is the lack of a mobile surveillance system that can provide the level of surveillance performance needed to support planned in-service radar relocations, temporary radar service needs and emergency operations in a dense or complex airspace. This program ensures continued safe primary radar coverage for the flying public. The MASR enables significant cost avoidance associated with long term airport radar service outages.

Detailed Justification for – 2B12 Runway Status Lights (RWSL)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Runway Status Lights (RWSL)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Runway Status Lights (RWSL)	$41,710	$24,170	$4,800	-$19,370

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. RWSL Implementation Phase		
a. Program Management	---	$1,195.0
b. Implementation	2	550.0
c. Hardware Procurement	---	355.0
d. System Engineering	---	728.0
e. Logistics and Documentation	---	987.0
f. Second Level Engineering	---	485.0
g. Independent Operational Assessment (IOA) formerly IOT&E	---	500.0
Total	Various	$4,800.0

For FY 2017, $4,800,000 is requested for RWSL Implementation Phase 1 activities that include: delivering and installing the system at two airports, and achieving Initial Operational Capability (IOC) at two airports. The remaining funds will be used for implementation activities, systems engineering, depot logistics and documentation, spare parts, second level engineering support, initial utility service, information system security requirements, and contractor support.

In FY 2016, the program is conducting a Post Implementation Review (PIR), site implementation activities, construction, system installation, and achieving initial operational capability. In FY 2015, remaining planned activities included commissioning two sites, achieving IOC at one site, completing site acceptance testing at two sites, and one site design. Completed FY 2015 activities include the commissioning of two sites and IOC at four sites.

What Is This Program And Why Is It Necessary?

RWSL integrates airport 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 a runway. Located along the centerline of a runway or taxiway, Runway Entrance Lights (REL) and/or Takeoff Hold Lights (THL) will illuminate red when a runway is in use. RWSL is designed to independently supplement existing air traffic controller tools and procedures without increasing the controller workload by automatically providing a clear, prompt indication of runway status directly to pilots and ground vehicle operators. RWSL acts as an independent safety enhancement and does not replace air traffic control issued clearance. The RWSL system provides a layer of redundancy in runway safety and is a backup and reinforcement of controller guidance.

- Twelve production sites are fully commissioned: Orlando (August 2013), Phoenix (March 2014), Houston (April 2014), Washington-Dulles (July 2013), Seattle (August 2014), Las Vegas (October 2014) Charlotte (March 2015), Ft. Lauderdale (May 2015), New York-LaGuardia (July 2015), Minneapolis (August 2015), Detroit (September 2015), and Los Angeles (October 2015)
- Two additional sites have achieved Initial Operational Capability (IOC): Newark (October 2015), and New York-Kennedy (December 2015)
- Three additional sites are under construction: Chicago, San Francisco, and Baltimore-Washington

A top priority of the FAA is to enhance airport safety while increasing airport capacity. Reducing runway incursions is a major component of this effort. Runway incursions develop quickly and without warning from safe and routine traffic situations on the airport surface. Such time critical runway incursions usually leave little time for corrective action. The National Transportation Safety Board (NTSB) issued a safety recommendation to the FAA to "Implement a safety system for ground movement that will ensure the safe movement of airplanes on the ground and provide direct warning capability to the flight crews." RWSL address this recommendation by providing direct indication to flight crews and vehicle operators that it is unsafe to enter a runway or to begin a takeoff.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$4,800,000 is required to maintain the baseline schedule and realize the safety improvement benefits upon which the investment is based.

What Benefits Will Be Provided To The American Public Through This Request?

RWSL provides an additional layer of safety to the dynamic runway environment. Automated surface surveillance systems alone may not be sufficient in certain time critical situations. RWSL display critical, time-sensitive safety status information directly to pilots and vehicle operators reducing the time it takes to alert them of potentially unsafe situations.

RWSL are designed to independently supplement existing air traffic controller tools and procedures without increasing the controller workload and without impacting safe efficient surface operations. RWSL does not replace air traffic control issued clearances.

As a result of budget constraints and unexpected costs to implement the program, the FAA reduced the scope of the RWSL program from 23 airports to 17. As a result, the FAA will take an alternative approach to the RWSL Program at selected airports. The agency formed a Surface Safety Team to work with stakeholders at these airports to evaluate available runway safety technologies, develop a portfolio of innovative solutions, and identify funding options that include cost sharing. The team will work with the airports to provide solutions that address airport-specific challenges and improve safety and efficiency.

Detailed Justification for - 2B13 National Airspace System Voice System (NVS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – National Airspace System Voice System (NVS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
National Airspace System Voice System (NVS)	$20,550	$53,550	$48,400	-$5,150

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Key Site System: En Route	1	$4,427.1
b. Key Site Systems: Terminal	1	1,346.9
c. Logistics and Depot Spares	---	3,165.3
d. Enterprise Voice Network Engineering	---	10,451.7
e. Unmanned Aircraft Systems (UAS) Engineering	---	1,200.9
f. System Engineering	---	6,850.3
g. Program Management	---	1,489.8
h. Contractor Support	---	10,572.9
i. Installation	---	2,249.5
j. Testing	---	3,763.1
k. Second Level Engineering	---	983.8
l. System Manual and Training Development	---	689.4
m. Security	---	491.6
n. Telecommunications	---	17.7
o. Independent Operational Assessment (IOA) formerly IOT&E	---	700.0
Total	Various	$48,400.0

For FY 2017, $48,400,000 is requested to procure two key site systems, installation, testing, and for Enterprise Voice over Intranet Protocol (VoIP) systems engineering for the National Airspace (NAS) Voice System – Demonstration and Qualification. UAS systems engineering work will be performed to further develop the capability to communicate with distant UAS operators via NVS based on new user requirements. The FY 2017 request also includes $700,000 to continue Independent Operational Assessment (IOA), formerly known as Independent Operational Test and Evaluation (IOT&E), activities in support of NVS.

Ongoing activities include work to deliver first and second article test systems, a Test Load Generator (TLG), and to continue systems engineering and software development. NVS received a Final Investment Decision (FID) from the Joint Resources Council (JRC) in September 2014 for NAS Qualification of the NVS system. In addition, the FY 2016 request included funding to procure and install additional radio and telephone interface cards to expand capacity of existing legacy voice switch systems.

What Is This Program And Why Is It Necessary?

NVS will provide voice communications services to Air Traffic Control Specialists (ATCS), supervisors, and ancillary Air Traffic Control (ATC) operators in support of continuous ATC operations in the Terminal and En Route domains of the National Airspace System (NAS). Voice communications connectivity will be provided to aircraft flight crews and Unmanned Aircraft System (UAS) operators through Air to Ground (A/G) radio circuits or equivalent network connections. Voice communications connectivity between ATCS, supervisors and traffic managers will be provided through access to intra-facility and inter-facility Ground to Ground (G/G) voice circuits or equivalent network connections.

The current switch technology deployed in the NAS will not support the expected future NextGen concept of operations for networked facilities, or such concepts as dynamic re-sectorization (expanding or contracting a controller's volume of airspace electronically) and off-loading during non-peak operations. These capabilities require that lines connected to a controller's workstation can be changed to add or eliminate lines as the geographical boundaries of the sector change. The legacy voice switches also do not have the capability to provide communication to UAS operators, who are often at distant locations from the aircraft. NVS will support current and future ATC operations as envisioned by both government and industry forecasters. In addition, the current voice switch system is aging and needs to be modernized to mitigate parts obsolescence and diminishing manufacturing sources.

This program maps to the FAA strategic priority of Delivering Benefits through Technology and Infrastructure, with a metric of maintaining an average daily airport capacity for Core airports of 59,122, or higher, arrivals and departures. NVS supports this FAA priority by:

- Increased Operational Efficiency and Return on Capital: NVS is replacing custom/expensive legacy systems with scalable, enterprise-managed platform that reduces acquisition costs.
- Improved Flexibility: NVS is supporting dynamic airspace operations and reconfiguration of controller positions and facility alignment. NVS will enable seamless and efficient airspace control allowing safe balance and manage of traffic loads.
- Improved Access: NVS will enable more capacity via efficient use of resources and services

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$48,400,000 is required to procure two key site systems, installation, testing, and for Enterprise Voice over Intranet Protocol (VoIP) and UAS systems engineering.

What Benefits Will Be Provided To The American Public Through This Request?

Three NVS demonstration systems were delivered in FY 2013. In early FY 2014, a demonstration was successfully performed to validate NextGen capabilities (e.g. resource sharing, load balancing, and enterprise management) in support of a production-ready system for deployment to any of the target environments.

NVS will replace the service that is currently provided by 11 different voice switch configurations including Terminal Voice Switch Replacement (TVSR) and Voice Switch 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.

Detailed Justification for - 2B14 Integrated Display System (IDS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Integrated Display System (IDS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Integrated Display System (IDS)	$16,917	$23,300	$7,700	-$15,600

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Procurement, Production and Deployment of IDS-R Systems	10	$2,200.0
B. Requirements Development, Investment Analysis for E-IDS	---	5,000.0
C. Technology Refresh of IDS-R System	---	500.0
Total	Various	$7,700.0

A. Integrated Display System – Replacement (IDS-R): For FY 2017, $2,200,000 is requested to complete the procurement and installation of workstations at 10 networks at Terminal Radar Approach Control (TRACON) Facilities and the associated Airport Traffic Control Towers (ATCTs).

B. Enterprise Integrated Display System (E-IDS): For FY 2017, $5,000,000 is requested to complete concept development through prototyping, Investment Analysis (IA) that will result in an Initial Investment Decision (IID), and preparation for Final Investment Decision (FID).

C. Integrated Display System – Replacement (IDS-R) Technology Refresh: For FY 2017, $500,000 is requested to perform technology refresh of the IDS-R system that was placed in service in 2012.

What Is This Program And Why Is It Necessary?

A. Integrated Display System – Replacement (IDS-R)

The IDS-R is a local and wide area network information dissemination and display system. It consolidates information from several operational FAA and National Weather Service (NWS) weather subsystems and from other operational sources onto a single display. It then distributes the data to air traffic controllers and airspace managers at TRACON, Tower (ATCT), and Air Route Traffic Control Center (ARTCC) facilities. These capabilities permit safe and efficient movement of aircraft in and out of airport terminal areas allowing air carriers to maximize their resources without compromising the safety of air traffic services.

The IDS-R program provides for the replacement of the legacy Integrated Display Systems-4 (IDS-4) with current technology. The program will replace 1,944 IDS-4 systems at approximately 256 sites nationwide. The equipment removed from the 256 sites will enable the depot to provide supply support for the remaining sites. The National Airspace System (NAS) relies on the continuation of the capabilities provided by the IDS. The existing IDS-4 has been operational since 1994 without any technology refresh of hardware/software. Replacement of the legacy equipment at the 256 facilities will benefit the FAA by providing greater operational availability of the IDS associated with the use of state-of-the-art equipment thereby reducing delays at the airports. The prime contract was awarded in May 2010 and design efforts were completed in early 2011. The current funding level will allow the completion of 10 sites in FY 2017, with the plan to complete the remaining 11 sites in FY 2018.

The consolidation of information provided by the IDS enhances controller's situational awareness and reduces the need for multiple displays. Additionally, controllers will be able to provide more dynamic responses to operational changes (e.g. real-time weather information communicated to satellite facilities). As currently configured, the IDS-4 system is unsupportable and lacks the capacity to incorporate software updates. Essential hardware components needed to support DOS-based software are not available from industry and the proprietary software is no longer supported by the vendor. Due to obsolescence issues, Logistic Center spares stocks are being depleted and the single board computer necessary to support DOS based programs is unavailable for purchase. As the age of the equipment increases, the cost of maintenance support increases. Additionally, the lack of repair parts increases the likelihood and frequency of system failures. Increasing system failures will negatively impact Air Traffic Control (ATC) workload, increase labor costs, and reduce ATC situational awareness thereby increasing flight delays.

B. Enterprise Integrated Display System (E-IDS)

E-IDS will replace obsolete standalone IDS workstations in Terminal and En Route domains with a common enterprise-based server and thousands of thin-clients in the field. The system will enhance situational awareness through a shared common operations picture between users. E-IDS will reduce manual entry and facilitate inter-facility coordination, integrate information into a separate view, remove display clutter and expedite information retrieval and assures data reliability through the System Wide Information Management SWIM.

E-IDS will Interface with and display data to the Air Traffic Controller from legacy systems like Automated Surface Observing System (ASOS), Automated Weather Sensors System (AWSS), Digital Altimeter Setting Indicator (DASI), Low Level Windshear Alert System (LLWAS), Terminal Doppler Weather Radar (TDWR), and Wind Measuring Equipment (WME). It will also provide the platform to display data from future programs/systems like Aeronautical Information Management (AIM), Notice to Airmen (NOTAMS), and new weather programs, to name a few.

The IDS-R program will not replace all IDS-4 systems, especially those at tier 1 facilities. As currently configured, the IDS-4 system is unsupportable and lacks the capacity to incorporate software updates. The E-IDS will complete the replacement of the remaining IDS-4 systems. The IDS models to be replaced by E-IDS include: the remainder of IDS Model-4 (IDS-4) that were deferred by the IDS Replacement (IDSR) program (quantity 483), all of the IDS Model-5 (IDS-5) (quantity 33), all of the ASOS Controller Equipment Integrated Display System (ACE-IDS) (quantity 709), and all of the En Route IDS (ERIDS) (quantity 1,628).

C. Integrated Display System – Replacement (IDS-R) Technology Refresh

The IDS-4 is being replaced with a state-of-the-art system comprised mainly of Commercial-Off-The-Shelf (COTS) components. As in any COTS based system, a technology refresh of the replacement components is essential to sustain system services. Therefore, the FAA plans to perform a system analysis in FY 2016, approximately five years after original COTS components were acquired, to identify affected components before they are no longer replaceable due to obsolescence. Based on the system analysis, components will then be acquired to ensure continued operation of the system.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. Integrated Display System – Replacement (IDS-R)

- Funding IDS-R at the required level supports the FY 2017 baseline for completing the procurement and installation of the workstations at the sites as planned.

B. Enterprise Integrated Display System (E-IDS)

- Funding E-IDS ensures that replacement of information display systems throughout the NAS (IDS-4, IDS-5, ACE-IDS, ERIDS, IDS-R, et. al.), many of which are at or near end of life status, occurs and creates one unique and seamless information display platform across the NAS.
- Funding E-IDS provides a NAS platform that will be able to utilize developing FAA enterprise architecture products like Common Support Services Weather via the SWIM platform.
- Additionally, as part of the JRC decision for the IDS-R program, E-IDS was identified to meet near-term system failure concerns with the remaining IDS-4 system which would exist even after IDS-R is deployed.
- Required funding will allow for the completion of the IID phase, beginning the FID phase, and continuation of concept engineering execution work.

C. Integrated Display System – Replacement (IDS-R) Technology Refresh

- The required funding level will begin acquiring equipment to replace the obsolete components. The key outcome will be a sustainable IDS-R system which provides a tool to exchange information that impacts the control of air traffic.

What Benefits Will Be Provided To The American Public Through This Request?

A. Integrated Display System – Replacement (IDS-R)

- Replacing IDS systems with current technology will reduce outages, thereby reducing delays at the airports associated with the sites addressed by this investment
- The first IDS-R site achieved Initial Operational Capability (IOC) on September 16, 2013, and the system operational availability has been 100 percent since that date

B. Enterprise Integrated Display System (E-IDS)

- Data standardization and sourcing ensures consistency of data among facilities and will result in efficiency of data sharing throughout the NAS
- Common Computer Human Interface (CHI) across Air Traffic environments and users will reduce training and maintenance costs
- Identical skill set for hardware and software maintenance across Air Traffic environments reduces the cost of maintaining disparate systems

C. Integrated Display System – Replacement (IDS-R) Technology Refresh

- Avoiding the IDS-R system from becoming obsolete will ensure the continued benefits of IDS-R.

Detailed Justification for - 2B15 Remote Monitoring and Logging System (RMLS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Remote Monitoring and Logging System (RMLS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Remote Monitoring and Logging System (RMLS)	$3,930	$4,700	$9,900	+$5,200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Remote Monitoring and Logging System (RMLS) Technology Refresh	2	$9,900.0

For FY 2017, $9,900,000 is requested to initiate the replacement of obsolete load balancers and servers used for remote monitoring and maintenance of the NAS, and as a repository for NAS maintenance logging information. The funds will be used to replace the equipment and update security requirements in two main hubs of the network, the Pacific Operations Control Center (POCC) and William J. Hughes Technical Center (WJHTC).

What Is This Program And Why Is It Necessary?

The FAA relies on the Remote Monitoring and Logging System (RMLS) to insure all NAS facilities and systems are operational so that flights are safe and on time. The NAS Defense program and Homeland Security also relies on the data for 24/7 monitoring of the NAS.

Several key issues affect the FAA's ability to support the Operation and Maintenance (O&M) of the NAS. Many Technical Operations programs are not integrated, and the O&M data is shared through manual processes, e.g., voice communications, email, point-to-point message exchange services, and manually searching multiple databases. Updating system status by these means of communication often results in errors which can lead to potential safety hazards, delays in NAS status information as well as equipment repairs, execution of improper maintenance actions and improper direction for supply chain management.

Through the implementation of an RMLS technology refresh, it is expected the FAA will improve the way it provides air traffic services and realize a positive business impact in the following areas: tracking and traceability, configuration management, warranty control, reliability and maintainability data, inventory accountability, data quality, acquisition management, and vendor accountability.

RMLS technology refresh will replace aging RMLS core components for NAS growth to ensure the Remote Monitoring and Maintenance (RMM) infrastructure supports the agency's storage, bandwidth, and security needs.

The RMLS program directly supports the NAS operational availability maintenance metric of 99.7 percent. RMLS supports the FAA operational availability performance metric by capturing, quantifying, analyzing, measuring and reporting maintenance information to determine operational availability as well as error levels, responsiveness, and utilization of NAS components, systems, services, and the NAS as a whole. The maintenance information is used by the FAA to analyze trends and improve performance; make investment decisions and support budget requests for replacement, relocation, or modification of existing equipment;

detect supportability problems; evaluate the efficiency and effectiveness of the overall maintenance program; and provide reports to Congress and FAA management.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$9,900,000 is required to continue technology refresh of RMLS commercial-off-the shelf (COTS) components and comply with the FAA's mandated security requirements before the support strategy (failure under warranty) fails. Solution implementation of RMLS technology refresh activities include: procurement, operational test and evaluation, technical data, supply support, site preparation, installation, and testing and activation.

What Benefits Will Be Provided To The American Public Through This Request?

The activity tasks within RMLS have shown previous success directly or are tied to previous successes within the agency. In FY 2007 - FY 2008 the FAA's Remote Maintenance System Engineering Team (RMSET) successfully designed, developed, and tested a proof of concept prototype for RMLS. The team also demonstrated success in FY 2013, as RMLS was made fully operational across the NAS. Benefits have been validated and were presented to arrive at the RMLS technology refresh Final Investment Decision in June 2014.

Validated cost avoidance benefits are the following:

- Improved maintenance systems integration
- Data standardization
- Improved system efficiency
- Integration with other supply chain programs as part of Supply Chain integration

Detailed Justification for – 2B16 Mode S Service Life Extension Program (SLEP) - Phase 2

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Mode S Service Life Extension Program (SLEP) - Phase 2
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Mode S Service Life Extension Program (SLEP) - Phase 2	$8,100	$16,300	$37,900	+$21,600

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Mode S Service Life Extension Program Phase 2		
a. Program Management	---	$1,600.0
b. Hardware Procurement	---	3,800.0
Total	Various	$5,400.0
B. ASR-9 and Mode S Service Life Extension Program Phase 3 Planning		
a. Program Management	---	$4,600.0
b. System Engineering Analysis and Design	---	5,000.0
c. Testing Development and System	---	1,300.0
d. Hardware Procurement	---	16,730.0
e. Implementation	---	2,300.0
f. Physical Infrastructure Support	---	747.0
g. Disposition	---	23.0
h. Integrated Logistics Support	---	1,300.0
i. In Service Engineering	---	500.0
Total	Various	$32,500.0

For FY 2017, $37,900,000 is requested to:

A. Terminal Radar (ASR) Mode S SLEP Phase 2

For FY 2017, $5,400,000 is requested to continue the procurement of High Gain Open Planar Arrays (HGOPA) for Depot Replenishment. The Mode S SLEP Phase 2 Final Investment Decision (FID) was approved on June 27, 2012.

Ongoing activities for the program include:

- Program Management
- Procurement of High Gain Open Planar Array (HGOPA)

B. ASR-9 and Mode S SLEP Phase 3

For FY 2017, $32,000,000 is requested to revalidate the required Joint Resources Council (JRC) documentation to support Final Investment Decisions (FID) planned for March 2017, complete market surveys for ASR-9 and Mode S Lowest Replaceable Units (LRUs), and for the analysis of design and development proposals from responders. The requested funding would be used to award a contract for the ASR-9 Maintenance Display Unit (MDU) prototype, and a prototype development and first article units of Mode S LRUs for the integrated solution, and to procure first article units of Analog/Digital (A/D) Converter and Coherent Oscillator (COHO) for the ASR-9. Additionally, funding will be required for initial production contract awards after final investment decisions.

Ongoing activities include:

- Software development for ASR-9 Data Communications Equipment (DCE) prototype
- Review and analyze market surveys for multiple LRUs
- Complete Critical Design Review (CDR) for the Mode S Integrated Solution
- Complete procurement of pre-production components for Mode S Integrated Solution
- Continue preparation of artifacts required for Final Investment Decision (FID)

For FY 2017, $500,000 is also requested for in-service engineering activities to allow for immediate response to emerging technology solutions.

What Is This Program And Why Is It Necessary?

A. Terminal Radar (ASR) Mode S SLEP Phase 2

Mode S SLEP Phase 2 will implement modifications to the aging secondary Mode S subsystems architecture and peripheral equipment to sustain secondary surveillance in terminal and En Route airspace through 2025. The sustainment of the Mode S aligns with the Surveillance Roadmap Decision[1], and the Surveillance and Broadcast Services (SBS)/Automatic Dependent Surveillance Broadcast (ADS-B) backup strategy.[2]

Based on this strategy, at a minimum, the Mode S systems at the 23 long range radar facilities and the top 45 high density terminal facilities will remain in service through 2025.

The Mode S SLEP Phase 2 will mitigate issues of obsolescence, reliability and maintainability, and lifecycle costs for:

- **Mode S High Gain Open Planar Array (HGOPA):** A five foot beacon antenna was deployed throughout the mid to late 1970's with a projected lifecycle of 20 years. All five foot beacon antennas currently servicing the National Airspace System (NAS) are operating at 10+ years past the intended lifecycle, and support for these obsolete assets is increasingly challenging. The primary means of repair/refurbishment is cannibalization of a limited number of unserviceable five foot beacon antennas for parts resulting in an urgent need to manage the supportability issues of the legacy five foot beacon antenna.
- **Mode S Depot Replenishment:** Mode S SLEP Phase 2 will procure LRUs and components to reinforce the FAA Logistics Center inventory of spares including High Gain Open Planar Array (HGOPA).
- **Mode S Development of Four Critical LRU Prototypes:** The Critical LRU Prototypes provide an alternative that will maintain current functionality balanced with the versatility to achieve future requirements. The Critical LRU addresses the issue of diminishing manufacturer sources and parts obsolescence issues at the LRU level. These four LRUs are included in the Mode S Integrated Solution.

[1] https://nasea.faa.gov/products/roadmap/main/display/7/tab/dps/
[2] https://nasea.faa.gov/products/roadmap/main/display/7/tab/assumptions/

B. ASR-9 and Mode S Service Life Extension Program Phase 3

ASR-9 and Mode S service provides for maintenance of aircraft separation standards, reduces delays, and improves safety at congested airports. During instrument meteorological conditions the radar provides air traffic controllers with information that allows closer aircraft operations and increases air traffic arrival and departure operations. This particular program, ASR-9 and Mode S Service Life Extension Program Phase 3, reduces the risk of unscheduled outages and ensures the continuation of maximum service capabilities. In addition, the ASR-9 and Mode S service life extension modifications will reduce the overall lifecycle operation costs by improving system reliability and maintainability. The sustainment of the ASR-9 and Mode S aligns with the Surveillance Roadmap Decision Points, and the Surveillance and Broadcast Services (SBS)/Automated Dependent Surveillance Broadcast (ADS-B) backup strategy.

This program will perform engineering studies for shortfall LRUs identified with major obsolescence issues and continue software development for the Data Communications Equipment (DCE) prototype. There are components of these radar systems that are not supportable through 2025 and analyses is needed to determine the extent of re-engineering and system modifications needed. The program will provide in-service support to improve radar performance, engineering and planning to correct performance/operational and reliability issues, resolution of performance issues such as radar interference, and sustainability management of ASR-9 and Mode S surveillance systems deployed in the National Airspace System (NAS).

The ASR-9 also provides data under Memorandum of Agreements (MOAs) to the Departments of Defense (DoD) and Homeland Security (DHS) through the Defense Radar Program and to the Department of Treasury and National Weather Service (NWS) through separate agreements. The DoD uses ASR-9 surveillance data to monitor and detect non-transponder equipped "intruders" in terminal airspace.

The Mode S system provides correlated radar and beacon reports and weather map reports to NAS En Route and Terminal Automation, U.S. Department of Defense (DoD) and Department of Homeland Security (DHS) through the Defense Radar Program, and to the Department of Treasury and National Weather Service (NWS) through separate agreements.

The ASR-9 and Mode S SLEP Phase 3 Planning will develop strategies and mitigate issues of obsolescence, reliability and maintainability, and lifecycle costs. In FY 2017, the SLEP Phase 3 will consist of both the planning and solution implementation phase. The planning phase will include the investment analysis process and the following:

- Perform engineering studies to determine the scope of the ASR-9 and Mode-S SLEP Phase 3 programs. There are components of these radar systems that will not be supportable through 2028 and these analyses will determine the extent of re-engineering and system modifications needed
- Software development, and test prototypes, and prepare production contracts for award of the prototypes for ASR-9 Data Communications Equipment (DCE) and Receiver Protector and prototypes for the Mode S four critical LRUs for the Integrated Solution
- Provide in-service support to improve radar performance, engineering and planning to correct performance/operational and reliability issues, resolution of performance issues such as radar interference, and sustainability management of ASR-9 and Mode S surveillance systems deployed in the NAS
- First Article Procurement of Production Hardware

The Next Generation Surveillance and Weather Radar Capability (NSWRC) and Next Generation Backup Surveillance Capability (NBSC) are currently in the investment analysis phase. Replacement of the ASR-9 and Mode S systems with NSWRC and NSBC systems respectively will need to be considered in the scope as the investment analysis process proceeds to FID for ASR-9 and Mode S SLEP Phase 3.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. Terminal Radar (ASR) Mode S SLEP Phase 2

The required funding will extend the service life of the Mode S system and will reduce outages due to performance deterioration and parts obsolescence. Furthermore, the Mode S service life extension will increase equipment and service availability. The requested funding will decrease maintenance costs and increase reliability.

B. ASR-9 and Mode S SLEP Phase 3

The required fund is based on maintaining availability of service. Continued service will ensure maintained separation standards for aircraft and reduce potential flight delays. The program will also ensure continued reduction of operational costs and a decrease of maintenance man-hours for the Mode S four Critical LRUs.

What Benefits Will Be Provided To The American Public Through This Request?

A. Terminal Radar (ASR) Mode S Phase 2

The extended the service life of the Mode S system will reduce outages due to performance deterioration and parts obsolescence. Furthermore, the Mode S SLEP will increase equipment and service availability. The success of the program will be measured by analysis of Mode S outages attributable to system components affected by this modification, air traffic delays due to these outages, and related demand for spare parts. Mode S SLEP Phase 2 will reduce the overall lifecycle operation costs by improving system reliability and maintainability.

B. ASR-9 and Mode S SLEP Phase 3

The continuation of a phased strategy will provide a service life extension of the ASR-9 and Mode S systems at the highest traffic airports. Phase 1B was completed in October 2010 (four months ahead of schedule). Phase 2 is in solution implementation. ASR-9 and Mode S SLEP Phase 3 will be implemented in a similar fashion to achieve similar benefits (reliability and maintainability improvements and maintenance cost reductions).

Phase 3 will build upon previous successes by ensuring that proven Commercial-Off-The-Shelf (COTS) technologies are utilized to the fullest degree possible. Where such products are not available, prototypes will be developed to demonstrate the desired functionality and will be in compliance with the ASR-9 and Mode S Final Requirements.

Extending the service life of the ASR-9 and Mode S systems will reduce outages due to performance deterioration and parts obsolescence. Furthermore, the ASR-9 and Mode S service life extensions will increase equipment and service availability. The success of the program will be measured by analysis of ASR-9 and Mode S outages attributable to system components affected by this modification, air traffic delays due to these outages, and related demand for spare parts.

Detailed Justification for – 2B17 Surveillance Interface Modernization (SIM)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Surveillance Interface Modernization (SIM)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Surveillance Interface Modernization (SIM)	$4,000	$23,000	$26,800	+$3,800

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Program Mission Product Hardware	---	$14,893.0
b. Program Management	---	3,225.0
c. System Engineering	---	655.0
d. Test and Evaluation	---	1,927.0
e. Integrated Logistics Support	---	346.0
f. RCL FAA Telecommunications Infrastructure FTI/Removal	---	5,754.0
Total	Various	$26,800.0

For FY 2017, $26,800,000 is requested to continue software and solution development along with implementation of SIM into surveillance and automation systems. Funding will also continue implementation of SIM to replace Radio Communication Link (RCL) and program and engineering support.

The SIM Program achieved Investment Analysis Readiness Decision (IARD) in November 2011. Ongoing activities have included achievement of Initial Investment Decision (IID) on June 17, 2015 and the Final Investment Decision (FID) is planned to be completed by September 2016. Key outcomes will be continuing solution development and initiating software development for surveillance and automation platforms.

What Is This Program And Why Is It Necessary?

The SIM Program will modernize the interfaces between FAA surveillance radar, automation, and specific weather systems for both Terminal and En Route. Surveillance data from today's legacy radars is distributed using Common Digitizer format [version 2] (CD2) over point-to-point serial interfaces to the nearest one or two automation systems. The point-to-point connectivity and CD2 message formats have inherent limitations that restrict the ease of distribution of surveillance information to users at other facilities and require additional physical connections. This program will implement a common industry standard communications architecture and format.

SIM's improvements are achieved by converting the radar and automation systems from the serial interfaces to flexible Internet Protocol (IP) addressable interfaces, over a secure network. The communication industry is planning to discontinue serial type communication infrastructure. Upgrading from serial to IP data transmission formats will simplify circuit management and provide a platform to enforce security policies, ensure delivery to each customer, and provide direct performance metrics. The result will be improved interconnectivity with less downtime and errors, potentially increased data precision, increased aircraft surveillance information delivered to the air traffic automation system, and increased operational efficiency. It is anticipated that by having all legacy radar interfaces and applications converged to a common data format, the cost of maintaining these interfaces as the National Airspace System (NAS) transitions to NextGen will be significantly reduced.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$26,800,000 is required to continue software and solution development and the implementation of SIM into surveillance and automation systems. This funding will also continue implementation of SIM to replace RCL. The SIM Program will decrease the risk to FAA that industry would no longer support existing serial communication infrastructure, decrease lifecycle support cost to the FAA for legacy serial interfaces, ensure schedules and decrease the cost of other modernization programs dependent on modern IP based interface provided by SIM and promoted improvement of the resiliency and continuity of operations enabled by SIM.

What Benefits Will Be Provided To The American Public Through This Request?

The objective of the program is to standardize all FAA radar to automation interfaces from point-to-point, limited data architecture to net-centric expanded data architecture. 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. This will reduce cost and performance risks associated with data limitations and non-standard interfaces. Telecommunications carriers are migrating from point-to-point serial technology to Internet Protocol (IP) based technology. The FAA will implement IP in order to migrate from serial communication technology to mitigate this potential costly technical and operational risk.

Detailed Justification for - 2B18 Terminal Flight Data Manager (TFDM)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Terminal Flight Data Manager (TFDM)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Terminal Flight Data Manager (TFDM)	$38,808	$15,000	$42,200	+$27,200

Note: TFDM Program moved from BLI 1A06. Program has moved to the Implementation Phase. FY 2015 and FY 2016 Numbers have been changed for comparability purposes.

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Terminal Flight Data Manager (TFDM)	24	$42,200.0

For FY 2017, $42,200,000 is requested to fund the TFDM development contract for the following:

- Complete the Preliminary Design Review (PDR) for Build 1 Development and Integration
- Start TFDM detail design for Build 1 Development and Integration
- Complete technology refresh deployment of Electronic Flight Strip Transfer System (EFSTS) at 24 of 39 sites

TFDM provides an integrated data automation system that will improve tower controller's common situational awareness and facilitate many fundamental processes. TFDM also disseminates surface data to both internal and external customers allowing for better management of the traffic flows within the NAS.

What Is This Program And Why Is It Necessary?

The TFDM program is currently 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. The TFDM program 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. The TFDM program will also automate the manual flight data processes to enable enhanced data sharing between the Tower Air Traffic Control (ATC), the En Route ATC, Approach Control ATC, Traffic Flow Management (TFM), and Flight/Airline Operations domains.

A key component is the transition from paper flight strips to electronic flight data representation and exchange. This will facilitate 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 and flight operators to support collaborative decision making. This will eliminate 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.

Improving surface operations and data sharing with the operators rated among tier one priorities for the NextGen Advisory Committee (NAC) in their report "NextGen Priorities in a Budget Constrained Environment (September 2013)." TFDM will replace or enhance these capabilities significantly to meet stakeholder recommendations and agency commitments. The capabilities provided by TFDM will deliver 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.
In FY 2016 the Program Office plans to complete the evaluation of the prime contractor proposals, Investment Analysis (IA) activities and receive a Final Investment Decision (FID) to begin design and development of the selected alternative. In FY 2017 the program plans to conduct activities to design and develop the system. The program will also complete the technology refresh deployment of Electronic Flight Strip Transfer System (EFSTS) at 24 of 39 sites.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want / Need To Fund The Program At The Requested Level?

$42,200,000 is required to provide funding for the TFDM development. The funding will secure a key site Initial Operating Capability (IOC) in FY 2020 and will fund Prime Contractor for the planned software development.

TFDM will be integrated into the NAS and will have program interdependencies for data exchanges with numerous other systems. The costs associated with other system interfaces and modifications required to deliver TFDM capabilities will be included in the TFDM cost baseline. Funding at the requested level is needed to support the interfaces required for TFDM. Interdependencies include the following:

- Airport Surface Detection Equipment, Model X (ASDE-X)
- Tower Data Link Service (TDLS)
- System Wide Information Manager (SWIM)
- Time Based Flow Management (TBFM)
- Traffic Flow Management System (TFMS)
- Standard Terminal Automation Replacement System (STARS)
- Flight Data Input Output (FDIO) System

FY 2017 funding is for the TFDM development contract and continued support of the risk reduction research regarding the coordination of the 3T's (TFDM, TFMS, and TBFM), integrated scheduling work, and collaborative departure management capability work that will be transferred to future TFDM implementation upon maturation.

What Benefits Will Be Provided To The American Public Through This Request?

This portfolio focuses on gaining efficient flow and management of aircraft on the surface at selected metroplex airports and the complex terminal airspaces within the NAS. High density airports typically see higher demand for runway capacity, operate multiple runways, and have complex airspace and ground interactions in the arrival and departure phases of flight. The surface capabilities being researched and implemented in this portfolio are expected to improve both the efficiency of individual flights while optimizing runway throughput. This work will make travel safer for the traveling public, help reduce passenger delays leading to a better traveling experience, and contribute to less pollution.

Once implemented, TFDM will provide the American public with benefits, such as reduced surface delay, taxi time and fuel burn resulting in reduced CO_2 emissions; better performance and airport capacity utilization during severe weather and other off-nominal conditions; improved usability and situational awareness; and enhanced safety.

Detailed Justification for - 2B19 Voice Recorder Replacement Program (VRRP)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Voice Recorder Replacement Program (VRRP)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Voice Recorder Replacement Program (VRRP)	$1,000	$3,000	$2,000	-$1,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. NAS Voice Recorder Program (NVRP)		
a. Program Office Support	---	$1,200.0
b. Cost Analysis Support	---	300.0
c. Information System Security (ISS) Support	---	300.0
d. Second Level Engineering	---	200.0
Total	Various	$2,000.0

For FY 2017, $2,000,000 is requested for the National Airspace System (NAS) Voice Recorder Program (NVRP) to continue Investment Analysis activities and complete the NVRP Screening Information Request (SIR) release and evaluation.

Currently available funding is being used for Concepts and Requirements Definition Readiness, Investment Analysis, and Screening Information Request (SIR) Development.

What Is This Program And Why Is It Necessary?

The NAS Voice Recorder Program (NVRP) will replace the legacy Digital Audio Legal Recorders (DALRs) procured under the previous program, the Next Generation Voice Recorder Replacement Program (NG VRRP) and provide enhanced digital voice recording functionality to meet new requirements that have evolved since the implementation of the NG VRRP. The replacement of aging voice recorders will reduce operational costs and address the increasing demand for more expeditious audio access and capabilities such as increased recording capacity, recording of Voice Over Intranet Protocol (VoIP) telephones, connection to FAA Telecommunications Infrastructure (FTI)'s enterprise Network Time Protocol (NTP).

In support of the FAA Strategic Priority to Make Aviation Safer and Smarter and as required in the NAS Systems Requirements Document (NAS-SR-1000), 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 across all domains. As the voice recorder technology and voice recorder requirements have evolved, earlier digital voice recorders are experiencing obsolescence and supportability issues. There are currently 482 recorders in operation today and these current models of voice recorders will begin to reach their end of service life starting in 2017.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$2,000,000 is required for NVRP to continue to conduct Investment Analysis activities and complete the NVRP Screening Information Request (SIR) release and evaluation. The requested funding level supports pre-acquisition documentation development to award a new contract for NVRP in FY 2018. Full implementation of this program will result in the replacement of the legacy voice recorders, Digital Audio Legal Recorders (DALRs) that do not meet current Safety Requirements. Additionally, it will decrease the risk of Diminishing Manufacturing Sources and Material Shortages (DMSMS) issues in order to maintain Operational Availability.

What Benefits Will Be Provided To The American Public Through This Request?

The primary FAA benefit is cost avoidance in the reduction of technical refresh costs associated with current voice recorder models to support obsolescence and supportability concerns. Additionally, NVRP will incorporate new Safety and Audit Requirements which will provide the following user benefits:

- Provide Voice over Intranet Protocol (VoIP) recorder functionality
- Centralized remote access, retrieval and dissemination through common, modern and flexible enterprise solution
- Increased channel capacity and increased user capacity
- Reduce workload-intensive download and manual transfer of audio data
- Provide near real-time accessibility of audio
- Provide for automated data-sharing required for Quality Assurance and Quality Control analyses
- Provide for the ability to synchronize audio with recorded radar video for analysis of potential safety issues, trends or hazards
- Provide audio data to the Operational Analysis Reporting System (OARS), under budget line item 1A01, as part of OARS effort to sustain and integrate current and new safety data sources to provide a safety information management framework at the NAS enterprise and domain service
- Provide enhanced security controls

Detailed Justification for - 2B20 Integrated Terminal Weather System (ITWS) – Technology Refresh and Disposition

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Integrated Terminal Weather System (ITWS) – Technology Refresh and Disposition ($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Integrated Terminal Weather System (ITWS) – Technology Refresh	$4,400	$5,400	$1,000	-$4,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Hardware Sustainment	---	$900.0
b. Program Support	---	100.0
Total	Various	$1,000.0

For FY 2017, $1,000,000 is requested for software and hardware sustainment activities. Planned activities include; Test and Evaluation, hardware sustainment, software sustainment, implementation and program support. The ITWS sustainment will allow the FAA to continue the generation of essential ITWS weather products to the Air Traffic Controller user community across the National Airspace System (NAS).

What Is This Program And Why Is It Necessary?

The Integrated Terminal Weather System (ITWS) provides automated weather information for use by air traffic controllers, supervisors, pilots and airline dispatch. The ITWS integrates data and information from FAA and National Weather Service (NWS) sensors such as the Terminal Doppler Weather Radar (TDWR), the Next Generation Weather Radar (NEXRAD), Airport Surveillance Radar (ASR), Low Level Windshear Alert System (LLWAS), Automated Weather and Surface Observing Systems (AWOS/ASOS), lightning detection systems, NWS weather models and aircraft via the Meteorological Data Collection and Reporting System (MDCRS).

Automated weather products produced by the ITWS include essential safety, windshear and microburst detection and predictions, storm cell intensity and direction of motion, lightning information, detailed winds in the terminal area and a one hour storm forecast. The graphical, full-color display provides an easy-to-use interface that does not require meteorological interpretation. ITWS weather information is available to air traffic managers, controllers and airlines via dedicated situation displays at FAA Air Traffic facilities, the web or an ITWS data feed. There are no other FAA weather programs that provide the type of airport-specific weather products that are generated by ITWS.

ITWS sustainment will replace the ITWS Commercial Off-The-Shelf (COTS) system components, as needed: processors, situation displays, computer operating systems and software to assure continued supportability over the service life of the system.

In accordance with the ITWS Supportability Study conducted by the FAA in 2010 the logistics support for the current ITWS sites has begun to diminish this year. System hardware spares, support tools and maintenance provisions for keeping the current ITWS sites operational is becoming unavailable, support costs are starting to escalate and system outages may increase in the future.

Interdependencies include NextGen Weather Processor (NWP) and Common Support Services – Weather (CSS-Wx). NWP and CSS-Wx are subsuming ITWS in 2020. The ITWS program supports terminal requirements. Program beneficiaries range from commercial aviation and general aviation to the flying public and the benefits to them are safety, flight efficiency and delay reduction.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$1,000,000 is required to support the ITWS sustainment. There are no other FAA weather programs that provide the type of airport-specific weather products that are generated by this program until NWP replaces it in 2020. Planned activities include: Test and Evaluation, hardware sustainment, software sustainment, implementation and program support. The ITWS sustainment will allow the FAA to continue the essential ITWS weather products to the Air Traffic Controller user community across the NAS.

What Benefits Will Be Provided To The American Public Through This Request?

The ITWS automated weather tool provides essential airport and terminal weather information. While difficult to quantify or measure, weather information that is timely, accurate, and easy to interpret clearly contributes to avoidance of delays and accidents. Maintaining the availability and functionality of ITWS is a significant contributor to the following:

- National Transportation Safety Board (NTSB) statistics indicate weather-related delays cost the aviation industry and the traveling public approximately $4.1 billion per year, of which $1.7 billion per year is considered avoidable.
- Through improved integration of weather data into timely, accurate aviation weather information, FAA can reduce delays and improve NAS capacity utilization while enhancing aviation safety.
- The ITWS sustainment will extend the life of the commissioned ITWS systems, preventing system outages to ensure these benefits and savings continue to be realized.

Detailed Justification for - **2B21 Next Generation: Surveillance and Weather Radar Capability (NSWRC) and Backup Surveillance Capability (NBSC)**

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Next Generation: Surveillance and Weather Radar Capability (NSWRC) and Backup Surveillance Capability (NBSC)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Next Generation: Surveillance and Weather Radar Capability (NSWRC) and Backup Surveillance Capability (NBSC)	$0	$0	$6,000	+$6,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. NSWRC	---	$5,000.0
B. NBSC	---	1,000.0
Total	Various	$6,000.0

A. NSWRC

For FY 2017, $5,000,000 is requested to continue investment analysis activities for Shortfall Analysis, System Engineering Management, Design Engineering, and Safety Security and Privacy in support of Business Case Development and Initial Investment Decision (IID) by December 2018. The funding will continue development of the initial Business Case Analysis Report (BCAR), Initial Implementation Strategy and Planning Document (ISPD), and update the proof of concept and prototype development demonstration report for NSWRC alternatives.

B. NBSC

For FY 2017, $1,000,000 is requested to support Investment Analysis Readiness Decision (IARD) by December 2017 and Initial Investment Decision (IID) by December 2018 for NBSC. The funding will support development of program requirements, market surveys, trade-off analysis of potential technical alternatives as well as development of all artifacts required for the Investment Analysis, including completion of the preliminary Program Requirements Document and Initial Implementation Strategy and Planning Document (ISPD).

What Is This Program and Why Is It Necessary?

A. NSWRC

The Next Generation Surveillance and Weather Radar Capability (NSWRC) will provide a cost-effective replacement for primary terminal surveillance and weather radars. The FAA currently operates several models of Airport Surveillance Radars (ASR) and the Terminal Doppler Weather Radars (TDWR) for terminal aircraft surveillance and weather detection. The 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 refreshes and Service Life Extension Programs (SLEP) may keep these radars operating in the near-term; however, as the demands of the National Airspace System (NAS) increase it is becoming increasingly clear that the present radars will not be capable of meeting the emerging future requirements.

The NSWRC will address all existing terminal radar requirements as well as any of the following emerging requirements that may be approved:

- Ability to detect and track aircraft and weather in the presence of clutter or obstructions
- Ability to reduce Operations and Maintenance (O&M) costs
- Ability to effectively discriminate between different types of hydrometeors (e.g. rain, ice, sleet, hail, etc.)

NSWRC completed the Concept Requirements Definition Readiness (CRDR) decision in December 2012 and is on track for an Investment Analysis Readiness Decision (IARD) by December 2016.

The current plans are to have the Initial Investment Decision (IID) by December 2018 and Final Investment Decision (FID) by December 2020.

B. NBSC

The FAA currently operates several models of beacon systems in the NAS. Most of these legacy systems are nearly thirty years old and have exceeded their service life. It is required that the FAA continue to provide secondary surveillance into the future as a back-up to Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance, to support cooperative target acquisition and to maintain continuity of operations for ADS-B outages. Ongoing technology refresh and Service Life Extension Programs (SLEPs) may keep legacy radars operating in the near-term; however, as the demands of the NAS increase it is becoming increasingly clear that the present radars will not be capable of delivering the required functionality in the future.

NBSC will provide a direct capability replacement for any remaining end of life systems including Air Traffic Control Beacon Interrogator (ATCBI)-5, ATCBI-6; Mode-S and Airport Surveillance Radar (ASR)-11 MSSR systems for ADS-B back-up services. The NBSC program plans to complete Concept Requirements Definition Readiness (CRDR) by December 2016.

DOT Strategic Goal - Economic Competitiveness.
- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. NSWRC

$5,000,000 is required to continue investment analysis activities in support of Business Case Development and Initial Investment Decision (IID) by December 2018. The NSWRC is intended to replace existing Terminal Radar systems starting in FY 2025. Many of the systems to be replaced by NSWRC have been in operational use for more than 40 years, far exceeding their original design life with the corresponding increased operational supportability risk.

B. NBSC

$1,000,000 is required to continue investment analysis activities in support of Business Case Development and Initial Analysis Readiness Decision (IARD) by December 2017.

What Benefits Will Be Provided To The American Public Through This Request?

A. NSWRC

The NSWRC program is in the Planning and Investment Analysis phase and completed the Concept Requirements Definition Readiness (CRDR) in December 2012. The program is on track for an Investment Analysis Readiness Decision (IARD) by December 2016; Initial Investment Decision (IID) by December 2018; and Final Investment Decision (FID) by December 2020. Benefits are being analyzed to make a decision on alternatives at IID.

B. NBSC

The objective of the NBSC is to consolidate four separate near end of life-cycle, support infrastructure capabilities into one common equipment baseline, second level engineering, depot and training capability, which will reduce life-cycle support costs. The program will provide improved reliability and maintainability performance over existing systems, supporting: FAA cost efficiency initiatives, increased airport capacity measures, and increased operational availability. The program is on track for an Investment Analysis Readiness Decision (IARD) by December 2017; Initial Investment Decision (IID) by December 2018; and Final Investment Decision (FID) by December 2020. Benefits are being analyzed to make a decision on alternatives at IID.

Detailed Justification for – 2B22 Flight Interfacility Data Interface (FIDI)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Flight Interfacility Data Interface (FIDI)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Flight Interfacility Data Interface (FIDI)	$0	$9,000	$15,000	+$6,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. ERAM FIDI Solution Implementation	---	$9,600.0
b. FDIO FIDI Solution Implementation	---	4,000.0
c. TFDM FIDI Solution Implementation	---	1,400.0
Total	Various	$15,000.0

For FY 2017 $15,000,000 is requested for FIDI to modernize the flight data interfaces between the principal NAS ATC systems including:

- En Route Automation Modernization (ERAM) as a flight data processor exchanging data with client systems
- Flight Data Input/Output (FDIO) as a flight data client to ERAM
- Terminal Flight Data Manager (TFDM) as a flight data client to ERAM

To support this modernization, FY 2017 funding allocated above will also support the migration of flight data communication lines from Time-Division Multiplexing (TDM)/Serial Link based connections to Internet Protocol (IP) based connections. Migration of the ATC flight data interfaces to network IP communications will support NAS resiliency in the event of individual ARTCC system outages.

What Is This Program And Why Is It Necessary?

The Flight and Interfacility Data Interface (FIDI) is a multiple-system portfolio program. It will modernize the flight data exchange interfaces between the En Route Automation Modernization (ERAM) system and other Terminal and Oceanic client ATC systems that exchange flight and Interfacility data via the En Route Communications Gateway (ECG). The NAS Services being modernized by this investment are called the Flight Data Entry and Printout (FDAT) and Interfacility Data Transfer (IDAT) services.

The legacy communications technology used by the ECG is based on antiquated Time-Division Multiplexing (TDM) serial interfaces, which are increasingly unsupportable in a communications industry dominated by switched network IP. The FAA is currently planning to phase out the TDM technology, by a target date of 2020, because the communications vendors may no longer support TDM/serial.

The outage event in the Chicago Air Route Traffic Control Center (ARTCC) identified shortfalls in ATC system configurations and resiliency that FIDI provides a solution to. Specifically, shortfalls in ERAM-to-client systems caused a lack of automated coordination between facilities when adjacent facilities took operational control to handle the demand on the airspace.

The shortfalls of the current ERAM-to-client ATC automation systems interfaces include:

- Low Resilience: Limited NAS-level system resilience because of limited link redundancy and the inability to reconfigure network communications in the event of system or facility outages and contingency operations
- Constrained Operations: Operational limitations of the flight data because it is conveyed in the limited legacy formats of the Flight Data Entry and Printout (FDAT) and Interfacility Data Transfer (IDAT) services; this includes flight data that supports new services such as Performance-based Navigation (PBN)-based routing, Wake Vortex Separation categorization, and controller flight data interaction needed for Trajectory-Based Operations
- Obsolete Technology: Diminished vendor support to solutions and equipment that is based on 1970's technology
- High Cost: High support costs due to the proliferation of interface equipment such as ECG, Flight Data Input/ Output – Gateway (FDIO-G), and Electronic Flight Strip Transfer System (EFSTS) systems, and FDIO platforms separate from STARS automation in TRACONs.

The FIDI solution and resultant configuration of ATC automation systems will improve NAS resilience to outages through greater reliance on Internet Protocol (IP) switched network communications, improve Trajectory-Based operations to terminal airspace through improved access to flight data information in Air Traffic Control Towers (ATCTs) and Terminal Radar Approach Control Facilities (TRACONs), eliminate reliance on obsolete technology and equipment, and eliminate unnecessary system hardware and software components.

The formats of the data which are communicated to clients are still limited to the capabilities supported by the terminal clients in the 1970s. The Flight Data Input/Output (FDIO) devices located in the ATCTs and TRACONs still depend on paper flight strips to convey flight data to controllers and the filed flight plan data, including route of flight and aircraft equipage data. This information does not physically fit onto the paper strips, which are formatted for the en route system rather than specifically to the terminal environment. Full flight plan data requested from an FDIO keyboard is presented in a format which is difficult to use or modify. Flight data sent to the TRACON Standard Terminal Automation Replacement System (STARS) systems is still limited by the processing limitations of the legacy Automated Radar Terminal System (ARTS) systems, requiring encoding of complex flight data into single characters, with no ability for controllers to access full flight data or modify flight plans from ERAM in the STARS system.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$15,000,000 is required to continue design and software development efforts, initiated in FY 2016, which will modernize the flight data software in ERAM that communicates with the Terminal FDIO and TFDM systems only.

What Benefits Will Be Provided To The American Public Through This Request?

The October 2014 fire at the Chicago (ZAU) ARTCC demonstrated the vulnerability of legacy TDM/serial network communications limiting ATC operations in the event of facility outage. While adjacent ARTCCs were able to assume airspace and most surveillance processing for ZAU, flight data communications with ZAU Air Traffic Control Towers (ATCTs) and Terminal Radar Approach Control Facilities (TRACON), including O'Hare Airport and Chicago TRACON, had to be conducted with verbal coordination. This program, in addition to the other benefits below, will create greater NAS resiliency in response to contingency operations.

Benefits of FIDI include:

- Improved Resilience: Improved flight data availability between facilities due to improved link redundancy and increased agility during contingency operations, utilizing the reconfigure-ability of IP networks resulting in flight efficiency and delay reduction for users and FAA cost avoidance.
- Improved Operations: Improvement of Trajectory-Based operations to terminal airspace through improved access to flight data information in ATCTs and TRACONs with resultant decreases in verbal coordination and increases in throughput/capacity utilization resulting in flight efficiency and delay reduction for users.
- Modern Technology: Elimination of FAA costs to support serial TDM communication hardware in end systems through the migration of interfaces to IP/Ethernet standards.
- Lower Cost: Reduced support cost through platform elimination or consolidation, including ECG, Flight Data Input/ Output – Gateway (FDIO-G), and Electronic Flight Strip Transfer System (EFSTS) systems, and FDIO platforms separate from STARS automation in TRACONs resulting in FAA cost savings.

Detailed Justification for - 2C01 Aviation Surface Weather Observation System

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aviation Surface Observing System
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aviation Surface Weather Observation System (ASWON)	$8,000	$8,000	$10,000	+$2,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. ASOS ACU and DCP Upgrade	---	$5,700.0
b. Integration Contract	---	1,300.0
c. NISC Contract Support	---	600.0
d. Construction, Site Preparation and Installation	---	1,000.0
e. Contractor Support	---	1,000.0
f. Second Level Engineering Support	---	400.0
Total	Various	$10,000.0

For FY 2017, $10,000,000 is requested for the Aviation Surface Weather Observation Network (ASWON) technology refresh program. This funding level is identical to the program's Joint Resource Council (JRC) approved Acquisition Program Baseline (APB). Procurement, assembly/integration, software development, and deployment will continue using FY 2017 funds to ensure completion of the Automated Weather Observing System (AWOS) technology refresh APB milestone planned for September 2017.

What Is This Program And Why Is It Necessary?

Aviation Surface Weather Observation Network (ASWON) is a service portfolio composed of the following primary and backup weather observation systems deployed throughout the NAS:

- AWOS
- Automated Surface Observing System (ASOS)*
- Automated Weather Sensor System (AWSS)
- Stand Alone Weather Sensors (SAWS)
- Digital Altimeter Setting Indicator (DASI)
- Wind Equipment F-Series (WEF) Wind System

*ASOS is maintained by the NOAA National Weather Service (NWS) through an interagency agreement.

ASOS, AWOS and AWSS provide the primary weather observation at airports, while DASI, SAWS and WEF provide secondary weather parameter measurements for backup/augmentation purposes at staffed air traffic facilities. These systems provide wind speed and direction, temperature, dew point, barometric pressure, cloud height and amount, visibility and precipitation information for approximately 1,100 airports in the National Airspace System (NAS).

The ASWON technology refresh program will provide form/fit/function technology upgrades/replacements to five legacy ASWON systems (ASOS, AWOS, AWSS, DASI, F420) experiencing obsolescence, supportability, and maintainability issues. This sustainment effort will extend the service life of these systems and continue their role of providing required weather observations. The investment will result in a cost-avoidance of the continually increasing maintenance costs of these systems. No new functionality or requirements will be added by this technology refresh effort. No other FAA initiatives address the shortfalls addressed by the ASWON technology refresh program.

The following systems, agencies, and users depend on the data provided by ASWON:

- NOAA National Weather Service (NWS)
- Commercial Aviation, General Aviation, and the Flying Public
- Air Traffic Approach and Ground Controllers
- Surveillance Broadcast Services (SBS) - Flight Information Service Broadcast (FIS-B)
- Common Automated Radar Terminal System (ARTS) - ARTS IIIE
- Airport Surveillance Radar 9 (ASR-9) - Weather System Processor (WSP) for Windshear Detection
- Integrated Terminal Weather System (ITWS)
- Weather and Radar Processor (WARP)
- Corridor Integrated Weather System (CIWS)
- Automatic Terminal Information Service (ATIS)

ASWON technology refresh ensures that the following functions will continue to be met:

- Acquisition of surface weather information
- Surface weather observations used by aircraft operators
- A minimum of two altimeter setting indicators (ASI) at Air Traffic Control (ATC) facilities
- Backup wind and altimeter required to maintain Parts 121 and 135 operations

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$10,000,000 is required to continue execution of the technology refresh. The FAA second level engineering support group, Logistics Depot, and Maintenance personnel continue to struggle to find ways to support aging, unsupportable, and obsolete ASWON equipment. The required funding will continue ASWON technology refresh implementation and will lead to a supportable and cost-effective ASWON, thus eliminating any risk of losing the essential services that ASWON provides to its numerous users.

What Benefits Will Be Provided To The American Public Through This Request?

ASWON Systems are deployed and operational at over 1,100 sites in the CONUS, Alaska, and Hawaii. NextGen programs such as ADS-B use ASWON weather stations in Alaska for use with their surveillance and broadcasting systems. Surface observations provided by ASWON are used continually by Air Traffic Control, Pilots, the general public, and several Air Traffic Control Systems.

Detailed Justification for - 2C02 Future Flight Services Program (FFSP)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Future Flight Services Program (FFSP)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Future Flight Services Program (FFSP)	$1,000	$3,000	$3,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Future Flight Services Program	---	$3,000.0

For FY 2017, $3,000,000 is requested to develop acquisition related documentation to achieve a Final Investment Decision (FID) and support FFSP Offeror(s) proposal evaluations. It is anticipated that the new FFSP contract will be awarded in late FY 2017.

What Is This Program And Why Is It Necessary?

Currently, a combination of entities and platforms provide Flight Services to the General Aviation (GA) community. These services include but are not limited to: flight planning, advisory services, weather briefings, pilot weather report (PIREP) processing, and Search and Rescue (SAR) coordination. These services are provided within the Continental United States (CONUS), Puerto Rico, and Hawaii. Flight Services also provides Visual Flight Rules (VFR) coordination, orientation support to lost aircraft, helps maintain continuous weather broadcasts on selected Navigational Aids (NAVAID), and issues Notices to Airman (NOTAM). GA pilots may access flight service information directly through web portals, thus eliminating much of the need for pilots to talk to a flight service specialist.

FFSP will expand the web portion of flight services, and reduce or eliminate human delivery of flight services as much as possible. The timeframe associated with the transformation is dependent on the technologies responsible for enabling the new capabilities, availability of the interdependent programs to perform their essential functions, and involvement from industry stakeholders such as Aircraft Owners and Pilots Association (AOPA), National Business Aviation Association (NBAA), etc. These interdependencies are as follows: FAA Telecommunications Infrastructure (FTI), National Airspace System (NAS) Enterprise Security Gateway (NESG), NAS Aeronautical Information Management Enterprise Systems (NAIMES), System Wide Information Management (SWIM), and Aeronautical Information Management (AIMM), Automatic Dependent Surveillance-Broadcast (ADS-B), National Voice Switch (NVS), Next Generation Very High Frequency Air/ground Communications Systems (NEXCOM) Segment 2, Time Based Flow Management (TBFM), Traffic Flow Modernization System (TFMS), and Terminal Flight Data Management (TFDM). Flight services will continue to be provided by contractor services in the lower 48 states.

FFSP will also leverage Next Generation Air Transportation System (NextGen) solutions in order to increase operational efficiency, and improve aeronautical data acquisition and utilization in the support of flight services. For example, prospective service providers will use weather data from Common Support Services - Weather (CSS-Wx) and aeronautical information from the Aeronautical Common Service (AIMM Segment 2) and leverage FAA enterprise infrastructure including SWIM, FAA Cloud Services, and other planned infrastructure enhancements to the extent possible.

The primary objective of FFSP is to realign the Flight Services mission by modernizing services and delivery methodologies. The FFSP will enhance services at lower overall cost to the taxpayers by:

- Leveraging emerging technologies and procedures
- Achieving efficiencies and cost reductions via the combining of contracts
- Capturing operational efficiencies

FFSP will focus on aligning Core Safety Functions. Some of these functions will remain within Flight Services and FFSP while others will be integrated or reengineered into other service areas of the ATO. The Core Safety Functions were defined by Flight Service as functions that need to be provided by the FAA for the safety of the NAS and include:

- Visual Flight Rules (VFR) search and rescue
- Emergency services to aircraft in distress
- Weather Observation Entry (METAR Entry)
- NOTAM Coordination, Entry and Dissemination
- Security related to Special Flight Rules Area (SFRA)/Air Defense Identification Zone (ADIZ)/Flight Restricted Zone (FRZ) Flight Plans
- Clearance relay
- Pilot weather report (PIREP) entry
- Instrument Flight Plans (IFR) and Services provided to DoD

The Automated Flight Service Stations (AFSS) contract with Lockheed Martin currently provides flight services in the CONUS and expires the last quarter of FY 2015. A single source contract extension is planned to ensure the continuity of services until the new FFSP contract is awarded.

The Direct User Access Terminal Service (DUATS) contracts that allow pilots direct access to flight service information expired in March 2015. The follow-on DUATS effort, DUATS II, was awarded to two Vendors (Lockheed Martin and Computer Science Corporation (CSC)) and will provide continued delivery of these services until the new FFSP contract is awarded. When the new FFSP contact is awarded, it will include those services provided via the DUATS II contracts.

The FFSP intends to leverage advances in technology and automation to enhance flight service capabilities, garnering efficiencies for long-term cost reductions. FFSP is a proposed single integrated service-based solution that will replace the existing Flight Service automation systems and services for CONUS, Hawaii, and Puerto Rico more cost effectively. FFSP will maximize technologies and procedures in use today to enhance automation, communications, navigation, and the way pilots manage information to generate cost savings, capture operational efficiencies, and consolidate services. In addition, FFSP will provide improvements in SAR, both to the pilots and to SAR responders, and the ability to support future requirements.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$3,000,000 is required to fund development of acquisition related documentation and activities (final business case and Offeror proposal evaluations) required to ensure a Final Investment Decision (FID) and the subsequent award of the new FFSP contract. This contract will ensure attainment of goals, realization of cost reduction, and the successful transition of the services provided by DUATS II and AFSS to a single contract.

What Benefits Will Be Provided To The American Public Through This Request?

The American Public, as well as the GA community, will benefit from technology enhancements and cost savings gained by elimination/reduction of services which are redundant, obsolete and/or do not align with Flight Services Core Safety Functions.

FFSP will realize cost savings and achieve efficiencies in the delivery of flight services by modernizing services and delivery methodologies. FFSP will discontinue obsolete services and activities as well as redundant activities provided by other FAA service organizations based on collaboration with user groups and outcomes of Safety Risk Management panels. FFSP will discontinue services not determined to be Core Safety Functions and incorporate selected Core Safety Functions into other service areas of the ATO as appropriate. FFSP will focus on innovative, efficient, and cost effective delivery of Core Safety Functions. Some of these functions, such as clearance relay and weather observation entry, may be reengineered to gain further efficiencies and provide additional benefits.

Detailed Justification for - 2C03 Alaska Flight Service Facility Modernization (AFSFM)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Alaska Flight Service Facility Modernization (AFSFM)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Alaska Flight Service Facility Modernization (AFSFM)	$2,850	$2,650	$2,650	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Alaska Flight Service Facility Modernization (AFSFM)	3	$2,000.0
B. In-Service Engineering	---	650.0
Total	Various	$2,650.0

The FY 2017 $2,000,000 is planned to complete roof replacement projects at Kenai and Juneau Flight Service Station (FSS) facilities and refurbish the equipment rooms, break rooms, pilot briefing rooms, and restrooms at the Talkeetna FSS facility. Also requested is $650,000 for in service engineering activities.

What Is This Program And Why Is It Necessary?

The Alaska Flight Service Facility Modernization (AFSFM) program is a multi-year facility modernization and sustainment program that addresses FAA FSS in Alaska. Thirty-three percent of the Alaska Flight Service facilities were constructed in the 1970's require extensive renovations to meet current building codes, fire life safety, electrical standards and generally do not meet the American's with Disabilities Act accessibility requirements, as defined and imposed by the Uniform Federal Accessibility Standards (UFAS) and the Architectural Barriers Act Accessibility Standard (ABAAS). These conditions endanger FAA personnel health and safety and increase the risk of service outages.

Specifically, 17 FSS facilities will be updated to meet environmental, safety and accessibility requirements and the electrical and safety systems will be upgraded to ensure they meet standards. The program benefits FAA flight service specialists and technical operations personnel by providing a reliable infrastructure for the continuity of flight service operations and ensuring a safe and secure working environment for employee safety and health.

The program identifies and corrects deficiencies such as substandard lightning, grounding and bonding protection, electrical systems, and/or heating and cooling systems that could disrupt flight service operations by reducing the reliability of flight service automation systems.

Projects at each facility are prioritized and vary each fiscal year depending on available funding and the Program Office works closely with Alaska Technical Operations and Western Service Center personnel to develop and implement project plans and schedules.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$2,650,000 is required for completion of the prioritized projects listed above and provides the expected benefits of this program identified above (i.e. providing a safe and secure working environment for FAA personnel; alleviating disruption of flight service operations due to environmental, power or electrical deficiencies).

What Benefits Will Be Provided To The American Public Through This Request?

This program uses funds to correct deficiencies in older FSS facilities such as substandard lightning, grounding and bonding protection, electrical systems, and/or heating and cooling systems that could disrupt flight service operations by reducing reliability of flight service automation systems. Project schedules are developed at least two years in advance, which allows opportunities to reduce costs through efficient use of engineering and technical resources. Additionally, this program allows the FAA to avoid hefty expenses and costs associated with unscheduled and emergency upgrades to flight service facilities. Effectively managing this program to ensure costs for upgrades are within project scope can provide cost savings to the American public.

Detailed Justification for - 2C04 Weather Camera Program

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Weather Camera Program
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Weather Camera Program	$200	$1,000	$2,200	+$1,200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Replace Aging Camera Systems	7	$2,200.0

For FY 2017, $2,200,000 is requested to fund the replacement of legacy and failing cameras, servers, and hardware at five Gen-1 camera sites and to refurbish infrastructure and equipment at two remote mountain pass high-sites: Lake Clark Pass East and Lake Clark Pass West. Additionally, the Weather Camera Program Office will fund the work to complete a business case Investment Analysis Readiness Decision (IARD) by the first quarter of 2018.

The Weather Camera Program Office continues to complete, update, and modernize its systems and services. Ongoing efforts include work to complete the following system needs:

- Upgrade legacy weather camera facilities
- Expand the program's 3rd Party camera hosting initiative by adding non-FAA images to the new website
- Complete Business Case Analysis, Investment Analysis Readiness Decision (IARD) by the first quarter of 2018

What Is This Program And Why Is It Necessary?

The combination of many pilots and extreme flying conditions has resulted in a much higher accident rate in Alaska. According to the National Institute for Occupational Safety and Health, a disproportionate number of all U.S. aircraft crashes occur in Alaska. Between 1990 and 2006, there were 1,497 commuter and air taxi crashes in the United States, of which 520 occurred in Alaska, 35 percent of all commuter and air taxi crashes. Deficient weather information in Alaska contributes to a higher risk of accidents and 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 leads to accidents and unnecessary fuel costs.

The primary goal of the FAA Weather Camera Program is to improve aviation safety and efficiencies by providing current visual weather information in the form of near real-time video camera images to aviation users in Alaska. The camera images are designated as an FAA supplementary weather product used for enhanced situational awareness and the images are made available free on the public website http://avcams.faa.gov. The camera images provide pilots, dispatchers and Flight Service Station Specialists with up-to-date weather conditions at airports, mountain passes, and strategic Visual Flight Rules (VFR) locations. This new FAA service enables pilots to obtain better informed decisions about whether or not it is safe to fly before becoming airborne and during a given flight via en route briefings. When combined with other available weather information products, such as Meteorological Aerodrome Reports (METARs), weather camera images become a powerful "go or no-go" aeronautical flight decision tool. This new FAA data service is facilitating measurable reductions in weather-related aviation accidents and fatalities in Alaska and is providing measurable reductions in weather-related flight interruptions and aviation fuel consumptions. The weather cameras in Alaska are also beneficial to the National Weather Service (NWS) Forecast Offices. The NWS uses the images from every camera site in Alaska to assist in formulating current weather reports and forecasts.

DOT Strategic Goal - Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want / Need To Fund the Program At The Requested Level?

Statistics indicate that weather cameras are contributing to the actual reduction in aircraft accidents in Alaska at a rate that is better than targeted. Funding the camera facility upgrades and disaster recovery system is necessary in order to continue camera services and operations in the case of total system loss.

What Benefits Will Be Provided To The American Public Through This Request?

The Weather Camera Program and its service continue to facilitate measurable reductions in weather-related aviation accidents and fatalities in Alaska and provide measurable reductions in weather-related flight interruptions and aviation fuel consumptions.

Weather cameras contribute to the FAA's aviation safety and efficiency strategic goals and to the American Public by reducing a subset of Alaska accidents per 100,000 operations. The following table depicts the program's OMB 300 baseline target metrics and is compared to the actual results.

Year	Goal	Actual
2007	0.28 accidents per 100,000 operations (Baseline)	
2008	0.24 accidents per 100,000 operations	0.21 accidents per 100,000 operations
2009	0.22 accidents per 100,000 operations	0.21 accidents per 100,000 operations
2010	0.20 accidents per 100,000 operations	0.17 accidents per 100,000 operations
2011	0.18 accidents per 100,000 operations	0.13 accidents per 100,000 operations
2012	0.17 accidents per 100,000 operations	0.17 accidents per 100,000 operations
2013	0.16 accidents per 100,000 operations	0.13 accidents per 100,000 operations
2014	0.15 accidents per 100,000 operations	0.04 accidents per 100,000 operations

Detailed Justification for - **2D01 VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME)**

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME) ($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME)	$8,300	$4,500	$7,000	+$2,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. VOR Minimum Operational Network (MON) Implementation Program		
a. Program Management – Planning, Authorization Control	---	$894.0
b. Requirements and Architecture Engineering	---	450.0
c. Training and Training Support	---	100.0
d. Implementation Engineering	---	370.0
e. Infrastructure and Co-located Equipment	---	762.0
f. Airspace Design	---	3,424.0
Total	Various	$6,000.0
B. VOR Collocated with Tactical Air Navigation (VORTAC)		
a. Sustainment Activities	---	$1,000.0

A. VOR Minimum Operational Network (MON) Implementation Program

For FY 2017, $6,000,000 is requested for the continuation of the VOR Minimum Operational Network (MON) Program Phase 1 efforts

B. VOR Collocated with Tactical Air Navigation (VORTAC)

For FY 2017, $1,000,000 is requested for engineering and technical services support, procurement of VOR Doppler Antenna Kits, and funding to dopplerize one on-going DVOR projects.

What Is This Program And Why Is It Necessary?

A. VOR Minimum Operational Network (MON) Implementation Program

The VHF Omni-Directional Range (VOR) Minimum Operational Network (MON) implementation program will prepare the analysis, amend/cancel/replace procedures, flight check, relocate any services/equipment collocated with the VORs, develop documentation and implementation plans for downsizing the VOR network to the minimum required as a backup navigation system for VOR equipped aircraft. This program will transition the legacy network of approximately 957 VORs to a MON of approximately 650 VORs with a target date of 2025. Downsizing the VOR network to the minimum required as a backup navigation system provides an opportunity for cost avoidance and savings and supports the National Airspace System (NAS) Efficient Streamlined Services (NESS) Initiative. It would allow aircraft to navigate and land safely under Instrument Flight Rules (IFR) in the event of disruption in a Global Navigation Satellite System (GNSS) signal; however, the planned backup capability will be less robust than the current VOR network.

As the need for VOR based procedures and routes decreases due to the transition to PBN, resources that are currently being spent in sustaining and operating the current legacy VOR facilities, many of which are beyond their service life, can be shifted for more efficient use. The legacy VOR routes and procedures will be cancelled, amended, or replaced, as necessary prior to a particular VOR being discontinued. Removing the VOR infrastructure occurs as new PBN routes and procedures are added to support NextGen.

B. VOR Collocated with Tactical Air Navigation (VORTAC)

This program replaces, relocates, or converts VOR and VORTAC facilities to improve NAS efficiency and capacity. The VOR family includes VOR/Distance Measuring Equipment (DME) (combination of VOR and Distance Measuring Equipment), and VORTAC (combination VOR and TACAN (Tactical Air Navigation)). The systems provide navigational guidance for civilian and military aircraft in both the en route and terminal areas. The program procures and installs Doppler VOR (DVOR) electronic and hardware antenna kits to dopplerize a conventional VOR.

Dopplerizing a VOR eliminates most restrictions. There are numerous VORs that have restrictions due to encroachment of the VOR sighting criteria caused by natural and manmade obstacles. 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 that are located outside the sighting restriction area but are now tall enough to cause electromagnetic interference.

There are many manmade obstacles that cause the same electromagnetic interference. These problems arise from the growth of nearby towns/cities and 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.

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 percent 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.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. VOR Minimum Operational Network (MON) Implementation Program

$6,000,000 is required to meet the Phase 1 goals of the VOR MON Program. This work will require substantial engineering; cancellation, amendment and/or replacement of routes and approach procedures; program management and safety risk management (SRM) analysis. It is critical for this effort to maintain planned funding levels in order to prevent the Phase 1 implementation schedule extending beyond 2020 which would impact the goal for the entire program being implemented by 2025, the Administrator's NAS Initiative to provide more efficient, streamlined services as well as the NextGen goal to transition to Performance Based Navigation (PBN).

B. VOR Collocated with Tactical Air Navigation (VORTAC)

The VOR/DME program reduces congestion by making air traffic flow more efficiently over land and sea. The replacement, relocation, conversion, or modification of VOR facilities (including VOR/DME) will improve VOR performance and enable the FAA to maintain a highly reliable, safe, and efficient ground based VOR and VOR/DME system until the use of Global Positioning System is widespread. The improved availability of this program provides enhanced aircraft routing and increased airport capacity.

$1,000,000 is required for the procurement of VOR/DME VOR Doppler Antenna Kits and completion of a project to dopplerize a conventional VOR.

What Benefits Will Be Provided To The American Public Through This Request?

A. VOR Minimum Operational Network (MON) Implementation Program

The FAA is transitioning the NAS to more efficient PBN routes and procedures, so fewer VORs are needed. VORs do not enable PBN and few aircraft are actually using the VORs, electing to use their PBN equipment to fly the conventional Victor Airways and Jet Routes.

The benefits of reducing the VOR facilities include opportunities for reduced operations and maintenance cost for facilities, instrument flight procedures, flight inspection, and opportunities to avoid potential recapitalization costs.

This program will result in a more optimized NAS, where the more efficient PBN operations will be primary and a MON of VORs will be retained to serve as a back-up in the event of a GNSS outage or interference.

B. VOR Collocated with Tactical Air Navigation (VORTAC)

VOR/VORTAC equipment has been deployed and maintained in the NAS for more than 50 years. VOR/VORTAC equipment is the primary source of navigational aid for commercial, private pilots, and military flying within the NAS and also for worldwide aviation.

Converting these flight restricted VOR sites to a Doppler VOR configuration mitigates operational system changes and enhances system performance, therefore ensuring system availability, service reliability and increased airport capacity. When VOR signal transmission deterioration occurs due to site encroachment such as wind farms, tree growth, construction of bridges, buildings, etc., it is necessary to restore these facilities to their full service volume.

Detailed Justification for - 2D02 Instrument Landing System (ILS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Instrument Landing System (ILS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Instrument Landing System (ILS)	$7,000	$7,000	$7,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Equipment Procurement	5	$2,415.0
b. Complete Two ILS Replacements/Begin Three ILS Replacements	5	4,375.0
c. Logistics/Engineering Support Service	---	210.0
Total	Various	$7,000.0

For FY 2017, $7,000,000 is requested for engineering and technical services support; procurement of five ILS systems, and ancillary equipment, attain service availability for two ILS projects, and initiate three sustain ILS replacement projects.

What Is This Program And Why Is It Necessary?

The program is necessary, because ILS systems continue to be the primary method used to meet immediate and critical precision approach requirements for the users. This program supports the installation of ILS and/or High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) for the establishment of new Category II/III precision approach procedures. An ILS precision approach system is comprised of a grouping of electronic devices Localizer, Glide Slope, marker beacons) and, in some cases, ancillary aids (Distance Measuring Equipment), Approach Lighting System, Runway Visual Range, etc. that provide landing aircraft with both electronic guidance and visual landing aids. These systems allow aircraft to land safely with a stabilized approach to a runway which improves both system safety and capacity for aircraft landing in adverse weather conditions at equipped runways.

The ILS provides both vertical and lateral guidance information for the pilot to allow safe landings to touchdown and rollout. The ILS sends information to instruments in the cockpit so that the pilot can maintain a predetermined flight path to the runway even in low visibility. Some aircraft are equipped with an autopilot which can use signals from a Category IIIc ILS to automatically guide the plane to a safe landing.

The ALSF-2 is a lighting system installed along the extended centerline extending a distance of 2,400 feet outward into the approach zone and ending at the runway threshold. ALSF-2 provides visual cues to help the pilot see the runway when the aircraft is at or above ILS minimum altitude.

There are three categories of ILS. Each category is defined by the lowest altitude at which a pilot is able to decide whether to land or abort (decision height (DH)) and how far the pilot can see the runway (runway visual range (RVR)).

- Category I: DH 200 feet and 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

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

There are approximately 1,200 runway ends that are equipped with an ILS in the U.S. Of these, approximately 55 are more than 25 years old. ILS' that have exceeded their expected service life may suffer from original manufacturers no longer providing 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 the next decade, more than 700 currently deployed ILS will exceed their service life.

$7,000,000 is required for engineering and technical services support; procurement of five ILS systems, and ancillary equipment, attain service availability for two ILS projects, and initiate three sustain ILS replacement projects.

What Benefits Will Be Provided To The American Public Through This Request?

The ILS along with required approach lighting systems directly impact both system safety and capacity. The ILS provides the pilot with vertical and horizontal guidance allowing aircraft to land safely in both Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC). The ability to land in IMC reduces the number of weather caused flight delays, diversions, over-flights and cancellations, thereby, increasing the capacity of the airport. A precision approach capability allows an airport to remain open to traffic when it would otherwise have closed; thereby avoiding weather caused flight delays. Additionally, replacement of aging ILS equipment will improve reliability and availability, which reduces the outage rate and the maintenance man-hours.

Detailed Justification for - 2D03 Wide Area Augmentation System (WAAS) for GPS

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Wide Area Augmentation System (WAAS) for GPS
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Wide Area Augmentation System (WAAS) for GPS	$98,600	$107,200	$85,000	-$22,200

Note: In FY 2017 the satellite lease costs that have been moved to the new Activity 6 Budget Line Item.

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Wide Area Augmentation System (WAAS)		
a. Technology Refresh	5	$54,900.0
b. NAS Implementation	---	7,030.0
c. Technology Evolution	---	4,270.0
d. Technical Engineering Program Support	---	17,300.0
Total	Various	$83,500.0
B. GPS Civil Requirements Oversight	---	$1,500.0

For FY 2017, $85,000,000 is requested to complete the following:

A. Wide Area Augmentation System (WAAS)

a. Technology Refresh, $54,900,000

- Complete Geostationary Earth Orbit (GEO) 6 GEO Uplink Subsystem (GUS) development, test and installation
- Complete GEO 6 satellite payload development, test and launch
- GEO 5 Integration completed (Acquisition Program Baseline (APB) milestone)
- Release 1 Deployed (APB Milestone)
- Release 2 Deployed (APB Milestone)
- Initiate integration of the GUS pair with the on-orbit GEO Satellite Provider (GSP) for the 5th GEO
- The Signal Generator Subsystem (SGS) fielding and deployment will be completed at the 5th GEO GUS sites
- Final production run of new Safety Computers will be completed and will be used to replace the existing Safety Computers that are no longer procurable or repairable

b. NAS Implementation, $7,030,000 – Supports the following activities: procedure feasibility studies, procedure design, procedure development, flight inspection, and surveys for 25 WAAS procedures. In addition, funds will be used for survey validation, data collection by operators, benefits analysis, avionics integration, and development of WAAS-specific operations within the NAS with a focus on Airport de-confliction and reduced delays in the terminal area operations.

c. Technology Evolution, $4,270,000

- Perform hazardously misleading Information (HMI) analyses required for WAAS modifications

- Support international coordination to ensure Satellite Based Augmentation Systems (SBAS) interoperability
- Research techniques to mitigate ionospheric impacts, in particular scintillation, on use of Global Navigation Satellite Systems
- Conduct initial performance assessment of Galileo signals
- Research techniques to improve GNSS ground monitoring
- Research techniques to mitigate impact of radiofrequency interference on use of GNSS
- Continue development of algorithms that improve WAAS today and support a future dual frequency service, such as the combined Covariance-User Differential Range Error algorithm
- Continue refinement of Dual Frequency Multiple Constellation (DFMC) SBAS concept
- Support development of SBAS Minimum Operational Performance Standard (MOPS) applicable to a Dual-Frequency Multiple Constellation (DFMC) SBAS. In 2017 RTCA plans to complete the dual-frequency antenna MOPS
- Conduct concept development and requirement validation for off-line monitoring supporting Advanced Receiver Autonomous Integrity Monitoring (ARAIM) concept

d. Technical Engineering/Program Support, $17,300,000

- Provide systems, software, safety, reliability-maintainability-availability (RMA), test and evaluation, human factors, logistics and hardware engineering support
- Provide specialty engineering support for Hazardously Misleading Information (HMI) analysis efforts, Radio Frequency Interference (RFI) investigation and mitigation, system security assessments, and system performance assessments
- Provide program management support in areas of finance; quality assurance (QA); Earned Value Management (EVM); project planning, execution, and monitoring

B. GPS Civil Requirements Oversight, $1,500,000

- GPS technical oversight: MITRE support, Technical Assistance Support, Volpe, and Position, Navigation and Timing (PNT) National Coordination Office (NCO) support
- Provide oversight of GPS safety assurance of the satellite vehicles and next generation operational control system (OCX)
- Provide oversight of GPS spectrum protection analyses pertaining to GPS civil signals
- Provide assessment of requirements and performance of modernized GPS signals and their impact on civil GPS aviation applications
- Perform configuration control functions for GPS Civil Applications office to include review and approval of all requests for change
- Support program management reviews and design reviews for the satellite vehicle and OCX programs

What Is This Program And Why Is It Necessary?

WAAS is one of four operational SBASs in the world and supports the FAA mission need of providing a satellite navigation capability that provides both horizontal and vertical navigation for precision approach-like operations for all WAAS equipped users at all qualified runway ends in the National Airspace System (NAS). Qualification of an airport/runway is based on FAA advisory circular 150/5300-13A, Table 3-4, 3-5 and Terminal Instrument Procedures Standards (TERPS) 8260.58. WAAS provides both vertical and horizontal guidance during all phases of a flight, regardless of weather conditions, without installing expensive legacy navigation hardware at each runway. WAAS consists of a network of 38 FAA 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 user receiver on the aircraft applies the corrections and integrity information from the WAAS message to obtain the precise navigation service. Today, WAAS users can conduct en route operations across the entire NAS and precision approach take off and landings at 95 percent of the qualifying airports in the 48 contiguous states.

WAAS is not mandatory for ADS-B operations but will allow for ADS-B enhanced operations. WAAS has been used as the ADS-B on-board position sensor in all demonstrations to date, because it meets the requirements to achieve levels of accuracy, integrity, and availability required by an ADS-B position sensor for all enhanced surveillance operations and will enable ADS-B to fully implement all capabilities (reduced separation). The development of a common WAAS/ADS-B avionics suite using the same WAAS-based position sensor will reduce the overall cost to the user and will facilitate the widespread, rapid, and cost-effective deployment of both WAAS and ADS-B. WAAS accuracy, integrity and availability have led to the integration of a WAAS capability into most commercial GPS chips and receivers supporting numerous applications (marine, automobile, agriculture, surveying and recreation). Other investments that WAAS interfaces with include Continuously Operating Reference Stations (CORS) operated by the National Geodetic Survey under the National Oceanic and Atmospheric Agency and Mobile E911.

As one of four operational SBASs, WAAS collaborates with both industry and international representatives through participation in the Institute of Navigation (ION), International Civil Aviation Organization (ICAO), RTCA (joint government-industry collaborative body for aviation standards development), Asian Pacific Economic Cooperative (APEC), Indian Space Research Organization (ISRO), Interoperability Working Group (IWG), International Committee on GNSS (ICG), Airports Authority of India (AAI), Japan Civil Aviation Bureau (JCAB), as well as Transport Canada, NAV CANADA, and Servicios a la Navegación en el Espacio Aéreo Mexicano SENEAM, assuring that all SBAS are interoperable and thus support global seamless operations.

WAAS Strategy to Contribute to NextGen, Air Traffic Operations Domain:

In Alaska, WAAS enables users to operate under Instrument Flight Rules (IFR) on routes currently classified as uncontrolled airspace. The WAAS enabled routes improve operator efficiency, access and safety, while incrementally reducing dependency on Ground Based navigation, which supports the Separation Management Portfolio and Flexibility in the Terminal Environment.

WAAS will support the near-term demonstrations with vertical flight aircraft, business/regional jets, and air carriers with airspace redesign and WAAS LPV approaches. The business/regional jet portion of these projects will be to develop RNAV/RNP routes from an en route environment using Optimized Profile Descents (OPDs), and WAAS LPV final approach segments that avoid environmentally sensitive areas.

The FAA is required by law to establish, operate, and maintain navigation capability for all phases of flight. Historically, the FAA has invested in ground-based navigation equipment, such as Instrument Landing Systems (ILS), to provide this navigational capability. Many of the aircraft flying in the national airspace system (NAS) lacked a seamless navigation capability, and many runways in the NAS lacked navigation aids that delivered stable vertical guidance in all weather conditions.

FAA determined that WAAS satellite-based GPS navigation capability provided the most efficient and cost-effective means of providing the service moving forward. It leverages modern technology advancements, and NextGen capabilities will build off this capability. A minimum operating network of ground based navigation aids will be retained. WAAS will provide access and LPV procedures at all runway ends allowing for a reduction in Instrument Landing Systems (ILS) and other ground-based navigation aids.

By increasing procedures and expanding WAAS coverage, users will equip with WAAS receivers and increase the total benefit realized by WAAS. In 2016, the FAA will make a decision to begin the drawdown of Category I ILS. Decisions on the removal of individual ILSs will be directly tied to WAAS LPV availability.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related injuries and fatalities.

Why Do We Want/Need To Fund The Program At The Requested Level?

The FAA's transition to Performance Based Navigation is heavily dependent on the WAAS program to be fully implemented and sustained. WAAS is a key enabler for NextGen programs (ADS-B, RNAV/Required

Navigation Performance (RNP), etc.) and supports the Performance Based Navigation (PBN) and Metroplex Portfolio.

$83,500,000 is required to execute planned tasks. WAAS will execute the approved baseline, WAAS Phase IV Dual Frequency Operations. The first Segment of Phase IV implements changes to the WAAS necessary to support the development and launch of Dual Frequency Operations and the sustainment and refresh of WAAS reference receivers and processors. In addition, critical development activities for the next two GEO satellites will continue as the current three GEO satellites in use by WAAS are nearing their end of service life and need to be replaced. In FY 2017, GEO 5 will be added to the WAAS and a selected legacy GEO will be decommissioned. GEO 6 development activities will continue.

$1,500,000 is required for GPS Civil requirements oversight, to include MITRE support, Technical Assistance Support, Volpe, and PNT NCO support. Funds are requested to provide oversight of GPS safety assurance of the satellite vehicles and next generation OCX and GPS spectrum protection analyses pertaining to civil signals. The funding will provide assessment of requirements and performance of modernized GPS signals and their impact on civil GPS aviation applications, as well as, performance of configuration control functions for the GPS Civil Applications office.

What Benefits Will Be Provided To The American Public Through This Request?

In terminal area and approach operations, a Flight Safety Foundation Report found that there is nearly an eight fold reduction in approach accident rates (53 per million for non-precision approaches vs. seven per million for precision approaches) when precision vs. non-precision approaches were used. Specifically, 141 accidents could be prevented over a 20 year period and save over 250 lives when using WAAS for vertically guided approaches at airports where stable vertical guidance is not available or not used today. WAAS provides vertical and horizontal guidance with an aviation safety component enabling pilots to make stable, vertically guided approaches to all qualified runway ends in the continental United States and most of Alaska. Presently precision vertically guided approaches using CAT I ILS are only available at 1,283 of the nation's 19,000 runway ends.

Cargo aircraft have shown increased cargo capacity, reduced fuel loads, reduced divert rates (inability to land at planned destinations), and operational cost savings of approximately $200,000 per year. Regional airlines have shown fuel and time savings by utilizing satellite-based waypoints that facilitate straight-line, shortest-distance routes as compared to legacy (zigzag) routes that fly a series of straight line route segments connecting ground based navigation aids. Commuter airlines have demonstrated cost avoidances attributable to lower minimum descent altitudes at airports through the installation of LPV approach procedures. This savings, along with very short return on investment timelines, has translated into commitments to fully equip airline fleets with WAAS avionics. Business jet operators in FAA Government Industry Partnerships (GIPs) have been able to decrease in-flight conflicts with major airport traffic while on approach at feeder airports. This has allowed increased frequency of operations and reduction of in-flight and ground clearance delays.

EMS helicopter operators have been able to create IFR LPV approaches to medical center helipads, eliminating the requirement to land at distant airports necessitating ground transportation and consequent delays in patient care. WAAS-based helicopter routes have allowed elimination of Air Traffic Control delays by assuring deconfliction with airline traffic at major metroplex airports. WAAS based helicopter routes and LPV approaches have been developed that reduce ground delays for executive transport in extremely complex and congested airspace such as the New York metropolitan area, allowing significant increases in flight operations during poor visibility. In 2010, an independent Post Implementation Review (PIR) found that WAAS was successfully delivering the expected performance and benefits while maintaining the program cost and schedule baseline.

WAAS performance has met or exceeded its performance requirements since commissioning in 2003, and is documented quarterly. Real time data and plots, daily plots, performance videos and performance analysis is available for WAAS at the following website: http://www.nstb.tc.faa.gov/.

Detailed Justification for - **2D04 Runway Visual Range (RVR) and Enhanced Low Visibility Operations (ELVO) Program**

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Runway Visual Range (RVR) and Enhanced Low Visibility Operations (ELVO) Program
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Runway Visual Range (RVR) and Enhanced Low Visibility Operations (ELVO) Program	$7,500	$6,000	$6,500	+$500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Runway Visual Range (RVR)		
a. Procurement of RVR Systems and Ancillary Equipment	---	$1,750.0
b. Complete/Initiate Establish/Sustain RVR Projects	8	1,750.0
c. Logistics/Engineering Support Services	---	500.0
Total	Various	$4,000.0
B. Enhanced Low Visibility Operation (ELVO)		
a. Complete/Initiate Implementation Activities for ELVO Phase II Projects	4	$2,500.0

A. RVR

For FY 2017, $4,000,000 is requested for engineering and technical services/support, procurement of approximately eight RVR systems and ancillary equipment, and to establish/sustain RVRs at approximately eight locations.

B. ELVO Phase II

For FY 2017, $2,500,000 is requested to complete/initiate approximately four new ILS projects and implementation activities to increase the operating capability at a minimum of three ELVO locations.

What Is This Program And Why Is It Necessary?

A. RVR

The RVR program replaces older RVR equipment with PC-Based RVR equipment. RVR provides air traffic controllers with a measurement of the visibility at key points along a runway: touchdown, midpoint, and rollout. That data is used to decide whether it is safe to take off or land during limited visibility conditions. During reduced visibility weather conditions, RVR system measurements are used by Air Traffic to establish airport operating categories; thus, properly equipped aircraft with a trained crew may continue operations under reduced visibility Category I, Category II and Category III conditions. Depending on the category of approach, the runway may require multiple visibility sensors to achieve the lowest minimums. The acquisition of more visibility sensors is required for a Category II/III approach. Each category is defined by the lowest altitude at which a pilot is able to decide whether to land or abort (decision height) and visibility conditions on the runway.

- Category I operations may use a rollout sensor of an RVR system
- Category II operations require a touchdown and rollout sensor of an RVR system
- Category III operations require a touchdown, midpoint and rollout sensor of an RVR system

The RVR decreases diversions and delays at an airport by providing an accurate measure of the runway visibility. The RVR information affects airline scheduling decisions and air traffic management decisions regarding whether flight plans should be approved for an aircraft to fly to or take off from an airport with low visibility. There are 280 airports in the NAS that have RVR systems.

The new-generation RVR and PC-based RVR are safer than the older systems, because the equipment is mounted on frangible structures that break away if accidently struck by an aircraft during take-off or landing. Replacement decisions are prioritized based on the level of activity at the airport and life-cycle issues. This program also provides the equipment for sites that have recently qualified for an upgrade from a Category I to a Category II/III precision approach.

The two main areas from which cost savings can be expected are:

- Reduced Flight Disruption: Weather caused flight disruptions: delays, diversions, over-flights, and cancellations impose economic penalties on both aircraft operators and users. Favorable RVR information is required to land during category II, III and many category I precision approaches. This allows an airport to remain open to traffic when it would otherwise have closed, avoiding weather-caused flight disruptions. These benefits are calculated by estimating the number of flight disruptions avoided multiplied by the unit cost for a flight disruption. The unit cost for a flight disruption is based on assumed operating scenarios that describe the flow of events when a flight is disrupted.

- Improved Safety: The benefit realized is the reduction or elimination of fatalities and costs associated with aircraft accidents involving low-impact resistant structures versus aircraft accidents involving rigid approach structures. Use of low-impact-resistant structures reduces fatalities and the severity of damage to aircraft that accidentally strike them during departure or landing.

This program is required per the Code of Federal Regulations §91.175, Takeoff and Landing under Instrument Flight Rules. This program allows airports to conduct takeoff and landing operations during conditions of low visibility.

B. ELVO Phase II

The Enhanced Low Visibility Operations (ELVO) Program Phase II provides the equipment and procedures to allow for reduced minimums for landing and takeoff during periods of low visibility at selected airports. Phase 1 of the program established the criteria for low visibility operations and implemented more than 985 new procedures that did not require infrastructure investment. These reduced minimums require that visibility as measured by the Runway Visual Range (RVR) system to be at or above the specified levels when Instrument Flight Rules (IFR) conditions exist. ELVO Phase II continues the work initiated by Flight Standards to put into place additional low visibility capabilities within the NAS. These additional capabilities include: RVR1800, Special Authorization (SA) Category (CAT) I, SA CAT II, and lower than standard IFR take off minimums. These low visibility flight operations were shown to provide significant additional benefit to operations and increase NAS efficiency. In addition to the lower than standard IFR take off minimums (as low as 500RVR), the table below shows the low visibility flight operations ELVO Phase II allows for landing.

Enhanced Low Visibility Operations (ELVO) Lower RVR Minimums			
Flight Operation	**Minimums**	**Decision Height (DH) / Decision Altitude (DA)**	**Required Avionics**
CAT I	1,800RVR	200 ft DA	Flight Director; or Head-Up Display (HUD); or Autopilot
Special Authorization (SA) CAT I	1,400RVR	150 ft DH	HUD
SA CAT II	1,200RVR	100 ft DH	Autoland or HUD

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 five 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.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

Funding at the required level is needed to promote the benefits associated with lower decision height minimums and to reduce the number of airport diversions and delays.

What Benefits Will Be Provided To The American Public Through This Request?

A. RVR

The Federal Aviation Administration (FAA) has been deploying RVR equipment for more than 40 years. The RVR has proven itself as an extremely useful aid for controllers and pilots flying within the NAS, primarily in low visibility conditions. Weather caused flight disruptions delays, diversions, over-flights and cancellations impose economic penalties on both aircraft operators and users. Favorable RVR information is required to land during category II, III and many category I precision approaches. This allows an airport to remain open to traffic when it would otherwise have closed, avoiding weather-caused flight disruptions.

An additional benefit is the reduction or elimination of fatalities and costs associated with aircraft accidents involving rigid approach structures. Use of low-impact-resistant structures reduces fatalities and the severity of damage to aircraft that accidentally strike these structures during departure or landing.

B. ELVO Phase II

ELVO Phase II is currently operational within the NAS, and there are numerous examples of saved flight operations that are attributable to those efforts. Additionally, post-implementation analysis has proven these operational benefits accruing at several sites, exceeding the projected benefits presented while seeking funding. The return on investment is often within one year. Specific benefits include:

- Increased number of arrivals/departures during low visibility conditions

- Decreased number of flight delays, cancellations, and/or diversions
- Increased flexibility in the terminal environment, with potential decreased congestion and better traffic flow
- Increased ability to utilize closer and more optimally located alternate airports, leading to less fuel requirements for dispatch
- Increased capacity for airlines to schedule flights in marginal weather conditions (since both the primary and alternate routes must be approved within the flight plan)
- Natural incentives to industry to modernize onboard equipment with advanced avionics such as the Head Up Display (HUD)

Detailed Justification for - 2D05 Approach Lighting System Improvement Program (ALSIP)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Approach Lighting System Improvement Program (ALSIP)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Approach Lighting System Improvement Program (ALSIP)	$3,000	$3,000	$3,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Procurement MALSR Systems	4	$1,954.0
b. Installation of One MALSR	1	950.0
c. Logistics/Engineering Support Service	---	96.0
Total	Various	$3,000.0

For FY 2017, $3,000,000 is requested for engineering and technical services/support; procurement of approximately four Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) systems; and to replace a MALSR with Runway Alignment Indicator Lights (RAILs) at one location.

What Is This Program And Why Is It Necessary?

The Approach Lighting System Improvement Program (ALSIP) upgrades 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 rigid 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 visual information on runway alignment, height perception, roll guidance, horizontal references for Category I Precision, and Special Authorization Category II Approaches.

Improved Safety: Many of the older approach lighting systems in the National Airspace System (NAS) have rigid structures. Aircraft that accidentally strike these structures during departure or landing can incur substantial damage. The National Transportation Safety Board (NTSB) recommended replacing the rigid approach lighting structures with low-impact resistant structures that collapse or break apart upon impact. This program reduces fatality incidents and costs associated with aircraft accidents involving rigid approach lighting structures, through the use of low-impact-resistant structures.

Reduce Flight Disruption: Weather-caused flight disruptions – delays, diversions, over-flights, and cancellations – impose economic penalties on both aircraft operators and users. An operational MALSR or ALSF-2 allows an airport to remain open to traffic, when it would otherwise have closed, avoiding weather-caused flight disruptions. These benefits are calculated by estimating the number of flight disruptions avoided multiplied by the unit cost for a flight disruption. The unit cost for a flight disruption is based on assumed operating scenarios that describe the flow of events when a flight is disrupted.

DOT Strategic Goal – Safety
- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want / Need To Fund The Program At The Requested Level?

$3,000,000 is required for engineering and technical services/support; procurement of approximately four MALSR systems and ancillary equipment; replacement of a MALSR at one location. If the program were funded at a lower level the Navigation Program Group would reduce the number of MALSR systems procured and/or reduce the amount of funding provided for the installation of one planned MALSR replacement project.

What Benefits Will Be Provided To The American Public Through This Request?

This program reduces fatality incidents and costs associated with aircraft accidents involving rigid approach lighting structures through the use of low-impact-resistant structures. Weather-caused flight disruptions – delays, diversions, over-flights, and cancellations – impose economic penalties on both aircraft operators and users. An operational MALSR or ALSF-2 allows an airport to remain open to traffic, when it would otherwise have closed, avoiding weather-caused flight disruptions.

Detailed Justification for - 2D06 Distance Measuring Equipment (DME)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Distance Measuring Equipment (DME)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Distance Measuring Equipment (DME)	$3,000	$3,000	$3,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Distance Measuring Equipment (DME) Procurement	25	$1,175.0
b. Complete and Initiate Establish/Replacement DME Projects	---	1,200.0
c. Logistics/Engineering Support Services	---	625.0
Total	Various	$3,000.0

For FY 2017, $3,000,000 is requested for engineering and technical services/support, procuring 25 DME systems, and attaining service availability for 25 establish/sustainment DME projects.

What Is This Program And Why Is It Necessary?

The DME is a radio navigation aid that is used by pilots to determine the aircraft's slant distance from the DME location. The program is procuring and installing state-of-the-art DME systems to: replace DMEs that have exceeded their service life expectancy; establish DMEs at qualifying airports; relocate DME facilities; and establish of DMEs in lieu of ILS marker beacons thus eliminating the need for expensive land lease outside airport property.

In addition, the program supports a Commercial Aviation Safety Team (CAST) recommendation to implement DME on various airport runways. The CAST includes FAA, airline and airport personnel, and it has identified 451 runway ends that require implementation of DME capability. These systems will support efforts to reduce the number of controlled-flight-into-terrain (CFIT) accidents at the most vulnerable locations in the NAS. The FAA has agreed to implement the 177 highest priority CAST DME installations.

For safety reasons, the industry wants to discontinue using step-down or dive-and-drive non-precision approach procedures, in which the pilot descends to the minimum allowable altitude to try to see the runway. Using DME minimizes the need for these types of approaches because the continuous ranging information from a DME allows procedure designers more flexibility in terms of where step down fixes are placed and how many are needed, leading to better specification and control over the vertical descent profile; thus reducing CFIT risk.

The unavailability of a DME network will severely impact general aviation's capability to navigate, commercial aviation Flight Management System performance, airport capacity due to the non-availability of CAT II/III ILS approaches and safety of the flying public in the NAS. Foreign carriers operations in the NAS will also be severely impacted. Delaying the upgrade of the DME network will increase future replacement costs and will prevent realization of the projected cost savings from future NAS improvements.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$3,000,000 is required for engineering and technical services/support, procuring 25 DME systems, and attaining service availability for 25 establish/sustainment DME projects. In order to maintain the availability of service of these critical systems, the FAA must replace and/or upgrade electronic systems that have reached the end of their lifecycle. This will avoid unacceptable disruptions to airport operations during low visibility conditions. In addition, these benefits will maintain the current level of safety and airport capacity.

What Benefits Will Be Provided To The American Public Through This Request?

The DME program supports airport capacity. Each year the program procures and replaces obsolete DME systems with state-of-the-art DME. This state-of-the-art DME can handle more aircraft simultaneously than the older obsolete DME systems in the NAS. Additionally, the state-of-the-art DME availability exceeds the older obsolete DME systems. Implementation of this state-of-the-art DME ensures reliable, predictable and cost-effective air navigation thus contributing to airport capacity.

Detailed Justification for - 2D07 Visual Navaids – Establish/Expand

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Visual Navaids – Establish/Expand
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Visual Navaids – Establish/Expand	$2,000	$2,000	$2,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Procurement of Precision Approach Path Indicator (PAPI) Equipment and Ancillary Equipment	7	$660.0
b. Complete PAPI Establish Project	---	1,050.0
c. Logistics/Engineering Support Service	---	290.0
Total	Various	$2,000.0

For FY 2017, $2,000,000 is requested for engineering and technical services/support; procurement of approximately seven Precision Approach Path Indicator (PAPI) systems and to complete approximately seven PAPI establishment projects.

What Is This Program And Why Is It Necessary?

This program supports the procurement, installation, and commissioning of PAPI systems and Runway End Identifier Lights (REIL) systems. The 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. PAPI consists of four lamp housing assemblies arranged perpendicular to the edge of the runway. 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 glide slope 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 runway end in use during approach. The REIL system consists of two simultaneously flashing white lights, one on each side of the runway landing threshold.

Visual Navaids are necessary to assist pilots in visually acquiring the runway environment. These lighting systems facilitate the transition from cockpit instruments to external visual references during the final landing phase. Different categories and types of approaches require different visual navaids equipment.

The program also supports a Commercial Aviation Safety Team (CAST) recommendation to implement a visual glide slope indicator approach capability on various airport runways including those affected by Land and Hold Short Operations (LAHSO) requirements. The CAST includes FAA, airline and airport personnel, and it has identified 781 runway ends that require implementation of a visual glide slope indicator approach capability. This capability will reduce the number of the controlled flight into terrain accidents during approach and landing.

LAHSO is an air traffic control tool used to increase airport capacity by allowing coordinated approaches on intersecting runways. Vertical guidance is required for air carrier operations on the hold short runway to avoid landing long and conflicting with operations on the other runway.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$2,000,000 is required for engineering and technical services/support; procurement of approximately seven PAPI systems and to complete approximately seven PAPI establishment projects.

What Benefits Will Be Provided To The American Public Through This Request?

Improved Safety - Safety benefits stem from the reduction of accidents. Safety benefits are estimated by comparing incidents and costs of non-precision approach accidents with the same for precision-like approach accidents to estimate a differential cost per approach. Use of a precision-like landing capability of a PAPI will reduce accidents during landing. The use of REILs increases safety and capacity during landing by providing a pilot with the location of the approach end of the runway.

Reduced Controlled Flight Into Terrain - Controlled flights into terrain causes fatalities and imposes economic costs on aircraft operators. The visual precision-like vertical landing capability of the PAPI reduces the number of controlled flights into terrain.

Detailed Justification for - 2D08 Instrument Flight Procedures Automation (IFPA)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Instrument Flight Procedures Automation (IFPA)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Instrument Flight Procedures Automation (IFPA)	$2,400	$3,371	$9,400	+$6,029

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Instrument Procedures Development System (IPDS) Technology Refresh/COTS Software-System Engineering Requirements Analysis	---	$500.0
b. AeroNAV Products Workflow System (APWS) Technology Refresh/COTS Software-System Development	---	8,900.0
Total	Various	$9,400.0

For FY 2017, $9,400,000 is requested to begin Segment-2 of IFPA technology refresh activities to include requirements analysis for workstation-based Commercial off the Shelf (COTS) software upgrades to IPDS, and for server-based COTS software upgrades to APWS.

In FY 2012, the program entered the first segment of its planned technology refreshes for its COTS hardware and software in support of the IPDS and APWS tools. In FY 2017, the program will enter the second segment of these activities. From FY 2017 through FY 2021 the IFPA program will be conducting technology refresh of its Information Technology tool suite, including both software and hardware, in accordance with FAA lifecycle guidance. Once System Requirements Analysis for IPDS is completed in FY 2017, System Development and Testing is planned to begin in FY 2018 with system delivery planned for completion in FY 2021. For APWS, System Configuration and Development will start in FY 2017 with system delivery planned for completion in FY 2019.

What Is This Program And Why Is It Necessary?

IFPA is a suite of advanced Information Technology (IT) tools. These tools create products using fully integrated solutions for visual and instrument flight procedures. IFPA consists of the IPDS, Instrument Flight Procedures (IFP) database application, Airports and Navigations Aids database (AirNav) application, Obstacle Evaluation (OE) system, and the AeroNav Products Workflow System (APWS).

The IPDS tool provides space-based navigation (RNAV and RNP) procedure design capability, as well as ground-based navigation procedure design capability. The IPDS tool contains COTS software for 2D and 3D rendering of instrument flight procedures and associated terrain and obstacles.

The AeroNav Products Workflow System (APWS) tool provides business process workflow automation for the Aeronautical Information Services organization, marshalling and metering work between AJV-5 Development, Quality Assurance, Flight Inspection, Pre-Publication and Publication work areas. The APWS tool contains COTS Software which provides the underlying routing of work via Business Process Management (BPM).

IFPA provides the following benefits:

- Increases the airport arrival capacity for eight major metropolitan areas, and at the nation's busiest airports when visibility is restricted
- Modernizes systems in support of both visual and instrument flight procedure development such as approaches, standard terminal automation replacement system, airways, and departures
- Increases automated capabilities for all types of precision and non-precision flight procedures, including conventional (ground-based navigation aids) and performance-based (satellite-based navigation)
- Provides an integrated obstacle evaluation application, replacing a manual process
- Provides new capability because existing systems cannot generate and integrate the necessary physical, temporal and spatial information needed to develop, inspect and publish flight procedures as well as evaluate the impact of obstacles

In addition to supporting FAA Flight Plan goals and strategic initiatives, IFPA provides additional benefits as follows:

- Capability for ongoing maintenance of over 23,000 instrument flight procedures in use at over 4,000 paved airports, accommodating requirements for precision approaches and departures using Global Positioning System/area navigation, Wide Area Augmentation System (WAAS) and Ground-Based Augmentation System (GBAS)
- Efficient response to Air Traffic Obstacle Evaluation (OE) requests, evaluating effects on instrument flight procedures, alleviating manual effort currently required for more than 70,000 OE requests annually. In addition, application of Terminal Instrument Procedures (TERPS) rules as part of automated obstacle evaluation will be an important benefit
- Conversion of legacy software to OMB, DOT and FAA recommended architecture, providing opportunities for improved integration as well as a foundation for anticipated flight procedure demand

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

IFPA is a key component in evolving the National Airspace System (NAS) into a performance-based system. Such an evolution requires an investment in systems integration and the automation of aviation data for safety and reliability purposes, as well as an automated electronic means of information sharing.

In accordance with the program's original business case approved by the FAA's Joint Resources Council (JRC) in 2006, the program will be seeking approval during FY 2015 for the second segment of the technology refresh to occur in the FY 2017 to FY 2021 timeframe.

What Benefits Will Be Provided To The American Public Through This Request?

The IFPA tool suite provided productivity gains for all Aeronautical Information Services' major work products, using FY 2006 labor hours as a baseline. For example, the development time required for a new Instrument Flight Procedure was reduced from 132 labor hours in FY 2006 to 104 hours by FY 2011, the amendment time for an existing Instrument Flight Procedure was reduced from 46 labor hours to 27 hours, the procedure NOTAM generation time was reduced from ½ labor hour to ¼ labor hour, and the obstacle evaluation time was reduced from ½ labor hour to 3/8 hour. These efficiency gains are multiplied by the hundreds and thousands of these products produced on an annual basis. Also, these gains are included in AeroNav's documented unit cost reductions. The program measures itself annually for its production efficiency.

Detailed Justification for - 2D09 Navigation and Landing Aids – Service Life Extension Program (SLEP)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Navigation and Landing Aids – Service Life Extension Program (SLEP)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Navigation and Landing Aids – Service Life Extension Program (SLEP)	$3,000	$3,000	$3,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Equipment Procurement	3	$1,065.0
b. Complete Replacement Projects	10	1,704.0
c. Logistics/Engineering Support Services	---	231.0
Total	Various	$3,000.0

For FY 2017, $3,000,000 is requested for engineering and technical services/support, procurement and installation of three ALSF-2 Replacement Lamp Monitoring System (RLMS) sets and components at non-Focus airports, and completion of Runway End Identifier Lights (REIL) replacement projects at 10 locations.

What Is This Program And Why Is It Necessary?

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. NAVAIDS 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) at Category II/III approaches
- Runway End Identifier Lights (REIL)

This program also supports Instrument Landing Systems (ILS) sustain and replace efforts at non-Focus Airports where primary precision approach capability outages are most likely. ILS components include electronic devices (i.e., localizers, glide slopes, and distance measuring equipment, etc.). ILS' (Mark 1F) removed from Focus Airports are reinstalled at lower activity airports to replace older existing Mark 1D and Mark 1E ILSs.

The program maintains the availability of service of these critical systems, the FAA must replace and/or upgrade electronic systems that have reached the end of their lifecycle. This will avoid unacceptable disruptions to airport operations during low visibility conditions. In addition, these benefits will maintain the current level of safety and airport capacity. The installation of RLMS will satisfy the FAA requirement to monitor the status of the ALSF-2s at all brightness steps during conditions of low visibility in CAT II/CAT III operations.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$3,000,000 is required for engineering and technical services/support, procurement and installation of three ALSF-2 Replacement Lamp Monitoring System (RLMS) sets, and completion of Runway End Identifier Lights (REIL) replacement projects at 10 locations on-schedule.

What Benefits Will Be Provided To The American Public Through This Request?

Replacing and upgrading the ALS equipment will help to maintain the services provided by visual and navigation aids without disruptions to airport operations. These benefits will increase safety and airport capacity. Runway downtime is associated with delays, diversions, over-flights, and cancellations which impose economic penalties on both aircraft operators and users. The installation of the RLMS will reduce the need for technicians to physically monitor the ALSF-2s during adverse weather conditions.

Detailed Justification for - **2D10 VASI Replacement – Replace with Precision Approach Indicator**

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – VASI Replacement – Replace with Precision Approach Indicator
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
VASI Replacement – Replace with Precision Approach Path Indicator	$5,000	$5,000	$5,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Procurement of Precision Approach Path Indicator (PAPI) Equipment	18	$1,700.0
b. Complete Replacement of VASI Systems with PAPI Systems	18	3,000.0
c. Logistics/Engineering Support Services	---	300.0
Total	Various	$5,000.0

For FY 2017, $5,000,000 is requested for engineering and technical services/support; procurement of approximately 18 Precision Approach Path Indicators (PAPI) systems; initiate approximately 18 new Visual Approach Slope Indicator (VASI) system with a Precision Approach Path Indicator (PAPI) projects; and completion of approximately 18 VASI replace with PAPI projects.

What Is This Program And Why Is It Necessary?

The International Civil Aviation Organization (ICAO) has recommended that all international airports replace the Visual Approach Slope Indicator (VASI) lights with Precision Approach Path Indicators (PAPI) lights. This standardizes the equipment used to allow pilots to determine visually that they are on the proper glideslope for landing. The program supports the procurement, installation, and commissioning of PAPI systems in order to comply with this ICAO recommendation.

The VASI and PAPI systems have a set of lights that are arranged so that the pilot sees all red lights when the aircraft is below the glideslope and all white lights when the aircraft is above the glideslope. This visual reference helps the pilot maintain the appropriate descent rate to the runway.

At the inception of this program, there were approximately 1,387 older (pre-1970's) VASIs at international and other validated locations requiring replacement. There are now 877 VASI systems remaining in the NAS. The first priority of the program is to replace VASI systems at approximately 329 ICAO designated runway ends. This will be completed in fiscal year 2018. The replacement of the remaining VASI systems at non-ICAO airports in the NAS will be completed in fiscal year 2051.

This replacement program:

- Fulfills the need to replace the aging VASI systems within the NAS
- Supports the ICAO standard to install PAPI systems at all international runways
- Responds to Airline Pilots Association and General Aviation requests for PAPI equipment at validated approaches within federally controlled airspace
- Eliminates the current supply support deficiencies related to lack of uniformity between various VASI configurations

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$5,000,000 is required for engineering and technical services/support; procurement of approximately 36 Precision Approach Path Indicators (PAPI) systems; initiation of approximately 18 new Visual Approach Slope Indicator (VASI) system with a Precision Approach Path Indicator (PAPI) projects; and completion of approximately 18 VASI replace with PAPI projects.

What Benefits Will Be Provided To The American Public Through This Request?

- Fulfills the need to replace the aging VASI systems within the NAS
- Supports the ICAO standard to install PAPI systems at all international runways
- Responds to Airline Pilots Association and General Aviation requests for PAPI equipment at validated approaches within federally controlled airspace
- Reduces maintenance labor
- Minimizes the current supply support deficiencies related to lack of uniformity between various VASI configurations

Detailed Justification for - 2D11 Runway Safety Areas (RSA) – Navigational Mitigation

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Runway Safety Areas (RSA) – Navigational Mitigation
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Runway Safety Areas (RSA) – Navigational Mitigation	$35,000	$30,000	$14,000	-$16,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Program Management	---	$1,000.0
b. Procurement of NAVAIDs	---	1,317.0
c. Installation of NAVAIDs	---	11,683.0
Total	Various	$14,000.0

For FY 2017, $14,000,000 is requested to conform to RSA standards contained in AC 150/5300-13 Airport Design. 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. The funding being requested will allow the continuation of the NavAids procurement and the completion of the remaining 293 RSA improvements.

What Is This Program And Why Is It Necessary?

This program is necessary and the primary benefit is the prevention of loss of life from aircraft striking non-compliant NAVAIDS located in designated RSAs. The FAA's runway safety program improves the overall safety of the Runways and Runway Safety Area (RSA). The RSA must be free of all objects that are three inches above the grade and are not frangible. The relocation or removal of existing rigid objects will decrease the potential for damage to aircraft and minimize injuries or fatalities to aircraft passengers and crew members if an aircraft has to use the RSA in an emergency. One key element of this program is RSA Sterilization which includes provisions for clear areas, surface drainage, and weight supportability.

The FAA currently owns and operates numerous NAVAIDs that need to be modified to satisfy the language of Title 14 Consolidated Federal Regulations (CFR) Part 139 (Certification of Airports). Although measured incremental progress has been made to restructure these FAA-owned NAVAIDs, a concerted, focused initiative will be necessary to comply with the current RSA airport design standards by December 31, 2015. Legislation requires FAA to report on the agency's progress toward RSA improvements.

The initiative to correct FAA-Owned NAVAID violations in RSA will take the corrective action on those Navigation systems that are not in compliance with the RSA requirements. The scope of the work to be accomplished will range from the installation of frangible connections on identified structures to the relocation of facilities within RSA, if no other solution is available. The objects are in two classifications: 1) fixed by function and 2) not fixed by function. Those objects that are fixed by function and will not be able to perform their intended function if relocated, in all likelihood, may receive a waiver with the addition of frangible mounting. Those objects that are not fixed by function will have to be moved outside of the RSA. Below is a listing of objects by classification:

Objects fixed by function:

- Runway End Identifier Lights (REIL)
- Precision Approach Path Indicator (PAPI)
- Visual Approach Slope Indicator (VASI)
- Inner Marker (IM)
- Approach Lighting System (ALS)
- Runway Visual Range (RVR)
- Access Roads
- Radar Reflectors
- Power Panels (case by case)
- Individual Control Cabinets (ICC)
- Engineered Materials Arresting System (EMAS)
- Glide Slope Antennas
- Antennas
- Maintenance Stands (Frangible Connections)

Objects not fixed by function:

- Localizer (most cases when not possible to relocate)
- NAVAID Buildings (power sheds)
- Transformers
- Power Panels (case by case)

The activities associated with this effort will be prioritized according to the major airport hubs, their supporting reliever airports and then other airports with reported NAVAID violations. The FAA has identified approximately 2,384 violations that need to be addressed at various airport locations. The FAA is committed to clearing all violations by December 31, 2018.

Large NAVAIDs 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. Another example, in November 1976, an aircraft taking off at Stapleton International Airport in Denver, Colorado collided into two non-frangible ALS structures resulting in 14 injuries.

In response to the Stapleton incident, the National Transportation Safety Board (NTSB) recommended that FAA expedite retrofitting of ALS structures with frangible materials so that the improvements would be completed within three to five years. However, more than 30 years later, FAA found that non-frangible ALSs remain in RSAs and continue to pose a safety risk to aircraft and passengers.

DOT Strategic Goals – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$14,000,000 is required to conform to RSA standards contained in AC 150/5300-13 Airport Design. 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 funding will allow the continuation of the NavAids procurement and the completion of the RSA improvements by the Congressional commitment date of December 31, 2018.

What Benefits Will Be Provided To The American Public Through This Request?

The benefits provided to the American Public are an increase in safety on the runways at Part 139 airports. The safety is increased by relocating objects outside of the RSA and mounting equipment on frangible bolts.

This significantly reduces the extent of personal injury and aircraft damage during overruns, undershoots and veer-offs. Since 2010, the program has relocated and/or modified NAVAIDs at more than 241 RSAs. Forty-five percent of all Part 139 RSAs have been improved to date. The RSA program has exceeded its goals every fiscal year.

Detailed Justification for - 2D12 NAVAIDS Monitoring Equipment

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – NAVAIDS Monitoring Equipment
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
NAVAIDS Monitoring Equipment	$0	$0	$2,000	+$2,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Hardware/Software Engineering Services	---	$1,250.0
b. Program Management	---	500.0
c. Second Level Engineering	---	125.0
d. Technical Center Test Support	---	125.0
Total	Various	$2,000.0

For FY 2017, $2,000,000 is requested for program management and system engineering activities to achieve Initial Investment Decision (IID). This funding is also required for the development of the Screening Information Request (SIR).

What Is This Program And Why Is It Necessary?

The Navigational Aids Monitoring Equipment (NME) program will deploy a single system solution to update the previously deployed Universal Interlock Controller (UIC) and Integrated Control and Monitoring System (ICMS) in the National Airspace System (NAS). The NavAids Monitoring Equipment program will provide consolidated monitoring and control of navigational aid equipment to air traffic control specialists and system maintainers by providing users the ability to change the state (e.g. on/off, brightness level) and monitor the status of navigational aid equipment using NME system displays. The NME system will interface to already existing systems on the airport such as instrument landing systems (ILS), runway visual range equipment (RVR), runway end identifier lights (REIL), precision approach path indicators (PAPI), and other airport lighting systems. The NME system will also be responsible for managing the interlocking functionality of the instrument landing systems to ensure that frequencies on the opposing ends of runways are not transmitted concurrently. Through consolidated monitoring using NME system displays, technical operations will be able to more efficiently monitor the state and condition of NavAids equipment.

The NME program is necessary to sustain the operations and to provide technological updates to the legacy control and monitoring systems (UIC/ICMS) located in the field since some of these systems were installed as early as 1999. The NME program will provide efficiencies by combining the control and monitoring functionality currently being provided by two systems into a singular solution with one common training and logistics support system. Preparation and approval of business case artifacts are essential to ensure stakeholder acceptance and justify FAA investment for the consolidated system.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$2,000,000 is required for program management and system engineering activities to achieve IID. This funding is also required for the development of the SIR.

What Benefits Will Be Provided To The American Public Through This Request?

The NME system development and deployment will maintain the safety and efficiency benefits of the legacy control and monitoring systems that are deployed in the National Airspace System (NAS). This will be achieved by combining the control and monitoring functionality currently being provided by two systems into a singular solution with one common training and logistics support system. The NME system will support the situational awareness of air traffic control specialists by providing a status and the ability to control the states of the many navigational aids that are used for arriving and departing aircraft. The NME system will provide the technological updates necessary to maintain the current levels of system availability and reliability for control and monitoring systems deployed today.

Detailed Justification for - 2E01 Fuel Storage Tank Replacement and Management

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Fuel Storage Tank Replacement and Management
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Fuel Storage Tank Replacement and Management	$14,500	$18,700	$22,700	+$4,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Modernize Fuel Systems with Current Generation Supportable Equipment	7	$1,376.6
b. Upgrade Fuel Systems to Meet Regulatory Standards	4	8,685.4
c. Replace Fuel Systems in Accordance with Lifecycle Guidelines	62	9,238.0
d. Engineering and Program Support	---	3,400.0
Total	73	$22,700.0

For FY 2017, $22,700,000 is requested to fund 114 tank unit replacements, modernizations, and upgrades at approximately 73 locations across the National Airspace System (NAS). Fuel systems at a given location may include multiple tank units.

Fuel Storage Tank (FST) Replacement and Management funding is utilized to acquire hardware and integration services in support of NAS operational requirements for bulk liquid storage. Tank system replacements are coordinated with engine generator sustainment actions under the Electrical Power Systems Program. The Fuel Storage Tank Replacement and Management program is one of the programs included in the ATC Sustainment Strategic Plan (SSP).

What Is This Program And Why Is It Necessary?

FST systems are fielded at facilities that cross every FAA line of business and all operational divisions. The majority of FAA FST systems support electrical generator operations that provide primary and emergency power supplies for key NAS facilities. The FST are also deployed to service bulk liquid storage requirements for lubricating oils, building heater and boiler system fuels, service vehicle fuels, liquid wastes, and similar NAS operational requirements. The FAA active tank system inventory includes over 3,800 units that must be continually sustained.

Operation of fuel storage systems is regulated under federal, state and local statutes with Federal Agency compliance mandated by Executive Order and specifically enumerated in federal statutes including the Clean Water Act (CWA), the Oil Pollution Act (OPA), and the Resource Conservation and Recovery Act (RCRA) among others. The FST program received a Final Investment Decision in June 2013.

The FST program operates to attain three primary objectives:

- Sustain NAS operational readiness - The NAS storage tank infrastructure is essential to enable Air Traffic Control (ATC) facilities to sustain capacity. A loss of integrity on any storage tank component can negatively affect the operational capacity of the supported systems and may ultimately result in a total

ATC facility outage. Additionally, the tank inventory must be updated and sustained to meet the changing bulk liquid storage requirements for all NAS services.

- Mitigate environmental damage and regulatory non-compliance associated with tank systems - Tank systems contain materials that may be considered hazardous or dangerous if they are released. Unintentional releases from tank systems failures increase risks to human health and damage the surrounding environment. The approved business case validated funding deficits for the FST program contribute to a growing fuel system related environmental remediation liability for the Agency exceeding $81 million that accrues at a rate of $14 million annually.
- Conduct effective in-service management and lifecycle replacement - Failure to properly manage in-service operation of fuel systems will result in fines, fees, and delivery restrictions for noncompliance. Tank systems that are not in compliance with federal, state, and local environmental authority regulations have both a short term ATC operational impact, fuel tanks servicing ATC facilities being prohibited from being refilled (i.e., "red-tagged") and unable to support the mission, and longer term fiscal impacts including fines on the FAA and unplanned retrofit costs which force emergency re-allocation of funds to attain regulatory compliance. As fuel tanks age beyond their lifecycle, there is an escalating risk of failure and associated leakage with attendant environmental damage.

The FST program interacts with and supports numerous internal and external organizations in sustaining bulk liquids storage requirements.

- The program office coordinates with internal stakeholders on FST systems fielded during integration of new systems (new control tower construction projects, NextGen system integrations)
- The program acts as the Subject Matter Expert repository for all FAA internal organizations and provides technical oversight, support, guidance and resources to the FAA Service Areas, Service Centers, District Offices, and Systems Support Center (SSC) for tank system construction, installation, operations, and removal
- The FST Program serves as the primary coordination point for FAA storage system construction, installation, removal, and operations with outside regulatory authorities/agencies (U.S. EPA, state programs, county and municipal governments, building code officials, fire protection officials, and airport operating authorities)

DOT Strategic Goal – Environmental Sustainability

- Reduction in transportation related pollution and impacts on ecosystems.

Why Do We Want/Need To Fund The Program At The Requested Level?

Executing an FST lifecycle sustainment program achieves the cost benefit of sustaining availability of the systems for NAS operations, reducing the risk of leaking FST systems, minimizing adverse impacts to personal and environmental safety, and preventing regulatory fines of up to $32,500 per day that may be assessed by the Environmental Protection Agency for failing to comply with regulatory standards for tank system installation, configuration, operation, and removal.

The funding request represents a manageable funding escalation to address the active equipment that exceeds service lifecycle or is not compliant with current regulatory standards and industry published best practices. The program office has the contracts and other supporting management tools in force to enable the funding to be obligated in accordance with the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan goals. The FST program implementation strategy and planning documents describe the processes and governance that the program office will employ to ensure allocated funding is managed effectively and efficiently.

What Benefits Will Be Provided To The American Public Through This Request?

Monthly tracking confirms fuel systems continually achieve minimum goal of 99.7 percent sustained operational availability. Operating modern, sustainable, and regulatory compliant fuel systems:

- Mitigate damage and associated costs from incidental release of hazardous, toxic, or dangerous materials
- Assure the travelling public and aviation stakeholders experience reliable and safe transit
- Reduce potential for fines, fees, and other penalties levied by the regulator community and born by realignment of funding

Detailed Justification for- 2E02 Unstaffed Infrastructure Sustainment (UIS) Program

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Unstaffed Infrastructure Sustainment
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Unstaffed Infrastructure Sustainment	$30,300	$39,640	$40,490	+$850

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Unstaffed Infrastructure Sustainment	150	$38,190.0
B. In-Service Engineering	---	2,300.0
Total	Various	$40,490.0

Unstaffed Infrastructure Sustainment (UIS) is one of the programs included in the FAA's Air Traffic Control (ATC) Facilities Sustainment Strategic Plan. The FY 2017 request includes a substantial increase of funding for this program and shows the FAA's commitment to sustaining the infrastructure for nearly 36,000 structures and reducing the current maintenance backlog. The funding will allow the FAA to convert the program's current reactionary model to a proactive enterprise portfolio management system that prioritizes component sustainment activities against the impact to overall NAS operations.

For FY 2017, $38,190,000 is requested to sustain approximately 150 unstaffed infrastructure projects located in all three service areas for communication, navigation, surveillance, weather, and support services. In addition, $2,300,000 is requested to support in-service engineering activities.

The sustainment projects include upgrades, modernization, refurbishment, and replacement of NAS antenna and equipment towers; heating, ventilating, and air conditioning (HVAC) equipment; buildings; shelters; roofs; electrical panels and distribution wiring; locks and alarm sensors and lighting; access roads; grounds; and fencing. Infrastructure improvements will protect electronic equipment and ensure reliable delivery of air traffic services.

What Is This Program And Why Is It Necessary?

The FAA owns thousands of buildings, broadcast towers, and poles whose sole purpose is to protect and support the NAS communications, surveillance, weather, and navigation aids. These structures are failing. They suffer from leaking roofs, deteriorated foundations, inadequate air conditioning systems and electrical systems, and severely corroded guy wires and anchors. A majority of these 36,000-plus structures were built during the 1940s and 1950s and are beyond their expected service life.

The UIS program sustains infrastructure supporting the NAS to enable the delivery of NAS-systems-required availability. NAS sustainment includes major repairs to and replacement of real property and structures that are normally not staffed. Sustainment of the unstaffed infrastructure includes:

- Major repair, refurbishment, and replacement of NAS antenna and equipment towers, which provide a safe climbing environment for FAA employees.

- Major repair and replacement of buildings, shelters, roofs, HVAC equipment, electrical panels and distribution wiring, locks and alarm sensors and lighting, access roads, grounds, and fencing.

The deferred maintenance backlog for these facilities is currently estimated at $446 million. A substantial deferred maintenance backlog increases the risk for operational service failures and premature air traffic control equipment replacement. Additionally, the growing deferred maintenance negatively impacts the agency's ability to use existing infrastructure required to support NextGen initiatives and other deployments.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

Funding the UIS program at the required level would decrease the level of deferred maintenance and to NAS system outages at core airports. The requested funding and will support critical infrastructure projects that include the following:

- HVAC replacement at airport surveillance radar (ASR) facilities
- NAS equipment shelter replacements at several locations
- Communication tower replacement and repair at several locations

What Benefits Will Be Provided To The American Public Through This Request?

As a result of the continued sustainment at the unstaffed infrastructure facilities that house the NAS equipment, NAS outages have decreased at core airports.

The UIS program supports greater capacity by providing major repairs/replacements 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.

The benefits of increased funding to the UIS program will be:

- Improved availability of air traffic control (ATC) services as a direct result of building improvements (e.g., HVAC replacement and electrical system upgrades) that provide a safe and optimum operating environment for electronic systems
- Extended operational service life of NAS remote facilities that house and protect valuable systems and equipment
- A safe and secure work environment for the Air Traffic Organization (ATO) technical operations personnel that is free from safety hazards
- Identification of opportunities for consolidation, modification, or reuse of existing assets in alignment with NextGen implementation requirements

Detailed Justification for - 2E03 Aircraft Related Equipment Program (ARE)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aircraft Related Equipment Program (ARE)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aircraft Related Equipment Program (ARE)	$9,000	$9,000	$13,000	+$4,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Flight Inspection (FI) Flight Program	---	$10,000.0
B. Flight Simulation Testing and Research Technologies (START)	---	3,000.0
Total	Various	$13,000.0

A. FI Flight Program

For FY 2017, $10,000,000 is requested for ongoing modifications/upgrades to FAA's FI aircraft, avionics, and mission equipment as follows:

- $6,500,000 for the Beechcraft 300 and Challenger aircraft modifications
- Beech 300 Aircraft - Install Pro Line 21 avionics suite, install enhanced vision system, complete interior modifications, and apply exterior paint
- Challenger 604/605 Aircraft - Acquire and install avionics upgrades that include communication, navigation, and surveillance systems in order to comply with European Union and U.S. airspace requirements
- $2,650,000 to sustain the current Automatic Flight Inspection System (AFIS) by enhancing the Flight Operations Management System (FOMS) that is integrated with airborne systems and continue other legacy system upgrades
- $850,000 to begin installation of the next generation of AFIS (Phase 1) by replacing the legacy camera with a high definition digital camera, installing a new graphical user interface, removing the hard copy printer, and replacing the Miltope computer with a Jetlan computer

B. Flight Simulation Testing and Research Technologies (START)

For FY 2017, $3,000,000 is requested for Flight START:

- $800,000 to purchase and install the latest industry standard Aircraft Flight Data update for the A320 Flight Package
- $2,000,00 to purchase and install the upgraded Input/Output (I/O) Interface including a new host computer for the Airbus simulator
- $200,000 to purchase spare parts for the I/O Interface and the host computer

What Is This Program And Why Is It Necessary?

A. Flight Inspection (FI) Flight Program

The FAA's flight inspection mission ensures FAA navigational systems, facilities, and tools are sound and operating according to specifications. The Agency is also responsible for Department of Defense (DOD) worldwide flight inspection requirements. The mission requires aircraft equipped with specialized test equipment and systems. The organization currently operates 31 FAA-owned aircraft (18-Beechcraft 300; 6-Learjet 60; 6-Challenger 600 series; and 1-Gulfstream IV).

The ARE Program, provides for the physical and technical updates to existing aircraft, avionics, and FI mission equipment. The program not only provides for expanded capability across the aircraft fleet, but expands the useful life of the aircraft, avionics, and mission equipment from 20 years to more than 30 years.

ARE projects fall under one of three categories:

- Aircraft Modernization: Projects support avionics technology refresh and new or changing regulatory requirements for operating aircraft in domestic and international airspace
- Flight Inspection System Sustainment: Projects support mission equipment technology refresh and new or changing regulatory requirements necessary to continue flight inspection of legacy National Air Space (NAS) systems
- Flight Inspection System Modernization: Projects support new mission equipment requirements and new or changing regulatory requirements necessary to provide flight inspection of Performance Based Navigation (PBN) and implementation of evolving NextGen systems

<u>Legacy Interdependencies</u>:

- Instrument Landing System (ILS)
- Visual Glideslope Indicator (VGSI)
- Very High Frequency Omni-Directional Range Station and/or Tactical Air Navigation (VORTAC)
- Distance Measuring Equipment (DME)
- Non-Directional Beacon (NDB)
- Global Positioning System (GPS)
- Air Traffic Primary and Secondary Radar Systems

<u>NextGen Interdependencies</u>:

- Standalone Distance Measuring Equipment (DME)
- Performance Based Navigation (PBN)
    - Required Navigation Performance (RNP)
    - Area Navigation (RNAV) Routes
    - RNAV Standard Instrument Departure (SID)
    - RNAV Standard Terminal Arrival Route (STAR)
- Augmentation System Navigation
    - Space Based (SBAS) – Wide Area Augmentation System (WAAS), Lateral Precision with Vertical (LPV) Guidance
    - Ground Based (GBAS) – Local Area Augmentation System (LAAS), GNSS Landing Systems (GLS)
- Surveillance Systems
    - Automatic Dependent Surveillance Broadcast (ADS-B)
    - Wide Area Multilateration (WAM)
    - Airport Surface Detection Equipment Model-X (ASDE-X)

B. Flight Simulation Testing and Research Technologies (START)

The next generation of Flight Simulation Testing and Research Technologies Program is a follow-on technology refresh to the Boeing 737-800 and the Airbus 330/340 Simulator. Flight START will integrate requirements for life cycle sustainment of the existing Flight Simulators and includes the development, design, and implementation of future technologies that will improve aviation safety. The FAA has regulatory authority for approving special instrument approach procedures and the introduction of new concepts and technologies for aircraft navigation. The upgrade of the simulators will enable FAA to analyze and test the viability of these new concepts and procedures for use in the NAS and develop the appropriate regulations regarding their use.

Flight Standards is currently using a Boeing narrow-body and an Airbus wide-body FBW simulator. Both are 6-axis, full flight aircraft simulators that are configurable to the performance and handling characteristics of a narrow-body aircraft with two jet engines (Boeing 737) or a wide-body aircraft with two/four jet engines (Airbus 330/340), utilizing electronic FBW flight control technologies. The Flight START Program will enable the continued technology refresh of the Airbus 320 Flight Package, existing A330/A340 simulator, and Boeing 737. The A330/A340 simulator, with side-stick control, complements the narrow-body Boeing 737-800 next generation 6-axis full flight aircraft simulator in performing realistic, high fidelity operational evaluation activities and supporting vital research and development projects such as Closely Spaced Parallel Operations, Required Navigation Performance, and Human-in-the-Loop (HITL) pilot/controller/aircraft terminal operations performance during introduction of new NextGen technology initiatives, NAS modernization, and National Transportation Safety Board (NTSB) safety initiatives.

Currently, there are no other FAA organic simulation platforms to test these advanced NextGen technologies and the Human Factors related issues. The FAA's Level D full flight simulation capabilities provide high fidelity platforms that test all operational parameters. With this capability the FAA can modify the computer code of the simulators to adjust for these new technologies. This ability is not allowed at outside commercial facilities as it would decertify their simulators.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. Flight Inspection (FI) Flight Program

$10,000,000 is required to continue the program's heavily integrated multi-year, multi-project, and multi-phased project plans. There are modification deadlines that must be met in order for aircraft to operate in the evolving international environment. These Flight Inspection aircraft ensure the safe operation of over 5,000 NAVAIDS, the periodic re-certification of over 21,000 Instrument Flight Procedures (IFPs), and up to 2,800 new and amended IFPs annually, not to mention FAA's responsibility to DOD overseas.

B. Flight Simulation Testing and Research Technologies (START)

$3,000,000 is required for technology refresh enhancements of FAA simulators. It will also provide simulation realism and high fidelity capability for Human-in-the-Loop data across all aviation safety areas. Furthermore, it will provide human factor evaluations of cockpit issues related to work load, operating procedures, and shared Air Traffic Management (ATM) responsibilities.

Technology refresh of the simulators is necessary to keep pace with the changing and expanding commercial airline fleet and will enable the FAA to conduct high fidelity operational procedures and concept development and Research, Engineering and Development (RE&D) programs on emerging technologies to ensure continued worldwide leadership in aviation safety.

What Benefits Will Be Provided To The American Public Through This Request?

A. Flight Inspection (FI) Flight Program

Flight Inspection is a key component of FAA's safety and increased capacity initiatives and evolving the NAS into a performance-based system. A performance-based NAS allows civil aircraft to navigate airspace more safely and with greater flexibility than the current ground-based system. Performance-based initiatives will be achieved through implementation of RNP, RNAV, in addition to the GBAS and the SBAS. To meet these safety and greater capacity objectives, the FI aircraft fleet must be updated to continue to certify an expanding number of RNAV RNP, GBAS, and SBAS approaches at the lowest possible cost.

Flight Inspection is the FAA's quality assurance program to verify that NAVAIDS and IFPs conform to prescribed standards and provide accurate guidance to all users. Flight inspection identifies discrepancies that are repaired before they cause delays and diversions of aircraft. In FY 2014 a total of 17,332 flight inspections were conducted. Of the 5,998 periodic NAVAID inspections, 318 had reportable discrepancies or a 5.3 percent discrepancy rate. In the same period 3,238 new and amended IFP inspections were flown. Of those, 527 were found unsatisfactory or required correction, or a 16.3 percent discrepancy rate. These inspections avoided potentially unsafe IFPs from being published. Another 8,096 inspections were accomplished for installation, restoration and optimization of navigation systems.

B. Flight Simulation Testing and Research Technologies (START)

The Flight START simulators improve air safety by providing the FAA with the capability to conduct operational evaluations on the impact of introducing new technologies and integrating advanced systems within the NAS. The simulators can also be connected via a high level architecture with an air traffic control lab to support on-going and future research and development projects providing regulators with analysis data to ensure safe implementation of new technologies. The aircraft simulators will improve safety by providing accident investigators, other inspectors, and analysts with capability to replicate incident and trend data for analysis and potential input into procedure and/or equipment modifications.

Detailed Justification for - 2E04 Airport Cable Loop Systems – Sustained Support

What Is The Request And What Funds Are Current Spent On The Program?

FY 2017 – Airport Cable Loop Systems – Sustained Support
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Airport Cable Loop Systems – Sustained Support	$5,000	$12,000	$8,000	-$4,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Site Engineering and Fiber Optic Installation	6	$7,150.0
b. Program Management	---	750.0
c. Engineering Support/Design/Documentation	6	100.0
Total	Various	$8,000.0

For FY 2017, $8,000,000 is requested for advanced engineering, construction activities, and Fiber Optic Transmission Systems (FOTS) equipment installations for Denver (DEN), Ft. Lauderdale (FLL), Anchorage (ANC) and Oakland (OAK). Funding will allow completion of reconfiguration and electronics installations at Ontario (ONT). Funding will also enable the program to start engineering, planning and installation activities at Houston (IAH). Funding will allow the program to start and complete four smaller scale projects (regionals) that will be determined at the Air Ground Integrated Requirements Team (AGIRT) meeting in FY 2017.

What Is This Program And Why Is It Necessary?

The program replaces existing on-airport, copper-based, signal/control cable lines that have deteriorated. The primary focus will be on projects at airports with high traffic counts and enplanements. The obsolete underground telecommunications cable infrastructure systems are vulnerable to failure and have caused flight delays related to these cable outages. These lines feed airport surveillance radar, air/ground communications, and landing systems data and information to the Air Traffic Control Tower (ATCT), and operational and maintenance information to FAA-staffed facilities. Where cost effective, the program will install fiber optic cable in a ring configuration to provide communications diversity. The ring configuration allows information to flow from either side if there is a break in the cable. The program takes advantage of opportunities to save cost by coordinating projects with major construction projects (e.g. tower relocations and runway projects).

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$8,000,000 is required to ensure the ability of the FAA to improve, sustain and/or upgrade the communications infrastructure at airports across the nation. As mentioned above, many critical systems at airports are endangered because of the condition of the underground cable (either copper or aged multimode fiber) supporting these systems. Many of the control/signal cables serving key airport facilities are 25 to 50 years old, exceeding expected service life, and are badly deteriorated. The requested level allows the FAA to invest in infrastructure upgrades at all the required areas. This protects the NAS from becoming vulnerable to potential catastrophic failures due to aging, unsupportable, and obsolete infrastructure. Investing in the infrastructure now will result not only in increased capacity at present but also substantial cost savings in future years.

What Benefits Will Be Provided To The American Public Through This Request?

The cable loop program increases capacity by reducing or eliminating communications cable related outages. The program also supports the goal of increased on-airport safety by reducing or eliminating runway incursions. System reliability and safety are enhanced due to increased system performance from diverse paths provided by the airport cable loop ring configurations. Standardizing installation configurations and fiber optic equipment will simplify logistics, configuration management, training, procurement, and depot support.

The FAA can realize savings in costs, resources, and time. Using fiber optic cable instead of copper reduces the possibilities of interference and impedance faced by deteriorated copper wire currently in use. Fiber optic cable is impervious to extremes in weather, lightning strikes, electromagnetic pulses, and electromagnetic interference. By using fiber optic cable and equipment, known as FOTS, the agency will be assured of bandwidth and capacity to serve future requirements.

The program measures the delays associated with cable outages on airports and analyzes them from previous years to determine success in trying to reduce delays by two percent a year, on average. The impact of one project may not be seen immediately as a typical project takes 2.5 - 4 years to complete. FAA is presently reducing cable related outages for Core Focus Airport airports by 3.42 percent averaged annually based on the original data record from 1998 of 128 delays.

Detailed Justification for - 2E05 Alaskan Satellite Telecommunications Infrastructure (ASTI)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Alaskan Satellite Telecommunications Infrastructure (ASTI)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Alaskan Satellite Telecommunications Infrastructure (ASTI)	$11,400	$12,500	$6,000	-$6,500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Implementation (Replace/Upgrade Modems, Multiplexers, Switches, Radio Equipment, Install and Test Network Management Hardware and Software)	64	$4,500.0
b. Engineering, Technical and Program Support	---	1,500.0
Total	Various	$6,000.0

For FY 2017, $6,000,000 is requested to complete the Alaskan Satellite Telecommunications Infrastructure (ASTI) Modernization effort. The strategy to execute the implementation phase of the program currently has post Key Site installations starting in FY 2017 and continuing into the beginning of FY 2019. This funding will facilitate completion of the modernization effort, testing activities, engineering and integration, and will support the execution of a revised implementation schedule with the goal of completing the final site installation in 2019.

What Is This Program And Why Is It Necessary?

The Alaskan Satellite Telecommunications Infrastructure (ASTI) is a FAA-owned satellite based network that provides 90 percent of the inter-facility communications required by the FAA in Alaska to support air traffic control operations. The ASTI network topology consists of hub earth stations, remote earth stations, leased transponder space segment, and a Network Operations Control Center (NOCC). ASTI uses primary and alternate satellites to provide service diversity. The remote earth stations are linked to their respective hubs and the NOCC through leased transponders providing Alaska with critical, essential and routine air traffic control telecommunications services such as:

- Remote Control Air Ground (RCAG) and Remote Communications Outlets (RCOs) 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)
- Wide Area Augmentation System (WAAS) Reference Station
- Automatic Dependent Surveillance-Broadcast (ADS-B)

The ASTI Technology Modernization is an ongoing program that replaces/upgrades system components originally deployed in the 1990s as part of the Alaskan NAS Interfacility Communications System (ANICS). The ASTI Technology Modernization program will improve system availability, reduce the frequency of system alarms and outages, reduce the level of FAA maintenance, provide satellite bandwidth savings, and improve life cycle support including training, second level engineering support, radome maintenance and depot level supply support.

The ASTI Technology Modernization program provides for the replacement and upgrade of vital system components due to aging and obsolescence and implements improved Support Services. ASTI is needed to address the current system deficiencies:

- Availability has fallen significantly below 0.9999 (for critical services) and 0.999 (for essential and routine services) and continues to decline
- Crucial system components are no longer supportable for required system operations
- Environmental destruction of system components
- Lack of support infrastructure for training, second level engineering support, radome maintenance, and logistics

The ASTI technology modernization effort will increase system availability to required levels. ASTI will improve and sustain the availability of the infrastructure and reduce future operations and maintenance costs. Additional qualitative benefits include:

- Improved training for FAA technicians and other operations personnel
- Improved second level engineering support
- Improved logistics support system
- Improved radome maintenance
- Modern and flexible system to support emerging NAS requirements
- Improved Information Systems Security (ISS)

Additionally, the current system, ANICS, has experienced increased outages and failures.

DOT Strategic Goal - Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$6,000,000 is required to facilitate completion of the Alaskan Satellite Telecommunication Infrastructure (ASTI) modernization effort and achieve system-wide component replacements/upgrades at 64 locations (including four hubs). The most serious concern surrounds a potential failure at one of the hubs. If the Anchorage Air Route Traffic Control Center (ARTCC) hub converters fail, 50 of 52 RCAGS at the ARTCC would not be available, leaving the ARTCC without air-to-ground communications.

The program is in the process of developing and implementing a revised detailed activity-based schedule that slates the majority of the implementation work to be completed in FY 2018. The FY 2017 required funding level allows the continuation of implementation of the system-wide upgrades and the completion of the final milestone installation at majority of the remaining ASTI sites.

What Benefits Will Be Provided To The American Public Through This Request?

The ASTI network is an integral part of the communications infrastructure in Alaska and ensures vital communication operations are available to controllers and pilots. Modernization is critical to continue the availability of a safe and reliable Air Traffic Control System in Alaska. It will sustain and improve the reliability of the network that connects air traffic controllers to the radios and sensors that provide the ability to see and communicate with all aircraft within the Alaska Air Space.

Detailed Justification for - 2E06 Facilities Decommissioning

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Facilities Decommissioning
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Facilities Decommissioning	$5,700	$6,000	$6,200	+$200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Facility Disposition	74	$6,200.0

For FY 2017, $6,200,000 is requested to fund the final disposition of decommissioned infrastructures and associated property restorations, conducting Environmental Due Diligence Audits (EDDAs), and investigating required work as listed below:

- Final disposition of decommissioned infrastructures and property restorations, meeting all applicable laws, including, but not limited to: the appropriate removal and disposal of hazardous materials; appropriate disposal of debris, evaluation of impact upon cultural preservation, historic preservation, wetlands, natural resource protection issues
- Conducting Phase I EDDA reports for government owned properties, as required by the General Services Administration (GSA), and other applicable laws
- Investigating and documenting the structures to be removed at each site and associated restoration

What Is This Program And Why Is It Necessary?

The June 2005 Government Accounting Office report "Air Traffic Operations, the Federal Aviation Administration Needs to Address Major Air Traffic Operating Cost Control Challenges," states that FAA needs to expand its efforts to cut operational costs to address an expected gap between budget forecasts and expenses. The report recommends accelerating decommissioning of ground-based navigational aids.

In recent years, FAA has decommissioned many redundant or underused facilities. Funding was identified in FY 2007 to begin the divestiture (including environmental testing, infrastructure demolition, and property restoration) of these facilities. In addition, under the NextGen program, FAA plans to decommission entire classes of facilities such as Non-Directional Beacons and Remote Communications facilities.

This program is necessary to complete the life-cycle of the decommissioned facilities. The program results in the final disposition of decommissioned buildings, access roads and other real property. This program provides the expertise and oversight to enable all discontinued FAA facilities to be handled in a comprehensive and systematic approach. The future NextGen facilities will require disposition of legacy systems in order to meet the cost benefit analysis derived from facility disposal. The program has the structure in place to provide for those needs.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want / Need To Fund The Program At The Requested Level?

$6,200,000 is required to fund the final disposition of decommissioned infrastructures and associated property restorations, conducting EDDAs, and to investigate other required work. The work this funding level will support is approximately 74 projects. The current backlog of inventory is projected to increase every year due to the discontinuance of ground based NAS facilities.

What Benefits Will Be Provided To The American Public Through This Request?

This program has experienced great success since FY 2005. Funded work results in the release of decommissioned real property from FAA inventory and associated cost avoidance of: property lease fees, property maintenance fees (e.g., grass cutting, snow removal), utility fees and communications frequency fees. There are also monetary gains for the US government in the sale by GSA of FAA property no longer needed. Between FY 2008 through FY 2013, the Facility Decommissioning Program disposed of 950 sites at a 10 year cost avoidance of $38,400,000.

Detailed Justification for - 2E07 Electrical Power System – Sustain/Support

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Electrical Power System – Sustain/Support
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Electrical Power System – Sustain/Support	$82,701	$125,000	$105,000	-$20,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Location/ Quantity	Estimated Cost ($000)
a. National Airspace System (NAS) Battery Set Replacement	76	$6,000.0
b. Power Conditioning System (PCS)/Uninterruptible Power Supply (UPS)	28	8,000.0
c. Direct Current Backup Systems (DC BUS)	25	4,300.0
d. Air Route Traffic Control Center (ARTCC) Critical and Essential Power System (ACEPS)	2	28,400.0
e. Lightning Protection, Grounding, Bonding and Shielding (LPGBS) Elements	5	2,600.0
f. Electrical Line Distribution (ELD) Replacements	6	16,400.0
g. Engine Generators Replacements	89	16,700.0
h. Critical Power Distribution System (CPDS) Elements	2	1,100.0
i. Alternative Energy Systems (AES) Elements	5	500.0
j. Environmental Remote Monitoring System (ERMS) Elements	70	1,000.0
k. Program Management and System Engineering		20,000.0
Total	Various	$105,000.0

For FY 2017, $105,000,000 is requested to accomplish the following:

The Electrical Power Systems – Sustain/Support (PS3) program will use the requested resources to provide quality electrical power that is reliable and available to meet National Airspace (NAS) requirements. The PS3 program directly impacts all NAS service areas having air traffic control (ATC) equipment and responsibilities. The requested resources, will replace, refurbish and renew components of existing prime power equipment, backup power equipment, and electrical power cable infrastructure as identified in the activity tasks above.

The power components are located at the 300 top airports, large terminal facilities, and Air Route Traffic Control Centers (ARTCC). Ninety-two percent of NAS services are provided by NAS equipment at these sites. Projects will be prioritized to provide the maximum risk reduction for a loss of NAS service. Resources will be used to assure backup power is available to the NAS; wherein, backup power equipment provides an average of 40 hours of uninterrupted operation each year to every system in the NAS. That is, each NAS system would fail to provide any service for a total of 40 hours per year without access to backup power. The backup power equipment also protects sensitive electronic equipment from commercial power surges and fluctuations.

Funding will enable PS3 to reduce the large backlogs of deteriorating power cables and engine generators that have been identified as systemic problems within the NAS by the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan (SSP). The SSP calls for consistent annual funding to steadily reduce these issues and increase NAS reliability. Project unit costs vary each year because of site specific installation costs for the power equipment at the different sites. The various costs may include: additional equipment needed for installation, site configuration or the installation method (FAA engineer or vendor supplied engineer).

The Electrical Power Systems – Sustain/Support (PS3) program funding profile exists through FY 2018. The program is preparing for a Financial Investment Decision (FID) in the May 2016 timeframe. The program is requesting a 10 year extension as a Variable Quantity (VQ) baseline.

The 11 electrical power programs that comprise PS3 are detailed below. The program management and systems engineering element that supports PS3 activity is included.

a. 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 ARTCC Critical and Essential Power System (ACEPS) and GNAS battery installations with periodic five to seven year replacements to assure reliability.

b. The Power Conditioning System (PCS)/Uninterruptible Power Supply (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 that have an expected useful life of 20 years. The PCS/UPS inventory requires replacement due to reliability and supportability issues attributable to age. The average age of PCS/UPS is approximately 14 years old.

c. A Direct Current Backup System (DC BUS) stores power in batteries, providing a low cost, short term power source at facilities with a limited amount 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 systems with a useful life of up to 20 years. DCBUS average approximately 14 years old, but 40 percent of the DC BUS units that are currently in service are obsolete, meaning no new parts can be ordered to service them. PS3 must replace the older units with new, serviceable units.

d. Air Route Traffic Control Center (ARTCC) Critical and Essential Power System (ACEPS) provides high quality and reliable power to the en route and large terminal control centers . The FAA operates ACEPS at 21 ARTCCs, two Combined Control Facilities (CCF) and three large Terminal Radar Approach Control (TRACON) facilities. ACEPS is comprised of engine generators, switchgear, and UPS systems. PS3 sustains ACEPS where the engine generators have a useful life of 24 years and other components have useful lives that range from seven to 20 years. The average age of the FAA's ARTCC generators is 53 years.

e. The Lightning Protection, Grounding, Bonding and Shielding (LPGBS) replaces, sustains and optimizes elements to minimize electrical hazards to personnel and 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. Lightning protection components at approximately 70 percent of the FAA's facilities have exceeded their useful life of 25 years.

f. Electrical Line Distribution (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 ELD components that have exceeded their useful life of 25 years.

g. 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. Over 58 percent of the engine generators in the NAS have exceeded their useful life.

h. The Critical Power Distribution System (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.

i. Alternative Energy Systems (AES) activities integrate 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 the goals of Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, 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.

j. Environmental Remote Monitoring System (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 information provides the FAA with real time data on the status of the systems which allows a response to system related issues.

k. Program management and system engineering provides support for design and management for sustaining electrical power systems in the NAS. Systems engineering within the Power Services Group (PSG) 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. Identifying options for, preparing drawings of, installing, and administering training and test facilities are included in this effort.

What Is This Program And Why Is It Necessary?

PS3 is an infrastructure sustain and renewal program. Other NAS programs fund the initial purchase and installation of components for backup power systems and power regulation and protection equipment. After new equipment/facilities have been commissioned, the power program replaces, refurbishes and renews components of their emergency power system and cable infrastructure when necessary to maintain and improve the overall electrical power quality, reliability, and availability.

PS3 program funds the purchase and installation of components to sustain the $4.2 billion NAS electrical power infrastructure. The PS3 program is vital to both maintaining and increasing NAS capacity by sustaining the reliability and availability of NAS equipment. Without reliable NAS power systems, electronics cannot deliver their required availability. Commercial power disruption results in flights being kept on the ground, placed in airborne holding patterns, or being re-routed to other airports. The PS3 program also prevents expensive damage to ATC electronic equipment. These actions avoid system and equipment failures that result in costly delays. For instance, over a four day period during Superstorm Sandy in October/November 2012, commercial power failed or was only intermittently available at four ARTCCs and one large TRACON. These unreliable commercial power conditions would have resulted in a loss of NAS services at these facilities if the PS3 program had not provided back-up services.

The ELDs (i.e. power cable and associated components) at the nation's top 300 airports are essential to the operation of air traffic and constitute $1.6 billion of the NAS electrical power infrastructure. Fifty-seven percent of the cable is beyond its useful life resulting in a cable replacement backlog of approximately $900 million. PS3 verified the backlog costs by conducting site surveys to determine what facilities are FAA or airport-owned, the linear footage of the power cable that PS3 maintains, and the cost per foot. FAA is seeing the results of this aging process through an increasing number of electrical failures or systems in imminent danger of failure, such as the cable failures that occurred at Charlotte Douglas Airport and Philadelphia International Airport. Also, operational risks are increasing for 2,200 NAS buildings and shelters that rely solely on utility power provided by FAA ELD installations. These have no backup electrical generators or batteries; they represent 34 percent of all NAS buildings receiving utility power. The operational risk of the NAS is rising since the number of ELD-related incidents is increasing at a rate of about five percent a year.

Engine generators supply electrical power to about 60 percent of the FAA's GNAS facilities during loss of normal commercial utility-supplied power. When commercial power outages occur, the engine generators keep air traffic operations available and reliable. Engine generators are becoming more important since commercial power failures are increasing according to industry sources. However, engine generator support is at risk. One-quarter of the FAA's total inventory of engine generators is more than 40 years old and over 40 percent are beyond their 24-year useful life. The FAA has an engine generator replacement backlog of

$697 million. PS3 has conducted an analysis to determine the portfolio of NAS engine generators and used that analysis as the basis for the estimate.

The PSG LPGBS Program replaces existing LPGBS components at NAS facilities. Replacing LPGBS components supports the optimum operation of NAS electronic equipment and augments electrical safety in the NAS work place. As a result of an air traffic controller receiving a shock from NAS electronic equipment in an air traffic control tower (ATCT) from a lightning strike, the LPGBS program surveyed and evaluated the quality of the lightning protection installations at more than 60 ATCTs. Annual projects are assigned based on the risk to employee safety and impact to the NAS. The backlog of replacing LPGBS components at the top 300 airports in the NAS is estimated at $222 million; however, the PSG is continuing to evaluate the estimate.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The PS3 program is vital to both maintaining and increasing NAS capacity by sustaining the reliability and availability of NAS equipment. These actions avoid power disruptions to NAS equipment that result in costly delays. The program replaces deteriorating equipment and decreases the rate of FAA operations activity needed to keep the electrical power equipment working. Although the rate of battery replacements will remain about the same, replacements of aging engine generators and power cable (ELD activity) will be increased in FY 2017. Work on improving employee safety regarding arc flash and lightning protection is ongoing and replacement of ACEPS equipment continues to ensure continued operations of critical and essential ARTCC systems.

What Benefits Will Be Provided To The American Public Through This Request?

The PS3 program goal is to sustain an adjusted operational availability of 99.7 percent for the reportable facilities that support the nation's busiest airports through FY 2018. PS3 program efficiently and effectively achieves its goal using responsible program management techniques and complies with the Environmental and Occupational Safety and Health (EOSH) requirements by reducing arc flash hazard to employees.

Detailed Justification for - 2E08 Energy Management and Compliance (EMC)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Energy Management and Compliance (EMC)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Energy Management and Compliance (EMC)	$1,000	$2,000	$2,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Energy Management and Compliance (EMC)	---	$2,000.0

For FY 2017, $2,000,000 is requested to achieve cost savings by installing advanced electric meters, monitoring energy and water consumption, and developing cost-effective recommendations to reduce energy and water use, implementing energy and water efficiency projects, and tracking and reporting on energy usage. Requested funding will support the following projects:

- Install one advanced electric meter at a select covered facility
- Perform energy and water improvements at three covered facilities
- Perform high performance sustainable building (HPSB) infrastructure upgrades at two covered facilities
- Provide required quarterly and annual reports on progress against legislative and executive order mandates to the Department of Energy (DOE) and the Office of Management and Budget (OMB)

A national energy management program is critical to ensuring that the FAA's Air Traffic Organization (ATO) has a single point of reference for technical expertise and analytical capabilities and is making the best use of the investment dollars by centrally identifying the best opportunities for the greatest return on efficiencies.

What Is This Program And Why Is It Necessary?

The EMC program centrally orchestrates cost-effective reductions of energy and water use at ATO facilities 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 but will also increase reliability of the National Airspace System (NAS) by reducing the likelihood of facility outages and disruptions that can be caused by out-of-service building systems. The EMC program promotes energy and water-use efficiency and the use of off-grid power and non-polluting energy sources for all activities and acquisitions.

The EMC program focuses on six specific capability areas:

- 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
- Implementing energy and water efficiency projects at targeted sites to improve performance, including infrastructure improvements with the greatest cost-to-benefit ratios and shortest payback periods in accordance with the Energy Policy Act of 2005 (EPAct)

- Increasing the number of high-performance sustainable buildings in the FAA portfolio by implementing targeted infrastructure improvements at selected large staffed facilities in compliance with Executive Order 13693
- Improving building operating performance by designating trained energy managers for the highest energy-using facilities to monitor energy and water consumption and develop cost-effective recommendations to reduce energy and water use
- Overseeing the development and implementation of performance based contracts to maximize third party investment in ATO infrastructure
- Benchmarking performance and documenting progress by completing quarterly and annual data call reports mandated by executive orders and legislative statutes

The EMC program is necessary to provide a coordinated approach for identifying and implementing cost-effective investments in the FAA infrastructure to reduce ongoing utility expenses. The FAA spends approximately $100 million every year in electricity alone, and for the past 10 years, expenditures in electricity have been increasing by an average of three percent per year. Without proactive investment in energy-efficient infrastructure, the FAA can expect utility costs to continue to climb, thereby impacting the agency's operations budget.

The EMC program also demonstrates a concerted effort toward meeting executive and legislative mandates for federal agencies on energy and water use reductions, greenhouse gas emissions, and sustainability. These requirements are highly visible since the FAA must report quarterly to the DOT and annually to the OMB on progress. The federal mandates include but are not limited to the following:

- Energy use: reduce by 2.5 percent annually from the 2015 baseline by 2025
- Greenhouse gas emissions: decrease by 12.3 percent from the 2008 baseline by 2025
- Water use: reduce by 36 percent from the 2007 baseline by 2025
- Renewable energy: increase to 25 percent of the total usage by 2025
- Sustainable buildings: 15 percent of inventory by 2025, eventual goal 100 percent

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

At the required funding level, the EMC program will be able to achieve measurable cost savings by installing advanced electric meters, monitoring energy and water consumption and developing cost-effective recommendations to reduce energy and water use**,** and implementing energy and water efficiency projects. These activities will demonstrate progress against energy and sustainability mandates, including the following:

- The National Energy Conservation Policy Act
- The EPAct
- The Energy Independence and Security Act of 2007 (EISA)
- Executive Order 13693
- The DOT/FAA Strategic Sustainability Performance Plan (SSPP)

The EMC program has identified 615 facilities that comprise 75 percent of the ATO's energy usage. The mandates of EPAct and EISA specify that the agency identify and implement recommended energy and water improvements to reduce utility usage and associated costs at all of these facilities. The EMC program has already initially identified more than $36,000,000 in recommended improvements to lower energy usage at ATO facilities, many of which would pay back in fewer than 10 years.

What Benefits Will Be Provided To The American Public Through This Request?

The EMC program has the potential to reduce electrical costs annually by approximately 2.5 percent at facilities where advanced meters are installed, 12 – 13 percent at facilities where energy improvements are performed, and 14 percent at facilities where HPSB upgrades are performed. These estimates are derived from a business case that estimated costs and benefits of executing EMC program improvements, and include results of sample energy and water audits conducted at approximately 16 FAA facilities of various types from 2010 to 2012. To verify achievement of reductions in utility usage and costs, the EMC program will monitor and report on energy and water usage at the facilities where improvements have been implemented.

Detailed Justification for - 2E09 Child Care Center Sustainment

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Child Care Center Sustainment
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Child Care Center Sustainment	$0	$1,600	$1,000	-$600

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Child Care Center Sustainment	---	$1,000.0

For FY 2017, $1,000,000 is requested to improve the condition of Child Care Centers (Centers) that are located at FAA facilities. FAA will utilize the funding to sustain the facility components at the Child Care Centers that are approaching end of life cycle and in turn reduce the risk to building occupants from the potential failure of critical building components. This funding will be used to modernize the 13 FAA Operated Centers that are in need of major projects and other expenses unique to a child care center (e.g. kitchen, children size restrooms). The fund would not be used to procure daycare supplies (e.g. crayons, paint, toys).

What Is This Program And Why Is It Necessary?

The FAA owned centers are reaching a facility age of 20 - 25 years; many are in need of roof replacements, HVAC system upgrades, and modernization to meet safety and building code requirements. This program is being established as a multi-year sustainment program that will address facility requirements for the 13 FAA Operated Child Care Centers. The Child Care Centers were established to provide FAA personnel with priority enrollment and flexibility to meet the unique schedule needs of air traffic personnel. FAA is responsible for maintaining the safety of the buildings.

The program is necessary to ensure that the Centers are properly maintained, up to local building codes and regulations, and are safe and secure. The lack of a consistent sustainment plan for these facilities has increased the risk to building occupants from failure of critical building components such as roofs, fire life safety and plumbing systems. Having a multi-year budget profile will help alleviate the stress of local facility costs and aid in keeping ahead of the sustainment issues at these Centers. Centers continue to be funded if/when funds are available. Repairs are prioritized by level of risk. The current level of risk assessment does not take into account that young children occupy the buildings and many "low" risk repairs are higher because of the ages and sizes of the occupants. A sustainment plan would ensure that these facilities are evaluated and repairs are addressed to avoid deterioration.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The required funding specifically allocated to these Centers will decrease:

- Deferred maintenance – which is the cost of rebuilding or replacing components whose service life has exceeded their scheduled lifetime
- The risk to building occupants from the potential failure of critical building components

What Benefits Will Be Provided To The American Public Through This Request?

The availability of on-site child care increases employee retention rate, employee satisfaction, loyalty, and decreases job vacancies (see source). Employee satisfaction leads to more productive employees which in turn benefit the American Public by making government more efficient. Additionally, these Centers have a 90 percent accreditation rate compared to only seven percent nationwide rate. As these Centers are also available to the community, they provide a safe and secure child care option for the wider public as well.

(Source: http://www.childrenschoice.com/benefits-of-employer-sponsored-child-care, http://www.businessweek.com/debateroom/archives/2007/04/day_care_an_office_affair.html)

Detailed Justification for - 2E10 FAA Telecommunications Infrastructure 2 (FTI-2)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 –FAA Telecommunications Infrastructure 2 (FTI-2)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
FAA Telecommunications Infrastructure 2 (FTI-2)	$0	$1,000	$10,360	+$9,360

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Complete Work Products for Investment Analysis Readiness Decision (IARD)	---	$2,000.0
b. Near Term Contingency Plan Technical Capabilities and FTI Reconstruction	---	8,360.0
Total	Various	$10,360.0

For FY 2017, $2,000,000 is requested to complete the activities and develop the acquisition work products necessary to achieve an IARD for FTI-2 in FY 2017. The current FAA Telecommunications Infrastructure (FTI) program is providing services today with its contract ending in 2017 and a bridge contract going through 2022.

For FY 2017, $8,360,000 is requested for near term contingency/resiliency work of the current FTI system and the reconstitution of a current FTI system. These efforts will ensure that critical communication links can be rerouted to other FAA facilities as necessary and that restoration of the telecommunications infrastructure equipment at one facility can be guaranteed in the event that the equipment is destroyed.

The ability to maintain these services are vital to National Airspace System (NAS) operations and to comply with the FAA mandates. These activities are required to implement the most cost effective solution for critical communication services.

What Is This Program And Why Is It Necessary?

A. FAA Telecommunications Infrastructure 2 (FTI-2)

The program will address the same scope of services as the existing FTI program to ensure no interruption to the NAS and FAA operations. As such, FTI-2 will provide high-availability, low latency telecommunications services for NAS systems and a separate Mission Support network that serves as the FAA's Intranet for secure connectivity to FAA internal administrative applications as well as the public Internet. FTI-2 will also continue to provide the enterprise messaging services required by the System-Wide Information Management (SWIM) program that will play a critical role in support of the NextGen concept of operations for broader, more cost-effective, and more timely sharing of data.

The current FTI program contract will expire in 2017. The FAA has implemented a strategy to put a bridge contract in place for five years to allow NextGen applications to start their implementation before changing the telecommunications infrastructure upon which it requires. This five-year period is believed to also provide for a more robust competitive environment for acquiring these new services. It is expected that FTI-2 will continue the service delivery paradigm utilized for NAS-wide and agency-wide telecommunications leveraging the existing infrastructure of commercial carriers since it is not affordable or practical to build-out a separate FAA-owned and operated network.

The FTI-2 program will replace the existing services provided by the current FTI program and will also address the aging owned telecommunications infrastructure obsolescence. Telecommunications is essential to the operations of the NAS and the FAA. The FTI-2 program will upgrade the existing infrastructure to stay abreast of technological upgrades of the telecommunications infrastructure. It will reduce risk by upgrading to the latest security standards. It will support the new NextGen programs such as NAS Voice System and Data Communications System and their migration to Internet Protocol (IP) technology. One key difference between the existing FTI program and the FTI-2 program is the objective of acquiring telecommunications services as a "commercial commodity" rather than the numerous types of individual services that are tailored to support FAA unique interfaces. As NAS systems continue to modernize, the FAA should be able to meet their needs more uniformly with services like Carrier Ethernet that have a lower cost per unit of bandwidth rather than more costly analog circuits and low-speed serial data links.

The FTI-2 program is necessary to ensure there is no disruption to NAS operations when the FTI contract expires. Under the FTI contract, the FAA obtains the telecommunications services it requires from a network integrator who contracts with hundreds of individual telecommunications carriers to meet the FAA's service requirements at over 4,000 locations. As the provider of the wide area networks (WANs) needed for NAS system and Agency applications, nearly all NAS systems and Agency applications are dependent on the telecommunications services that will be provided by the FTI-2 program.

B. Near Term Contingency Plan Technical Capabilities and FTI Reconstitution

The FAA Telecommunications Infrastructure (FTI) is a secure private network for transferring critical data between FAA facilities and to the customer. If the FTI services at a given air traffic facility fail, all data and communications for that airspace is isolated from the NAS. The current infrastructure cannot quickly reroute communications. The following actions allow critical communication links to be rerouted to other FAA facilities as necessary:

- Expand Voice Switch Interfaces at Terminal Facilities: Enables expansion of Air/Ground Communications at an Air Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) facility should these services need to be rerouted from another facility impacted by a catastrophic event.
- Rerouted surveillance information to support facilities within 12 hours of divestment decision but limited to predetermined backup facilities.
- FTI Reconstitution: Restores the telecommunications infrastructure equipment at one facility in the event that the equipment is destroyed
- Enhance FTI infrastructure to address GAO audit findings.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$10,360,000 is required to fund the necessary resources that will complete the activities and develop the acquisition work products necessary to achieve an Investment Analysis Readiness Decision in FY 2017 as well as work to enhance the resiliency of the current FAA FTI infrastructure. These efforts will ensure that critical FAA systems can continue to transmit information for Air Traffic Control in the event of any negative impact on NAS facilities.

What Benefits Will Be Provided To The American Public Through This Request?

The following benefits will be provided from the work under this program:

- Highly resilient infrastructure that has the ability to auto-recover during outages so they will be transparent to FAA end user systems and result in a reduction in delays.
- Enhanced security capabilities that benefit all user systems connected to the FTI-2 wide area networks and messaging services.
- Highly reliable services that incur fewer outages and result in enhanced safety for NAS users.

Detailed Justification for - 2E11 System Capacity, Planning, and Improvements

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – System Capacity, Planning, and Improvements
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
System Capacity, Planning, and Improvements	$6,000	$3,000	$6,500	+$3,500

Note: FY 2015 and FY 2016 numbers represented for comparability. This program has been moved from BLI 1A01 in FY 2017

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
System Capacity, Planning and Improvements	---	6,500.0

What Is This Program And Why Is It Necessary?

The System Capacity, Planning, and Improvements program provides data and analyses on NAS operations to FAA executives and managers to help them identify deficiencies and develop proposals to improve NAS performance. This program also sponsors NAS performance and airport capacity studies where 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. This work includes:

- Airport modeling and analysis using actual data collected from Air Traffic Control Systems (ATC) in the field to determine the value of potential improvements like new runways, airfield improvements, air traffic procedures, and other technology
- Airport capacity studies that provide assessment of procedural, technology, or infrastructure improvements and will provide recommendations for improving airspace and airport capacity
- Enhancements of the Performance Data Analysis and Reporting System (PDARS), a fully integrated performance measurement tool designed to help the FAA improve the NAS by tracking the daily operations of the ATC system and their environmental impacts
- Using PDARS operational data to baseline the measurement and analysis of Next Generation Air Transportation System (NextGen) capability improvements such as the efforts to support Optimization of Airspace and Procedures in the Metroplex (OAPM)
- Provide quick response data and analysis to support Safety Event Responses, that include aircraft accidents, with backing for the determination of causal factors and mitigation actions
- Development of new agency level metrics to enhance management awareness of, and response to, system performance
- Benchmarking Air Traffic Organization (ATO) performance with other Air Navigation Service Providers (ANSPs) to support joint projects with EUROCONTROL and as part of International Civil Aviation Organization (ICAO), Civil Air Navigation Services Organization, and Aerospace Transportation Advisory Group work plans
- Provide analytical and modeling support for Commercial Space initiatives
- Provide performance modeling and economic analysis to develop a business case with ICAO member states for Reduced Oceanic Separation over the North Atlantic
- Provides data and analysis to support the decision-making process for implementing new rules, requirements, and procedures

The legacy PDARS system is nearing the end of the life cycle, and there is a requirement to update the system, through the implementation of the Data, Visualization, Analysis and Reporting System (DVARS) because the current system is not sustainable.

Why Do We Want / Need To Fund The Program At The Requested Level?

$6,500,000 is required to proceed with the implementation of DVARS since PDARS is no longer sustainable. This program is necessary to provide the data and analytical capabilities required to complete cost benefit analysis and determine what Operational Improvements should be made in the NAS.

What Benefits Will Be Provided To The American Public Through This Request?

PDARS is the Air Traffic Control System Command Center's (ATCSCC) primary tool for accessing radar data and provides an objective tool for operational planning, assessment and support of flow management initiatives. Integration of PDARS with Airport Surface Detection Equipment (ASDE-X); Out, Off, On, and In time (OOOI) data; restrictions data; and playbook scenarios will help to reduce ground delays. These enhancements, which encompass the final phase of PDARS development, are critical for analyzing surface operations and baselining NAS performance. PDARS is a well-accepted tool used at all major ATC facilities.

As a result of the data and analysis resulting from this program the FAA has satisfied and improved external reporting. New metrics developed and reliant on this program have facilitated management awareness and response to system performance. The end result is improved efficiency and capacity, leading to a better experience for the flying public.

The modernization of PDARS planned through the implementation of DVARS will provide a modernized enterprise solution inclusive of data processing, visualization, and reporting. DVARS will implement a service oriented architecture which will facilitate its ability to provide data across the FAA using web services in place of the current proprietary vendor format that is used for the PDARS data. Users will gain access to ad hoc reporting capabilities and will be able to query the database and create their own custom reports without assistance from the help desk.

Executive Summary – Facilities and Equipment, Activity 3.

What is the Request and What Funds are Currently Spent on the Program?

The Facilities and Equipment (F&E) Activity 3 program is requesting $182,930,000 for FY 2017, an increase of $11,930,000 (7 percent) above the FY 2016 enacted level. This funding supports modernization of non-air traffic control facilities, business systems, and equipment. The programs support safety, regulation, security, information technology security, and regional and service center building infrastructure and support. A key outcome expected to be achieved in the budget year with the requested resources includes increasing functionality enhancements of existing systems to allow FAA to be proactive in analyzing safety data.

$17 million has been requested for the System Safety Management Portfolio. Included within that portfolio is $15 million for Aviation Safety Information Analysis and Sharing (ASIAS), which will 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 leverages internal FAA datasets, airline proprietary safety data, publicly available data, manufacturers' data and other data and fuses these data sources in order to identify safety trends in the NAS.

The System Approach for Safety Oversight (SASO) Program will transform the FAA Flight Standards Service to a national standard of system safety based upon Safety Management System (SMS) principals. The primary beneficiaries are the flying public. $17.2 million is requested to support SASO in FY 2017.

The Hazardous Materials Management, Mobile Asset Management Program (MAMP), and Facility Security Risk Management are programs that are included under the Air Traffic Control (ATC) Facilities Sustainment Strategic Plan and are included under Activity 3. In the FY 2017 budget, $57.7 million is requested to address:

- The most serious FAA owned or leased sites that have experienced contamination and FAA has been deemed responsible for remediation.
- The Mobile Asset Management Program provides easily transportable NAS equipment to establish, restore, or augment air traffic control operations. Funding will refurbish or replace 20 year old Mobile ATCT's.
- Implementation of standardized facility protective measures at all FAA staffed facilities.

What Is This Program And Why Is It Necessary?

This Activity contains F&E programs that support modernization of the tools and support infrastructure used to perform Aviation Safety, Information Security, and Security and Hazardous Materials activities. Activity 3 also provides funding for the procurement and modernization of systems that allow the agency to archive safety-related data and perform complex analyses in support of aviation safety issues.

The FAA's priority is safety, and the majority of Activity 3 programs support our safety, security, and statutory functions. These programs support the efficient and effective processes we use to meet the increasing demands of a growing National Airspace System (NAS). Several programs in this portfolio directly support external mandates. For example, the NAS Recovery Communications (RCOM) and Information Security programs are both presidentially-and congressionally-mandated.

Activity 3 efforts contribute to the following DOT Strategic Goals:

- Safety: Improve public health and safety by reducing transportation related fatalities and injuries
- Economic Competitiveness: Promote Transportation policies and investments that bring lasting and equitable economic benefits to the Nation and its citizens

- Organizational Excellence: Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs

Why Do We Want / Need To Fund The Program At The Requested Level?

Funding for Activity 3 programs is required for accomplishing our safety, security, and statutory mission effectively and efficiently. This funding will allow FAA to sustain ATC safety and services at levels expected by the public, the military, and our other stakeholders.

What Benefits Will Be Provided To The American Public Through This Request?

Funding for Activity 3 programs has been requested in the budget for almost two decades, and these programs have successfully achieved expected performance measures over time. For example, Recovery Communications (RCOM) has a Continuity of Operations Plan (COOP) that is tested regularly and serves as a major element of FAA training exercises in this area. The Information Security program, which is responsible for tracking and reporting cyber security incidents in compliance with the provisions of the Federal Information Security Management Act (FISMA) of 2002 and National Institute of Standards and Technology (NIST) Special Publication (SP) 800-61 has allowed the discovery and remediation of multiple system compromises. In addition, the Aviation Safety Information Analysis and Sharing (ASIAS) program that is a component of the System Safety Management Portfolio within NextGen, has discovered potential safety issues in the NAS that were addressed through procedural and airspace design. Coordination efforts have ensured that throughout the NextGen evolution planning process ASIAS results were integrated into the airspace and design process and information design tools.

Detailed Justification for - 3A01 Hazardous Materials Management

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Hazardous Materials Management
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Hazardous Materials Management	$22,000	$26,400	$31,000	+$4,600

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Superfund Sites Remediation (WJHTC)	---	$11,000.0
b. Investigation and Remediation (Alaska)	---	13,000.0
c. Investigation Other Sites and Program Management	---	7,000.0
Total	Various	$31,000.0

For FY 2017, $31,000,000 is requested to continue the management and remediation of 708 contaminated Areas of Concern (AOCs), as of October 2014. To achieve compliance with all federal, state, and local environmental cleanup statutes, including the Resource Conservation and Recovery Act of 1976, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and the Superfund Amendments and Reauthorization Act of 1986, the FAA must continue mandated program activities.

The $31,000,000 is requested to:

- Continue remediation activities at the National Priority List (NPL) "Superfund" site at the William J. Hughes Technical Center (WJHTC), Atlantic City, New Jersey.
- The Hazardous Materials (HAZMAT) program works diligently to move the status of sites listed on the Environmental Protection Agency (EPA) Federal Hazardous Waste Compliance Docket (Docket) to No Further Remedial Action Planned (NFRAP) status. The majority of non-NFRAP status sites remaining on the Docket have significant technical challenges to obtaining closure (e.g., long timeframe for site remediation, Superfund site, and ownership liability issues). The five remaining FAA Docket sites include Mike Monroney Aeronautical Center (MMAC), the Ronald Reagan Washington National Airport (DCA), the William J. Hughes Technical Center, the Alexandria International Airport-Air Route Surveillance Radar (AEX ARSR), and Sunset Cove, Alaska.
- Continue to perform investigations and remediation projects at all other identified contaminated sites in accordance with federal and state mandates and enforcement agreements to limit future liability to the agency and foster environmental stewardship.

What Is This Program And Why Is It Necessary?

The FAA operates the HAZMAT Management program to clean up approximately 708 contaminated areas of concern at approximately 153 distinct sites nationwide that require investigation, remediation, and closure activities. Site investigations at the identified sites have revealed that toxic contamination resulted from a variety of hazardous substances, including cleaning solvents, degreasing agents, pesticides, asbestos, polychlorinated biphenyls, and heavy metals.

The FAA has identified cleanup schedules in place as part of enforcement agreements with regulatory agencies. These agreements require the FAA to remediate contaminated soil and groundwater. Extensive contamination at the WJHTC prompted the EPA to place the site on the EPA NPL or Superfund as one of the nation's most environmentally dangerous sites. Other contaminated sites (many of which are located in Alaska) and the requirements of the HAZMAT Management program account for a large portion of unfunded environmental liabilities documented in the FAA's financial statements.

To achieve compliance with all federal, state, and local environmental cleanup statutes, including the Resource Conservation and Recovery Act of 1976, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and the Superfund Amendments and Reauthorization Act of 1986, the FAA must continue mandated program activities. The FAA's program activities include investigating sites; remediating site contamination; and obtaining closure of sites.

DOT Strategic Goal - Environmental Sustainability

- Advance environmentally sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources.

Why Do We Want/Need To Fund The Program At The Requested Level?

$31,000,000 is required to continue the management and remediation of 708 contaminated AOCs, as of October 2014. To achieve compliance with all federal, state, and local environmental cleanup statutes, including the Resource Conservation and Recovery Act of 1976, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and the Superfund Amendments and Reauthorization Act of 1986, the FAA must continue mandated program activities.

Postponing remedial activities at these contaminated areas of concern can lead to noncompliance with the federal, state, and local environmental cleanup statues. Noncompliance with environmental cleanup statues includes maximum penalty amounts that range from $1,000 (Bahamas) to $100,000 (Alaska) for the first day of violation; and ranges from $1,000 (Bahamas and Idaho) to $50,000 (Hawaii, New Hampshire, and New Jersey) each day after the first day of violation.

What Benefits Will Be Provided To The American Public Through This Request?

The HAZMAT management target is to annually remove five percent of the total sites listed in the HAZMAT Management program's published Environmental Site Cleanup Report (ESCR). The FAA continues to exceed its goal of closing five percent of the total sites. In FY 2014 the ECU Program began the year with 681 AOCs at 129 Locations (LOCs) or sites and removed 57 Areas of Concern (AOCs), which resulted in the removal of 42 LOCs for a removal rate of 34 percent of the FY 2013 ESCR listed sites. However, during FY 2014, 84 new AOCs at 66 LOCs were added to the program. These new AOCs were predominately inflow from the facility decommissioning program. From FY 2000 through FY 2014, the HAZMAT Management program has closed 374 sites.

The direct outcome of closing these sites leads to overall decreased environmental remediation (ER) liability to the FAA. The FAA is currently analyzing alternate remedial technology that optimizes remediation and cost efficiency. Examples of this optimization are at Area D, Area 20A, and Area 29 at the WJHTC NPL site which is expected to yield at least a 100 percent return on investment (ROI) at Area D, 69 percent ROI at Area 20A, and 280 percent ROI at Area 29.

Investigating, remediating, and obtaining site closure at FAA's contaminated areas of concern also increase public safety by minimizing exposure to toxic and hazardous substances at these sites.

Detailed Justification for - 3A02 Aviation Safety Analysis System (ASAS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aviation Safety Analysis System (ASAS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aviation Safety Analysis System (ASAS)	$11,900	$20,200	$11,300	-$8,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Hardware/Software System/Services	---	$11,300.0

For FY 2017, $11,300,000 is requested to begin Segment 3 of the Aviation Safety Analysis System (ASAS) Regulation and Certification Infrastructure for System Safety (RCISS) program. This segment will perform technology refreshment of equipment for the existing infrastructure as it continues to develop and implement Information Technology (IT) services. ASAS RCISS Segment 3 will continue to deploy these IT services in the following areas:

- Mobile Technologies
- Remote Connectivity Telecommunications
- Consolidated Server/Storage Area Network (SAN) Systems
- Enterprise Software
- Disaster Recovery

These services ensure continuity of operations for critical and non-critical safety systems. Additionally, these services ensure that critical safety data are safeguarded against loss by providing a secure, reliable and timely back up of data. These new services support the coming integration of Aviation Safety's (AVS) disparate safety data, where individual stove-piped applications own specific data sets, into an enterprise level data store that isolates the data from the application. In this new environment, safety workers assemble data as needed from various data sources to support new business processes. Data in these data stores requires critical recovery response.

What Is This Program And Why Is It Necessary?

This program consolidated all previous IT infrastructure programs that supported the Associate Administrator for the AVS safety workforce. It also enhances the current AVS infrastructure while leveraging components across the AVS services. ASAS RCISS provides all IT infrastructure components to the AVS safety workforce, ensuring standard and reliable accessibility to safety data. The program is continuing to enhance and maintain the AVS IT infrastructure to meet evolving AVS business needs by addressing its mobile safety workforce requirements and changes in the aviation industry. The program focuses on providing safety data to the AVS workforce while they are mobile (off-site) and conducting safety inspections and investigations of airlines, manufacturers, pilots, accidents, etc. The ASAS RCISS enterprise infrastructure provides the access methods to all AVS national safety applications developed by System Approach for Safety Oversight (SASO), Aviation Safety Knowledge Management Environment (ASKME), Aerospace Medicine Safety Information System (AMSIS), and all other national safety programs deployed within AVS. The ASAS RCISS infrastructure directly contributes to the success of AVS in meeting its mission goals as it is developed, implemented and administered as an integrated IT solution.

During Segment 3, RCISS will be performing technology refresh and enhancements on the enterprise infrastructure that was established during RCISS Segments 1 and 2.

RCISS encompasses the following six key components:

- Devices for AVS' 7,000+ Safety Workforce (including mobile devices) - Activities include lifecycle replacement of existing devices to meet operational demands and replace outdated or malfunctioning devices
- Telecommunications - Activities include lifecycle replacement of existing devices and procurement of additional equipment and services where telecommunications bandwidth is deficient.
  - Improves accessibility and speed in utilizing national safety systems and supports centralized server infrastructure
  - Provides enhanced services for the transmission of safety data
  - Replaces outdated or malfunctioning equipment
  - Provides enhanced communication infrastructure for Disaster Recovery environment
  - Coordinates communication infrastructure enhancements in line with FAA Administrative Voice Enterprise Services (FAVES) objectives
- Enterprise Services (Hardware and Software which allow components of the infrastructure to work together) - Activities include lifecycle replacement of existing devices and software.
  - Improves management and operation of the infrastructure through enhanced monitoring, consolidation of equipment and data collection
  - Improves infrastructure reliability
  - Maintains Service Oriented Architecture (SOA) infrastructure and services that lower development costs for AVS national safety applications
- Application Data Servers (Hosting of national AVS safety applications) - Activities include lifecycle replacement of existing servers and storage devices as well supporting FAA migration to cloud based services
  - Continues implementation of application servers supporting national AVS safety applications
  - Replaces outdated or malfunctioning servers by reducing the number of physical servers through virtualization, resulting in reduced costs
  - Provides additional processing power and data storage required to support new (SASO, ASKME and AMSIS) and legacy AVS safety applications
  - Provides enhanced data center environmental upgrades to increase reliability, maintainability and availability (RMA)
- Commercial-Off-the-Shelf (COTS) Software (Operating System Software, Database Software) - Activities include acquisition and maintenance of enterprise software licenses
  - Ensures continued vendor support for software
  - Evaluate future software to support safety workforce, enterprise management services and all other aspects of the infrastructure
- Contractor Support - Activities include providing the knowledge and expertise necessary to refine and streamline the ASAS RCISS enterprise infrastructure
  - Provides specialized technical expertise in the enhancement of select component areas, e.g., mobile technologies and data center optimization

The ASAS RCISS program addresses AVS's need for an enterprise IT infrastructure that supports AVS personnel responsible for promoting aviation safety through regulation and oversight of the civil aviation industry. ASAS RCISS addresses the need for enhancing and evolving the current infrastructure to support data storage, data access, data integration, connectivity, availability and disaster recovery created by the changes in the aviation and IT industries.

The ASAS RCISS IT infrastructure supports the AVS safety workforce in their effort to reduce aviation accidents by making real-time safety data immediately accessible to and from all involved, e.g., inspectors, engineers, investigators, and medical examiners.

Additionally, work load capacity, performance, and reliability of the workforce is increased and enhanced by the ASAS RCISS IT Infrastructure. It also enables AVS IT infrastructure to be modified to respond to changing business processes without additional staffing requirements, such as allowing for a more mobile workforce and the creation of virtual workplaces.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$11,300,000 is required to support the technology refresh of infrastructure components and end user devices that have reached the end of their lifecycle. Devices in service beyond their intended lifecycle have higher component failure rates resulting in reduced overall reliability of IT infrastructure. To avoid these failures, RCISS is completing necessary infrastructure enhancements needed to accommodate new capabilities resulting from evolving business needs. It is critical that RCISS address these business needs in order to contribute to the DOT and FAA strategic goals to increase aviation safety.

ASAS RCISS enables the safety benefits promised by the SASO, ASKME and AMSIS programs by providing the IT infrastructure they require. The data developed, manipulated, analyzed, and reported on by the SASO, ASKME and AMSIS programs will reside on the ASAS RCISS IT infrastructure. Without the ASAS RCISS IT infrastructure, the full capabilities and benefits promised by SASO, ASKME and AMSIS will not be realized.

What Benefits Will Be Provided To The American Public Through This Request?

The ASAS RCISS program provides detailed reports about its IT investments and their progress over time to senior FAA executives and makes reports publicly available on the Federal IT Dashboard. The ASAS RCISS program assesses actual program results against baseline expectations determining if performance and benefit targets as well as customer needs are being met. The program management team continues to conduct surveys and data calls to monitor actual investment costs, schedules, benefits, performance, and mission outcomes.

The RCISS program management team periodically surveys end users to measure effectiveness of mobile safety devices deployed. Results are used to validate that solutions meet end user requirements and to identify lessons learned for future deployments. Surveys conducted to date have successfully demonstrated user satisfaction and validated benefit projections.

The following program performance measures have consistently been met:

- Availability of end user mobile telecommunication devices to the AVS safety workforce
- Technology refresh of end user devices to assure an acceptable level of system reliability, maintainability, and availability
- Development of standard aviation safety data sets to ensure enterprise conformity to increase efficiency and effectiveness of data analysis

Detailed Justification for - 3A03 National Air Space Recovery Communications (RCOM)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – National Air Space Recovery Communications (RCOM)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
National Air Space Recovery Communication (RCOM)	$12,000	$12,000	$12,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. VHF/FM and HF Radio Equipment	---	$2,500.0
b. Emergency Operations Network (EON)	---	3,600.0
c. Emergency Operations Facility	---	2,000.0
d. Communications Support Team (CST)	---	250.0
e. Secure Communications (COMSEC)	---	800.0
f. Information Technology Support	---	2,150.0
g. Satellite Telephone Emergency Network (STEN)	---	700.0
Total	Various	$12,000.0

For FY 2017, $12,000,000 is requested for NAS RCOM. For this amount the Command and Control Communications (C3)/RCOM program provides the FAA with the capability to directly manage the NAS during local, regional and national emergencies when normal common-carrier communications are interrupted; provides and enhances a variety of fixed-position, portable, and transportable emergency communications systems that support crisis management; enables the FAA and other Federal agencies to exchange classified and unclassified communications to protect national security; and supports and modernizes the Washington Operations Center Complex and several FAA continuity of operations (COOP) sites, which ensures FAA decision makers have command and communications during times of crisis. Funding is spent on the following activities:

- $2,500,000 to continue funding the Very High Frequency (VHF)/Frequency Modulated (FM) and national High Frequency (HF) radio network modernization efforts. Existing regional networks will continue to operate in the 25 kHz mode until all antiquated infrastructure equipment has been replaced with 12.5 kHz equipment in accordance with the National Telecommunications and Information Administration (NTIA).
- $3,600,000 to continue funding the Emergency Operations Network (EON). Support includes the continued development of EON Geographical Informational Systems (GIS) layers, maps, and visualization tools, as well as the EON Dashboard, EON Collaborative Communication platform, and the EON Data Discovery platform.
- $2,000,000 to continue funding the Emergency Operations Facilities activities which includes the continued support of activities related to audio/video display systems, national situational awareness view, Domestic Event Network (DEN), incident monitor, emergency notification system, conference-bridge, help desk support, and equipment refresh.
- $250,000 for support of the Communications Support Team (CST) emergency response activities, related communication equipment, and Emergency Response Vehicle (ERV).
- $800,000 for continued funding of Secure Communications (COMSEC) activities and exercises to ensure continued system viability related to all secure telephone, secure facsimile, and secure classified communication equipment.

- $2,150,000 for continued funding of C3 Information Technology (IT) activities used to maintain the IT infrastructure for COOP sites and the Emergency Operations Network.
- $700,000 for continued support and refresh of the Satellite Telephone Emergency Network (STEN).

What Is This Program And Why Is It Necessary?

$12,000,000 is requested to meet the minimum support necessary to maintain the infrastructure mandated by Federal continuity directives; Executive Order 13618, National Security Presidential Directive 51 (NSPD-51)/Homeland Security Presidential Directive 20 (HSPD-20), Federal Continuity Directive 1 (FCD-1), Federal Continuity Directive 2 (FCD-2), and the National Communications System Directive 3-10 (NCSD 3-10). The infrastructure includes the Washington Operations Center Complex (WOCC), the Emergency Operations Center (EOC), and the Primary Alternate Facility (PAF), as well as the minimum requirements for Continuity Communications Capabilities.

The C3/RCOM program provides senior leadership with command and control emergency communications and provides the FAA and other Federal agencies the ability to exchange and collaborate information, both classified and unclassified, to promote national security. The C3/RCOM program also supports the Washington Operations Center Complex and modernizes several COOP sites, which ensures FAA decision makers command and communications during times of crisis. Where applicable, C3/RCOM is an OMB SAFECOM compatible program that encompasses multiple independent procurement projects, which are currently at various stages in the acquisition lifecycle.

In 1995, the National Telecommunication and Information Administration (NTIA) required a decrease in the frequency bandwidth used by the current VHF/FM network. As a result, the older VHF/FM radios that are configured to the outdated frequency separation requirements can no longer be utilized. In addition, the current system lacks coverage and integration with current VHF/FM equipment. This makes it difficult, and often impossible, to communicate over long distances. Network hardware has been fielded for approximately 20 years, long past its expected life cycle. For example, the cost to repair one module is more than the purchase of a new modern radio, yet for compatibility reasons, the repair of outdated equipment is continued.

The FAA's C3/RCOM program has a mission to develop web-based emergency operation information-sharing tools that create a common operational picture and support effective decision-making. A secure, highly available, and flexible infrastructure has been created for effective collaborative communications, continuity of operations, and adaptive situational awareness for enhancing decision support. This Emergency Operations Network (EON) infrastructure has been built upon existing FAA networks and technologies and the operations framework is built upon the lessons and best practices learned from previous and existing initiatives.

The C3/RCOM program office also has Presidential and Congressionally mandated responsibilities to provide reliable communications support to the White House, Department of Transportation, FAA and other government agencies during national security events, disaster recovery efforts, accident investigations, government exercises, and special invitational events.

Other efforts within the C3/RCOM program revolve around National Security. There are several operational command and control centers within the Washington area and other sites around the country that require modernization. Since September 11, 2001, the C3/RCOM program has had its responsibilities increased to meet the current national security demands.

DOT Strategic Goal - Organizational Excellence

- Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs.

Why Do We Want / Need To Fund The Program At The Requested Level?

$12,000,000 is required to meet the minimum continuity and communications requirements defined above to ensure FAA can conduct its mission essential functions under all conditions. These include enabling the FAA to exchange and collaborate with other agencies on both classified and unclassified information to promote national security and aviation safety, sustain the EON infrastructure for effective collaborative communications, continuity of operations, and adaptive situational awareness for enhancing decision support, and implementing the VHF/FM radio replacement program to ensure that the Agency's VHF/FM radios comply with the NTIA mandate. The requested funding level will also continue support for the CST and facilitate the Administration's ability to provide emergency communication capabilities that support FAA's mission essential functions in operating the NAS under all conditions.

What Benefits Will Be Provided To The American Public Through This Request?

The American public benefits from the C3/RCOM program by ensuring that the FAA can reliably and continuously communicate and exchange information, enabling operations and decision-making at all times, especially during times of crisis and natural disaster.

Detailed Justification for - 3A04 Facility Security Risk Management

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Facility Security Risk Management
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Facility Security Risk Management	$14,300	$15,000	$21,000	+$6,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Facility Security Risk Management		
a. Personal Identification Verification (PIV) Retrofit	---	$4,800.0
b. Homeland Security Presidential Directive (HSPD) – 12 Security Level (SL) 1/2	---	6,200.0
c. HSPD – 12 Upgrades Security Level (SL) 3	---	7,000.0
Total	Various	$18,000.0
B. NAS Resiliency	Various	$3,000.0

For FY 2017, $21,000,000 is requested to support the continuing effort for the following upgrades:

- Construction/Installation for security upgrades
- Engineering design and equipment installation Eastern and Western Pacific Regional Offices
- Security PIV upgrades at SL 2 and SL 3 facilities
- Technology refresh of security systems at SL 3 facilities to replace outdated security equipment
- Begin installation of cameras and PIV card readers at all access points to areas housing critical NAS systems in all ARTCC's and ATCT/TRACONs that support the busiest US terminal areas

These security upgrades will result in increased security at FAA Staffed facilities.

What Is This Program And Why Is It Necessary?

In 1999, the FAA established the FSRM program. The program implements standardized facility protective measures at all FAA staffed facilities. These measures include personnel access control (via card readers, fencing, gates and security guards), surveillance (cameras), vehicle access control (barriers), visibility enhancements (lighting) and x-ray machines. The FSRM Program participates in the construction of facilities that secure FAA personnel and assets, such as guard houses, and facility retrofitting to protect against blast (explosive attacks). Finally, the FSRM Program manages contracts that provide maintenance services to installed security systems regardless of age, manufacturer or condition. In addition to the protection of FAA personnel and assets, another program goal is one of standardization across the National Airspace System (NAS). The standardization of security equipment and processes will result in a substantial cost savings to the FAA. To aid in NAS-wide standardization, the FSRM program facilitates security system installation for not only Air Traffic Organization facilities, but also for facilities serving the Aviation Safety (AVS) and Airports (ARP) lines of business within the FAA. FSRM is participating with NextGen Planning to identify the security needs and vulnerabilities of NextGen facilities to ensure that the safety and security of FAA assets and personnel are maintained as the FAA prepares for the future of flight.

The FSRM program is necessary because aviation assets are attractive targets for those who would seek to harm and terrorize the American Public. Security vulnerabilities jeopardize air traffic services to the NAS. Threats to aviation safety are ever-increasing and ever-adapting. FSRM, in conjunction with FAA Security and Hazardous Materials (ASH), ensures that the FAA has an operational and administrative environment that provides reasonable safeguards against disruptions that could occur if FAA facilities were to be attacked. HSPD-7, Critical Infrastructure Identification, Prioritization, and Protection, mandates that agencies identify, prioritize, and coordinate the protection of infrastructure and key resources against terrorist acts. The work of FSRM is part of that effort.

The FSRM Program is instrumental in ensuring that FAA efficiently and cost effectively implements all issued Presidential Directives aimed at securing federal facilities and personnel. With regard to HSPD-12: "Policy for a Common Identification Standard for Federal Employees and Contractors", through the national Security System Design and Integration Contract, managed by FSRM, card readers throughout the NAS are being replaced with those that will read the common ID media required by the Directive. Through HSPD-16, National Strategy for Aviation Security, the federal government intends to "deter and prevent terrorist attacks and criminal or hostile acts in the Air Domain." The installation of security measures by the FSRM Program accomplishes the goal of this Directive.

Support is also provided to other FAA programs by the FSRM program. FAA will begin installation of cameras and PIV card readers at all access points to areas housing critical NAS systems in all ARTCC's and ATCT/TRACONs that support the busiest US terminal areas. Through the use of the Security System Design and Integration Contract, facilities under construction receive security systems that meet security requirements while maintaining standard security configurations.

DOT Strategic Goal - Organizational Excellence

- Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs.

Why Do We Want/Need To Fund The Program At The Requested Level?

$21,000,000 is required in order to sustain the work of securing FAA facilities and performing the activities described above.

What Benefits Will Be Provided To The American Public Through This Request?

FSRM has contributed to obtaining security accreditation at over 980 FAA facilities. This was accomplished by the program's management of national contracts through which security measures such as X-ray machines, cameras, card readers, gates, vehicle barriers, etc., were installed. The installation of the measures led to security accreditation of the facility as required by FAA Order 1600.69.

The impact of those upgrades has been to reduce the risk of the facility to intrusion and unauthorized entry.

Detailed Justification for - 3A05 Information Security

What Is The Request And What Funds Are Currently Spent On The Program

FY 2017 – Information Security
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Information Security	$12,000	$12,000	$24,970	+$12,970

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Information Systems Security (ISS)	---	$12,000.0
B. NAS Critical Infrastructure Cyber Enhancements	---	12,970.0
Total	Various	$24,970.0

For FY 2017, $12,000,000 is requested to provide funding for Information Security Services and includes the following:

- Security Operations Center (SOC)
- Enterprise Architecture and Interoperability
- William J. Hughes Technical Center (WJHTC) Cyber Test Facility
- Advanced Concept Technology Demonstrations
- Wireless Intrusion Detection System (WIDS)
- Vulnerability Code Scanning
- Data Loss Prevention (DLP)
- National Airspace System (NAS)/NextGen Information System Security Capability

These projects and services allow FAA to meet the following outcomes:

- Evaluate solutions and services to achieve continuous diagnostics and mitigation (CDM) Phase 2 goals such as network access control management, credentials and authentication management, account access management, and security-related behavior management
- Evaluate and deploy, if appropriate, a new technology to combat Advanced Persistent Threat (APT)
- Validate full packet capture capability through Flexible Analysis System (FAS) at two new strategic network points
- Integrate advanced and evolved vulnerability and United States Government Configuration Baseline (USGCB) scanning within the FAA's Internet Protocol (IP) based networks
- Deploy wireless intrusion detection/wireless application protocol (WID/WAP) to 145 FAA facilities
- Improve software development secure coding by conducting software code vulnerability security analysis on 120 legacy and developmental agency systems

For FY 2017, $12,970,000 is requested to provide funds for Cyber Security Services. In 2013, the NAS was identified through Presidential Policy Directive-21 (PPD-21) "Critical Infrastructure Security and Resilience" and Executive Order 13636 (EO 13636) "Improving Critical Infrastructure Cybersecurity" as a national Critical Infrastructure and Key Resource (CIKR) for which a cyber-attack could have catastrophic economic and national defense impacts. National Institute of Standards and Technology (NIST) Special Publication 800-82 describes the NAS as an Industrial Control System, required to implement specific security controls not required by other Federal information technology assets.

A NIST Cybersecurity Framework (CSF) was developed to address and manage cybersecurity risks and provide a methodology for assessing the systems and services in an operational environment. The NIST CSF was tailored for the NAS environment and provides a way to identify common solutions that result in more efficient and cost-effective implementations. A resiliency assessment was conducted in the first quarter of FY 2015 and the resulting cybersecurity requirements were based on data from security authorization risk assessments and the GAO cybersecurity audit reports. Operational improvement requirements include the following:

- NAS Data Flow Monitoring:
  The FAA does not currently monitor all system data flows in the NAS and continuous monitoring is needed to detect errors in data flows and malicious attacks on NAS systems or services. Today, the NAS Cybersecurity Operations (NCO) uses manual processes that are time consuming, unreliable, and not scalable to the NAS needs. In conjunction with the implementation of cyber security sensors throughout the NAS to enhance modeling and detection of anomalous data flow activity, the FAA must develop and implement a method to capture, baseline, and analyze internal and external NAS data flows for real-time incident investigation.

- NAS Boundary Network Security Gateway:
  The NAS Enterprise Security Gateway (NESG) is the protection mechanism used by the FAA to provide communications between air traffic critical systems and external systems and users. Currently, the NESG does not have the capability to allow a remote maintenance access to these systems. This forces system owners to implement customized remote maintenance solutions that are not under the established FAA security controls purview and creates an access backdoor to potential cyberattacks. To meet the growing NAS remote system management requirements, the FAA must enhance a layered defense-in-depth enterprise secure gateway to prevent unauthorized entities and data flows from reaching the NAS critical infrastructure. In early 2015, an incident involving Maintenance Data Terminals (MDTs) occurred during maintenance activities. MDTs are used to perform maintenance on systems in the operational network and cannot currently access these systems through a secure gateway. A Dyre virus spread across the FAA's administrative network and infected almost 5,000 computers. A flash drive containing a system update was obtained from an infected laptop on the administrative network. This flash drive was used to update Digital Audio Legal Recorder and could have spread the Dyre virus across the NAS. Fortunately, the Dyre virus was detected and removed from the flash drive prior to the completion of the update on the DALR system.

- NAS Centralized Software Management Security:
  Today, NAS systems do not have a repository of software updates (e.g., operating system security patches updates) to ensure that the systems have the latest updates to protect them from security attacks. Systems owners use different procedures (e.g., unsecure remote maintenance connections, USB drives, etc.) to deploy software updates. These mechanisms are vulnerable to cyberattacks. The FAA must develop and implement a standard and secure method for NAS systems to access critical security configuration updates and implement these updates more expeditiously to reduce the risk of security compromise. The FAA must develop and implement a centralized capability to support NAS asset management as mandated in OMB Memo 14-03.

  An example of how the lack of this capability is a serious vulnerability to the NAS is an incident that involved the Blaster worm. Blaster infected an FAA TRACON Flight Strip Transfer System (FSTS). This worm was accidentally installed by a technician four years prior to detection. This incident required reversion to a manual system until the anti-virus procedures could be applied. The worm infected a system considered isolated from other networks and caused a service failure despite the fact that virus signatures have been available for four years. Similar systems of similar design exist at other FAA control facilities. If the proposed controlled centralized software repository had been in place this worm wouldn't have infected the FSTS system.

- Training of New Cyber Capabilities:
  The new capabilities identified in the previous recommendations require training the cybersecurity workforce. FAA Order 6000.15G section 6-4 states that NCO is the central organization responsible for managing NAS operational cybersecurity incidents. The FAA must develop and implement training programs for NCO personnel and systems personnel on the use of these new capabilities and on

analysis of the newly generated data. This training enables the cybersecurity specialists operating the NCO to stay current with new capabilities (e.g., NAS Data Flow Monitoring).

- Remediate High Priority System Vulnerabilities:
  At the beginning of 2015, the GAO released the report on the cybersecurity audit of five NAS systems (i.e., FTI, ECG, ERAM, TFMS, and SBSS). The report contained 168 Cybersecurity recommendations. The FAA agreed to address all recommendations and set a plan to accomplish this goal. The resiliency assessment highlighted additional high-priority Plan of Action and Milestones (POAMs) that make the NAS vulnerable to cyberattacks. The FAA must remediate the NAS system level vulnerabilities identified in the GAO report and the high-priority POAMs identified by the resiliency assessment. This will include the evaluation of solutions at the enterprise level. Enterprise solutions are both more efficient and more cost effective than having individual programs implement unique solutions.

What Is This Program And Why Is It Necessary?

The FAA ISS program spans governance, operations and compliance and is comprised of the following areas: SOC/Cyber Security Management Center (CSMC); IT and ISS awareness and training; IT development; policy, standards, and requirements; program evaluations; system certification and compliance; Data Loss Prevention, applied technology and enterprise architecture. The SOC/CSMC is the operational organization of the FAA ISS Program. It is comprised of facilities, technologies, as well as FAA and contract personnel. The SOC/CSMC is a 24x7x365 day operation and represents the entire DOT as the single source provider of the cyber "big picture" when reporting to the Department of Homeland Security (DHS). At the Federal reporting level, the CSMC holds two seats on the National Cyber Response Coordination Group (NCRCG), a DHS-sponsored emergency action team and advisory council reporting directly to the White House on cyber issues affecting, or potentially affecting, national security.

This program funds Information Security Services including the SOC/CSMC with responsibility for cyber security incident management for the Department of Transportation (DOT) in compliance with the Federal Information Security Management Act (FISMA) of 2002 and National Institute of Standards and Technology (NIST) Special Publication (SP) 800-61, Revision 1. The facilities and equipment required to maintain a high level of vigilance is essential to the overall success of the SOC/CSMC's cyber security mission, including the detections of alerts/attacks generated against DOT infrastructure, mitigations of cyber and privacy breach incidents for DOT infrastructure including the FAA and the reporting of special threat events.

DOT Strategic Goal – Organizational Excellence

- Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs.

Why Do We Want/Need To Fund The Program At The Requested Level?

Under the FISMA of 2002, FAA must ensure all information systems 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 support the agency, aviation safety and security, and the NAS.

State Sponsored 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, and dictates that they be detected and prevented to the maximum extent to which the FAA is capable.

What Benefits Will Be Provided To The American Public Through This Request?

The overall benefit to the public is improved Safety by making aviation safer and smarter. Specifically this program will:

- Protect, detect and respond to cyber-attacks to ensure sustained reliability and integrity of NAS systems and networks
- Trusted Internet Connections (TIC) improve FAA cyber security posture
- Maintain the Federal Data Registry (FDR) in support of NAS shared data
- Complete mapping of FAA network configurations
- Ensure that external facing websites and routers are IPv6 compliant
- Reduce risks to Personally Identifiable Information (PII) and Sensitive information, including that of the flying public for data-at-rest, data-in-use and data-in-motion

Information Security has allowed for the discovery and remediation of multiple system compromises, including:

- The immediate discovery of the exfiltration of FAA employee data in 2009 allowed the FAA to mitigate the severity by providing Identity Theft Protection to those affected in a timely manner
- By the detection of hacker activity, we were able to remediate systems and prevent valuable information from being stolen

Information Security has been responsible for FAA system vulnerability scanning and assessment to provide a proactive approach to protecting the FAA network.

Detailed Justification for - 3A06 System Approach for Safety Oversight (SASO)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – System Approach for Safety Oversight (SASO)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
System Approach for Safety Oversight (SASO)	$22,500	$18,900	$17,200	-$1,700

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. System Approach for Safety Oversight, Phase IIB		
a. Prime Mission Product	---	$9,300.0
b. Program and System Engineering Management	---	3,000.0
c. System and Business Process Re-Engineering	---	3,600.0
d. Change Management and Training	---	1,300.0
Total	Various	$17,200.0

For FY 2017, $17,200,000 is requested to continue the Safety Assurance System (SAS) Phase IIB, Segment 1a development for SASO.

System Approach for Safety Oversight Phase IIB

SASO Phase IIB is the second phase of SAS development and implementation and covers the years from FY 2015 thru FY 2024. SASO Phase IIB was initially divided into two separate Segments, Phase IIB, Segment 1 and Phase IIB, Segment 2.. In Phase IIB Segment 1, the remaining SAS functionality will be developed and implemented for all remaining Title 14 Code of Federal Regulations (CFR) Parts regulated by Flight Standards Service (AFS) along with other SAS functionality. SASO Phase IIB, Segment 1 was further subdivided into two sub-segments. SASO Phase IIB, Segment 1a will implement the Phase IIB requirements associated with AFS' highest priorities, a subset of the full Phase IIB, Segment 1 requirements. This includes SAS development for Title 14, CFR Parts 141, 142 and 147, development of a Designee Management System (DMS) interface to facilitate information exchange resulting from CFR Part 183 oversight, the development of an initial risk assessment model, and increased government and industry data collaboration. SASO Phase IIB, Segment 1b will implement the remaining Segment 1requirements.

During FY 2017, the SASO Phase IIB, Segment 1a activities include further development of the SAS software product to address the additional automation requirements associated with the AFS priorities. Funding also supports a robust business process reengineering effort to identify the "as is" and "to be" states for the development and implementation of the three remaining components of the AFS Safety Management System (SMS): Safety Risk Management, Safety Policy, and Safety Promotion.

Additionally, Phase IIB Segment 2 activities include the business/process consolidation effort including the possible consolidation and decommissioning of several AFS Information Technology applications. Funding in FY 2017 supports an analysis of the existing AFS infrastructure and development of the requirements and business case for the potential consolidation. The program plans to return to the Joint Resources Council (JRC) in FY 2019 to refine its estimate to fund this Phase IIB, Segment 2 consolidation effort. Results of this analysis will better define the future state of AFS business processes and systems and establish a defensible plan for out-year funding.

What Is This Program And Why Is It Necessary?

The SASO program is one of several FAA initiatives to increase safety and control cost by adopting the International Civil Aviation Organization (ICAO) mandate to revise Safety Programs to incorporate SMS principles. To accomplish the above, the SASO Program is reengineering AFS business processes and developing an oversight system based upon SMS principles. The difference between the current "regulatory compliance-based" approach and the reengineered SMS-based approach is the performance gap SASO is closing. The SASO program will transform the AFS to an SMS-based national safety system standard.

As the regulator of a major segment of the U.S. aviation industry, AFS must continually strive to improve aviation safety. AFS is responsible for oversight of nearly the entire civil aviation industry that uses the National Airspace System (NAS). Today's safety oversight system is stove piped, reactive in nature, and "regulatory compliance-based." While many technical and human factors problems contributing to accident rates have been resolved, more complex organizational factors requiring additional systems-based, data-supported analysis and assessment for their resolution remain.

Increases in technical and operational complexity of aviation operations and introduction of new technologies further stress today's oversight system. SASO will implement a more structured data-supported risk-based oversight system allowing inspectors to directly enter information into the SAS tool. FAA will use SAS as a hazard identification and risk assessment tool to formulate surveillance plans and target FAA resources. The scope of the investment includes reengineering AFS business processes and consolidating AFS applications into the appropriate number of enterprise systems that serve: 4,800 FAA Aviation Safety employees, in 8 regions, at headquarters and approximately 100 field offices, and more than 25,000 aviation industry professionals managing aviation safety throughout the United States.

By implementing SASO via the SAS, AFS expects to contribute to reducing the commercial air carrier fatalities per 100 million persons on board by 24 percent over the nine-year period (2010 - 2018), no more than 6.2 in 2018. The flying public is the primary beneficiary of the safety oversight system that is rooted in safety management principles.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

The success of the SASO program depends upon continued development funding through FY 2024 to achieve and sustain full benefits. The required funding supports further SAS automation development, policy updates, training, and implementation to achieve the full oversight capabilities and benefits as envisioned during the business process reengineering analysis and design phase of the program.

What Benefits Will Be Provided To The American Public Through This Request?

By implementing the SMS principles, AFS oversight of the aviation industry will result in fewer accidents being attributable to gaps or failures of FAA oversight. Standardization and consolidation of business processes and associated systems will lower maintenance costs as well as increase efficiency of the AFS workforce while maintaining rather than increasing the current number of aviation safety inspectors.

Detailed Justification for - 3A07 Aviation Safety Knowledge Management Environment (ASKME) – Segment 2

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aviation Safety Knowledge Management Environment (ASKME)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aviation Safety Knowledge Management Environment (ASKME)	$10,200	$7,500	$4,200	-$3,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Program – Level Technical Analysis and Engineering	---	$2,000.0
b. Application/Solution Design, Development and Testing	---	2,100.0
c. Certification and Accreditation (C&A)/Security Testing	---	100.0
Total	Various	$4,200.0

For FY 2017, $4,200,000 is requested to fund the continued iterative Design, Development, Testing, and Production Releases for the ASKME Segment 2 Integrated Development Effort (IDE), an integrated system that will automate Air Certification Service (AIR) business functions: Airworthiness Directives Development (ADD), Compliance and Enforcement Actions (CEA), Airworthiness Certification (AC), and Budget Management (BMGMT).

ASKME Sub-functions status of ongoing work:

- ADD – Started FY 2013. Completed business requirements FY 2013. Completed detailed technical requirements for integrated system FY 2015. Iterative Development started FY 2015. Projected completion May 2016.
- CEA – Started FY 2014. Completed business requirements early FY 2015. Completed detailed technical requirements for integrated system FY 2015. Iterative Development to start FY 2015. Projected completion February 2017.
- AC – Started FY 2013. Completed business requirements FY 2014. Completed detailed technical requirements for integrated system FY 2015. Iterative Development to start FY 2016. Projected completion September 2017.
- BMGMT – Started FY 2013. Completed business requirements early FY 2015. Completed detailed technical requirements for integrated system FY 2015. Iterative Development to start FY 2017. Projected completion September 2017.

What Is This Program And Why Is It Necessary?

The ASKME is a suite of IT tools designed to support and enable the FAA Aircraft Certification Services (AIR) to automate its business processes resulting in more efficient processes that enhance safety benefits.

The program was established to provide a comprehensive automation environment for critical safety business processes for Aviation Safety (AVS) through deployment of 18 integrated business solutions/projects between FY 2008 and FY 2017. Phase 1 covered FY 2008 - FY 2012, and Phase 2 covers FY 2013 to FY 2017. ASKME Segment 2 was approved by FAA Joint Resource Council on

September 23, 2011. Segment 2 projects started as planned during the first and second quarters of FY 2013.

ASKME deliverables will provide for the electronic storage and retrieval of FAA technical documentation and lessons learned from previous certifications that involve aircraft design and manufacturing safety issues so that they can be accessed and shared more easily. This technical data includes: rationale for design and production certification decisions, interpretations of rules and policies, and audits of aircraft industry manufacturers. ASKME will provide tools to improve the ability to identify potential unsafe conditions by analyzing this documentation along with safety information such as Service Difficulty Reports, National Transportation Safety Board safety recommendations and reports, accident reports, and Maintenance Difficulty Reports. ASKME will also provide electronic tools for capturing key safety related data resulting from its standard business activities for rulemaking and policy development, airworthiness directives, design certification, production/manufacturing certification, airworthiness certification, designee management, evaluation and audit, external inquiries, enforcement, continued operational safety management, and international coordination.

ASKME business process tools will help AIR to streamline work activity and oversight practices, enabling AIR technical staff to transfer non-safety critical work activities to its pool of designees. This better enables AIR technical staff to focus more on safety identification, risk management, resolution, and improvement activities.

The analytical tools produced by ASKME provide the basis for AVS technical staff to identify and pre-empt potential hazards and events through predictive analysis and subsequent decision-making and corrective action.

Within the FAA AVS organization, AIR is responsible for ensuring that civil aircraft are designed and built to operate safely within the NAS. In carrying out their responsibilities, FAA personnel perform numerous business activities that generate massive amounts of data and information used in making strategic aviation safety decisions. The data is also used throughout AIR to ensure standardized regulatory compliance, workforce education, trend analysis, and program reporting. As the aviation industry has grown in size and complexity, so has the requirement for additional resources to perform AIR services. Additionally, within AIR, new security requirements related to terrorist countermeasures have surfaced as a result of September 11, 2001.

ASKME will provide current and accessible information, designee program effectiveness will be improved, designees better utilized, and AIR designee oversight and evaluation will be enhanced.

ASKME activities are as follows:

- Implement a proactive safety management system. This system is designed to identify and address safety risks and accident precursors throughout the product lifecycle of design, manufacturing, build, operations, and maintenance into the 'safety management process/automated lessons learned feedback' mechanisms. The risk assessment performed on the safety data may be used for risk management analysis, root cause analysis, corrective action, and follow-on work in the areas of standards, certification, maintenance, and operations
- Provide comprehensive, real-time, organization-wide access to current and historic digital and paper-based documentation aimed at supporting effective and timely decision making in standards, certification, and continued operational safety
- Enable real-time collaboration among AIR technical staff, industry, international aviation agencies, applicants, approval holders, and designees to facilitate effective and timely decision making
- Automate the integration of risk management processes into standards development, certification, and continued operational safety
- Provide tools to assist with designee oversight and delegation in certification through the use of automated risk management tools
- Provide tools to enhance resource utilization and performance management and monitoring

When integrated into our safety management approach and practices, these combined capabilities will enhance aviation safety and promote a culture of system safety.

In order to accomplish the objectives, the ASKME suite of tools will provide AIR a Web-based knowledge management portal. The integrated tools will be designed to store valuable knowledge assets, making the safety related assets accessible to facilitate management and workforce decision making while providing a proactive approach to systems safety.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$4,200,000 is required to complete the remaining ASKME Segment 2 baseline functionality on-schedule by the end of Segment 2 in September 2017.

What Benefits Will Be Provided To The American Public Through This Request?

The goal of ASKME is to improve the Aircraft Certification Service's (AIR) ability to fulfill its mission and, by extension, facilitate air travel accident prevention. The projected dollarized safety benefit was calculated for each ASKME sub-function. The safety benefits are derived from the economic value associated with the prevention of accidents, including fatalities, injuries, and equipment loss and damage.

Below is a summary of the ASKME Segment 2 sub-functions being and the associated safety benefits projection (in constant-year FY 2011 dollars) through FY 2023:

Sub-Function	Safety Benefits (through FY 2023) in Constant Year ($000)
Airworthiness Directives Development (ADD)	$47,319
Compliance and Enforcement Actions (CEA)	$25,688
Airworthiness Certification (AC)	$18,357
Budget Management (BMGMT)	$0

Although Budget Management itself does not have any projected safety benefits, it will enhance AIR's ability to perform the other sub-functions by improving resource planning across AIR. All Segment 2 sub-functions support the FAA's Strategic Initiative for Risk-Based Decision Making.

The current ASKME performance baseline funding is projected to the end of FY 2017.

Detailed Justification for - 3A08 Aerospace Medical Equipment Needs (AMEN)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aerospace Medical Equipment Needs
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aerospace Medical Equipment Needs	$0	$2,500	$3,000	+$500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Aeromedical and Human Factors Research Laboratory Equipment	12	$3,000.0

For FY 2017, $3,000,000 is requested to continue the replacement of the Aerospace Medical Research Division's laboratory assets at the Civil Aerospace Medical Institute (CAMI). Phase 2 of the AMEN program includes the replacement of CAMI Human Factors Research Division old and obsolete research laboratory assets. AMEN Phase 2 will replace 12 equipment items, all of which are Commercial-Off-The-Shelf (COTS) or modified-COTS products. The equipment is summarized as follows:

- Five Flight Operations and Air Traffic Control Simulators
- Two Biochemistry/Forensic Toxicology Testing Systems
- Two Specialized Cameras
- One Anthropometric Test Device
- One Engineering Calibration Device
- One Data Acquisition and Processing System

The AMEN phase 1 program continues to be executed with prior FY 2014 funding to address the replacement of aeromedical research laboratory items. The equipment to be replaced includes forensic toxicology laboratory fume hoods, Altitude Research Chamber environmental control system, and analytical biochemistry equipment.

What Is This Program And Why Is It Necessary?

The Federal Aviation Administration (FAA) Office of Aviation Safety (AVS) is responsible for promoting aerospace safety by regulating and overseeing the civil aviation industry. To fulfill this mission, AVS establishes aviation safety and certification standards; monitors safety performance; conducts aviation safety education and research; and issues and maintains aviation certificates and licenses. The Civil Aerospace Medical Institute (CAMI), located at the FAA Mike Monroney Aeronautical Center (MMAC) in Oklahoma City, OK, supports the AVS mission as the medical certification, education, research, and occupational medicine wing of the Office of Aerospace Medicine (AAM). The AMEN investment supports CAMI research activities that will address several aerospace human safety and performance research areas, summarized as follows:

- **Aerospace Medical Systems Analysis:** Assessment of large datasets concerning aircrew, their medical certification, and their involvement in aviation accidents and incidents.

- **Accident Prevention and Investigation:** Development of procedures to detect aeromedically unsafe conditions and trends. The forensic toxicology laboratory serves as the primary national site for toxicology testing relative to accident investigation fatalities.
- **Crash Survival:** Assessment of crash environments including head impact, seat deformation, occupant restraint performance, and safety device effectiveness; all key issues in aircraft certification processes and protection of human life.
- **Aerospace Physiology:** 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. This research will lead to a better understanding of disease and environmental stress factors (alcohol, fatigue, hypoxia, g-forces) that concern medical certification decision-making processes, aeromedical education programs for aviation medical examiners, pilots, and flight attendants; accident investigation practices; certification of aircraft equipment and protective devices; and harmonization of standards.
- **Advanced General Aviation Systems:** Human factors evaluations of performance changes associated with advanced multifunction displays and controls in general aviation and air traffic control.
- **Operator Performance:** Development and assessment of measures of performance in ATCs and technical operations specialists. Research addresses managing advanced cockpit displays, advanced weather displays, and digital air to ground communication of traffic and navigation information. This research includes assessments of human performance under various conditions of impairment, human error analysis and remediation, agency workforce optimization, assessing the impact of advanced automated systems on personnel requirements and performance, and the psychophysiological effects of workload and shift work on job proficiency and safety in aviation-related human-machine systems.

CAMI in-house research personnel discover methods and recommend strategies to enhance the safety, security, health, and performance of the most important aspect of the National Airspace System (NAS), the human operator and the public which she/he serves. CAMI is the only federal entity that performs this work on behalf of the U.S. Personnel work in numerous research laboratories and testing facilities that require complex and technically advanced scientific, engineering, simulation, and medical systems. CAMI research scientists use this equipment to enhance the interface of the NAS with the human system (e.g., pilots, air traffic controllers, cabin crew, maintenance personnel, and passengers).

Phase 2 of the program is a continuation of the AMEN technology refresh approved in May 2010 and initiated in 2012. AMEN 2 was established to provide urgent upgrades to research laboratory equipment of the two CAMI research divisions. By FY 2016, the equipment that will be replaced by the AMEN Phase 2 program will include 5 – 31 years old legacy equipment with an average life of 14 years that has exceeded its useful life. The advanced age of the equipment will result in a serious shortfall in system capability and efficiency. The technology supporting CAMI research activities is highly specialized and is ever changing. Future research requirements driven by changes in the NAS, aircraft, life support equipment, and the physical and/or mental demands on the operators and the flying public will need to be addressed in a proactive fashion so that the FAA remains the leader in safety assurance related to aerospace medicine and human factors. Pharmaceutical companies are continuously introducing new products into the market. Likewise, breakthrough in cockpit technology and advanced man-machine interfaces are expected in the future. As a result, CAMI must have state-of-the-art equipment for testing the effects of these advances in human physiology and performance. The safety of the flying public, the NAS, and its operators is contingent on the FAA's ability to remain ahead of such advances and thus maintain human safety as the number one mission. More modern equipment will support human safety and performance research areas that are associated with reducing aviation accidents and fatalities.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

To perform their research missions, CAMI's aerospace medical and human factors research personnel require sophisticated, highly technical, and specialized equipment. Much of the laboratory equipment used by CAMI's scientists, physicians, and engineers is old and becoming obsolete. As the single provider of key medical and human factors research, CAMI research laboratories must keep up with new scientific and technical advances in technology that aid the discovery of methods to improve human health, performance, and safety.

The aging and obsolete laboratory research equipment is no longer supportable and jeopardizes mission accomplishment. Not only is this equipment outdated from a technology standpoint, but is also becoming more difficult to maintain at a level that is sufficient to serve CAMI's needs. The majority of the equipment sought is highly sophisticated and protected by proprietary data; third party vendor options are usually not available or their service may nullify warranty agreements. Vendors for some of the current laboratory equipment have notified CAMI that further support of critical systems cannot be guaranteed and in some cases both hardware support and the associated software is no longer available. Parts' obsolescence will increasingly cause higher costs for replacement parts when they can be found or fabricated.

What Benefits Will Be Provided To The American Public Through This Request?

The AMEN investment will allow for the continued performance of aerospace medical and human factors research. This research serves as the knowledge base for Physicians, Physiologists, Human Factors Experts, Engineers, Psychologists, Educators, Flight Attendants, Aircrew, and numerous other academia, industry, and government personnel in the U.S. and abroad who are concerned with the safety of humans in aerospace operations.

The AMEN program has demonstrated its success since it was approved in May 2010. Its schedule and budget remain within the constraints assigned to the program.

The beneficiaries of the research resulting from the use of the equipment sought by AMEN include: the General Public, Aeromedical Scientific and Engineering Communities, Aeromedical Education/Training Communities, Aeromedical Certification, including FAA AAM Regional Flight Surgeons and Aviation Medical Examiners (AMEs), Aircraft Accident Prevention and Investigation, Aircraft Certification, Flight Standards, Legal Counsel, Space Transportation, Quality Management, Aviation Operations Personnel and their organizations, Aircraft manufacturers, and Industry/Government Accreditation/Standards development organizations.

Detailed Justification for - 3A09 NextGen – System Safety Management Portfolio

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – System Safety Management Portfolio
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
System Safety Management Portfolio	$18,700	$17,000	$17,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. Aviation Safety Information Analysis Sharing (ASIAS)	---	$15,000.0
B. System Safety Management Transformation (SSMT)	---	2,000.0
Total	Various	$17,000.0

For FY 2017, $17,000,000 is requested to continue development of both the ASIAS and SSMT programs by expanding their capabilities to better manage, integrate and process aviation safety performance data. This request will enable the development of tools to convert both text and numeric data into safety information. It will also support the development of visualization capabilities to enable causal/contributing factor analyses and risk assessment. In addition, tools and methods will be developed to integrate safety data from a number of disparate sources into a suite of system level models. The models will deliver products that allow users to evaluate system performance in near-real-time. Models and tools are based upon ASIAS data inputs and modeling. This supports a federally required Safety Management System (SMS) process managed by the FAA's Aviation Safety Organization (AVS). Risk mitigation strategies to address potential system safety risks are evaluated by the emergent risk forecasting activities in this portfolio to ensure that NAS sustainment and NextGen implementation does not introduce hazards into the NAS, while supporting the Administrator's Strategic Initiative – Risk Based Decision Making (RBDM).

A. Aviation Safety Information Analysis and Sharing (ASIAS)

For FY 2017, $15,000,000 is requested to provide the following:

- Expand Rotorcraft participation in ASIAS and incorporate initial Rotorcraft data into the ASIAS data set.
- Complete transition of ASIAS Flight Operations Quality Assurance (FOQA) data from a proprietary data format to an open format (ARINC 717/767) for improved efficiency and reduced cost.
- Leverage developing FAA Cloud capabilities to improve data storage, analysis, and sharing of capabilities for ASIAS members and FAA Lines of Business while reducing long term sustainment costs.
- Mature the ASIAS architecture to support an expanded set of NextGen data as it becomes available for data ingest.
- Enhance the ASIAS event analyzer, used in data visualization of ASIAS fused data, to include a 360-degree/3-D visualization platform for improved safety analysis; modify for use across FAA lines of business using FAA infrastructure.
- Develop analytical capabilities that allow General Aviation (GA)-Flight Data Manager (FDM) data to be used with FDM data from other aviation sectors. Using this capability, develop prototype capabilities that identify monitor safety risk areas where disparate operations intersect (i.e., 121, small GA, rotorcraft, etc.).

- Develop additional tools to discover hard-to-find (not pre-defined) subgroups of flights with higher rates of safety precursor events, and deploy automated capabilities to alert on non-typical flight or NAS system behaviors by leveraging ASIAS digital and textual safety data fusion techniques.
- Expand ASIAS studies beyond those affecting commercial aviation through assessment of issues that impact multiple segments of the aviation community (e.g., interaction of commercial, corporate/business GA, small aircraft GA), and targeted studies for specific communities such as Corporate GA or small GA aircraft.
- Deploy supporting applications that facilitates access to ASIAS data (e.g., application program interface (API), web-based narrative authoring tools, and analysis in line with narratives to support individual communities, working groups, via distributed participants sharing.

B. Systems Safety Management Transformation (SSMT)

For FY 2017, $2,000,000 is requested to provide the following:

- Safety Information Toolkit for Analysis and Reporting (SITAR) Monthly Terminal Risk Baseline
- SITAR Integration to Web Platform
- Integrated Risk Baseline and Forecast (Application to OI Concepts)
- ESD Redesign (including new structures for case studies) with explicit human performance and UAS modeling)
- Validation and Verification (specific topic case studies) including UAS analysis
- Automation System Baseline Risk Modeling

What Is This Program And Why Is It Necessary?

A. Aviation Safety Information Analysis and Sharing (ASIAS)

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 leverages 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. Safety insights from ASIAS analyses are communicated to the FAA and ASIAS participants and to others in the aviation community and are applicable to a broad range of aviation communities (e.g., commercial, general aviation, helicopters, Unmanned Aircraft Systems (UAS) airport operators, airport authorities) and other government agencies such as NTSB, DoD, and NASA.

B. Systems Safety Management Transformation (SSMT)

Systems Safety Management Transformation (SSMT) enables safety assessments of proposed NextGen concepts, algorithms, and technologies and provides system knowledge to understand 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 safety risk throughout the system is managed to an acceptable level. The activities in the SSMT Program include an Airport and Terminal Risk Baseline and Forecast models for all 35 major airports, an Integrated Safety Assessment Baseline and Forecasting Model that includes baseline event trees, fault trees and hazard data. This tool is used to provide annual safety metrics featuring the potential effect of NextGen initiatives, and to establish the requirements for safety mitigations in the system acquisition process. It also supports subject matter experts (SME) evaluation protocols for NextGen initiatives by providing linkages from SME estimates to actual historical accident and incident data. It also links these data to precursors that can be observed and tracked by ASIAS and a Hazard Risk Tracking system that supports the monitoring of safety baselines and forecasts for use by all FAA offices.

This development activity includes the expansion of information sharing and data analysis to identify and mitigate risks before they lead to accidents. New automated processes and models are required to facilitate advanced analysis of comprehensive data and will unlock new insight about potential safety risks.

Systems Safety Management Transformation (SSMT) provides the development required to improve system safety as air traffic grows to achieve the nation-wide goal of continuous safety improvement through implementation of an integrated safety management approach. This approach provides a proactive means for building safety into the air transportation system. By developing new analytical methodologies and leveraging state-of-the-art information technology, the FAA and its industry partners are able to monitor the effectiveness of implemented safety enhancements, establish baselines and trending capability for safety metrics, and identify emerging risks.

Safety information discovered through this portfolio will be used across the FAA and industry to drive improvements and support Safety Management Systems (SMS). Stakeholders will leverage insight to identify risk-reducing alternatives or changes to operations or processes as NextGen capabilities are deployed.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related facilities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

Achievement of the ASIAS mission of a proactive data-driven approach to aviation safety will require development of capabilities to acquire access to existing and previously unattainable information sources, enhanced analytical methodologies and technical advancements to support the monitoring and identification of system level safety risks. 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 reduce the risk of would-be accidents. 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, and it enables risk based decision making, a core element of the Administrator's Strategic Initiative to make Aviation safer and smarter.

SSMT ensures that current NAS-wide operational safety is maintained and improved, and that the safety risk analysis and safety assurance functions required by SMS for future NAS implementation are delivered. Without this activity, data collection and analysis, and NAS-wide risk modeling, the definition of risk baselines and impacts of NextGen systems on risk could not be evaluated. Due to the complexity of the NAS and the number and diversity of NextGen improvements, traditional operational safety assessments are inadequate to ensure that safety goals will be met. NextGen concepts often transfer responsibility among domains within the system (from ATC to aircraft or other operators) and include the introduction of significantly new concepts and roles for all of the operators and stakeholders in the system. The ISAM capability provides an integration platform capable of reflecting the complexity of the new NextGen operating environment. The system can capture traditional accident and data and establish historical baseline information. The SSMT activities enable a systematic integration process from primary data sources such as local sensor data derived from radar and flight performance via FOQA. The SSMT programs also enable integration of SME inputs with simulations that have been based upon these primary data sources. SSMT provides a range of risk-analysis outputs at varying levels of detail to support multiple FAA stakeholders. These include supporting documentation for operational safety assessments of NextGen performance, inputs for validation exercises including human-in-the-loop (HITL) simulations, as well as high-level risk assessment results which measure overall system safety performance.

SSMT integrates the data from a number of disparate sources into system level models and provides products that will allow users to evaluate system performance in near-real-time. SSMT links the hazard assessments to occurrence models and ASIAS data in a standard model that is available to the entire FAA safety community. These program efforts support the federally mandated Safety Management System (SMS) process, managed by AVS. Risk mitigation strategies to address potential system safety risks are evaluated by the emergent risk forecasting activities in this portfolio to ensure safety in the NAS and the safety of NextGen implementation.

What Benefits Will Be Provided To The American Public Through This Request?

A. Aviation Safety Information Analysis and Sharing (ASIAS)

The primary benefit of the ASIAS program to the American Public is its contributions to the reduction of the aviation accidents and fatalities across a broad range of aviation communities (e.g., commercial, general aviation, rotorcraft, UAS). ASIAS has already discovered potential safety issues in the NAS that are being addressed in the near-term through procedural and airspace redesign. ASIAS data has been used by the Optimization of Airspace and Procedures in the Metroplex (OAPM) program, Performance Based Navigation (PBN) program, and by the Commercial Aviation Safety Team (CAST) for the development of Safety Enhancements (SEs).

B. Systems Safety Management Transformation (SSMT)

SSMT has developed and deployed a standardized methodology to use Airport Surface Detection Equipment, Model X (ASDE-X) radar data to detect anomalous surface movement on airports and is currently being used by the ATO, Safety and Technical Training to identify and investigate runway surface safety issues. It is also capable of analyzing outputs from the Airport Surface Surveillance Capability (ASSC) system currently in trial operation in San Francisco. SSMT has also integrated these data with models of aircraft performance to model wake vortices, weather related turbulence, and human performance factors that potentially affect NextGen implementation within a safety analysis system called the Safety Information Toolkit for Analysis and Reporting (SITAR). The SITAR methodology is now in use to verify the risk baseline for all airport surface and terminal area operations in the NAS and to validate changes in the procedures required to implement NextGen changes for the ATO Safety organization. The ISAM is now an FAA official methodology for AVS and ATO's Safety and Technical Training Organization (AJI) to coordinate on risk assessment of NextGen. SME assessments with representatives of ATO, AVS, and industry have produced individual assessments of risk based upon the ISAM model environment.

The objective of the SSMT program is to provide "decision quality" analyses that support NextGen and other mission deployment decisions. Without this integration process, elaborate data collection efforts and operational safety assessments would still be isolated within individual lines-of-business and segregated from other potentially significant sources of information.

Detailed Justification for - 3A10 National Test Equipment Program (NTEP)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – National Test Equipment Program (NTEP)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
National Test Equipment Program (NTEP)	$2,000	$4,000	$5,000	+$1,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Hardware and Software Engineering Program Support	---	$4,000.0
b. Corrective Maintenance	---	500.0
c. Program Planning and Control	---	500.0
Total	Various	$5,000.0

For FY 2017, $5,000,000 is requested to replace obsolete test equipment. The funding provided will be used to procure replacement test equipment used to accomplish corrective maintenance/installation, contractor support to administer the program, and disposing of obsolete test equipment.

What Is This Program And Why Is It Necessary?

The National Test Equipment Program (NTEP) manages the modernization, distribution, calibration, and inventory of test equipment required to perform preventive and corrective maintenance, equipment installations and modifications, and service certifications in support of numerous National Airspace System (NAS) Platforms.

The NTEP is charged with procuring and maintaining the test equipment that ensures the NAS are operating to set standards by troubleshooting, repairing, and re-certifying both new and legacy systems. These systems are located on various NAS platforms including communication, automation, surveillance, power, navigation, and weather whose sensitivity must be maintained within specific tolerances. Failure to achieve certification of critical NAS systems at an FAA facility will result in the restriction of air traffic in the facility's air space and potentially cause major flight delays. The NTEP provides and maintain test equipment used in nearly 27,000 facilities throughout the NAS. However, a large portion of the equipment is either damaged or rife with supportability and maintenance issues which impacts Mean-time-to-restore (MTTR), safety, maintenance cost, and inventory management for practically every system within the NAS. No other FAA program office or initiative currently addresses this problem.

DOT Strategic Goals – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$5,000,000 is required to allow the FAA to incrementally replace obsolete test equipment and continue to support the FAA's mission.

What Benefits Will Be Provided To The American Public Through This Request?

The National Test Equipment Program's mission is to support the restoration of Air Traffic services by procuring and delivering functioning test equipment throughout the NAS in order to provide reliable measurement data to the thousands of technicians using the equipment on a daily basis. Failure to provide these services will have a dangerously negative effect on the NAS as it poses a major safety risk to the technician as well as delaying the restoration of critical Air Traffic systems crucial for the protection of the flying public.

Detailed Justification for – 3A11 Mobile Assets Management Program

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Mobile Assets Management Program
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Mobile Assets Management Program	$4,000	$4,800	$5,760	+$960

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Acquire Mobile/Modular ATCTs and Provisions	2	$4,660.0
b. Continue Upgrade/Perform Technology Refresh to Existing Mobile Assets	---	800.0
c. Continue Establishment/Outfitting the Service Area Deployment Centers	---	250.0
d. Decommission Assets That Are Beyond Their Useful Life	---	50.0
Total	Various	$5,760.0

For FY 2017, $5,760,000 is requested to ensure that a sufficient number of the FAA's mobile assets are available to maintain and restore continuity of aviation operations, such as:

- Acquire two Mobile/Modular ATCTs
- Establish or supplement air traffic control for facilities that are damaged or destroyed by natural or man-made disasters
- Support emergency or special event requirements
- Continue establishment/outfitting of the Service Area Deployment Center(s)
- Support scheduled maintenance and modernization programs

What Is This Program And Why Is It Necessary?

The MAMP provides for the continuity, restoration, or augmentation of NAS operations at the FAA operational facilities, such as air traffic control towers (ATCT), terminal radar approach control facilities (TRACON), remote transmitter/receiver sites, remote communications air/ground sites, and other sites that experience unexpected or planned system outages. The program will acquire new, operational mobile facilities to replace existing assets that have exceeded their useful life and to fill capability gaps in the existing inventory. The program will provide life-cycle support that will consist of equipment repairs and needed upgrades to ensure conformance to the FAA operational standards. Additionally, mobile assets provide temporary facilities to support air traffic operations when a fixed facility must be taken down during modernization projects and major equipment outages.

The MAMP was established in response to a visible inability to support the continuity of NAS operations in the event of natural or man-made disasters. The FAA established the MAMP because there was no centralized, national program to manage mobile assets and provide for their life-cycle support. As a result, the FAA's mobile assets, specifically the Mobile Air Traffic Control Towers (MATCTs), have deteriorated to the point where many are not operational as a result of inconsistent preventative, pre-deployment, or post-deployment maintenance, and insufficient funding and management oversight. This lack of oversight has resulted in the MATCTs containing systems that are no longer supported by the FAA logistics center. Procedures that are currently followed for life-cycle support and management are not standardized across the FAA's service areas, leading to varying degrees of readiness and availability between the three Service Areas. This funding will help to ensure that mobile assets with current NAS systems will be available and ready to meet emergency or special events requirements when they occur.

The inventory of significant mobile assets currently stands at 43 assets. Of these 43, 33 (77 percent) are operational and capable of performing their mission. Of the MATCTs, which are the most critical, most costly, and the largest of the mobile assets, one (14 percent) is currently inoperable and in a crisis could not be deployed immediately to perform the mission for which they were designed. Additionally, eight out of these nine critical MATCTs are at or beyond the end of their life cycle and are populated with equipment that is no longer supportable.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$5,760,000 is required to ensure that a sufficient number of the FAA's mobile assets are available to maintain and restore continuity of aviation operations, such as:

- Under FAA Order 6000.15, the agency is required to procure and maintain mobile assets that are capable of providing and supporting tactical ATC services that include communication, navigation, surveillance, infrastructure support, and mission support (e.g., command centers)
- Meet emergency or special event requirements
- Temporarily replace facilities destroyed by natural or man-made disasters
- Augment or establish air traffic control to reduce safety risk

What Benefits Will Be Provided To The American Public Through This Request

The American public will benefit by proficient restoration of air traffic control operations within hours of arriving on-site. The program will be working when it is able to ensure the availability and readiness of mobile assets to maintain or re-establish continuity of air traffic operations in response to emergencies and natural disasters. The FAA's mobile assets have been deployed to support relief efforts during natural disasters like the earthquake in Haiti or the hurricanes that hit the Gulf Coast each year. These assets have played a significant role during disasters such as the recovery efforts following the space shuttle Columbia tragedy and forest fires in Colorado and on the West Coast. Mobile assets are currently deployed to support several tower renovation projects including Isla Grande, PR, Paducah, KY, and Montgomery Field in San Diego, CA.

Detailed Justification for - 3A12 Aerospace Medicine Safety Information System (AMSIS) Program

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aerospace Medicine Safety Information System (AMSIS) Program ($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aerospace Medicine Safety Information System (AMSIS)	$3,000	$3,000	$12,000	+$9,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Prime Mission Product Development	---	$10,000.0
b. Program Management	---	1,000.0
c. System Engineering	---	1,000.0
Total	Various	$12,000.0

For FY 2017, $12,000,000 is requested in order to award the prime solution contract, complete software design, fund system engineering and program management support. Software design and development will involve five function modules: Medical Certification (Airman) and Medical Clearance (Air Traffic Control Specialists (ATCS)), Industry Substance Abuse, Reporting and Data Services, Workflow Management, and Common Module Functionality. The AMSIS Segment 1 Final Investment Decision (FID) is planned for the fourth quarter of FY 2016. Award of a prime contract will immediately follow Segment 1 FID. FY 2016 and FY 2015 funding will support investment analysis, requirements definition and development, system engineering, and program management support contracts.

What Is This Program And Why Is It Necessary?

The Office of Aerospace Medicine (AAM) is responsible for advancing the field-of-study of aerospace medicine and for the medical certification of airmen, Air Traffic Control Specialists (ATCS) and other safety critical personnel. AAM processes over 450,000 medical certifications annually and maintains records on millions of past examinations as part of AAM's role in the oversight of approximately 600,000 airmen and nearly 17,000 ATCS.

Currently, the coordination between FAA and the medical certification applicants is all conducted through the United States Postal Service and is very labor intensive. In addition, the information systems that support the storage and record keeping for this information were developed in the 1990's. The technology and architecture of these systems are becoming unsupportable and will soon be obsolete. The business processes that support the medical certification of airmen, and the other aviation safety programs, have changed and need to be re-engineered. The information technology must be aligned with OMB/DOT/FAA information systems architecture and security standards.

There is an immediate need to define new and improved business processes and design/implement automated information management systems for the Offices of Aerospace Medicine (AAM). An efficient and reliable system is needed to support the following:

- Establishing and maintaining aerospace medical and safety standards and policy

- Monitoring safety performance to ensure compliance with current standards and regulation
- Conducting aerospace safety education and research
- Issuing and maintaining aviation certificates and licenses
- Medically certifying all pilots operating within United States (U.S.) airspace except those operating under a Sport Pilot certificate)
- Surveying industry safety programs and practices (e.g., drug and alcohol compliance and enforcement programs) to verify compliance
- Investigating the medical aspects of aviation accidents.

AMSIS received approval for Concept Requirements Definition Readiness (CRDR) on December 7, 2011. AMSIS completed an Investment Analysis Readiness Decision (IARD) on August 28, 2013, and received approval to split the program into two segments on August 20, 2014. AMSIS then received an affirmative Initial Investment Decision (IID) for Segments 1 and 2 on December 17, 2014. The Segment 1 Final Investment Decision (FID) is planned for September 2016.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related fatalities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$12,000,000 is required to award the prime solution contract, complete software design, fund system engineering and program management support. This work will modernize the tools and processes that are used to processes medical certifications and maintain records of current and former airmen, and air traffic controllers.

What Benefits Will Be Provided To The American Public Through This Request?

Cost Avoidance and Savings

AMSIS will provide the tools required to capture, exchange, evaluate, and analyze information with significant improvements in efficiency, accuracy, and detail. AMSIS will simplify current processes and eliminate wasted effort by incorporating current technical medical standards. In addition, the updated automated process will cut operational cost while improving customer service.

Increased Data Security

The information technology will be aligned with OMB/DOT/FAA information systems architecture and security standards. Because these are medical information systems AAM must also align these systems with the national health information technology standards and security requirements for medical information systems developed by the Federal government, private sector and voluntary standards organizations, including the International Organization for Standardization (ISO). The systems will successfully and securely interface with approximately 4,250 health care providers designated by the FAA, known as Aviation Medical Examiners, who perform pilot and ATCS medical examinations.

Detailed Justification for - 3A13 Tower Simulation System (TSS) Technology Refresh

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Tower Simulation System (TSS) Technology Refresh
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Tower Simulation System (TSS) Technology Refresh	$3,000	$7,000	$3,000	-$4,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Variable Quantity/TSS Hardware and Software	11	$3,000.0

For FY 2017, $3,000,000 is requested to continue procurement and replacement of obsolete technology within the current Tower Simulation Systems (TSS) to decrease ongoing support demands and costs.

The TSS program will provide technology refresh of obsolete tower simulation equipment. The current system is over seven years old and is becoming expensive to operate and maintain. The projectors will be replaced with updated visual technology and the video processors will be replaced with current graphics and image processors to increase fidelity and processing power, and reduce maintenance costs. FY 2017 funding will support installation for 11 locations. TSS provides support for controller qualification and skill enhancement training and can be used as an aid 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 and departure procedures in an accurate and safe simulated environment.

What Is This Program And Why Is It Necessary?

The FAA releases its 10-year air traffic control workforce plan every year on March 31. It calls for greater efficiency in training procedures and identified a need to speed the training process while maintaining the high established standards. It is the goal of the TSS technology refresh program to address these needs and continue to provide exceptional training while reducing time-to-certification. These goals depend on creating a more efficient training program.

According to the "Controller Staffing Plan," the agency aims to reduce the overall cost of training to Certified Professional Controller (CPC) status. This program results in a more efficient training process, which accounts for producing CPCs in less time.

The TSS system provides an essential role within the NAS as well as satisfies the simulation training requirement identified in Joint Order 3120.4M. The TSS system is currently deployed at 32 sites and supports 142 tower facilities. These facilities provide support to both local and district Air Traffic qualification, contingency and skill enhancement training.

TSS provides realistic training for Tower Air Traffic Controllers in a non-operational environment. The Tower Simulator System is a full-scale ATCT simulator providing an interactive, highly realistic environment for controller training. The Tower Simulator System can support up to four simultaneous positions including local, ground and flight data/clearance delivery and coordinator. Trainees can prove initial proficiency at one of the four tower cab roles in the simulator and then work in that role as a developmental in the tower under the supervision of an on the job instructor (OJTI) and Front Line Manager (FLM) in preparation for certification. Realistic scenarios are generated, at the direction of an instructor. 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. The Tower Simulator acknowledges students' instructions using synthetic voice. Under certain complex traffic scenarios pseudo pilots respond directly to the student overriding the voice response capability. A recorded playback feature allows instructors to review and evaluate performance with the student after the training session.

The TSS is capable of displaying airport visual representations. For example, a simulator in Los Angeles can, within minutes, display and simulate operations at any airport for which a database has been created. The TSS is deployed in a hub and spoke methodology. Satellite facility within commuting distance of the hub can have a database on file at the TSS location. This allows one simulator to train developmental controllers from several nearby airports.

The impact to training operations is significant. Training no longer depends on the density or complexity of actual air traffic operations. Preemptive intervention on the part of an instructor to avoid a possible hazardous situation is eliminated. The student "works through" the scenario to an eventual successful, marginal or unsuccessful outcome. Scenarios can be repeated to build habits and reactions to potential operational errors with the ultimate goals improve safety and efficiency.

The TSS does not interact with live air traffic control operational systems and poses no threat to service interruption. The system creates an entirely new environment that operates away from and independently of ongoing air traffic operations. It realistically replicates operations that enable training in a safe environment. In addition to initial training, the TSS provides for refresher training to heighten awareness of controllers from repeated exposure to seldom seen operations and airport conditions. Before departing on a change of assignment, transferring certified controllers may prepare for and actually train on the operations they will encounter at their new assignment thereby greatly reducing the training time required when they arrive.

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.

DOT Strategic Goal – Organizational Excellence

- Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic security, and environmental needs.

Why Do We Want/Need To Fund The Program At The Requested Level?

The TSS technology is an integral component of Air Traffic Controller training providing a higher level of training quality and effectiveness, while decreasing training times and costs at specific locations. Components need to be replaced as the demand of our controller workforce and ability to meet shifting geographical demand increases.

This ongoing demand requires an investment in training systems technology and infrastructure to deploy and maintain a higher quality of systems to meet training demands. The current technology deployed for TSS is becoming obsolete and support costs are increasing. FAA is evaluating how to make the current hub and spoke model more efficient and effective.

What Benefits Will Be Provided To The American Public Through This Request?

TSS has been deployed at 32 operational locations in the NAS today. Initial data analysis indicates a decrease in On the Job training times ranging between 10 - 20 percent at specific locations.

Surveys conducted by the program offices reflect qualitative benefits in training that are not logged through a data collection program. The benefits are familiarization of operations, phraseology and best practices for procedures. Facilities have also indicated the value of evaluating new procedure and communication with airports and airlines on the impacts of construction and new procedures.

TSS provides the following benefits:

- Reducing the time required to attain CPC status and achieving increasing levels of certification will reduce training costs
- Reducing the time to achieve CPC status by providing developmentals the opportunity to practice seldom-used skills and to take advantage of low traffic levels by practicing complex scenarios in the simulator
- Tower simulation training will provide increased flexibility in scheduling, more rapid response to facility staffing needs, and reduced stress on training resources, such as OJT instructors
- Enhanced simulation and inherent simulation capabilities also provide for more standardized instruction, unbiased assessment of performance, mitigation of weaknesses, and useful remedial and proficiency training
- Provide a functionally compatible and realistic simulation environment that closely duplicates traffic situations/conditions to teach and test required operational skills and procedures
- Provide the controller with the opportunity to experience and practice important skills, some of which are seldom used under normal air traffic conditions simulation training will take advantage of a broad variety of training scenarios in a constant and consistent manner
- Through enhanced voice recognition technology, a potential reduction in remote pilot/pseudo pilot costs can be achieved
- Systems are used to re-create procedures that may require recurrent training or communication of best practices in all facilities
- Systems used for safety studies to identify risk and mitigate hazards associated with new airport construction and development of new air traffic procedures
- Development of airport models can be utilized for technical operations ground program by providing airport familiarity of new airport changes

Detailed Justification for: 3B01 Aeronautical Center Infrastructure Modernization

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2016 – Aeronautical Center Infrastructure Modernization
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aeronautical Center Infrastructure Modernization	$13,180	$15,200	$14,000	-$1,200

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks		Locations/ Quantity	Estimated Cost ($000)
a.	Multi-Purpose Building (Bldg 24) Renovation Construction for Seismic Wind Bracing, Replace Electrical Distribution, Fire Suppression, Lighting, Plumbing, Heating, Ventilation, Air Conditioning (HVAC)	1	$8,600.0
b.	Major Building System Replacements (Seismic and Wind Bracing, Roof Replacement, Boiler Replacement, Fire Suppression)	---	1,130.0
c.	Telecommunications Technology Refresh (routers, switches, fiber, security)	---	1,770.0
d.	NAS Integration and Technical Support Services	---	2,000.0
e.	Classroom, Laboratory Relocation Design for Air Surveillance Radar (ASR)	---	500.0
Total		Various	$14,000.0

For FY 2017, $14,000,000 is requested for the following:

- $8,600,000 is requested for major building system replacement in the Multi-Purpose Building (Bldg 24); a 211,203 square foot building constructed in 1972 that has not had major renovation in 41 years. The funding requested is for the addition of fire detection/suppression systems, the addition of seismic and wind bracing; replacement of electrical distribution, lighting, plumbing, and HVAC
- $1,130,000 is requested for major building system replacement
- $1,770,000 is requested to provide technology replacement of telecommunications at the Aeronautical Center. Over a six year phased cycle, funding will replace the telecommunications network switches, routers, internet filtering hardware for redundancy, reliability, security and availability in a total of 78 buildings. Replacements in 9 buildings will be complete in FY 2017. Tasks include security assessments, upgrades, disaster recovery testing, and installation of fiber/copper cable for network diversity
- $2,000,000 is requested to provide NAS Integration Support Services and Technical Support Services Construction inspectors for construction renovation
- $500,000 is requested for the design to relocate classrooms and laboratories for the ASR to the west side of the campus

Major tasks anticipated for completion by end of FY 2016:

- Award renovation construction contract for the Multi-Purpose Building #24, to replace elevators, windows, remove uninsulated exterior building panels, add insulation that complies with industry standards, and provide energy efficient lighting

- Complete Phases 3 and 4 (final phase) renovation construction of the Systems Training Building (Bldg 23) to add seismic and wind bracing to the building, replace mechanical systems, (HVAC, also boilers, chillers), replace electrical systems, plumbing, and provide energy efficiency in lighting and insulation
- Award contracts for Phase 5 (of 6) telecommunications network design, test, reconfiguration, security assessments in 16 of 78 buildings. Includes security assessments, upgrades, disaster recovery testing and installation of fiber/copper cable for approximately one quarter of the campus
- Complete telecommunications network design, test, reconfiguration, security assessments and upgrades, disaster recover testing and installation of communication duct banks/fiber from contracts awarded in prior year

What Is This Program And Why Is It Necessary?

The Aeronautical Center Infrastructure Modernization program funds renovation and restoration of leased and owned facilities at the Aeronautical Center in Oklahoma City to ensure they remain viable for the mission of present and future FAA employees, students, and contractors. Funding from this program allows renovation of facility space used by Air Operations, Engineering Training (Radar/Navigational Aids (Navaids)), NAS Logistics, Airmen/Aircraft registration, Safety, and Business Services. Program funding will be used for facility renovation, building system and telecommunications infrastructure replacement.

The Aeronautical Center is the FAA's centralized location that supports the FAA NAS and comprises 1,100 acres of leased land with approximately 3.4 million square feet of space under roof, supporting the work of 7,100 FAA employees, students, and contractors on a daily basis; and approximately 11,000 visitors annually; the largest concentration of FAA personnel outside of Washington D.C. Many buildings are approximately 50 years old and in need of renovation and building system replacement.

This program extends the service life of Aeronautical Center buildings through renovation and major building system replacement where FAA missions are performed. Eighty percent of the space at the Center directly supports the Air Traffic Organization (ATO). Thirteen percent of the Center space supports DOT and FAA Business Services and includes DELPHI/Prism, Castle Data Center Operations, Accounting Operations, Acquisition, the ATO Data Center, and Aviation Safety/Research.

Some NAS support functions are conducted in outdated structures and in buildings that do not meet current building codes. Delays to renovation and replacement of building systems have consequences that include leaking roofs, deteriorating plumbing, malfunctioning heating, ventilation, air conditioning, and non-compliance with life safety codes that can disrupt work, cause NAS automation and technology failures, risk occupant health and safety, require emergency repairs, and loss of productivity.

The aging infrastructure, in combination with growth and improvements to the NAS and business services, affects Aeronautical Center personnel and facility requirements in which they work. This program extends the useful life of facilities at the Center for 25 - 30 years, for current and future generations of the FAA work force.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

There is a significant backlog of facility improvements that need to be addressed to prevent further deterioration of buildings. The backlog can be addressed with systematic funding to improve facility conditions and assure the aging infrastructure remains viable in future years. The required funding supports these improvements.

What Benefits Will Be Provided To The American Public Through This Request?

Renovating aging facilities at the Aeronautical Center allows space efficiencies for additional functionality, personnel, and systems. Center facilities are cost effective and lower in cost than comparable General Services Administration (GSA) metropolitan Oklahoma City leased facilities, FAA Headquarters, and other FAA facility locations.

Renovation of Center facilities extends the useful life of renovated buildings, ensuring a viable future for FAA at these facilities. Renovation improves facility space and energy utilization, reduces maintenance costs of major systems within renovated buildings, provides for incremental upgrades of telecommunications infrastructure, and improves productivity of personnel using renovated facilities through space efficiencies and improved environmental controls.

This program, in combination with the lease, benefits the NAS and avoided $15.1 million in FAA costs during FY 2014 through the following:

- Lower lease and operating cost (includes utilities (gas, water, electric), janitorial, cleaning, security) costs in FY 2014 than other alternates: $17.09 per net square footage (nsf) at the Mike Monroney Aeronautical Center (MMAC), when compared with Oklahoma City GSA leased facilities at $25.04 per nsf
- Allowing flexibility and growth to support National Airspace (NAS) requirements. The Aeronautical Center has one or two of every legacy and new systems in the NAS that are used for Air Operations flight checks, engineering, system testing, training, NAS logistics, aviation regulation, registration, certification, aviation and transportation safety research
- Supporting NAS operations/maintenance, current and future ATO initiatives
- Decreasing energy and repair operations costs

Detailed Justification for - 3B02 Distance Learning

What Is The Request And What Funds Are Currently Spent On The Program?

**FY 2017 – Distance Learning
($000)**

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Distance Learning	$1,500	$1,500	$1,500	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Services to Support Distance Learning Platforms (DLP) Procurement	---	$600.0
b. Purchase and Install DLPs	400	900.0
Total	Various	$1,500.0

For FY 2017, $1,500,000 is requested to fund contract services and DLP hardware procurement to modernize 265 facilities with 400 DLP's.

Major Components:

- Administer contract services to develop, maintain configuration control, and deploy DLP hardware to field sites.
- Procure, configure, and deploy 400 Distance Learning Platforms to Air Traffic learning center field facilities. This action provides for the delivery of some or most of the initial, refresher, operator, and maintenance training for various FAA Capital Investment Programs such as En Route Automation Modernization (ERAM), Standard Terminal Automation Replacement (STARS), Airport Surface Detection Equipment – Model X (ASDE-X), and Airport Surface Surveillance Capability (ASSC).

What Is This Program And Why Is It Necessary?

Distance learning provides FAA with state-of-the-art quality course delivery to geographically dispersed students with a reduced dependency on travel to centralized facilities.

The Distance Learning program will provide for technology refresh of DLP (previously-Computer Based Instruction (CBI) Delivery Platforms) at all DLP Learning Centers, 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. The FAA is providing the technology refresh of the DLP's for two reasons:

- To support high-performance media and simulations required in many lessons
- To replace hard to obtain, obsolete parts for current platforms

The technology refresh is accomplished in a phased, multi-year approach.

This program reduces the cost of training to maintain and operate the National Airspace System (NAS) and to perform Air Traffic operations. This program provides the infrastructure to deliver simulations and training to all FAA employees via DLP and FAA Academy Aviation Training Network (ATN). The largest groups of DLP users are Technical Operations technicians and Air Traffic controllers. This program provides productivity improvements for Air Traffic Organization (ATO) employees by shortening the time to achieve full performance and certified employees and to maintain performance and certification. The time reduction for training is based on reduced time for training and by delivery of training at the job site thus avoiding travel time to the Academy or factory schools.

All Air Traffic Controllers accomplish refresher/initial training on the DLP's. For example, at the En-Route facilities, the DLP systems provided for approximately 240,000 course completions in FY 2014. Many facilities require a monthly refresher for specific local issues that are accomplished on the DLP systems. Most of the ATO Technical Operations Technical Training Resident courses offered at Mike Monroney Aeronautical Center (MMAC) require DLP courses as prerequisites. Additionally, the DLP, ATN, and web delivery systems are required to deliver initial operator, transition, and maintenance training for many NAS programs.

The FAA requires cost-effective distance learning alternatives to reduce the current resident-based training load, accommodate increases in training due to the introduction of new national airspace systems, continue personnel transition/refresher training, support succession training, and provide performance support. The requested funding is for the scheduled technology refresh cycle to replace DLP's at the Air Traffic Terminal field sites and Federal Contract Tower field sites.

The Distance Learning program supports the FY 2013 Destination 2025 Plan. Distance Learning supports the "Next Level of Safety" because it will strengthen and improve technology, infrastructure, and training, to reduce the risk of accidents from all causes in all phases of operation.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$1,500,000 is required to replace DLP equipment for the scheduled life cycle technology refresh to replace unsupportable equipment used for the DLP Training field sites. The Distance Learning Resource Center data shows hardware-related calls increase significantly in the last few months of a system's warranty period, which would likely continue past warranty expiration. Replacement of DLP's will prevent system degradation and/or Platform inoperability. Distance Learning will be able to continue providing field training to employees with decreased travel and per diem costs.

DLP's must be replaced when warranties expire for the following reasons:

- To decrease the risk of extended training platform downtime at field sites (75 percent of field sites are single platform sites)
- Less overall maintenance support cost vs. maintaining a stock of spare parts

What Benefits Will Be Provided To The American Public Through This Request?

This program reduces the cost of training required to maintain and operate the NAS and to perform Air Traffic operations. This program provides the infrastructure to deliver simulations and training to all FAA employees. The Distance Learning Program through the Distance Learning Platforms is currently providing well over $10 million per year in savings. The Aviation Training Network (ATN) is providing an additional $8 million in cost avoidance per year. The $8 million ATN figure was derived by averaging the last 12 years of savings in student travel costs.

Executive Summary – Facilities and Equipment, Activity 4.

What is the Request and What Funds are Currently Spent on the Program?

The Facilities and Equipment (F&E) Activity 4 program is requesting $237,400,000 for FY 2017, an increase of $11,700,000 (5.2 percent) above the FY 2016 enacted level. Of this funding, $10,400,000 is requested to continue to transform current digital aeronautical information in conformance with international standards and NextGen objectives. This transformation will enable the near real-time processing of such data to improve mapping and flight planning, as well as the accuracy and timeliness of ATC instructions.

Key outputs and outcomes expected to be achieved in the budget year with the requested resources:

- Program Leases – Funds over 2,800 facility and land leases in support of essential National Airspace (NAS) requirements.
- Mike Monroney Aeronautical Center Leases – Funds warehouse, administrative office space, and training facilities that support the mission of 7,300 employees, contractors, and students.

Activity 4 funding provides mission support services for the modernization of air traffic control, safety, regulation, and information security requirements. The funding for Activity 4 programs support:

- Major support contracts that cross programmatic, functional, and organizational lines
- System-engineering, logistics, requirements analysis, and systems management for the overall NAS, and safety, security functions throughout the FAA.

What Is This Program And Why Is It Necessary?

This Activity provides mission support services that cross FAA organization and functional lines. Funding for MITRE's Center for Advanced Aviation System Development (CAASD), one of FAA's Federally Funded Research and Development Center (FFRDC), is provided under Activity 4. In addition, this funding provides technical and installation support to assist the FAA's technical workforce in handling a surge in demand for short-term programs/projects that are vital to managing the volume of diverse systems and equipment associated with NAS modernization.

FAA requests Activity 4 funding for leasing ATC facilities and related research and laboratory facilities (including those located at the Mike Monroney Center in Oklahoma City, Oklahoma and the William J. Hughes Technical Center in Atlantic City, New Jersey).

Activity 4 funds many of the mission support activities that FAA must perform to effectively operate and maintain its Air Traffic Control operation. FAA will use the funding to procure the additional systems engineering skills and lease facilities and equipment required to complete mission. Activity 4 can be viewed as an overhead account for the overall F&E budget.

Activity 4 efforts contribute to the following DOT Strategic Goals:

- Safety: Improve public health and safety by reducing transportation related fatalities and injuries
- Economic Competitiveness: Promote Transportation policies and investments that bring lasting and equitable economic benefits to the Nation and its citizens
- Organizational Excellence: Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs

Why Do We Want/Need To Fund The Program At The Requested Level?

Funds are requested for a variety of purposes under Activity 4 including equipment installation; research, development and demonstration of new technologies; facility leases; systems engineering support; and program management services. In many cases, it is more efficient for FAA to contract for a portion of support services and lease facilities to obtain the personnel and infrastructure needed to meet current requirements than to hire additional permanent staff and procure land and buildings. Activity 4 funding enables the agency to flexibly procure the additional resources needed to meet current demand while not substantially increasing fixed operating costs.

What Benefits Will Be Provided To The American Public Through This Request?

This program has been successfully implemented for over 15 years. FAA has demonstrated that this is an effective way to allocate program costs across functional and organizational lines. Under this approach, FAA has achieved management efficiencies while obtaining the expertise needed to augment in-house resources.

FAA revalidates support contract requirements annually. Funding on various initiatives changes based on FAA priorities and requirements. These FAA resources have demonstrated the ability to quickly reallocate resources to support FAA needs to support the overall mission of Air Traffic Control operation.

Detailed Justification for - 4A01 System Engineering (SE2020) and Development Support

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – System Engineering (SE2020) and Development Support
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
System Engineering and Development Support	$34,504	$35,000	$35,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. System Engineering (SE2020) Contract	---	$30,000.0
b. Program Evaluation	---	400.0
c. Computer Services	---	1,600.0
d. ATC/ANF Systems Support	---	3,000.0
Total	Various	$35,000.0

For FY 2017, $35,000,000 is requested to provide technical contract support services which will ensure sound systems engineering practices and business case development processes, instrumental to the safety, efficiency, and security of the NAS (National Airspace System).

The System Engineering and Development Support program supports the agency's goals of improving aviation safety, security, and efficiency. These objectives are achieved by delivering continuity, innovation, and cost effective techniques while increasing capacity and productivity.

a. System Engineering (SE2020) Contract:

- Provides continuous critical support activities which complement NextGen Air Transportation System programs, which include Configuration Management, Infrastructure Roadmaps, Operation Planning, Requirements Engineering, System Engineering Services, Enterprise Integration Services, Forecast Analysis and Investment Planning and Analysis for the life of the NextGen Program.
- Support for critical programs such as NAS Enterprise Architecture (integrate and align the Enterprise Architecture portal), Segment Implementation Plan, and Safety Process Improvement are procured through this budget line item.
- Provides portfolio of multiple prime contractors with large subcontracting teams who can provide support across a broad range of Research & Mission Analysis and System Engineering requirements thus reducing the need for new standalone contracts and contract vehicles which reduces overall costs and promotes efficiency.

b. Program Evaluation:

- Provides cost estimating, operations research and business case analysis in support of investment analyses for NextGen

c. Computer Services:

- Supports application and upgrades to program management financial tools

d. ATC/AFN Systems Support:

- Supports technical analysis and oversight of acquisition programs goals and performance reporting

What Is This Program And Why Is It Necessary?

The required engineering support consists of disciplines ranging from systems requirements and system modeling to transition and human resource planning. The research of emerging procedures and technologies will help to determine the best way to develop and deploy critical NextGen initiatives. These activities include demonstrating that NextGen procedures and operational changes will work on a large scale within the current and evolving air traffic system. In addition, automated data processing and information resource support is required to support the development and/or enhancement of computer simulation models, miscellaneous software upgrades, databases, and program management tools. Program management, financial management and investment analysis support are provided to assist with planning, decision-making, and budgetary oversight of the activities involved in implementing newly acquired systems, components, and equipment in existing operational NAS facilities.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The System Engineering and Development support budget line item provides future enhancement of the Air Traffic System by establishing and documenting the FAA's Enterprise Architecture (EA) requirements. The EA is the blue print for the future air transportation system and must be documented clearly and accurately. This program assists in developing, delivering, and implementing guidance to move forward the engineering and prototyping effort for NextGen and the transition to NextGen.

In addition, contract support services have ensured sound systems engineering practices and business case development processes. Also, the contract provides support to FAA's planning and budgetary processes ensuring consistent application of the AMS (Acquisition Management System) policy.

What Benefits Will Be Provided To The American Public Through This Request?

This request will support the agency's goals of improving aviation safety, security, and efficiency while increasing capacity and productivity by providing technical assistance through contracts for various programs. The technical assistance will provide support for enhancing software tools, integrating and aligning the Enterprise Architecture portal, along with updating infrastructure roadmaps annually.

Detailed Justification for - 4A02 Program Support Leases

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Program Support Leases
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Program Support Leases	$43,200	$46,700	$46,600	-$100

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Operational Leases	---	$46,600.0

For FY 2017, $46,600,000 is requested to pay the annual rent on leases for real estate (both land and space) to house facilities required to operate the National Airspace System (NAS). This program funds more than 2,900 leases along with other real estate requirements and will include:

- Payment of rents for land and space leases that directly support navigation, communication, weather observation and reporting, air traffic control, and other functions that support the NAS
- Funding for leased access roads and easements providing ingress and egress to and from leased facilities to include perpetual easements
- Costs associated with the rental and management of land and space for service/maintenance centers, deployment/development centers, laboratories, test beds, and other types of facilities that support the deployment and operation of technical facilities
- Funds for conversion of existing leases to fee ownership or perpetual easements
- Payments for condemnation (leasehold or fee) of real property interests
- Costs for real estate appraisals, market surveys, title reports, land surveys, and other costs associated with the acquisition and management of real property assets
- Funds for costs to relocate offices, facilities, personnel, and equipment
- Funds to downsize, consolidate, or combine multiple offices when technically feasible and economically advantageous
- Funding for the development of business tools to enhance real estate acquisition and management activities and for implementing program efficiency practices
- Funding for costs associated with real property lease terminations and equipment disposals
- Funding for testing and studies (environmental, suitability, sustainability, cost-effectiveness, etc.) in connection with the leasing, purchasing, usage, management, and disposal of real property

What Is This Program And Why Is It Necessary?

To operate the NAS, FAA utilizes more than 2,900 rentable real estate leases since the majority of its facilities reside either on leased land or in leased building space. The Program Support Lease program requests funds to meet contractual obligations including rental payments or other requirements to provide the necessary real property rights for land, tower space, aerial easements, and technical operational space for these leases. Without these property rights FAA could not operate the NAS.

Leases for building space include those for planned, constructed, and newly finished Air Traffic Control Towers. The FAA must also obtain restrictive aerial easements or clear zones to prevent interference with electronic signals at certain facilities, such as very high frequency omni-directional ranges, airport surveillance radars, and air route surveillance radars.

The real property leases are legally binding contracts that usually require rents to be paid each year. The total rent amount for the leases portfolio increases each year due to the addition of leases for new facilities, rent escalation clauses written into leases, and market value adjustments of expired leases through renewal negotiations.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want / Need To Fund The Program At The Requested Level?

$46,600,000 is required to fund rent payments for the projected total real estate lease portfolio, pending judgments for fee condemnation court awards, and costs associated with real property lease terminations and equipment disposals. This program also pays costs for the reconfiguration of a space facility if a reduction in space reduces the footprint for better space utilization and cost savings. Many of the leases being renewed after 20 years are in areas targeted for development with escalating lease costs since the original lease was executed. Some of these increases for lease and purchase costs are the results of wind turbine development, sophisticated bankers and financial lessors, and commercial development in the area. Maintaining the status quo for lease costs is difficult. In some cases rental payments must continue even after decommissioning of the facility because the requirements for environmental reporting and site restoration have not been completed in accordance with the terms of the lease. Costs associated with real estate acquisition and disposal such as surveys, appraisals, appraisal reviews, environmental reports, and title work continue to rise. Large investors are moving into many areas and buying properties occupied by the FAA and are demanding higher rents.

According to the Acquisition Management System (AMS), purchase is the last option if a negotiation impasse exists. If this option is removed due to lack of funding, the Government will incur greater risk and expense through inverse condemnation or be forced to negotiate rates far above market values including possible legal actions. Funds required for this Program are budgeted to include rental costs, associated lease costs (appraisals and surveys), environmental costs, restoration costs, and purchases. These are all essential to continue with our contractual obligations.

What Benefits Will Be Provided To The American Public Through This Request?

Sufficient funding is available to make rent payments for all the real estate leases for NAS operational facilities. Funding for the implementation of co-location, consolidation, and oversight measures are an integral part of this program in order to achieve long-term savings.

Detailed Justification for - 4A03 Logistics Support Services (LSS)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Logistics Support Services (LSS)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Logistics Support Services (LSS)	$11,500	$11,000	$11,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Logistics Support Services (LSS)	---	$8,800.0
b. Acquisition Support Services	---	2,200.0
Total	Various	$11,000.0

For FY 2017, $11,000,000 is requested to fund contractor-supplied logistics and acquisition support services.

What Is This Program And Why Is It Necessary?

Through the LSS program, the agency utilizes contractor-supplied services to perform real property acquisition and leases, materiel management, contracting activities in support of FAA Capital Investment Plan (CIP) projects, and to conduct capitalization and property control-related activities. These services currently provide a significant portion of the workforce for acquisition, real estate, and materiel management at the FAA regions and centers. The LSS program provides critical support personnel involved in the acquisition of new or upgraded facilities, including air traffic control towers and Terminal Radar Approach Control Facilities (TRACONs), throughout the National Airspace System (NAS). The LSS resources will continue to be used for asset tracking and documentation efforts to obtain and maintain a clean audit opinion.

The LSS program directly supports improved 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 acquisition activities supporting the NAS. These functions are performed throughout the three Service Areas (Eastern, Central, and Western), the FAA Technical Center, and the FAA Aeronautical Center.

The FAA logistics and acquisition personnel at regions and centers manage real estate, acquisitions, and materiel for NAS modernization and capitalize agency assets as required by the agency's strategic plan. This includes acquiring real estate, awarding contracts to buy or upgrade equipment and construct facilities, and installing and commissioning modernized equipment and systems. Additionally, the FAA must adequately document the capital cost of FAA facilities, and comply with accounting standards set by the Government Accountability Office (GAO).

Related project management goals include:

- Complete 82 percent of the annual real property inventory validation effort
- Designate 75 percent of the disposed real property assets as "retired" within 30 days of the date the disposal forms are received from the Air Traffic Organization (ATO)
- Capitalize 92 percent of all personal and real property capital assets within 65 days of date placed in service
- Capitalize 92 percent of all purchase orders within 45 days and award 90 percent of all contracts (over $100,000) in less than 180 calendar days from the time a purchase request is received from the requiring organization

DOT Strategic Goal – Organizational Excellence

- Develop an innovative, world class organization to advance the U.S. transportation system and serve the Nation's long term safety, social, economic, security, and environmental needs.

Why Do We Want / Need To Fund The Program At The Requested Level?

The requested funding will continue to promote processing efficiencies within acquisition, real estate, and materiel management that have been made over the last several years since this contract was put in place.

What Benefits Will Be Provided To The American Public Through This Request?

LSS resources have been utilized across the three service areas, including the nine regional offices located within the three service areas, the FAA Aeronautical Center, the FAA Technical Center, and FAA Headquarters to provide the technical support to process capitalized assets. As a direct result of the LSS staffing support, these FAA assets were processed in a timely and accurate manner.

Detailed Justification for - 4A04 Mike Monroney Aeronautical Center Leases

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Mike Monroney Aeronautical Center Leases
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Mike Monroney Aeronautical Center Leases	$18,350	$18,800	$19,300	+$500

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Annual Rent for Leased Land/Buildings/Sustainment/Insurance	1	$14,300.0
b. Replace Building 2 Lighting and Insulation	1	580.0
c. Replace Building 15 Windows, Install Fire Suppression	1	2,200.0
d. Replace Elevators in Buildings 22, 25, Hanger 8; Demolish Building 113; Pave Parking Lot; Replace HVAC in Hanger 8 and 9	---	2,220.0
Total	Various	$19,300.0

For FY 2017, $19,300,000 is requested to continue the Aeronautical Center Leases and to replace major building systems sustainment in leased facilities that require replacement based on age and condition to prevent further deterioration. Deferred sustainment includes the replacement of heating, ventilation, air conditioning systems, boilers/chillers, electrical system replacement, plumbing systems, interior finishes, seismic remediation, and other building systems that include exterior enclosures, roofs, interior construction, stairs, fire protection, and site improvement replacement. Funding for this program assures continuity of the Aeronautical Center facility and that it remains viable for current and future generations of FAA employees.

What Is This Program And Why Is It Necessary?

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/Navigational Aids (Navaids)), 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 is the largest concentration of FAA personnel outside of Washington D.C. In addition, approximately 11,000 visitors come to the Aeronautical Center annually.

The Aeronautical Center leases provide leased land/building rent and insurance that comprise approximately 80 percent of Aeronautical Center space: 2.7 million square feet of leased space and 1,100 acres of land, having a leased facility replacement value of $696 million.

The lease is comprised of:

- Master Lease land/building rent, replacement of major building systems and insurance
- Thomas Road warehouse lease

- Tower space for Terminal Doppler Weather Radar (TDWR) target generators

The Aeronautical Center requires large parcels of land as NAS test sites for surveillance radar, communications, weather, and navigation/landing systems, as well as warehouse, administrative office space, and training facilities. It is a Level IV security site based on numbers of employees, facility square footage, sensitivity of records, volume of public contact, and mission essential facilities whose loss, damage, or destruction may have serious or catastrophic impact on the NAS.

DOT Strategic Goal – Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$19,300,000 is required to pay rent under the long-term lease agreement and to correct a backlog of deferred sustainment needs in leased buildings to prevent deterioration of facility conditions that affects the missions of FAA organizations.

Leased Aeronautical Center facilities support FAA missions that include:

- Aviation training for 90,000 FAA and international students per year in resident and distance learning, including approximately 1,000,000 hours of distance learning delivered annually
- Logistics services and supply support to the operational NAS to all FAA Airway Facility locations, Air Traffic, and approximately 70 Department of Defense (DoD) and international organizations
- Engineering services for NAS systems modification and repair
- Aviation research of medical and human factors impacting aviation personnel
- Standards and flight inspection services
- Regulation certification of safety related positions and equipment, airmen and aircraft records and registration
- Business services that include DOT/DELPHI/Prism/Castle Data Center Operations, Accounting Operations, Acquisition Services, Air Traffic Organization (ATO) Data Center, Aviation Safety/Research

What Benefits Will Be Provided To The American Public Through This Request?

This program, in combination with the Aeronautical Center Infrastructure Modernization, benefits the NAS and avoided $15.1 million in FAA costs during FY 2014 through the following:

- Lower lease and operating cost (includes utilities (gas, water, electric), janitorial, cleaning, security) costs in FY 2014 than other alternates: $17.09 per net square footage (nsf) at MMAC, when compared with Oklahoma City General Services Administration (GSA) leased facilities at $25.04 per net square footage (nsf)
- Allowing flexibility and growth to support National Airspace requirements. The Aeronautical Center has one or two of every legacy and new systems in the NAS that are used for Air Operations flight checks, engineering, system testing, training, NAS logistics, aviation regulation, registration, certification, aviation and transportation safety research
- Supporting NAS operations/maintenance, current and future ATO initiatives
- Decreasing energy and repair operations costs
- Enables Air Traffic Organization initiatives by providing infrastructure that supports new NAS facilities funded from other sources that include ATO Technical Operations, Precision Runway Monitor (PRM), Power Services Center and Lab (PSC/PSL), and others

No work stoppages have been identified due to unsafe/unusable facilities even though the average age of leased facilities at the Center is almost 50 years.

Detailed Justification for - 4A05 Transition Engineering Support

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Transition Engineering Support
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Transition Engineering Support	$16,596	$19,200	$24,100	+$4,900

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. NAS Integration Support Contract (NISC)		
a. NISC Program Support	---	$2,500.0
b. NISC Contract Management	---	12,500.0
Total	Various	$15,000.0
B. Configuration Automation Management (CMA)	---	$9,100.0

For FY 2017, $24,100,000 is requested for the following:

A. NISC: $15,000,000 is requested to support the modernization schedules for NAS programs. This budget level is necessary to provide continual NISC contract management and infrastructure support for the prime contractor for the NISC III contract valued at $1.4 billion. In addition, these funds will be used for program acquisition management, financial management, administrative support services, continued operation and IT support services for the NISC contract tracking system and reporting system, other indirect contractor costs, and other program management support.

B. CMA: $9,100,000 is requested to continue implementing the CMA system. CMA consists of a commercial-off-the-shelf tool that, when integrated with legacy systems, will support configuration management (CM) assets and investments for both NAS and non-NAS programs.

What Is This Program And Why Is It Necessary?

A. NISC: Provides engineering and technical resources to the FAA organizations responsible for NAS transition and implementation. The NISC team, working in partnership with these organizations, ensures that capital investments and regional projects are implemented in the most effective manner to support the NAS mission. The Transition Engineering Services program maps to organizational excellence by providing a highly skilled and experienced workforce at cost-effective rates.

This program provides technical support to assist the FAA's technical workforce in handling a surge in demand for short-term programs/projects that are vital to managing the volume of diverse systems and equipment associated with NAS modernization.

B. CMA: A vital component of the FAA's lifecycle management effort to manage the complexity of today's physical and virtual IT environments. The FAA CMA system will allow for flexible, robust capabilities to incorporate necessary changes in preparation for the agency to transition to the Next Generation Air

Transportation System (NextGen). CMA will support Configuration Management (CM) planning and management, configuration identification, configuration control, configuration status accounting, and configuration audits. It will interface with other FAA systems to create a closed-loop process that provides the appropriate structure and toolsets. This will allow the FAA to fundamentally change and move from a CM process that relies heavily on CM practitioners' institutional knowledge to a scalable, network-centric architecture that ensures effective CM of NAS and non-NAS IT assets. CMA will create the infrastructure necessary to leverage process-to-process integration, minimizing redundancy and clustering processes around a single integration point. Also the lack of a closed-loop CM system and the fact that information is not integrated into a single system require multiple manual processes that lead to duplication of effort, time-consuming activities, and potentially inaccurate results.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. NISC: $15,000,000 is required for Transition Engineering Services to support the modernization schedules for NAS programs by providing a cost-effective contractual vehicle for meeting capital investment plan (CIP) projects and the FAA organizational technical requirements.

B. CMA: $9,100,000 is required to acquire an enterprise tool to meet Configuration Management requirements. These requirements not only provide capability of an engineering change process through the capture, documentation, and approval of proposed changes to FAA processes and systems, but to manage data that can be used by various FAA groups. Accounting for the performance of equipment, systems, and processes will support planning for the requirements far-future systems, facilitate implementation of near-future systems, and help to scrutinize the need for current systems toward the path of efficiency.

What Benefits Will Be Provided To The American Public Through This Request?

A. NISC: Affords the FAA flexibility in obtaining the technical expertise required to meet demand surges with minimal lead time and without the need for long-term commitments. The NISC program provides FAA with rapid access to highly qualified and experienced professional engineering and technical support where and when determined necessary by the incumbent federal workforce. The NISC program facilitates other national programs in defining, securing and administering the utilization of hard to capture professional labor categories once deemed necessary by those program offices. All work is based on documented FAA requirements.

B. CMA: Will enable the FAA to evolve from CM processes that rely on CM practitioners' institutional knowledge to a scalable, network-centric architecture that ensures effective CM. The CMA solution will use commercial systems and industry standards to reduce developmental and upgrade costs, while simplifying maintenance activities. CMA will help the FAA reduce CM-related errors and delays while providing up-to-date CM information to support enterprise-level decision making. CMA will allow the FAA to move from disconnected and incompatible CM information systems to a system that will allow all users simultaneous access to the same standardized information. CMA will facilitate development of loosely coupled processes and data integration across the FAA to plan, manage, and support the agency's transition to NextGen.

Detailed Justification for - 4A06 Technical Support Services Contract (TSSC)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Technical Support Services Contract (TSSC)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Technical Support Services Contract (TSSC)	$23,000	$23,000	$23,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Contractor Program Management	---	$13,500.0
b. Planning, Quality Control, Security, Safety	---	4,400.0
c. Award Fee	---	3,500.0
d. Program Management Support Contract	---	1,100.0
e. Defense Contract Audit Agency	---	500.0
Total	Various	$23,000.0

For FY 2017, $23,000,000 is requested to continue the TSSC infrastructure. This will enable other programs to use its services to accomplish more than $100 million of project work each year.

Funding the TSSC infrastructure, referred to as infrastructure costs, sustains the FAA's national capability to supplement and leverage federal skills during site-specific National Airspace System (NAS) implementation efforts. TSSC is the Agency's primary installation support service vehicle and is used by a myriad of capital budget improvement program customers to achieve timely and cost-effective NAS modernization. Through TSSC, implementation of capacity and safety enhancements are achieved via approved and funded NAS capital projects that would otherwise be delayed.

What Is This Program And Why Is It Necessary?

The TSSC program is the agency's vehicle to provide a workforce multiplier that installs equipment and supports the capital budget improvements to the NAS in a timely, cost-effective manner. These activities include work planning, quality control, subcontracting, the contractor safety program, and award fee paid under the contract, as well as the usual rent, telecommunications and utility costs incurred under the contract.

Significant work is required to install, modify, and relocate equipment by personnel with electronic, mechanical, and civil engineering skills. Often the engineering and technician support is of short duration and requires skills that the FAA government employee workforce does not have or which exist in insufficient numbers. The TSSC program allows the FAA to avoid hiring additional employees for a limited duration to handle a surge in demand, such as when new equipment is installed at multiple locations and during compressed schedule periods.

TSSC infrastructure activities include program-specific and site-specific work planning, quality control and assurance, legal compliance with subcontracting law, contractor safety programs, and invariable costs such as office space rent, and supporting telecommunication and utilities. The TSSC program funds Defense

Contract Audit Agency (DCAA) audits of contractor accounting systems, corporate indirect rates, and other processes to ensure technical and legal compliance.

TSSC infrastructure funding pays for the following:

- Project implementation safety, security, and quality control efforts, which help avoid worker's compensation claims and increased insurance costs, and to avoid costs to the FAA for rework that would be required to correct defects that occur when quality control efforts fail due to a lack of adequate funding
- The prime contractor's costs for the effort to award and administer subcontracts to accomplish $35,000,000 of annual public works efforts on behalf of the FAA
- Contractor management of its personnel, office rent, communications and utilities
- DCAA audits of contractor costs

DOT Strategic Goal – Organizational Excellence

- Develop an innovative, world class organization to advance the U.S. Transportation System and serve the Nation's long term safety, social, economic, security, and environmental needs.

Why Do We Want / Need To Fund The Program At The Requested Level?

$23,000,000 is required to fund continuing contract operations. These operations, referred to as infrastructure costs, sustain the FAA's national capability to supplement and leverage federal skills during site-specific NAS implementation efforts. TSSC is the agency's primary installation support service vehicle, and it is used by a myriad of capital budget improvement program customers to achieve timely and cost-effective NAS modernization. Through TSSC, the implementation of capacity and safety enhancements are achieved via approved and funded NAS capital projects that would otherwise be delayed.

The requested funding will support the FAA by:

- Providing program management support, which is used to assist the program office in its cost, schedule, and scope oversight on the national TSSC
- Significantly improve the number of projects that are completed, and the timeliness of their completion, decreasing costs, promoting safety and quality assurance capabilities.

What Benefits Will Be Provided To The American Public Through This Request?

The TSSC program has an award fee, performance-based acquisition contract vehicle to promote efficiency and FAA customer satisfaction. The TSSC customer award fee evaluation survey participation return rate is typically greater than 90 percent. Direct FAA customer award fee feedback rated contractor performance greater than 90 percent in the excellent and good range across several hundred individual contractor performance evaluations in the past years of TSSC performance.

In a typical year, the TSSC vehicle is used to purchase more than $65,000,000 in labor and accomplish more than $35,000,000 in non-labor cost activities, such as site preparation and other public works construction that would not otherwise be accomplished.

Detailed Justification for - 4A07 Resource Tracking Program (RTP)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Resource Tracking Program (RTP)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Resource Tracking Program (RTP)	$4,000	$4,000	$6,000	+$2,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Program/Project Management	---	$6,000.0

For FY 2017, $6,000,000 is requested to continue to keep hardware and software licenses current, program/project management support in the National Airspace System (NAS), maintain Technical Support Services Contract (TSSC) and NAS Implementation Support Contract (NISC), upgrade training documentation, and continue to provide training to users and data administrators.

What Is This Program And Why Is It Necessary?

The RTP is a computer management system (including hardware, software, development, training, and support) used by the FAA Service Centers, the William J. Hughes Technical Center, and the Mike Monroney Aeronautical Center for identifying requirements, internal budget preparation, implementation planning, resource estimating, project tracking, and measuring performance of projects. The Corporate Work Plan (CWP) process is the Air Traffic Organization's (ATO) method to implement approved projects and to standardize National Processes in support of the NAS. The CWP system, which falls under the RTP program, enables users to share FAA's project data during the various stages of implementation (i.e., planning, scheduling, budgeting, execution, and closeout). The CWP toolset and its supporting data are continuously used for reporting project metrics to project managers, responsible engineers, program offices, and various other customers.

The hardware and software for the CWP TOOLSET, which is the key tool that makes up the CWP, must be constantly maintained and upgraded, to support FAA and the processes that will be impacted as it continues to evolve into the ATO. The CWP TOOLSET is used to track all ATO Capital projects from cradle to grave. This system is also used to develop the CWP and work releases for the TSSC.

This system interfaces with DELPHI and Fund Control Module (FCM) and various other systems. The CWP TOOLSET is a centralized system with load-balanced servers residing in Oklahoma City, OK.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$6,000,000 is required to keep current the CWP TOOLSET software and hardware. NAS Implementation Support Contract (NISC) and the Technical Support Services Contract (TSSC) will be maintained for contractor support, software development efforts, and technical support. Also, hardware and software licenses will be maintained to keep the cost of upgrades to a minimum. This maintenance will cover the Headquarters, Atlantic City and Oklahoma City sites. Documentation that is used to provide training to users and administrators of the system will also be maintained.

What Benefits Will Be Provided To The American Public Through This Request?

The CWP TOOLSET contributes to improving the efficiency of the FAA and enhances program management of FAA Capital Programs.

On-going achievements for FY 2017 are:

- Continue providing reliable data with an automated tracking and reporting system for capital projects that will enable decision-makers to enhance the use of agency resources
- Continue cost and schedule assistance for major acquisition programs by providing enhanced program/project management capabilities with reliable data on cost accounting of capital expenses for FAA Managers and engineers through the CWP TOOLSET
- Continue to improve productivity (on time completion of projects in the field) when a standardized project management process is supported by the toolset and emulates current operating procedures
- Provide on-going earned value management capability

Detailed Justification for - 4A08 Center for Advanced Aviation System Development (CAASD)

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Center for Advanced Aviation System Development (CAASD)
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Center for Advanced Aviation System Development (CAASD)	$60,000	$60,000	$60,000	$0

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Center for Advanced Aviation System Development (CAASD)	---	$60,000.0

As the FAA's only Federally Funded Research and Development Center (FFRDC), the support provided by CAASD is critical for the development of policy and investment decisions for the future of the NAS Systems and NAS Enterprise Architecture. CAASD provides indirect technology and infrastructure support to FAA programs and NAS systems under the NAS Enterprise Architecture. FAA programs having planned work scheduled to be provided by the FFRDC under CAASD funding have no other source of funding for such work.

For FY 2017, $60,000,000 is requested to fund technical, engineering, as well as research and development support for the CAASD program. The FY 2017 funding will support approximately 179 MITRE Technical Staff (MTS) years of research and systems engineering as well as technical and operational analyses. This staffing level is well below the Congressional ceiling of 600 MTS.

What Is This Program And Why Is It Necessary?

The CAASD is an FAA-sponsored FFRDC operated under a Sponsoring Agreement with the MITRE Corporation. CAASD's high quality research, systems engineering, and analytical capabilities help FAA meet the technically complex challenges in the National Air Space (NAS). CAASD provides independent advanced research and development required by the FAA to obtain technical analyses, prototypes and operational concepts needed to fulfill the agency's Strategic Initiatives, Capital Investment Plan (CIP), enterprise aspects of the NextGen Implementation Plan, NAS Enterprise Architecture, and the Principles of the National Aviation Research Plan (NARP).

The CAASD Product Based Work Plan (PBWP) defines an outcome-based program of technically complex research, development, and system engineering activities. The Work Plan is categorized in the following areas:

NAS Concept of Operations, Architecture and Integration: Develop the NAS Concept of Operations; Architecture and Next Generation Air Transport System (NextGen) 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 (EA), operational concepts, capability action plans, and roadmaps to ensure an integrated evolution that aligns with the agencies enterprise architectures; and Analyze NAS-wide strategic issues (operational and technical) and the impact on the evolving NextGen architecture.

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, and conducting Human-in-the-Loop (HITL) evaluations. Develop and evaluate new metrics to measure overall NAS operational performance. Develop and validate cross domain operational evolution plans.

Airspace and Performance-Based Navigation: Leverage the precision, reliability, predictably, and efficiencies of improved navigation and procedures through Area Navigation (RNAV). FAA will research new concepts for achieving a performance-based NAS, including the closely spaced Paired Approach concept. Model and simulate operational improvements to address mid-term and far-term Performance-Based Navigation (PBN) requirements. Perform system-wide optimization analyses of airspace and procedures for NextGen. Design and execute technical analyses on airspace security incidents on the NAS. Perform airspace security concept development for mitigating airspace security incidents.

Safety and Training: Develop safety assurance processes as an integral part of normal operations. Perform technical analyses of NAS-wide accident and runway incursion risks to identify airports or specific types of operations with the highest risk. Develop metrics and processes that allow FAA to proactively identify potential safety issues. Identify and assess the feasibility of new or advanced capabilities and standards that mitigate safety issues in the NAS. Enhance the quality and efficiency of Terminal Radar Approach Control (TRACON) and En Route controller training.

Communications, Navigation, Surveillance, and Cyber-Security Infrastructure: Establish the Communications, Navigation, and Surveillance (CNS) foundation for FAAs 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. Perform research, modeling, simulation, and demonstration of prototypes of technical and operational enhancements to the NAS CNS and cyber security systems. Conduct spectrum analysis focusing on strategic issues related to the availability of adequate spectrum resources. Participate in the development of international standards and harmonization. Develop transition strategies for the FAAs NextGen Voice Communications System (NVS).

Unmanned Aircraft Systems: Provide technical analyses supporting strategic solutions for 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.

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 and Experimentation for Aeronautics (IDEA) laboratory infrastructure. Provide a data repository system that allows efficient access to aviation data and associated tools.

Mission Oriented Investigation and Experimentation (MOIE): Develop tools and techniques for studying NAS capacity, throughput, performance, system dynamics and adaptation to technology and policy-driven change. Identify opportunities for innovative solutions to NAS problems and enhancements to NAS capabilities and procedures. Explore new regimens including complexity theory, agent-based modeling, and productivity modeling.

FAA relies on CAASDs integrated knowledge of the National Airspace System (NAS) and long-term experience with FAA's enterprise level efforts developing the NAS infrastructure. The challenges the FAA faces in meeting established goals and charting an achievable course for the development of the NAS are extensive and technically complex. CAASD assists FAA in addressing NAS complexity challenges effectively. CAASD provides a unique system-wide integrated understanding, tools, labs, and other capabilities that are fundamental to FAAs ability to address these challenges. The required development of system architecture and comprehensive research, development, and system engineering services can only be provided by an FFRDC whose charter permits special access to sensitive Agency and Aviation Industry information and data, not normally available to support contractors. Numerous elements of the CAASD work program are highly specialized research and systems engineering activities that require extensive knowledge of the present and planned NAS systems. These capabilities are fundamental to the FAA's ability to meet its AOA Strategic Priorities under the NAS.

Today CAASD Outcomes produce critical products that directly impact the successful development of the NAS as it matures in Mid-term and on to Far-term. CAASD research products directly contribute to the FAA's National Aviation Research Plan (NARP) Principles and their Goals. CAASD Outputs are aligned to one or more of the three NARP Principles and Goals. The work executed by CAASD supports a multitude of programs across all lines of business. The support provided by CAASD is essential for major FAA programs to continue activities to satisfy operational requirements, and area short-comings. The Qualitative Benefits of CAASD work are detailed in the CAASD Long Range Plan's (LRP), Section VI, for each Outcome in the Outcome Profile's annual "Accomplishments" and "Key Activities and Benefits" sections.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

The latest CAASD Sponsoring Agreement was executed in September 2015 and provides for continued FFRDC operations through FY 2020. The FAA has funded the CAASD FFRDC's support efforts under a series of support contracts since 1990. Currently FFRDC support is provided under the CAASD Contract's Option that runs from FY 2016 through FY 2020. The new Sponsoring Agreement states that: "The FAA needs to provide sufficient physical and financial resources for CAASD to maintain and develop its personnel's technical skills and laboratory infrastructure, as well as sufficient financial resources to maintain a reasonably stable and effective staffing level". The requested funding continues a stable source of funding, along with a long-term contractual relationship, which is in the best interest of the public and the FAA.

What Benefits Will Be Provided To The American Public Through This Request?

CAASD's high quality research, systems engineering, and analytical capabilities are key to FAA in meeting technically complex challenges in the NAS. CAASD provides independent advanced research and development required by the FAA in technical analyses, prototypes, and operational concepts needed to fulfill FAA's mission and vision. CAASD plays a key role in meeting FAA's near-term and long-term mission objectives and in maturing the NAS to meet the nation's public air transport needs. Its expertise is critical to FAA's efforts in transforming the nation's air transportation system in an effective and timely manner.

CAASD's quick response capability is essential to the FAA. CAASD has a broad and deep knowledge of FAA, the NAS, ATM, and air transportation stakeholders through its 50 year relationship with the FAA. These qualities that are unique and cannot easily be duplicated.

CAASD has successfully controlled its costs over the past five years. CAASD has reduced the average cost per staff year by 4.5 percent since 2009, after adjustment for inflation, while consistently delivering high value results to the FAA.

Detailed Justification for - 4A09 Aeronautical Information Management Program

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aeronautical Information Management Program
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Aeronautical Information Management Program	$12,650	$5,000	$10,400	+$5,400

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
a. Prime Mission Product	---	$5,960.0
b. Program Management	---	1,320.0
c. System Engineering	---	1,600.0
d. Test and Evaluation	---	720.0
e. Integrated Logistic Support	---	200.0
f. Site Implementation	---	400.0
g. Information System Security	---	200.0
Total	Various	$10,400.0

For FY 2017, $10,400,000 is requested to continue procurement of the AIMM S2 Aeronautical Common Service and aeronautical information infrastructure enhancements. Specifically, the funding is requested to continue design, development and implementation of the Aeronautical Information Management Modernization Segment 2 (AIMM S2) program. AIMM S2 will provide Aeronautical Information Management (AIM) technologies and tools for Aeronautical Information exchange via the Aeronautical Common Services (ACS) infrastructure. ACS will support accuracy and timeliness of special activity airspace (SAA) and airport data and will deliver information across the National Airspace System (NAS) using standard System Wide Information Management (SWIM) compliant protocols. AIMM S2 will deliver release 1 of the ACS in the fourth quarter of CY 2015 and finish implementing release 2 scheduled for deployment in fourth quarter CY 2016. In FY 2017 AIMM S2 will continue developing, testing, and implementing Release 3.

- ACS Infrastructure Platform (Hardware) installation and integration Release 1 Operational and IOC
- AIMM S2 In Service Decision
- SAA Services Release 2 Operational
- National Airspace System Resources (NASR) and Notices to Airman (NOTAMs) Release 3 Operational and Final Operating Capability (FOC)

What Is This Program And Why Is It Necessary?

The AIM Modernization program is an infrastructure enhancement program modernizing services delivering aviation users with digital aeronautical information that conforms to international standards and supports NextGen objectives and meets the needs of AIM's customers, both in the short term, and in the future. Digital aeronautical data enables the processing of data to improve mapping, flight planning, and the timeliness and accuracy of air traffic control instructions. The program will re-engineer and automate information management business processes and develop an information platform called aeronautical common service for the provision of key aeronautical information using digital technology that is consistent with FAA and international architecture standards. AIMM S2 will implement a Cloud Computing eligible software solution. FY 2017 funding will be used to finish implementing the AIMM S2 SAA services software Release 2 and begin work on final release for AIMM S2 delivering NASR reference data and spatial imaging enhancements.

AIMM S2 will:

- Provide ACS as a single trusted source of aeronautical information
- Expand the distribution of NOTAMs included as part of the Federal NOTAM System
- Support the future global air traffic management environment, expanding access to authorized NAS users by leveraging System Wide Information Management (SWIM) Common Support Services infrastructure
- Integrate aeronautical information into the Traffic Flow Management System (TFMS)
- Allow future integration of aeronautical information with Advanced Technologies and Oceanic Procedures (ATOP), Tower Flight Data Manager (TFDM), En Route Automation Modernization (ERAM), and Common Support Services – Weather (CSS-Wx) (CSS-WX leverages the AIMM S2 Web Mapping Service functionality)
- Provide a fully compliant SOA to facilitate efficient development and implementation of enhancements

AIMM S2 received the Final Investment Decision (FID) approval on August 20 2014. Contract award was made on October 29, 2014.

AIMM S2 modernizes special activity airspace, NOTAMs, and aeronautical information services. These services are necessary to improve the accuracy and timeliness of SAA and airport information management and flow. The capabilities are realized through the development of the ACS and the integration of information flows, leveraging SWIM Core Services infrastructure. The ACS is a NextGen common service identified in the NextGen Segment Implementation Plan (NSIP) to support the On Demand NAS Information portfolio and the development and implementation of the SAA, NOTAM, and airport data services for consumption by NAS systems.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related facilities and injuries.

Why Do We Want/Need To Fund The Program At The Requested Level?

$10,400,000 is required to continue development and implementation efforts to support deployment of Release 2 in the fourth quarter of 2016 and the design and development phases of Release 3. Releases 2 and 3 are focused on SAA data service enhancements and NOTAM data service enhancements respectively.

The required funding will facilitate program execution to deliver all AIMM S2 capabilities on time.

What Benefits Will Be Provided To The American Public Through This Request?

The AIMM S2 benefits include SAA hazard reduction, NOTAM safety enhancements, Aeronautical Information Safety Enhancements, and SAA business process improvements and infrastructure enhancements resulting in cost savings for operations and system development. Specifically, through AIMM S2 the Aeronautical Common Service (ACS) will deliver SAA schedules to NAS users via ACS. The flight path savings will include reduced flight time, flight distance, and fuel usage resulting in real dollar savings.

AIMM S2 Aeronautical Information Data Analytics (AIDA), a key AIMM S2 capability consisting of query, metrics engine, data transformation, will enable stakeholders to analyze historical SAA operations. As a result, continuous process improvement opportunities will be identified and realized based on the analysis of SAA usage data.

With the Aeronautical Information Query and Subscription Service (AIQS), AI consumers will receive easier to read information directly into smart systems that map the information and assist pilots with identifying

NOTAMs that affect their particular flight and provide the ability for consumers to pull, or push (at requested intervals) on-demand of specific TFRs (based on the consumer's need), providing updates in an efficient and easily consumable format. The AIMM S2 Program will consolidate the AIM Legacy help desk with the AIMM S2 Help Desk, and modernize the NASR.

Detailed Justification for - 4A10 Cross Agency NextGen Management

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Cross Agency NextGen Managment
($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Cross Agency NextGen Management	$2,000	$3,000	$2,000	-$1,000

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
Cross Agency NextGen Management	---	$2,000.0

Cross Agency program allows the coordination of multi-agency activities on the future of the aviation transportation system through collaboration with agency partners on research and work plans, and to facilitate the development and transition of emerging NextGen technologies, tools, and services.

For FY 2017, $2,000,000 of funding is requested to collaborate with partner agencies in supporting the following areas:

- Recommendations report for multi-year aviation weather focus areas for NextGen Executive Weather Panel (NEWP) endorsement
- Integrated 2016 Cross Agency NextGen initiatives in the National Air Space (NAS) Enterprise Architecture (EA). Includes harmonizing NAS EA to facilitate interoperability and assessing potential future benefits based on this harmonization. 2017 Multiagency Aviation Cyber Exercise After Action Report including recommendations, cyber R&D, and shortfall analysis (e.g. Annual National-level CYBERGUARD); Integrated Core Cyber Team (ICCT) collaboration
- Incorporated long-term NASA Air Traffic Management (ATM) concepts into the NextGen cost-benefit analysis
- NextGen Research-to-Operations (R20) Projects progress report to NEWP
- Research Transition Teams progress reports; 2017 Multi-year Strategic Plan; End-of-Year Report, and quarterly progress reports to NextGen Executive Board; annual Executive Summary to the Senior Policy Committee

What Is This Program And Why Is It Necessary?

The development of NextGen is a priority for the Administration and active participation by Federal Partner Agencies (e.g. Department of Commerce (DOC), Department of Homeland Security (DHS), National Aeronautics and Space Administration (NASA), and Department of Defense (DOD) is necessary for modernizing the air transportation system in order to safely meet the expected growth in air traffic. 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.

Cross Agency NextGen Management program conducts cross-agency coordination on research such as the ongoing technology transfer between FAA and NASA. It will expand research activities to include technology transfer between FAA and National Weather Service (NWS). This program will also work with industry through the established Next Generation Air Transportation System (NGATS) initiatives.

DOT Strategic Goal - Economic Competitiveness

- Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

Why Do We Want/Need To Fund The Program At The Requested Level?

$2,000,000 is required to provide a foundation for coordinating efforts between all Federal Partner Agencies whose decisions impact NextGen. These activities include planning, analysis of special topic areas, and architecture development.

What Benefits Will Be Provided To The American Public Through This Request?

This effort will ensure efficient coordination between all Federal Partners. A coordinated multi-agency approach to long-term research and development allows the Partners to align separate efforts to leverage resources and infrastructure resulting in improved coordination of NextGen initiatives.

Detailed Justification for – 5A01 Personnel and Related Expenses

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Personnel and Related Expenses
($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
Salaries and Benefits	$401,895	$413,335	$420,498	+$7,163
Non-Pay	$58,105	$56,714	$68,502	+$11,788
Total	**$460,000**	**$470,049**	**$489,000**	**+$18,951**
FTP	2,658	2,678	2,710	+32
FTE	2,619	2,629	2,655	+26

For FY 2017 $489,000,000 and 2,710 FTP/2,655 FTE is requested to pay the personnel, travel and related expenses for the Federal Aviation Administration (FAA) Facilities and Equipment (F&E) workforce performing work essential to FAA's efforts to sustain and modernize the National Airspace System (NAS). This includes increases of:

FY 2016 Enacted			**$470,049**
Adjustments to Salaries and Benefits	**$7,163**	**Adjustments to Non-Pay**	**$11,788**
FY 2016 Pay Raise Annualized	$1,343	Non-Pay Inflation	$567
FY 2017 Pay Raise	$4,960	Travel	$5,654
FY 2016 Annualization of hires (10 FTE)	$1,500	Training/Other	$5,567
FY 2017 Hires (32 FTP/16 FTE)	$2,500		
Two Less Compensable Days	-$3,140		
FY 2017 President's Request			**$489,000**

The FAA F&E workforce includes: electronic, civil and mechanical engineers; electronics technicians; quality control and contract specialists; Ops research analysts, and safety inspector personnel. The F&E workforce resides in Air Traffic, Aviation Safety, NextGen, and Finance and Management. Seventy-seven percent of the FAA F&E workforce is located in the field.

The F&E personnel provide oversight and management of the FAA's capital projects including the NextGen portfolio. F&E personnel and related expenses are distributed across FAA Organizations as follows:

FTE

Organization	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ATO	1,826	1,836	1,862	+26
AVS	74	74	74	0
ANG	563	563	563	0
AFN	156	156	156	0
Total	2,619	2,629	2,655	+26

(Dollars in Thousands)

Organization	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ATO	$319,704	$326,647	$342,461	+$15,814
AVS	12,084	12,413	12,504	+91
ANG	90,871	92,492	94,622	+2,130
AFN	37,341	38,497	39,413	+916
Total	$460,000	$470,049	$489,000	+$18,951

What Is This Program And Why Is It Necessary?

F&E employees perform essential services in managing the acquisition and installation of new systems, including NextGen programs, into the NAS. Major capital programs can take over a decade to implement from proof of concept to final implementation, which requires a sustained engagement. Civil, mechanical and electrical engineers, along with technicians, provide technical support for design reviews, perform site preparation and installation, conduct technical evaluations, and provide systems integration and in-service management. Operations research analysts and cost estimators conduct investment analyses for new capital projects. Contracting officers provide acquisition services, and Safety Inspectors conduct the necessary regulatory and safety oversight functions for new services and operational capabilities being installed in the NAS.

Payroll, travel, and related expenses for the FAA F&E workforce are paid for out of this activity. On an annual basis, approximately 90 percent of the program covers FAA F&E workforce payroll costs; 10 percent of the program supports programmatic travel and related expenses of the workforce.

Why Do We Want/Need to Fund This Program at the Requested level?

Each year Congress appropriates over $2.5 billion for capital improvement to the NAS. These funds are available for a period of three years. As a result, each year the FAA is managing three years of active program funding (approximately $3.5 billion per year). On average, the FAA has over 8,000 active projects being managed by F&E staff. Each year the FAA completes 2,000 to 2,500 projects. This requires long-term program management and oversight capabilities to ensure continuity and to get best-value for the government's investment in new systems and technology. Some major capital investments like System-Wide Information Management (SWIM), ADS-B NAS Wide Implementation, and Data Communications (Data Comm) are system-wide in scope and take years to fully implement, and this budget line item provides FAA personnel with the long-term technical expertise necessary to oversee the design and implementation of new NAS systems.

In support of the Agency's FY 2017 F&E requested level of $2.838 billion for capital improvements to the NAS, $489 million is requested for the personnel and related expenses. This is a $19 million increase from the FY 2016 enacted. Approximately $6 million, or 40 percent of the requested increase, is travel in support of the 130+ requested Capital Investment Programs (CIPs).

The request will support a staffing level of approximately 2,600 full time equivalents who are assigned to all phases of managing and implementing major capital acquisitions including site engineering, installation and implementation, and oversight of capital programs. The request also provides for on-site travel, IT support and supplies.

What Benefits Will Be Provided To The American Public Through this Request?

The FAA's Facilities and Equipment capital program invests in developing and implementing new technologies to meet future demand and to sustain the current NAS.

The FAA is undertaking a wide-ranging transformation of the United States air transportation system. NextGen proposes to transform America's air traffic control system from a ground-based system to a satellite-based system. GPS technology will be used to shorten routes, save time and fuel, reduce traffic delays, increase capacity, and permit controllers to monitor and manage aircraft with greater safety margins. Planes will be able to fly closer together, take more direct routes and avoid delays. This transformation has the aim of reducing gridlock, both in the sky and at the airports to accomplish NextGen and to maintain the current infrastructure the FAA requires a stable workforce focused on the sustained effort necessary for the acquisition of major capital assets.

Detailed Justification for - 6A01 Automated Dependent Surveillance – Broadcast (ADS-B) Subscription Costs and Wide Area Augmentation Services (WAAS) Geostationary (GEO) Satellite Leases

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2016 – ADS-B Services and Wide Area Augmentation System (WAAS) GEOs

($000)

Activity/Component	FY 2015 Actual	FY 2016 Enacted	FY 2017 President's Request	Difference From FY 2016 Enacted
ADS-B Services and Wide Area Augmentation System (WAAS) GEOs	$0	$0	$150,300	+$150,300

COST ESTIMATE OF WORK TO BE FUNDED THIS YEAR

Activity Tasks	Locations/ Quantity	Estimated Cost ($000)
A. ADS-B and Colorado WAM Subscription Costs	---	$123,700.0
B. Wide Area Augmentation System (WAAS) GEO Satellite Leases	---	26,600.0
Total	Various	$150,300.0

For FY 2017, $150,300,000 is requested for the sustainment of NAS Service Acquisitions that are satellite based service contracts, which are paid in full in the first year of F&E funding availability. Although this is a new budget line item that was first requested in FY 2016, it is a transfer from two pre-existing programs under Activity 2: 2A12 ADS-B and 2D03 Wide Area Augmentation Systems (WAAS).

A. ADS-B Sustain Leased Services (Subscription Costs)

For FY 2017, $123,700,000 is requested for continuing ADS-B Baseline Services, utilizing performance based service fees for ADS-B infrastructure owned and operated by the prime contractor. Subscription charges to the Service Provider consist of Service Establishment Charges (SEC's) for new service volumes and annual subscription charges to provide essential services to existing service volumes.

The budget also provides subscription charges for the Colorado Wide-area Multilateration (WAM) project, which is operating a Multilateration surveillance service capability providing aircraft location information to the automation system at Denver Air Route Traffic Control Center (ARTCC), allowing controllers to provide separation services at four Colorado airports (Durango, Gunnison, Montrose and Telluride).

Activities planned by ADS-B for FY 2017 include the following:

- Provide WAM surveillance services supporting air traffic operations for four Colorado airports
- Provide service at over 300 service volumes within specified requirements
- Pay performance based subscription charges

B. GEO Satellite Acquisition

For FY 2017, $26,600,000 is requested for the WAAS to complete the on-going Lease payments for the operational 3rd, 4th and Gap Filler Geostationary (GEO) services.

What Is This Program And Why Is It Necessary?

A. ADS-B Sustain Leased Services (Subscription Costs)

ADS-B consists of a network of over 630 Ground Based Transceivers (GBTs) broadcasting across more than 300 service volumes, utilizing performance based service fees for ADS-B infrastructure owned and operated by the prime contractor. Subscription charges to the Service Provider consist of Service Establishment Charges (SEC's) for new service volumes and annual subscription charges to provide essential services to existing service volumes.

ADS-B is an advanced surveillance technology that provides highly accurate and more comprehensive surveillance information. Aircraft position (longitude, latitude, altitude, and time) is determined using the Global Navigation Satellite System (GNSS), and/or an internal inertial navigational reference system, or other navigation aids. The aircraft's ADS-B equipment processes this position information along with other flight parameters for a periodic broadcast transmission, typically once a second, to airborne and ground-based ADS-B receivers. The information will be used to display aircraft position on en route and terminal automation systems such as Common Automated Radar Tracking System (CARTS), Standard Terminal Automation Replacement System (STARS), Microprocessor En Route Automated Radar Tracking System (Micro EARTS), En Route Automation Modernization (ERAM), and Advanced Technologies and Oceanic Procedures (ATOP).

B. GEO Satellite Acquisition

WAAS consists of a network of 38 FAA 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 GEO satellites. The user receiver on the aircraft applies the corrections and integrity information from the WAAS message to obtain the precise navigation service. Today, WAAS users can conduct en route operations across the entire NAS and precision approach take off and landings at 95 percent of the qualifying airports in the 48 contiguous states. WAAS is not mandatory for ADS-B operations, but will allow for ADS-B enhanced operations.

Three GEO satellites are required to meet WAAS performance requirements. This Budget Line Item (BLI) is to specifically cover the ongoing lease costs of the three existing GEO satellites.

DOT Strategic Goal – Safety

- Improve public health and safety by reducing transportation related injuries and fatalities.

Why Do We Want/Need To Fund The Program At The Requested Level?

A. ADS-B Sustain Leased Services (Subscription Costs)

In FY 2017 NAS Wide operation of ADS-B will continue with subscription services for surveillance across the NAS and for weather in the Gulf and Alaska. The national deployment of over 630 stations in FY 2014 served as the entrance criteria for stakeholders to accelerate the installation of ADS-B Out avionics that meet the performance requirements of 14 CFR §91.227. This will allow for the ADS-B capability to deliver the benefits identified in the business case.

B. GEO Satellite Acquisition

FAA has two existing contracts to cover leases of the three operational WAAS GEOs. Funding at the required level is needed to meet FAA's contractual obligations and to avoid incurring termination liability for failure to meet these obligations.

What Benefits Will Be Provided To The American Public Through This Request?

A. ADS-B Sustain Leased Services (Subscription Costs)

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 direct aircraft operating costs and passenger value of time. The Business Case Analysis Report dated May 15, 2012 shows $3.2B in capacity and efficiency benefits.

Expected benefits include reduced delays and fuel burn, and consistent, low variance relative spacing between paired aircraft which will improve arrival capacity.

Also included in this activity are subscription charges for the Colorado WAM 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. This aircraft location information is provided to the automation system at Denver ARTCC to allow controllers to provide separation services at 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.

B. GEO Satellite Acquisition

The three existing WAAS GEO satellite leases ensure that WAAS is able to meet its availability requirements over the entire WAAS service volume. Failure to fund these leases would result in loss of availability over certain portions of the service volume, particularly Alaska, in addition to increased system outages over the National Airspace System.

(Page Intentionally Left Blank)

INSERT TAB HERE:

3C. RESEARCH, ENGINEERING & DEVELOPMENT

RESEARCH, ENGINEERING, AND DEVELOPMENT
(AIRPORT AND AIRWAY TRUST FUND)

For necessary expenses, not otherwise provided for, for research, engineering, and development, as authorized under part A of subtitle VII of title 49, United States Code, including construction of experimental facilities and acquisition of necessary sites by lease or grant, $167,500,000, to be derived from the Airport and Airway Trust Fund and to remain available until September 30, 2019: Provided, That there may be credited to this appropriation as offsetting collections, funds received from States, counties, municipalities, other public authorities, and private sources, which shall be available for expenses incurred for research, engineering, and development.

PROGRAM AND FINANCING
($ in Millions)

Identification code: 69-8108-0-7-402	FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
Obligations by program activity:			
0011 Improve aviation safety	92	101	99
0012 Economic competitiveness	20	35	25
0013 Reduce environmental impact of aviation	39	36	38
0014 Improve the efficiency of mission support	12	5	6
0100 Subtotal, direct program	163	177	168
0799 Total direct obligations	163	177	168
0801 Research, Engineering & Development (Airport & Airway Trust Fund (Reimbursable)	3	3	3
0900 Total new obligations (total)	166	180	171
Budgetary resources available for obligation:			
1000 Unobligated balance brought forward, Oct 1	67	61	50
1021 Recoveries of prior year unpaid obligations	1	.....	.....
1050 Unobligated balance (total)	68	61	50
New budget authority (gross), detail:			
Appropriation, discretionary:			
1101 Appropriation (special or trust fund)	157	166	168
1133 Unobligated balance of appropriations temporarily reduced	.....	.....	.....
Spending authority from offsetting collections, discretionary:			
1700 collected	2	3	3
1701 Change in uncollected payment, Federal sources	1	.....	.....
1750 Spending auth from offsetting collections, disc (total)	3	3	3
1900 Budget authority (total)	160	169	171
1930 Total budgetary resources available	228	230	221
Memorandum (non –add) entries:			
1940 Unobligated balance expiring	-1	.....	.....
1941 Unexpired Unobligated balance, end of year	61	50	50
Special and non-revolving trust funds:			
1950 Other balances withdrawn and returned to unappropriated receipts	.....	.....	.....
1951 Unobligated balance expiring	1	.....	.....
1952 Expired Unobligated balance, start of year	5	5	.....
1953 Expired Unobligated balance, end of year	4	.....	.....
1954 Unobligated balance canceling	1	.....	.....
Change in obligated balances:			
Unpaid obligations:			
3000 Unpaid obligations, brought forward, Oct 1 (gross)	135	141	141
3010 Obligations incurred, unexpired accounts	166	180	171
3020 Outlays (gross)	-159	-150	-188
3040 Recoveries of prior year unpaid obligations, unexpired	-1	.....	.....
3041 Recoveries of prior year unpaid obligations, expired	.....	.....	.....
3050 Unpaid obligations, end of year	141	141	124
Uncollected payments:			
3060 Uncollected payments, Federal Sources, brought forward, Oct 1	-4	-4	-4
3070 Change in uncollected payment, Federal sources, unexpired	-1	.....	.....
3071 Change in uncollected payment, Federal sources, expired	1	.....	.....
3090 Uncollected payments, Federal sources, end of year	-4	-4	-4
Memorandum (non-add) entries:			
3100 Obligated balance, start of year	131	137	137
3200 Obligated balance, end of year	137	137	120

	Budget Authority and outlays, net:			
	Discretionary:			
4000	Budget authority, gross	160	169	171
	Outlays, gross:			
4010	Outlays from new discretionary authority	47	76	77
4011	Outlays from discretionary balances	112	104	111
4020	Outlays, gross (total)	159	180	188
	Offsets against gross budget authority and outlays			
	Offsetting collections (collected) from:			
4030	Federal sources	-3	-3	-3
	Additional offsets against gross budget authority only:			
4050	Change in uncollected pymts, Fed sources, unexpired	-1	. . . . .	. . . . .
4052	Offsetting collections credited to expired accounts	1	. . . . .	. . . . .
4060	Additional offsets against gross budget authority only (total)	. . . . .	. . . . .	. . . . .
4070	Budget authority, net (discretionary)	157	166	168
4080	Outlays, net (discretionary)	156	177	185
4180	Budget authority, net (total)	157	166	168
4190	Outlays, net (total)	156	177	185

This account provides funding to conduct research, engineering, and development to improve the national airspace system's capacity and safety, as well as the ability to meet environmental needs. The proposed funding is allocated to the following performance goal areas of the Federal Aviation Administration: improve safety, economic competitiveness, and environmental performance of the National Airspace System. The request includes funding for several research and development activities of the Next Generation Air Transportation System (NextGen), as well as activities related to unmanned aircraft systems.

OBJECT CLASSIFICATION
($ in Millions)

Identification code: 69-8108-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Direct obligations:			
	Personnel compensation			
11.1	Full-time permanent	26	29	30
11.3	Other than full-time permanent	1	1	1
11.9	Total personnel compensation	27	30	31
12.1	Civilian personnel benefits	8	9	9
21.0	Travel and transportation of persons	1	2	2
25.1	Advisory and assistance services	23	25	23
25.2	Other services from non-Federal sources	53	57	52
25.3	Other goods and services from Federal sources	2	2	2
25.4	Operation and maintenance of facilities	2	2	2
25.5	Research and development contracts	17	19	18
25.7	Operation and maintenance of equipment	1	1	1
26.0	Supplies and materials	2	2	2
31.0	Equipment	2	2	2
41.0	Grants, subsidies, and contributions	25	26	24
99.0	Direct obligations	163	177	168
99.0	Reimbursable obligations	3	3	3
99.9	Total new obligations	166	180	171

Employment Summary

Identification code: 69-8108-0-7-402	FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
1001 Direct civilian full-time equivalent employment	234	249	249

EXHIBIT III-1

RESEARCH, ENGINEERING & DEVELOPMENT
Summary by Program Activity
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

	FY 2015 Actual	FY 2016 Enacted	FY 2017 REQUEST	CHANGE FY 2016 - FY 2017
Improve Aviation Safety	91,019	95,969	97,870	1,901
Economic Competitiveness	22,286	25,589	22,243	-346
Environmental Sustainability	37,935	41,897	41,187	-710
Mission Support	5,510	5,545	6,200	655
TOTAL	**156,750**	**166,000**	**167,500**	**1,500**
FTEs				
Direct Funded	249	249	249	0
Reimbursable, allocated, other	0	0	0	0

Program and Performance Statement

This account provides funding for establishing and overseeing FAA's Research and Development (R&D) policies and plans. Its diverse scientific, engineering and technical workforce supports all aspects of aviation from research on materials to development of new products and procedures.

In partnership with both domestic and international entities within the aviation community, the FAA RE&D programs provide world leadership by conducting high-priority research and developing innovative technologies to support a safe, efficient, and environmentally acceptable global aviation system.

EXHIBIT III-1a

RESEARCH, ENGINEERING & DEVELOPMENT
SUMMARY ANALYSIS OF CHANGE FROM FY 2016 TO FY 2017
Appropriations, Obligations, Limitations, and Exempt Obligations
($000)

ITEM		Change from FY 2016 to FY 2017 $000	Change from FY 2016 to FY 2017 FTE
FY 2016 ENACTED	$	166,000	249
Administrative Adjustments to Base:	$	559	-
Annualization of FY 2016 FTE	$	-	
Annualization of FY 2016 Pay Raise	$	96	
FY 2017 Pay Raise	$	463	
Two Less Compensable Days	$	(294)	
Non-Pay Inflation	$	1,275	
etc.			
SUBTOTAL, ADJUSTMENTS TO BASE	**$**	**1,540**	**-**
PROGRAM REDUCTIONS			
Improve Aviation Safety	$	-	
Economic Competiveness	$	(567)	
Environmental Sustainability	$	(1,122)	
Mission Support	$	-	
SUBTOTAL, PROGRAM REDUCTIONS	**$**	**(1,689)**	**-**
NEW OR EXPANDED PROGRAMS:			
Improve Aviation Safety	$	1,040	
Economic Competativeness	$	-	
Environmental Sustainability	$	-	
Mission Support	$	609	
SUBTOTAL, NEW OR EXPANDED PROGRAMS	**$**	**1,649**	**-**
FY 2017 REQUEST	**$**	**167,500**	**249**

Page intentionally left blank

RESEARCH, ENGINEERING AND DEVELOPMENT (RE&D) PORTFOLIO OVERVIEW

The Research, Engineering and Development (RE&D) budget is formulated following a systematic process that considers agency strategic plans, program execution, and program evaluation. This process strengthens the alignment between the planning, programming, budgeting and execution of the RE&D program; increases the return on taxpayer investment; enhances productivity; and ensures the relevance, quality, and performance of the RE&D program.

Strategic planning supporting the agency's RE&D program is presented in the National Aviation Research Plan (NARP). Updated and published annually, the NARP presents a five year outlook of planned research projects and expected outcomes resulting from the investments in each of the research activities and programs detailed in this submission. The NARP also links current and proposed RE&D projects with broader strategic priorities specified in FAA and DOT strategic plans. The investments reflected in the RE&D portfolio are aimed at addressing the challenges to the continued operation of the safest, most efficient air transportation system in the world while building a foundation for the future.

Formulation of the RE&D portfolio is coordinated by the Research Executive Board (REB)—a cross agency executive body representing research needs sponsors and program performers. The REB oversees the development and review of the portfolio and approves its presentation to the FAA Joint Resources Council (JRC) for subsequent integration into the agency's budget submission. This framework ensures coordination at all levels for a well-balanced portfolio.

Research project execution and internal project evaluations are conducted by Program Planning Teams (PPTs) composed of program managers (performers) and sponsors to ensure research needs are satisfied. Independent program review is provided by the Research Engineering and Development Advisory Committee (REDAC). The REDAC is a chartered advisory committee performing in accordance with the Federal Advisory Committee Act (FACA); it brings industry and academia together to review the RE&D portfolio and provide independent advice to the FAA Administrator.

The requested funds provide for 22 separately funded programs each of which is aligned with one or more of three research activities that in turn align with agency and departmental strategic priorities. A fourth activity provides for cross-cutting mission support programs that enable development, coordination and management review of the RE&D portfolio and support the sustainment of laboratory facilities and equipment to perform critical research. A summary of each activity follows.

Executive Summary – Improve Aviation Safety, Activity A11

The Research, Engineering and Development (RE&D) Improve Aviation Safety Activity (A11) is requesting $97,870 for FY 2017, a level that is essentially unchanged from the enacted FY 2016 level of $97,969. This funding supports a broad and diverse research and development work program aimed at the systematic expansion and application of knowledge to produce useful materials, devices, systems or methods that will improve aviation and space safety with the goal of achieving the lowest possible accident rate. This activity supports the FAA's Aviation Safety organization in its regulatory mission which includes conducting inspections and the issuance of regulation and guidance materials to ensure sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components. Programs within this activity align with FAA strategic priority – *"Making Aviation Safer and Smarter".*

Included in the Activity A11 request are $7,925,000 to continue the Fire Research and Safety Program (A11.a). This program performs research and development in materials, technologies and methods to prevent accidents caused by in-flight fires and improve occupant survivability during a post-crash fire. Building on prior research, the program will continue to evaluate the hazards associated with the air transport of lithium batteries and other high density power sources and explore improved designs for battery packaging, fire resistant cargo containers, covers for palletized cargo, and on-board water spray fire suppression systems. The program will also conduct research to evaluate emergent composite materials fire propagation characteristics and develop appropriate flammability test standards to ensure sustained or enhanced safety levels as application of these materials in aircraft design increase. The A11 request also includes $8,422,000 to continue agency research efforts aimed at ensuring the safe integration of unmanned aircraft systems (UAS) into the National Airspace System (NAS). The requested funds provide for research activities to generate technical information to support development of policies, guidance materials, and advisory circulars to govern the use of new or novel technologies in the design and operation of UAS and to demonstrate regulatory compliance while operating in the NAS. The FY 2017 portfolio of work will be focused on sense (detect) and avoid, control and communications, system safety criteria, modeling and simulation requirements, and research that will support the safe, efficient, and timely integration of UAS in the NAS within the 14 Code of Federal Regulations (CFR) regulatory framework.

Detailed Justification for
A11.a Fire Research and Safety

What Is The Request and What Funds Are Currently Spent on the Program?

FY 2017 – Fire Research and Safety – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.a Fire Research and Safety	$6,000,000	$6,000,000	$7,925,000	+$1,925,000

What Is This Program And Why Is It Necessary?

The purpose of this program is to conduct research to prevent accidents caused by in-flight fire and to improve survivability during a post-crash fire. This program is necessary because of the catastrophic consequences of an uncontrollable aircraft fire – the large loss of life and the destruction of the aircraft. The program supports the FAA's Aviation Safety organization - which is responsible for issuing regulations, standards, and guidance material to ensure the highest level of safety in commercial aviation - and the FAA's Security and Hazardous Materials organization. Research efforts specific to hazardous material transport are completed in coordination with the Department of Transportation's Pipelines and Hazardous Materials Safety Administration (PHMSA). The program also benefits the aviation industry by developing, validating, and transferring cost-effective aircraft fire safety technology.

The benefit derived from this program will be the introduction of enabling technologies to prevent accidents caused by fire in freighter aircraft and hidden in-flight fires in passenger-carrying airplanes. New technologies of interest to the aircraft manufacturers and operators will be enabled in a fire-safe manner or prohibited if warranted.

<u>Lithium Battery Cargo and Freighter Fire Safety</u>

This area of concern is driven by accidents, incidents, and National Transportation Safety Board (NTSB) recommendations related to the billions of lithium batteries shipped annually in cargo. In the space of less than one year, two destructive fatal freighter accidents were caused by in-flight fire (UPS 747-400 on September 3, 2010 and Asiana 747-400 on July 28, 2011). In both accidents, the presence of large quantities of lithium batteries was a potential source of the fire or a contributing factor. As discussed at the NTSB Forum on Lithium Ion Batteries in Transportation held in Washington, D.C. April 11-12, 2013, as many as six freighter fire accidents are predicted to occur over the next decade (http://www.fire.tc.faa.gov/pdf/TC-13-2.pdf). In four of six predicted accidents, lithium batteries were the dominant factor. Development of new fire safety standards for freighters could prevent these predicted incidents.

Additionally, more than 50 lithium battery fire incidents have occurred in aviation, primarily in cargo shipments where the fire fortunately occurred before takeoff. Because of this growing threat, in 2013 the NTSB updated its Most Wanted List to include *Improve Fire Safety in Transportation* (http://www.ntsb.gov/news/2012/121114.html). More recently, FAA research has demonstrated that an uncontrolled cargo fire involving lithium batteries could cause a sudden explosion and catastrophic accident from the build-up of flammable gases vented by the lithium batteries in thermal runaway. Research activities will focus on battery packaging, fire resistant cargo containers, covers for palletized cargo, and on-board water spray fire suppression systems.

<u>Hidden In-Flight Passenger Aircraft Fires</u>

There is a real threat of an uncontrollable fire originating in a hidden area, as evidenced by the 900 or more incidents of unknown odor and smoke events each year in the U.S. Most of these events are not fire related, but safety considerations dictate the actions a pilot takes at signs of smoke (i.e., return or divert to the nearest airport), and in some cases to initiate an emergency evacuation. Research will be conducted to evaluate in-flight smoke and odor incidents and identify state-of-the-art detection technologies will improve detection capability and discriminate between fire events and non-fire events. This will lead to early fire detection and a significant decrease in the incidents of declared emergencies and flight diversions due to non-fire sources with the accompanying reduction in hazards those actions create.

New Materials (Composites and Magnesium)

New materials and new material applications raise new fire safety concerns. On July 12, 2013, a fire occurred in an Ethiopian Airlines 787 aircraft while parked at London's Heathrow airport. Preliminary findings indicate a fire involving lithium batteries in the aircraft's Emergency Locator Transmitter (ELT). The fire ignited the composite fuselage skin adjacent to the ELT and spread a considerable distance, raising concerns about the consequences of a similar failure if the airplane was in flight. Previous testing by the FAA and Boeing involving composite fuselage structure did not exhibit this behavior. This incident illustrates not only the changes in fire properties of newer materials but also the changes in potential fire scenarios due to higher energy fire ignition sources such as lithium batteries installed in aircraft equipment. Research activities involving composite fuselage material will consist of studying the slow burning behavior in an oxygen-deprived environment, as occurred in the referenced incident.

Aircraft manufacturers are proposing new fire resistant magnesium alloys as a weight saving substitute for aluminum in seat structure. A subsequent magnesium alloy seat structure flammability test standard was developed, and will be used to certify the first aircraft seats employing magnesium framing. Another application for magnesium alloy under consideration is air conditioning ducting. Research will be required to demonstrate safety under hidden in-flight fire threats and to develop an appropriate flammability test standard, if warranted.

Research activities will provide necessary training support and guidance material for proposed new or improved tests methods. The support will include testing on a range of materials that might require specific clarifications based on their unique behaviors, including leather seat cushions, magnesium ducting, and lithium/aluminum alloy fuselage structure. The support may also involve production of training videos that demonstrate the proper execution of new and revised flammability tests for field personnel responsible for certifying material compliance. This support is needed to ensure repeatability and reproducibility in the flammability test results among all labs that conduct certification tests. Poor reproducibility between labs was the driver for the development and evaluation of an improved heat release rate test specified in 14 Code of Federal Register (CFR) Part 25.853, which will be finalized in FY 2017.

Environmental Constraints (Halon Fire Extinguishing Agents and Flame Retardants)

Over the last 50 years, the preferred fire extinguishing or suppression agent for the aviation industry has been Halon. Worldwide availability of Halon continues to decline due to environmental restrictions that require elimination of any future use by prescribed dates. These actions will force the use of alternative agents or systems and suitable replacements that have not yet been identified, tested or certified.

Additionally, environmental restrictions and health concerns prohibit the use of effective brominated flame retardants used to impart fire resistance in numerous interior materials in order to meet stringent FAA flammability criteria. Research will be conducted to develop screening tools to evaluate the effectiveness of new flame-retardants and to address any potential toxicity issues. Research will be conducted in collaboration with aircraft manufacturers that includes the testing of selected Halon replacements for effectiveness and means of compliance during certification.

High Energy Density Power Sources for Aircraft and Consumers

These power sources include existing and emerging lithium battery chemistries and fuel cell technologies. The dangers of large lithium batteries used in electrical cars and residential solar power grids, shipped as cargo, is of increasing concern. Fuel cells powered by compressed hydrogen are being developed for various applications, ranging from small cells to power medical diagnostic equipment to the auxiliary power unit turbine generator on the aircraft. The greatest danger from fuel cells is the risk of a hydrogen fire or explosion. The research will include practical and cost effective aircraft based fire detection and suppression systems for these evolving electrical power sources.

Fire Modeling

Fire research will model transport of combustion products and fire suppression agents will be validated in a variety of situations. A robust and validated model of the transport of heat, smoke, and gases will supplement full scale testing to evaluate methods for the detection of fires in any location inside the fuselage and to evaluate options for applying fire suppression agents for a variety of fire scenarios.

The majority of the requested funding will be used for contracted technicians and data collection for the in-house activities that support the above research areas. The remaining funding is for the purchase of required test fixtures and instrumentation and representative aircraft materials to be used in the evaluations and new test standards development.

Major activities and accomplishments planned in FY 2017 include:

- Characterize the fire hazards of lithium batteries in thermal runaway, including the composition of vented flammable/explosive gases, and evaluate the effectiveness of current cargo compartment fire suppression systems.
- Evaluate and develop methods to safely ship lithium batteries, including packaging, cargo loading devices (containers and pallets), and on-board cargo compartment fire suppression systems for freighters.
- Develop a draft performance standard for packaging designed to contain the hazards of lithium batteries in thermal runaway, working with the International Civil Aviation Organization (ICAO) Dangerous Goods Panel.
- Evaluate the hazards of hydrogen-fueled fuel cells and test and evaluate technologies to mitigate these dangers.
- Evaluate and test technologies and procedures to detect, control and characterize in-flight incidents of fire, smoke and fumes, and sensors that discriminate between fire and the far more common non-fire sources.
- Develop an improved aircraft material heat release rate test specified in 14 CFR Part 25.853.
- Support the standardization of new flammability test methods, advisory circulars, and training guidance for planned Notice of Proposed Rulemaking to revise and upgrade the current flammability regulations for interior materials.
- Develop and validate a computational fluid dynamics model for heat, smoke, combustion gas, and fire suppression agent movement through the interior spaces of aircraft using experimental data.
- Develop a small-scale test procedure that exhibits the production of incomplete products of combustion experienced by interior materials in a fire to evaluate the effectiveness of non-halogen flame retardant replacements for U.S. Environmental Protection Agency-banned brominated flame-retardants.

Why Do We Want/Need To Fund The Program At The Requested Level?

The vast majority of the research is conducted in the unique Fire Safety facilities at the William J. Hughes Technical Center, Atlantic City, NJ, by internationally recognized experts in aircraft fire safety research. The FAA operates the most extensive civil aircraft fire test facilities in the world. The fire research facilities and technical expertise developed through their use have continually demonstrated a high level of contribution to aviation safety due to the flexibility, quick response, and capability to effectively address newly emerging fire hazards. Thus, because of its expertise and facilities the international aviation community looks to the FAA for leadership in aircraft fire safety research and development. Outputs from this research to increase aircraft fire safety are fire tests for interior materials, fire detection and suppression systems, fire-fighting procedures, minimum performance standards for mandated Halon replacement suppression agents, and safeguards to protect against fires involving lithium batteries and hazardous materials.

Goals for FY 2017 Funding:

- By FY 2020, develop the enabling technology to prevent accidents caused by in-flight fires in freighter (all cargo) and passenger carrying large transport aircraft.
- By FY 2020, enable the fire-safe introduction of new materials, such as lightweight composite structure and magnesium alloys, and advanced electrical power sources, including lithium batteries and hydrogen-fueled fuel cells, into commercial transport aircraft.
- By FY 2020, support and facilitate the evaluation and replacement of environmentally damaging Halon fire extinguishing agents and halogenated cabin material flame-retardants, which have both adverse environmental and health effects, with effective and practical alternatives.

The effectiveness of this program has been demonstrated by the continued low level of occurrences of aircraft accidents where fire was either a direct cause of the accident or a major contributor to fatalities during evacuations. Emerging fire threats such as the proliferation of high energy density batteries and equipment containing batteries as both cargo and in aircraft installed equipment as well as the increased use of less fire resistant composite fuselage structure replacing the traditionally used aluminum have been identified. Proactive research to mitigate these threats is underway and is proposed to continue.

What Benefits Will Be Provided To The American Public Through This Request?

The primary benefit to the American public from this research is the prevention of catastrophic aircraft accidents caused by in-flight fires and increasing survivability during a post-crash fire. In 2015, the international aviation community has taken or proposed action regarding the shipment of lithium batteries, primarily because of FAA test findings. ICAO recommended the prohibition of lithium metal (non-rechargeable) battery shipments in passenger aircraft, effective January 1, 2015. In early 2015, United, American, Delta, Qantas, and Cathay Pacific airlines unilaterally banned the bulk shipment of lithium ion batteries, which are manufactured and shipped in far greater quantities than lithium metal batteries, in passenger aircraft. Moreover, in April 2015, Boeing and Airbus proposed to ICAO that bulk shipments of lithium ion batteries be banned in passenger aircraft because the current cargo compartment fire suppression systems were not designed to protect against the severe and unusual hazards of a lithium battery fire, until effective shipping packaging becomes available. These unilateral measures by the airlines have improved aircraft fire safety, but also underscore the need for the research proposed in this program to safely ship lithium batteries in both freighter and passenger aircraft cargo compartments.

Research products from this program have been implemented in large passenger transport aircraft throughout the world to improve post-crash fire survivability. The probability of dying from a survivable post-crash fire has been reduced by a factor of three due in part to this past research. This is perhaps best demonstrated by the following recent accidents in which the aircraft was destroyed by a post-crash fire: Air France 340 (Toronto, 2005), Continental 737 (Denver, 2008), and Asiana 777 (San Francisco, 2013). There were 731 passengers and crewmembers in the three destroyed airplanes and zero fire fatalities. The introduction of new aircraft materials and technologies increases the need for both in-flight and post-crash fire safety research.

Detailed Justification for
A11.b Propulsion and Fuel Systems

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Propulsion and Fuel Systems – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.b Propulsion and Fuel Systems	$2,000,000	$2,034,000	$2,574,000	+$540,000

What Is This Program And Why Is It Necessary?

The FAA establishes rules for the certification and operation of aircraft engines, fuels, and fuel management systems that enhance the airworthiness, reliability, and performance of aircraft propulsion and fuel systems. The Propulsion and Fuel Systems Program conducts research on advanced damage-tolerance and risk assessment methods that provide the FAA's Office of Aviation Safety with the basis for new or revised engine certification and continued airworthiness standards. This research also supports preparation of Advisory Circulars (ACs) that provide industry with technical information on acceptable means of compliance with regulations. Benefits will accrue in the form of a reduced risk of engine failures and fewer accidents, which in turn will lead to fewer injuries and fatalities.

The history of turbine engine operation in commercial aviation is a safe one, but the risk of an engine failure is always present and the potential consequences are enormous: the large loss of life in accidents and the destruction of the aircraft. Although they are very rare, accidents such as United Airlines Flight 232 on July 19, 1989 in Sioux City, Iowa, and Delta Airlines Flight 1288 on July 6, 1996 in Pensacola, Florida are noteworthy because they were caused by the failure of turbine engine components that caused catastrophic loss of life. Propulsion research conducted in conjunction with the manufacturers has shown that the primary failure modes in these accidents resulted from the presence of material and manufacturing anomalies that can degrade the structural integrity of high energy turbine engine rotors. From this research, the FAA made recommendations related to the improvement of titanium metallurgical quality, nondestructive inspection, and turbine rotor structural design and service life prediction standards. This research yielded a probabilistic damage tolerant rotor design and life management code called DARWIN® (Design Assessment of Reliability With INspection) that determines the risk of fracture of turbine engine rotor disks containing undetected material anomalies. DARWIN® is used by nearly all major engine manufacturers.

The Propulsion and Fuel Systems program will develop advanced damage tolerance methods, risk assessment methods and tools, and incorporate them into DARWIN® to enhance its predictive capabilities. These advances are needed to assess damage mechanisms, new design practices, and classes of materials and components not previously addressed by FAA research. The advances will extend the applicability of damage tolerance (as a supplement to conventional safe life methods) much more broadly throughout the engine and will introduce an increased level of engineering rigor to the risk assessment process. The research will focus on improved fleet risk assessment methods, turbine engine blade fretting fatigue and edge contact issues, damage tolerance for other rotating and static structures, inherent defects in nickel-based superalloys turbine rotors, and increases in engine operating temperatures.

A separate but related area of research within this budget line will address turbine engine operation in a volcanic ash environment. Typically, there are about 150 volcanic eruptions world-wide on a yearly basis. Many eruptions impact heavily used airway routes. Historically, over 130 volcanic ash aircraft encounters have been reported. Specifically, between 1980 and 2006 there were nine encounters with ash that resulted in aircraft engine power loss with a resulting re-start. Three of these encounters involved at least a temporary and, in some cases, a permanent loss of power to an engine. Although volcanic ash has caused severe engine damage and total power-loss, there have been no accidents resulting from a volcanic ash encounter. The International Civil Aviation Organization (ICAO) has issued guidance for airline operators when operating near volcanic ash contaminated airspace. U.S. airline operators are directly affected by these international standards, which require regulators to assess operators' safety risk assessments for flight near ash contaminated airspace. Given the continued threat of eruptions, it is important to develop an understanding of the effects that volcanic ash has on the safe operation of commercial turbine engines.

Additionally, funding will provide for engineering, technical, and management support of overall research activities.

Major activities and accomplishments planned in FY 2017 include:

Advanced Damage Tolerance and Risk Assessment Methods for Engine Life-Limited Parts

- Develop and release a DARWIN® analysis mode to support a proposed AC that addresses damage tolerance of blade attachment slots.
- Develop and implement an improved fleet risk analysis capability into the DARWIN® design code that is able to address inspection-related corrective actions to assess continued airworthiness associated with AC 39-8.

Volcanic Ash Engine Ingestion

- Determine the risks to the continued airworthiness of turbine engines associated with the inadvertent flight through and ingestion of various concentrations of volcanic ash.

Why Do We Want / Need To Fund The Program At The Requested Level?

Goals for FY 2017 Funding:

- By 2018, develop advanced damage-tolerance based methods for aircraft turbine engine life-limited parts that will be used to improve engine certification standards and reduce the risk of turbine engine failures.
- By 2018, gather sufficient engine data that relates engine performance and degradation to volcanic ash ingestion to provide guidance for the development of risk-based operational guidelines.

Requested funding will continue the development of advanced damage tolerance and risk assessment methods that reduce the risk of failures of high-energy rotors and other life-limited engine components. Implementation of new and revised engine certification and continued airworthiness standards and ACs will reduce the risk of failures of high-energy rotors and other life-limited engine components.

Requested funding will provide an accurate assessment of critical engine components during exposure to ash. This data will be used to build an accurate engine model and to assess the level of risk associated with individual components and in turn, the system as a whole. Both of these risk values will be used to establish operational limits to include guidelines on inspection, safety impacts, and critical part reviews.

What Benefits Will Be Provided To The American Public Through This Request?

The specific benefit of research from this budget line will be the reduction or elimination of commercial aircraft uncontained turbine engine failures and in-flight engine shut down events attributable to rotor design, manufacturing, and service induced anomalies and engine ingestion of volcanic ash. Benefits will accrue in the form of reduced risk of engine failures and fewer accidents, which in turn will lead to fewer fatalities, injuries, and aircraft damage. The research conducted under this program is critical to the FAA's ability to understand these challenges and to ensure that acceptable safety improvements are incorporated into the user community.

Detailed Justification for
A11.c Advanced Materials/Structural Safety

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Advanced Materials/Structural Safety – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.c Advanced Materials/Structural Safety	$2,909,000	$7,409,000	$4,113,000	-$3,296,000

What Is This Program and Why Is It Necessary?

The Advanced Materials and Structural Safety program conducts research to support the FAA safety and regulatory activities in the technical areas of composite and other advanced materials, and aircraft dynamic impacts. This program is divided into two research areas, Advanced Materials and Structural Safety (crashworthiness).

The Advanced Materials program investigates damage tolerance and fatigue issues of composite structures, including the assessment of impact damage (e.g., in-flight hail, ground vehicle collisions) and fatigue effects of composite materials on structural strength. The program explores composite environmental and aging effects; control issues related to composite fabrication and continued operational safety, bonded joints, bonded and bolted repairs and the characteristics of new materials and applications used in aircraft structures. The program develops safety awareness training material for advanced composite materials and manufacturing processes for education of aviation workforces.

The Structural Safety program performs research to evaluate test and analysis procedures used by the industry to meet crashworthiness regulations. These regulations are evolving and are supplemented with special conditions for transport aircraft with composite fuselage and wing structures. The program ensures new aircraft structures demonstrate levels of safety equivalent to existing aircraft structures subjected to survivable crash conditions. The program develops dynamic test methods to determine composite material properties, loading rates for emergency landing conditions including strain rates, typical material response rates at the component and system level, and occupant survivability. The program also identifies issues limitations associated with structural scale and boundary effects, and develops crashworthiness safety awareness training materials.

Over the last decade, there has been a rapid expansion of the use of composites in increasingly larger structures. Dominating the rapid expansion is the use of reinforced composites to provide lighter, more fuel efficient airframe and engine components including full-fuselage barrels and wings. The current certification process for many advanced materials and structures was established for smaller, less critical components and service conditions. The difference in the structural characteristics of these new components and increased scale of these components must be understood and incorporated into certification and operational plans to assure safety.

Advanced Materials and Structural Safety research requirements are driven by industry advancements in construction of airframes and related components presented for certification. The FAA must assure that the changes maintain an equivalent or improved level of safety compared to that achieved with current operational aircraft. Requests from the aircraft certification offices and from the aircraft manufacturers seeking 'type certification' approval are major influences that shape research requirements. Additional requirements are developed from assessments of existing techniques, protocols, and service histories. These are examined to determine if modifications to certification methods are required for novel materials, processes, and forms. The National Transportation Safety board review of accidents (e.g., AA587 (http://www.ntsb.gov/investigations/AccidentReports/Pages/AAR0404.aspx), R22 (https://www.atsb.gov.au/publications/investigation_reports/2007/aair/aair200701625.aspx) involving these structures provides additional impetus for research required to understand these emerging technologies.

Major activities and accomplishments planned in FY 2017 include:

Advanced Materials

- Damage Tolerance of Composite Structures
  - Document severe impact damage mechanisms from simulated service vehicle collisions and effect on structural properties.
  - Investigate, test and analyze guidelines to assure designs are resistant to operational damage to establish future certification policies.
  - Isolate critical damage and defect types for dynamic components, including focused studies on safety issues derived from service.
  - Evaluate advances in analysis methods, failure criteria and test procedures applied to composite fatigue and damage tolerance.
- Composite Maintenance Practices
  - Evaluate repair trials, inspections, and structural integrity data that serve as proof of consistent and reliable composite maintenance practices used by the industry.
  - Evaluate field bonded and bolted repair practices to update related guidance and training for composite aircraft structures.
- Structural Integrity of Adhesive Joints
  - Collect structural integrity data for composite and metal bonded structure that is representative of the design and processing variables used for aircraft structures currently in service.
  - Evaluate industry process quality control procedures and their tests and analysis methods used for structural integrity that yield an assessment of the strengths and limitations.
  - Establish training and best industry practices to support guidelines for expanding applications and new rules, policies and guidance.
- Composite Materials Handbook 17 (CMH-17, formerly MIL-HDBK-17)
  - Continue to develop content for the next revision of the composite handbook.
- Crashworthiness Issues Unique to Composite Materials
  - Review and update the composite crashworthiness safety awareness training module to reflect changes in regulations, materials, processes, guidance, and practices.
  - Conduct research to develop standardized dynamic test methods that determine composite material properties.
  - Develop modeling guidelines and best practices to support certification requirements.
  - Identify issues and limitations associated with structural scale and boundary effects on crash analysis.
  - Identify data gaps that affect the use of modeling and simulation for crashworthiness analysis.
- Continued Operational Safety and Certification Efficiency for Emerging Composite Technologies
  - Perform studies to understand key issues associated with the introduction of composite materials in large scale aircraft structures.
  - Develop an understanding and perform a gap analysis on the following areas of concern on the critical parameters and protocols for developing policy and guidance on the effect on the performance of composites; lightning effects on structures, carbon fiber production control; and of new fuel chemistries.

- Develop evaluation methods for determining structural failure causes after a post failure fire will be investigated.

Structural Safety

- Transport Airplane Ditching
  - Perform parametric studies against identified ditching conditions develop a range of likely ditching scenarios and corresponding airframe damage with an aircraft ditching simulation model. Where applicable, the model will be used to address issues brought up by the aviation rulemaking advisory committee's team on aircraft ditching.
- Airframe Structural Crashworthiness Response Characterization
  - Develop and/or modify an analytical model to address structural performance and identify important crash parameters during an emergency landing.

Why Do We Want / Need To Fund The Program At The Requested Level?

Advanced Materials

While the top level requirements for demonstrating safety of aircraft are the same for composite or metal materials, different characteristics of composite structural materials require an understanding of their unique response to the civil aircraft operational environment. Advisory Circular 20-107 *Composite Aircraft Structure* is the primary guidance for composite aircraft structures. It requires continual review and periodic update to assure civil aircraft continue to meet the applicable safety standards as changes in the materials and processes are introduced into their design. Advances in understanding of composite structural response leads to periodic updates and revision of safety requirements for composite structures. These updates are identified and requirements are investigated through the research performed by this program. Workshops and industry involvement provide timely information to the aviation community and focus the research on workable solutions to safety concerns. The FAA aircraft certification service engineers, applicants, certificate and approval holders, parts manufacturers, material suppliers, maintenance, and repair organizations use the technical information developed in this program through direct involvement in the research, technical reports, handbooks (e.g., *Composite Materials Handbook 17*), guidance, policy, and training courses. This data exchange allows the regulatory process to address industry advances and assure the safety of state-of-the-art technology and design.

Structural Safety (Crashworthiness)

The FAA revises or updates crashworthiness-related regulations and standards to enhance the safety of airframe structures by studying and developing new information for overhead stowage bins; auxiliary fuel tanks and fuel systems; aircraft configurations; seat and restraint systems; and human tolerance injury criteria. It supports development of alternative methods to improve the certification process (e.g., certification by analysis and component tests in lieu of full-scale tests).

Goals for FY 2017 Funding:

- By FY 2018, identify needs for lightning strike criteria and policies specific to composite structures.
- By FY 2018, identify issues and limitations associated with structural scale and boundary effects on crash analysis.
- By FY 2018, develop preliminary basis for performance related crashworthiness certification requirements.
- By FY 2019, assess loading rates for emergency landing conditions at the component and system level including occupant survivability.

- By FY 2020, document severe impact damage mechanisms from simulated service vehicle collisions and effect on structural properties. Outline test and analysis guidelines to assure designs are resistant to such damage.
- By FY 2020, provide detailed background on the unique static, fatigue, environmental durability and impact performance of advanced composite splicing concepts.
- By FY 2020, complete an evaluation of field bonded and bolted repair practices to update related guidance and training for composite aircraft structures.
- By FY 2020, develop information on the effect of environmental and heat exposure on structural properties and durability of composite structures.
- By FY 2020, provide documentation and background data for regulatory action to assure reliable processing of adhesively bonded structures.

This program depends on a collaboration of individuals from industry, academia, and regulators to develop focused research efforts where the products of the research are usable immediately in certification and other related safety programs. The engagement of industry in the process is contingent on the research reaching a specific level of development before industry review. Requested funding will provide the ability to determine the adequacy of the current composite structural and crashworthiness certification protocols for the continued operational safety of the current fleet and the designs, materials, and processes of future aircraft certification projects.

What Benefits Will Be Provided To The American Public Through This Request?

Research funding includes the study and exploration of threats to aviation safety that leads to resolutions, preparation for the safe integration of new technologies in the cockpit, and investigation of continued airworthiness issues.

The use of advanced materials and structural concepts is central to a vibrant aviation industry in the U.S. All aircraft manufacturers are using more and more advanced materials on their aircraft. As the methods of structural verification are being extended to new components and aircraft applications, it is important to understand the envelope of acceptable design parameters that have not been explored with traditionally designed advanced composite structures. This will ensure that as more applications are introduced, the safety record of composite structures is maintained. This effort will assure the civil aircraft manufactured with these materials are safe and reliable. The benefit to the American public is a reduction in accidents related to the design and use of composite materials.

Currently, there are no existing structural crashworthiness requirements for transport airplanes. The development of new materials and novel designs has required the manufacturers to provide a level of safety comparable to existing traditional metallic structures. The FAA is seeking to develop a single policy for demonstrating crashworthiness that would be applicable to all transport airplanes regardless of the structure. The FAA would develop requirements to establish acceptable levels of safety and guidelines to help industry meet these accepted levels of safety. The benefit to the American public is a reduction in fatalities and injuries in the event of a crash.

Detailed Justification for
A11.d Aircraft Icing/Digital System Safety/Aircraft Cyber

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aircraft Icing/Digital System Safety/Aircraft Cyber – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.d Aircraft Icing/Digital System Safety/Aircraft Cyber	$5,500,000	$5,500,000	$5,102,000	-$398,000

What Is This Program And Why Is It Necessary?

The FAA establishes rules and regulations for the certification and operation of aircraft in icing conditions and for the use of digital systems. The agency uses research results to generate Advisory Circulars (ACs) and other forms of technical information to guide certification and airworthiness specialists and inspectors on acceptable means for meeting these rules and regulations.

Aircraft Icing

The Aircraft Icing program will improve existing capabilities and develop new engineering tools to support improved means of compliance and new guidance material for engine and airframe certification and operations in Supercooled Large Droplet (SLD), mixed-phase, and ice crystal icing conditions. Research will study the effects of various winter weather conditions, including mixed conditions, on the performance and aerodynamic effects of anti-icing fluids, new non-glycol fluids, and ice phobic applications. Research will support holdover time determination and operational assessment of fluid effectiveness and will yield data packages for development of operational guidance and standards on their use. Finally, the FAA will enhance icing simulation methods for means of compliance; and conduct swept-wing ice accretion experiments for a validation database and to better understand three-dimensional (3-D) iced aerodynamic flow phenomena. The outcome of this research will provide new test methods and a 3-D ice accretion database to support validation of computer codes and means of compliance for certification.

Aircraft icing due to the freezing of supercooled water on aircraft surfaces is a continuing concern in all phases of flight: ground; takeoff; and cruise, holding, and landing. The FAA has identified over 160 turbine engine power loss and engine damage events caused by ice crystals between 1989 and 2014. There were also 11 total power loss events from flameout and one forced landing due to ice crystals. Ice crystals have also caused engine thrust events due to ice crystal blockage of the inlet temperature probe. The FAA is also aware of events where pitot probes have stopped working in ice crystal conditions and the flight crew temporarily lost all indication of airspeed. Temporary inconsistency between the airspeed measurements, likely following obstruction of the pitot probes by ice crystals, was identified by the investigating authority as one of the causes contributing to an airplane accident that occurred on June 1, 2009 in which there were 228 fatalities.

Digital System Safety

Airborne systems' designs have become increasingly dependent on highly integrated software and hardware architectures that share power, computing, networking, input/output, and other resources to support the needs of multiple aircraft functions. Research is required to address the evolution of these highly complex architectures especially as they begin to integrate with ground systems and NextGen implementation. This will require a systems-level approach that focuses on system life cycle assurance in addition to development assurance at the software/digital level.

The FAA has taken a proactive approach to keep pace with the ever changing technological industry and is conducting research on software and digital aircraft systems, before they become too complex to safely certify. The majority of operational software and electronic hardware issues are due to missing or incorrect requirements. Many of these issues and can be attributed to system complexity and associated difficulty in requirements validation to ensure completeness and correctness. Research will be conducted to analyze and mitigate the issues and shortcomings associated with requirements and system integration processes, electromagnetic compatibility, single event effects, and automated test generation for complex systems. Modeling of software intensive systems may facilitate the early validation verification of complex requirements, thereby improving the timelines of NextGen implementation.

Outputs from Digital System Safety program research will be used to develop new or revised guidance and training material as well as to recommend best practices for the industry. These outputs will generate the following benefits:

- Continuous improvement and risk management; and improved safety that could have potentially prevented incidents due to digital systems such as:
    - The Malaysian Airlines Boeing 777 incident on August 1, 2005 (caused by a faulty accelerometer being processed by the air data inertial reference unit and used by the primary flight computer, autopilot and other aircraft systems), and
    - The Qantas A330 incident on October 7, 2008 (caused partially by a single event upset in the digital equipment).

<u>Aircraft Cyber</u>

Aircraft network systems security is an increasing concern for current and future aircraft. Recently some of these concerns have also been documented by the Government Accountability Office (GAO), which released a report GAO-15-370 (published April 14, 2015) entitled *FAA Needs a More Comprehensive Approach to Address Cybersecurity*. The future generations of aircraft will be increasingly network centric with expanded aircraft connectivity for improved safety, operations and maintenance. The aircraft manufacturers and modifiers are installing avionics systems to allow this increased connectivity within an aircraft as well as to networks external to the aircraft to take full advantage of new computer technologies for more efficient aircraft operations and safety enhancements. The increased connectivity - particularly to external networks and systems without sufficient security controls - could introduce information security vulnerabilities, which, if exploited, could impact safe aircraft operations and continued airworthiness. Examples of such external networks and services - referred to as apertures - include airline operation centers, airport gate links, aircraft software uploads and maintenance, electronic flight bags, flight information databases, etc.

These concerns, which encompass certification and continued operational safety, will be addressed through the Aircraft Systems Information Security / Protection (ASISP) initiative. The focus is on the aircraft itself and does not encompass the entire National Airspace System (NAS) but does include any aircraft connectivity to external links (also called access points or apertures). The research will explore where ASISP-related threats and risks can compromise fail-safe mechanisms in the architecture, design, and operation of aircraft systems, including specific ASISP-related risks that might lead to common cause failures. Research activities planned for the near-term include defining and identifying the potential associated risks with access points or apertures, generating system level testing to test those risks for individual apertures, and determining how maintenance tools work to maintain airworthiness integrity in relation to ASISP risks. The research will address issues introduced by connectivity to aircraft systems that are internal and external to the aircraft, protection mechanisms, and related electronic security and safety network concerns.

The technical data from the research will be used to develop policy, guidance, best practices, standards, regulatory, and training development to address gaps, safety issues, and potential malicious intent from various cyber threats. The generated findings from this research will be used to justify proposed changes to policy, guidance, best practices, standards, regulatory and training requirements related to Aircraft Systems Information Security / Protection. In addition, the outputs will be used to enhance standardization and support timely certification for complex systems.

Major activities and accomplishments planned in FY 2017 include:

Aircraft Icing

Research on Ice Crystal and SLD (Appendix C Exceedance) Icing Conditions to Support Means of Compliance

- Report on ice formation in warm environments simulating an engine compressor.

Safe Operations and Take-off in Aircraft Ground Icing Conditions

- Compile data and information package needed to update Flight Standards annual winter notice that provides guidance for airlines on issues to be addressed in their required ground deicing plan.
- Investigate characteristics of simulated cold soaked fuel frost in icing tunnel.

Simulation Methods Development, Validation to Support Appendix C Icing Certification and Continued Operational Safety

- Conduct testing of swept wing model with 3-D ice shapes in ONERA F1 pressurized tunnel.

SLD engineering tools development and validation

- Develop a collaborative and coordinated research plans for SLD engineering tools with aerospace industry manufacturers and the European Union.

Digital System Safety/Aircraft Cyber

- Define and identify the potential associated risks with ASISP access points or apertures.
- Generate system level testing to test those risks for individual risks.

Why Do We Want/Need To Fund The Program At The Requested Level?

The Aircraft Icing program develops and tests technologies that detect frozen contamination, predict anti-icing fluid failure, and ensure safe flight operations in atmospheric icing conditions. A major goal of the program is to reduce aviation's vulnerability to all in-flight icing hazards. The research will develop databases and test methods to improve guidance materials and technical standards. Current aircraft that are certificated for flight in icing conditions (based on Appendix C engineering standards in 14 Code of Federal Regulations (CFR) Part 25) can fly as long as they do not operate in conditions where the accumulation exceeds the capability of the deicing/anti-icing equipment. New regulations will change the operational criteria for operating in icing conditions. There are two additional appendices to 14 CFR Part 25, Appendix O (for SLD) and Appendix D (for ice crystals). The research team will develop new means of compliance, guidance material, and new technologies to support ground and in-flight operations under these new icing regulations.

The Digital System Safety program supports development of new guidelines for testing, evaluating, and approving digital systems during the certification of aircraft and engines. The program also studies the airworthiness requirements of airborne cybersecurity as it applies to aircraft and engine certification. The program supports development of policy, guidance, best practices, and training needs of the Aircraft Certification Service and Flight Standards Service on airborne digital system safety and their safe applications to aircraft systems. The goal of this program is to approve and maintain aircraft safety by taking a proactive approach to the ever changing technological marketplace and conduct research in the areas of advanced digitally-intensive systems and assess how they can safely be deployed in the onboard airborne systems of systems environment. These systems include fly-by-wire flight controls, augmented manual flight controls, navigation and communication equipment, autopilots, as well as those systems with network connectivity both within and outside the aircraft. The program also works with industry, government agencies, and aviation standards development bodies - such as RTCA, EUROCAE, and SAE - to establish consensus-based standards and improve the effectiveness of the FAA rulemaking and policy issuances in digital aviation systems.

Goals for FY 2017 Funding:

Aircraft Icing

- By 2018, complete icing tunnel and analytical studies of frozen contamination, including cold soaked fuel frost and other forms of frost, and their aerodynamic effects.
- By 2018, complete a benchmark database of swept wing 3-D ice shapes and their aerodynamic effects for evaluation and validation of computer codes.
- By 2019, complete modeling studies of compressor icing in high ice water content conditions.
- By 2020, develop engineering tools and icing test facilities for freezing drizzle and potentially freezing rain icing conditions.

Digital System Safety/Aircraft Cyber

- By 2018, identify methodologies for identification and analysis of security threats to aircraft safety in an airborne network environment.
- By 2019, identify and analyze airborne electronic hardware and airborne software issues that could affect aircraft airworthiness.
- By 2020, determine an acceptable means to analyze, integrate, validate, and verify complex airborne digital systems and improve safety.
- By 2021, consider new policy statements to address the results from the integration of complex digital systems and automatic test generations research.

The requested funding for aircraft icing will be used to address the reduction of risk of engine power and damage events in high ice water content conditions; safe takeoff in ice pellet mixed ground conditions; and development of database and methods for validation of numerical analysis methods for icing for certification.

The requested funding for digital systems will allow the FAA to evaluate emerging, highly-complex aircraft systems implemented digitally, using hardware and software techniques. This allows certification specialists to properly assess proposed aircraft and systems designs, which employ this technology for flight-essential and flight-critical applications. In addition, funding would provide the FAA with needed technical input to develop and update certification policy, criteria, and training as needed to accommodate new technologies or methodologies.

What Benefits Will Be Provided To The American Public Through This Request?

The benefits to the public through the aircraft icing request are continued and improved safety for ground and in-flight icing conditions. The ground icing research program is managed in such a way that it can address safety and other issues through testing within months of those issues being identified. The inflight icing program is currently focusing on the threat of high ice water content conditions for turbine engines. In addition, this program supports improved atmospheric characterization of the ice crystal conditions for certification and simulation in test facilities for evaluation of engine designs.

The Digital System Safety program has the potential to prevent and mitigate fatalities and injuries. More systems functionality is being implemented in increasingly complex software and electronic hardware that is integrated with other increasingly complex components. While great strides have been made in the processes of developing and verifying individual components, the processes of developing and verifying the functionality and behavior of a system of complex components still contains many challenges to be resolved at both the component level and system level. Inadequate and misunderstood integration, validation, and verification techniques for complex components leave potential for faults to exist with failure manifestation at the airplane level. The Digital System Safety program will enhance safety regulations and standards. Most standards and regulations address development and safety requirements for individual components. Little exists for complex, highly integrated components and resulting systems, particularly using commercial-off-the-shelf equipment developed for a non-aviation (non-safety) market. As technology continues to change and become more complex, the verification and validation processes must change to adequately assess systems for compliance to the regulations and to minimize risk to the flying public.

Air transportation demands are expected to increase in the near future, which means capacity and efficiency also needs to increase to avoid huge delays in civil aviation. One key enabling technology to improve the capacity and efficiency of the NAS is to allow future generations of aircraft to be network centric with advanced avionics systems that will allow for improved safety, operations, and maintenance. This can only occur if the aircraft avionics systems can ensure data integrity and reliability. The ASISP initiative will ensure that aircraft avionics systems are secure and provide the public benefit of timely and safe air transportation.

Detailed Justification for
A11.e Continued Airworthiness

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Continued Airworthiness – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.e Continued Airworthiness	$9,619,000	$8,987,000	$10,269,000	+$1,282,000

What Is This Program And Why Is It Necessary?

The Continued Airworthiness program's focus is on the continuing operational safety of all aircraft throughout their lifecycle. It is based on research requirements developed by the FAA's Office of Aviation Safety (AVS). The requirements reflect the need of the regulatory office for technical data and information to support regulatory activities or for possible solutions to real world questions and problems. For example, the inspection of composite, metallic, and bonded structures in an accurate and reliable way presents a significant challenge for regulatory engineers, inspectors and the industry. The program investigates improved inspection technologies and procedures and quantifiable measures of accuracy. Research outputs include feasibility demonstrations of inspection technologies, characterization of new inspection methods and procedures, or proposed inspection standards for the aviation industry.

Aircraft and aircraft engines are extraordinarily complex systems, operating in an unforgiving environment, with a long design service life. Continued operational safety is ensured in several phases: design and certification; operational maintenance; and timely discovery and repair of damage and unanticipated issues. The FAA issues rules and advisory materials regulating all of these phases. As aircraft design and systems mature, operational data become available from several sources including Service Difficulty Reports, Aviation Safety Action Program reports, and the Aviation Safety Reporting System. The FAA uses this information to fine tune these oversight instruments, continually increasing safety. However, as new technologies are introduced, the FAA must anticipate all potential problems without the benefit of historical operational data.

As aircraft products age, the probability of component and subsystem failures, increases. Structures fatigue, corrode and crack. Moving parts wear; electrical systems fail; and aircraft suffer damage from a myriad of mishaps on the ground and in the air. The FAA uses regulations and guidance that require manufacturers to assess potential failures in their designs and establish design and inspection requirements to reduce the probability of catastrophic failure. Over the past 25 years, this program successfully addressed issues of continued airworthiness by providing the information and data in support of those regulatory efforts that enable the current high level of safety of commercial aircraft.

New aircraft designs, metallic and composite materials, and fabrication techniques that have entered service in recent years will require updated regulatory guidance and requirements to maintain the current level of aviation safety. Flight controls, avionics, and other electrical and electromechanical systems have been rapidly evolving for some time and the newest aircraft share little in common with airliners of just a decade ago. These advanced aircraft are introducing new challenges and issues for continued airworthiness. One of the primary goals of this program is to anticipate those issues and plan and execute the necessary research to support appropriate regulatory policy and procedures. Composite materials present an exceptionally difficult challenge in detecting impact damage. For example, unlike metallic structures, damage to the fuselage from ramp activities may not be apparent.

Research is necessary to address issues of continued operational safety and is not limited to new aircraft types. Even older aircraft types are continuously being updated and new issues arise as the individual aircraft age. Recent in-flight incidents, such as Southwest Airlines flights 2294 in 2009 and 812 in 2011, demonstrate the technical challenges of maintaining continued airworthiness, predicting potential failures, and determining appropriate maintenance actions.

In FY 2017, the planned research will focus on four technical areas: Flight Controls and Mechanical Systems (FCMS), Maintenance and Inspections (M&I), Electrical Systems (ES) and Structural Integrity Metallic (SIM). Funding will also provide for engineering, technical, and management support of overall research activities. Additionally, funding may provide for build-out of laboratory facilities to support test equipment.

Flight Controls and Mechanical Systems

- In the FCMS effort, the research will focus on providing Angle of Attack (AOA) information to the pilot to help reduce the number of fatal general aviation accidents. The number one cause of fatal accidents in General Aviation (GA) is loss of control, usually preceded by dynamic stall at low altitude. The research will investigate how sensed and derived AOA systems can be incorporated into general aviation cockpits to prevent stall, and identify potential future certification requirements for AOA systems. Additional research will focus on low energy alerting for transport category airplanes, transport category tire failure modes, and how volcanic ash may affect transport category mechanical systems if ingested into the cockpit and cabin atmosphere.

Maintenance and Inspections

- The M&I research will support the FAA's safety mission by evaluating the reliability, robustness, and efficiency of current and emerging Non-Destructive Inspection (NDI) methods. This includes NDI of composites; specifically the ability of NDI to detect various forms of impact damage as well as to detect hidden damage to substructure such as frames and stringers. M&I inspection will study the sources of variability when inspection and repairs are made by technicians in the field and at repair depots. Additionally, an effort will be made to assess the performance of aged in-service composite and metallic component bonded repairs through the collection, inspection, and testing of documented parts. The information gathered in this program will support the development of training material, guidance, and revisions to Advisory Circulars (AC's) such as AC 65-33 Development of Training/Qualification Programs for Composite Maintenance Technicians, and AC 43-214 Repairs and Alterations to Composite and Bonded Aircraft Structure.

Electrical Systems (ES)

- The ES research will address three safety and environmental needs of electrical energy storage:
    1. Develop technical data to support the development of appropriate rules and guidance that will ensure integrity of electrical systems and safety of aircraft equipped with fuel cells.
    2. Investigate technology and processes to improve the safety aspects of lithium battery cell(s) in aerospace applications.
    3. Determine characteristics of safe aerospace rechargeable lithium battery installation techniques and provide technical data that supports new regulatory requirements for use and installation of these energy storage devices.

Structural Integrity Metallic

- SIM research addresses both air transport and small airplanes. New metallic materials being introduced are much more process intensive and a good understanding on their mechanical behavior and long-term durability is needed to provide the appropriate regulatory guidance. Research will focus on emerging technologies such as damage tolerance and durability issues of new aluminum-lithium alloys, Additive Manufacturing (AM), as well as new and emerging alloys to be studied for inclusion in Metallic Materials Properties Development and Standardization (MMPDS). It also includes risk management methods to support the Aircraft Certification Services Monitor Safety/Analyze Data initiative, which is a data-driven, risk-based continued operational safety decision-making process.

Major activities and accomplishments planned in FY 2017 include:

Flight Controls and Mechanical Systems

- Stall Departure Identification, Recognition and Recovery
  - Complete the development of criteria to describe stall departure trigger and characteristics for transport airplanes.
- Tire Failure Characteristics
  - Document and catalogue all data on existing tire failure characteristics such as tire burst plumb, thrown tire debris, and flailing tire thread.
- Integrated Flight Path Control to Address GA Joint Steering Committee and FAA GA Safety Interventions
  - Conduct research that will assist the FAA's AVS to identify design and certification requirements for flight path control autopilot technology in GA aircraft.
  - Categorize system faults or pilot errors that have resulted in GA accidents and incidents.
- Low Energy Alerting and Awareness Systems
  - Design simulator experiments and assessment scenarios to provide a controlled evaluation of system features that will alert flight crews of airplane low energy state.

Maintenance and Inspections

- Inspection and Tear Down of Bonded Repairs
  - Obtain a representative sample of a documented bonded field repair with a service history.
  - Develop mechanical-characterization test articles by performing non-destructive evaluation and teardown of specimens.
  - Conduct mechanical and material testing of articles as specimens are torn down.

Electrical Systems (ES)

- Fuel Cell Systems for Aircraft Applications
  - Conduct tests to provide feasibility data of using fuel cell systems for aerospace applications while retaining or improving the current level of safety in commercial transport aircraft.
  - Identify and quantify the short- and long-term safety risks associated with fuel cell aerospace applications including a potential failure mode and effect.
- Recharge Lithium Batteries and Battery Systems for Aircraft Applications
  - Provide data to evaluate the feasibility of using non-flammable electrolytes for rechargeable lithium battery systems for aerospace applications.
  - Identify and quantify the short- and long-term safety risks associated with rechargeable lithium batteries and battery systems for aerospace applications.

Structural Integrity Metallic

- Emerging Technology – Active Flutter Suppression
  - Refine the FAA active flutter suppression research plan. Obtain data and technical information to evaluate and assess active flutter suppression technologies for compliance with certification and continued airworthiness requirements.

- MMPDS Support and Design Values for Emerging Materials
    - Develop, maintain, and distribute the annual update to the MMPDS Handbook and derivative products.
- Damage Tolerance and Durability Issues for Emerging Technologies
    - Develop preliminary procedures and guidelines for establishing design values for highly process-dependent emerging metallic-based materials including metal additive manufacturing.
    - Continue efforts to assess bonded repair technology to generic beam structures (e.g., wings and stabilizers) in partnership with Boeing. Emphasis will be placed on developing capabilities for structural integrity testing of wing-like structures.
    - Continue assessing emerging metallic structures technology for fuselage structures using the FAA's Full-Scale Aircraft Structural Test and Evaluation Research fixture in partnership with Boeing and ALCOA.
- Metal Additive Manufacturing for Aircraft, Engine and Propeller Applications
    - Benchmark the current state of additive manufacturing to develop AVS additive manufacturing Roadmap.
    - Conduct research to support development of appropriate additive manufacturing policy, guidance, standards, and rulemaking.

Why Do We Want / Need To Fund The Program At The Requested Level?

The Continued Airworthiness program addresses issues of continued operational safety in a range of structural and systems areas. Proactive research is being done in several areas including: emerging metallic structures to determine the appropriate FAA response to the introduction of these process intensive materials for which the FAA has no previous experience, NDI of the new generation of advanced metallic and composite aircraft; advanced flight control systems, and active flutter suppression systems which are being introduced. Other research focuses on known issues such as loss of control in Part 23 aircraft, operational safety of rotorcraft, management of fatigue in small airplanes, aging of electrical systems, the evolving use of maintenance and repair organizations, and NDE of rotating engine components.

Goals for FY 2017 Funding:

- By 2018, develop process for establishing mechanical property standards for emerging process-intensive metallic materials, including metal additive manufacturing. Property standards are needed for FAA certification guidance.
- By 2018, develop an increased understanding of aged-bonded repairs for use in new and existing FAA guidance material.
- By 2018, publish revised standards, advisory materials, and FAA evaluation criteria for complex AOA systems used to feed highly automated controls and flight path management systems.
- By 2018, develop technical data to evaluate non-flammable electrolyte lithium batteries and battery systems for aerospace applications.
- By 2019, develop an understanding of the durability and damage tolerance behavior of emerging technologies including unitized welded structure, new metallic alloys, and hybrid bonded construction to be used in support of developing appropriate policy, guidance, standards, and rulemaking.
- By 2019, provide data relative to active flutter suppression to allow for the review of pertinent regulations and guidance material, and prepare recommendations for new, modified, or otherwise improved criteria.
- By 2019, develop technical data to evaluate the feasibility of using fuel cell systems for aerospace applications while retaining or improving the current level of safety in commercial transport aircraft.

- By 2020, provide data to assess additive manufacturing technologies in support of developing appropriate policy, guidance, standards, and rulemaking.

There is a risk profile associated with the life cycle of every aircraft type and every specific airframe. While newer aircraft tend to have a lower risk profile than older aircraft, newer aircraft types tend to have a higher risk profile than more mature designs. The introduction of new designs, materials, fabrication techniques, etc., increase the risk associated with new aircraft types. This is borne out by the fact that the structural and electrical problems already in the first years of service of the advanced aircraft far outstrips those seen in the same timeframe on more mature aircraft types such as the Boeing 747. New aircraft technology also brings with it the near certainty of new problems, which did not pertain to previous aviation technology and therefore are not anticipated or remediated. This increases the risk associated with aging airframes and reduces the predictability of that risk.

The Continued Airworthiness program supports the regulatory and certification updates intended to reduce the risk associated with all phases of the lifecycle of traditional and advanced aircraft. This program depends on a collaboration of individuals from industry, academia, and regulators to develop focused research efforts where the products of the research are usable immediately in certification and other related safety programs. The program also leverages its resources to obtain significant support from industry through funding, equipment, and labor.

What Benefits Will Be Provided To The American Public Through This Request?

The Continuing Airworthiness program provides increased safety for the flying public. The AOA research will lead to new standards and performance requirements for automated systems on GA aircraft that directly control flight path, leading to a reduction in loss of control and stall related accidents. A reduction in GA accidents may significantly reduce the number of fatalities in the GA community.

Maintenance and Inspection research provides increased capability to determine adequate bonded repair strength to ensure continued airworthiness through in-service bonded repair tear down research and advanced inspection methods.

Technical data developed under the agency ES research initiative will yield new regulations and guidance that will facilitate safe incorporation of fuel cells and using non-flammable electrolytes for lithium battery systems onto aircraft. This will produce a framework for the FAA to evaluate applications for this new and novel civil technology, and state the regulatory expectations for operation and maintenance of the devices, integrity of their power generation, and safety of their fuel supplies and infrastructure.

One of the primary benefits of the SIM research is to allow the safe introduction of new metallic material forms and technology advancements onto the U.S. aviation fleet that will improve operational safety, ensure continued airworthiness, and prevent and mitigate accidents. In addition, the program promotes a uniform level of safety by developing and maintaining safety standards through a widely recognized government-industry organization. Through this program, FAA resources are optimized by streamlining approval of data submittals, allowing for the rapid response to safety issues, and providing improved confidence in data for decision-making.

Detailed Justification for
A11.f Aircraft Catastrophic Failure Prevention Research

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Aircraft Catastrophic Failure Prevention Research – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.f Aircraft Catastrophic Failure Prevention Research	$1,500,000	$1,433,000	$1,528,000	+$95,000

What Is This Program And Why Is It Necessary?

The Aircraft Catastrophic Failure Prevention Research program will develop, test, and analyze methods that produce publicly available tools to better predict aerospace engine impact events. FAA engineers need publicly available tools to standardize the analysis of engine rotor burst and fan blade containment. An increasing number of engine and aircraft projects are relying on proprietary analysis tools to show compliance, complicating the FAA task of making compliance findings and allowing potential variation in the standard of safety.

The goal of this research program is to have a public tool with standardized generic models, user guides, training, software quality control process, and validated public material models. This will reduce workload and allow for the timely processing of applications.

The program is largely driven by accidents, incidents, National Transportation Safety Board safety recommendations and the introduction of new technologies. This program was initiated after the 1989 DC-10 crash landing at Sioux City, Iowa. The major thrust of the program started in engine containment and uncontained engine failures mitigation. The program works closely with Aviation Rulemaking Advisory Committees, Aerospace Industry Association focus groups, Department of Defense (DoD), the National Aeronautics and Space Administration (NASA), and academia to leverage existing work and develop data, analytical methods, and processes that make up the foundation for improved policy, regulation, and advisory materials.

Past research focused on material characterization tests for titanium, aluminum, and Inconel 718 to develop unique, state-of-the art models in a general-purpose finite element program called LS-DYNA. LS-DYNA is widely used by industry and government for impact analysis and risk assessment related to engine containment issues. The material models greatly improve the accuracy of the analysis and the safety of aircraft designs. The process for developing these unique material models is used by automotive companies and aircraft companies in crash analysis studies.

The majority of the LS-DYNA user community deals with relatively low-speed automotive crash. In commercial transport engine failure, rotating speeds of the engine are limited to the speed of sound at the tips of the largest blades, so fragment velocities vary from several hundred feet per second up to near the speed of sound. Research is needed to address this unique speed range because the mode of failure changes with speed.

A new challenge has emerged with the proposed open-rotor engine concept, which promises greater efficiency. In this design, the engine containment is removed and two rows of counter rotating fan blades create a new configuration that requires certification. Current ducted fan designs used in large commercial transport completely mitigate a fan blade loss with engine containment. For these new engines, a fan blade failure is not contained therefore fuselage shielding is needed. Research is necessary to improve analytical tools previously developed under the program to evaluate this new configuration.

The FAA has accepted an Australian Transportation Safety Board recommendation because of the Qantas Airlines uncontained engine failure on the Airbus A-380 aircraft. Research is necessary to review and update the guidance in AC20-128 and Uncontained Engine Debris Damage Assessment Model (UEDDAM) code to address this safety recommendation.

The current engine and aircraft certification methods require full-scale destructive tests of an engine. There is a need for more robust and accurate non-destructive analytical methods and predictive tools to assess safety risks to the aircraft to minimize or replace non-destructive tests. Research is necessary to achieve and validate certification-by-analysis using analytical and predictive tools.

Standardized methods and numerical tools to analyze effects of both engine rotor-burst and fan blade releases assist the FAA certification offices and industry applicants in gaining a common understanding in demonstrating compliances of regulatory requirements. The option for standardized compliance by analysis (for specified rules) for derivative designs of already certified engines will be possible. The analysis tools developed in this program will also help to mitigate aircraft damage from an uncontained engine failure and prevent potential aircraft catastrophic failures. It provides FAA engineers a means to validate proprietary tools currently used by engine manufacturers and streamline the certification process. The long-term goal is certification-by-analysis.

A new challenge for this program is the move away from the traditional aluminum and into composite structures. This creates a significant increase in the model complexity. Metal alloys typically have the same properties throughout the material and in all directions; they are isotropic. Composites have very different properties depending on the fiber orientation in the resin. Industry trends indicate an increased use of composites for both engine containment and fuselage structure. Better algorithms to predict the failure of these materials are needed. Research is necessary to build on the recent success with metals, increase capability of computer platforms through parallel processing, and develop a new generation of predictive anisotropic models.

Additionally, funding will provide for engineering, technical, and management support of overall research activities.

Major activities and accomplishments planned in FY 2017 include:

<u>Advanced Analysis Methods for Impact of Composite Aircraft Materials in Rotor-Burst and Blade Release</u>

- Update and revise the new impact and failure models available in LS-DYNA through the LS-DYNA Aerospace Users Group.
- Evaluate the new MAT213 composite modeling and properties available in LS-DYNA to assess the improvement in predictive modeling. This work will be coordinated with the NASA advanced composites program.
- Address the Australian Transportation Safety Board recommendation on the Airbus A-380 uncontained engine failure by incorporating any lessons learned from this accident into revision of the FAA Large Engine Uncontained Engine Debris analysis Report.

Why Do We Want/Need To Fund The Program At The Requested Level?

The program develops data, analytical tools, and methods for both uncontained engine fragment impact and engine containment systems. Aircraft safety depends upon protecting identified critical systems that may need shielding from uncontained engine debris. Through the LS-DYNA Aerospace Users Group, FAA works with industry to establish standards for finite element analysis and guidance for use in support of aircraft engine and aircraft certification. The program provides technical information to establish certification criteria for aircraft and support for certification of new technologies and supports development of Advisory Circulars that outline acceptable means of compliance in meeting regulatory mandates. Research plans are reviewed with industry and NASA to ensure FAA products are meeting the needs of all involved. A primary review takes place yearly during the FAA/NASA/Industry LS-DYNA Aerospace Working Group Meeting.

The program also develops UEDDAM, which evaluates aircraft vulnerability and mitigates damage from uncontained engine events. Research will develop improvements to the UEDDAM model to address the Australian Transportation Safety Board Recommendation.

Goals for FY 2017 Funding:

- By 2017, develop a homogeneous model relating to LS-DYNA composite failure analysis.
- By 2018, develop new metal material analysis guidance relating to LS-DYNA metal failure analysis.
- By 2018, complete Phase 3 development of a new anisotropic composite material model.
- By 2020, validate composite material models with associated guidance for certification.
- By 2020, maintain Rotor-burst Vulnerability Analysis (UEDDAM) in conjunction with DoD, as a means of compliance for ducted and open rotor engines.

What Benefits Will Be Provided To The American Public Through This Request?

The program has a long history of addressing the overlap between aircraft certification and engine certification, which is known as engine installation. Continued investment in computing capability promises to provide opportunity to improve the accuracy of failure analysis for the rare but hazardous engine fragment impact events. The long-term goal is to advance certification-by-analysis with predictive tools. This will improve safety and reduce the cost of producing new engine and aircraft designs. Anisotropic composite materials are the current focal areas of interest in impact analysis; and the A-380 accident recommendation is the current focus of aircraft vulnerability analysis.

Today, certification of fan blade off requires a test that can cost upwards of $20 million. Predictive analysis will improve the design capability - allowing for a more thorough evaluation that improves safety of aircraft - and significantly reduce the cost of certification. The safety benefits from this research are a reduction in the number of accidents related to engine failures, and mitigation of fatalities and injuries if an accident occurs.

Detailed Justification for
A11.g Flightdeck/Maintenance/System Integration Human Factors

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Flightdeck/Maintenance/System Integration Human Factors – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.g Flightdeck/Maintenance/ System Integration Human Factors	$6,000,000	$5,000,000	$8,513,000	+$3,513,000

What Is This Program And Why Is It Necessary?

The Flightdeck/Maintenance/System Integration Human Factors program provides the research foundation for FAA guidelines, handbooks, orders, Advisory Circulars (AC's), technical standards orders and regulations that help ensure the safety and efficiency of aircraft operations. It also develops human performance information that the agency provides to the aviation industry for use in designing and operating aircraft, and training pilots and maintenance personnel.

The Flightdeck/Maintenance/System Integration Human Factors program focuses on the needs of pilots, inspectors, and aircraft maintainers. The revolution in digital avionics has changed flightdeck design and operational practices and enabled new Head Up Display (HUD) technologies, surface moving maps, electronic flight bags, advanced controls, communications, navigation, surveillance systems, and tools for aircraft system management. With these advances come important human performance and human factors implications which must be understood and applied in the appropriate guidance material developed for policy, procedures, operations, and training. This research supports the development of these products. Human error continues to be a major contributor to aircraft accidents and incidents both in commercial and General Aviation (GA). Current research is proactive in identifying error tendencies and thereby enhancing the safe and effective introduction of new technologies and procedures into the National Airspace System (NAS).

The FY 2017 research program will develop human factors scientific and technical information to support the development of standards, procedures, training, policy, and guidance material addressing human factors in safety-critical flightcrew and maintainer performance areas. Human factors efforts addressing Loss of Control and Recovery, as well as Flight Envelope Protection are intended to provide training and checking guidance that will reduce accidents and fatalities due to flightcrew loss of aircraft control in air carrier and GA operations. Research will also continue to advance the scientific knowledge base supporting flightdeck technologies such as advanced vision systems, Automatic Dependent Surveillance Broadcast (ADS-B), Cockpit Displays of Traffic Information (CDTI) symbology, Electronic Flight Bags (EFB) and night vision goggles. Additionally, funding will provide for engineering, technical, and management support of research activities.

Major activities and accomplishments planned in FY 2017 include:

<u>Enhancing Aviation Safety through Advanced Procedures, Training & Checking Methods, to include Loss of Control Detection, Avoidance, and Recovery</u>

- Provide scientific and technical data to support recommendations for Performance Based ATP.
- Provide scientific and technical data to support recommendations for distance learning.

Avionics and New Technologies

- Develop research plan to investigate issues related to pilot distraction, e.g., the effects of CDTI/airport moving map display compellingness on pilot attention, alerting, field of view, and workload.
- Update the *Human Factors Considerations in the Design and Evaluation of Flightdeck Displays and Controls* comprehensive reference for human factors issues and guidance.

Maintenance Human Factors to Support Risk-Based Decision Making and Maintenance Safety Culture

- Produce a report documenting methods used to develop, evaluate, and enhance safety culture in aviation and other industries.
- Review and categorize aviation support tools for risk-based decision-making.
- Recommend maintenance human factors issues that should be integrated into Safety Management System (SMS).
- Produce a report documenting the types of maintenance human factors errors involved in GA accidents and incidents.

Advanced Vision Systems, Enhanced Flight Vision System, Enhanced Vision System, Synthetic Vision System (SVS), and Combined Vision System (CVS).), HUD, Helmet Mounted Displays, Certification and Operational Approval Criteria

- Document minimum equipment requirements for new operational concepts using advanced vision systems and HUDs. Quantify the performance contribution of HUD use.
- Complete training scenarios and minimum training requirements to ensure the safe use of these technologies.

Fatigue Mitigation in Flight Operations

- Analyze Fatigue Risk Management Program (FRMP) databases on day-to-day operational fatigue evaluating the effectiveness of fatigue mitigation outcomes both before and after implementation of the new rule.
- Document effectiveness of fatigue mitigation of day-to-day operations of the new rule.
- Recommend updates to relevant AC guidance and/or educational materials.

Why Do We Want/Need To Fund The Program At The Requested Level?

This program directly supports the engineers, test pilots, human factors specialists, and inspectors within FAA Aviation Safety who are responsible for approving flightdeck systems, equipment, procedures, and maintenance and also responsible for developing the regulatory and guidance material in these areas. The research ensures that the critical FAA decisions to approve a given system, operation, procedure, etc. are made based on data. Human error routinely appears as a critical safety risk. The research is aimed at identifying and mitigating the human factors issues. The research results feed into the Aviation Safety's regulatory and guidance material.

A major goal of the program is to improve pilot, inspector, and maintenance technician task performance. Research results support enhanced methods for training and evaluating performance especially associated with new technologies and aircraft systems. Performance and evaluation capabilities are also enhanced through research that facilitates an improved understanding and application of risk and error management strategies in flight and maintenance operations.

Goals for FY 2017 Funding:

- By 2018, define methods for evaluating both traditional and Advanced Qualification Program training programs to support updates to guidance for Crew Resource Management.

- By 2018, provide guidance and training materials on methodology for evaluating and improving aircraft maintenance technical documentation.
- By 2018, provide recommendations on the use of synthetic vision and head down displays, as well as HUDs for operations conducted on Special Authorization Category I and Category II approaches.
- By 2018, provide guidance for aviation safety inspectors for reviewing and approving operator use of Night Vision Imaging Systems in night rotorcraft operations.
- By 2018, provide assessments and recommendations on the effectiveness of fatigue risk management approaches to improve flightcrew member alertness and inputs for guidance and educational materials associated with Fatigue Risk Management Systems.
- By 2019, increase risk-based decision making guidance and materials to enable FAA Inspectors and industry to follow data-driven processes for identifying and addressing the highest risk issues.
- By 2019, increase the integration of human factors-related risk in comprehensive SMS programs.
- By 2019, provide a means to quantify and address maintenance human factors error in GA.

What Benefits Will Be Provided To The American Public Through This Request?

The flying public looks to the FAA to ensure the safety of flight operations and this program supports that goal by providing scientific and technical information feeding into regulations and guidance that ensure safe pilot and maintainer performance. Human error is typically cited as a contributory factor in 80% of air carrier accidents. While many human error categories warrant research, this program has been scaled to address some of the most critical areas for flight safety. Recent accidents such as Asiana and Colgan emphasize the continuing need to address flightcrew performance. One product from this program will provide recommendations for training and checking guidance on loss of control detection, avoidance, and recovery. Another product will provide recommendations on the effectiveness of fatigue risk management approaches to improve flightcrew member alertness. Finally, research will address human factors considerations that will mitigate the increasing incidence of helicopter accidents to include helicopter emergency medical services.

Detailed Justification for
A11.h System Safety Management/Terminal Area Safety

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – System Safety Management/Terminal Area Safety – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.h System Safety Management/Terminal Area Safety	$7,970,000	$6,063,000	$7,000,000	+$937,000

What Is This Program And Why Is It Necessary?

System Safety Management

The System Safety Management program is designed to improve safety through developing safety data collection methods, advanced safety data and risk analysis techniques, and prototypes of risk-based decision-making capabilities to identify and analyze emerging safety issues in a cooperative nature with the aviation stakeholders. The program provides an ability to analyze trends across the aviation community that is much more effective than monitoring individual certificated entities, e.g., air operators and air traffic facilities.

Through this program, the FAA has developed an infrastructure and capability - called Aviation Safety Information and Analysis Sharing (ASIAS) - that enables the free sharing and analysis of de-identified safety information derived from government and industry sources. The ASIAS team, in collaboration with the aviation industry and the Commercial Aviation Safety Team (CAST), has developed safety metrics for monitoring precursors to aviation accidents such as near midair collision, runway excursion and incursion, loss of control, and controlled flight into terrain. The ASIAS team regularly monitors safety metrics, uses specific measures to understand the effectiveness of safety enhancements put in place by the CAST, and detects changes in the current levels of safety.

Although research for commercial ASIAS ended in FY 2015, research for helicopter safety will continue into FY 2017. Research will be used to understand the unique challenges posed by helicopters in terms of helicopter flight data monitoring (FDM) equipment, data formats, and processing techniques; and how to apply different safety risk methodologies to increase safety across the complex mix of helicopter mission segments and operational environments. Research will identify the tools and techniques necessary to analyze rotorcraft flight data and create prototype safety metrics specific to the unique needs of the helicopter community and its various mission segments.

Through this program, the FAA has also developed methodologies and a concept of operations to improve its oversight of Air Traffic Organization (ATO) facilities. The program developed a methodology to determine risk at ATO facilities within the National Airspace System (NAS) by using safety indicators. The FAA's field and headquarter personnel can target available oversight resources towards facilities posing the highest risk to air traffic safety using this methodology. The program also developed a methodology to support evaluation of risk controls that are proposed by the ATO to mitigate or eliminate potential high-risk hazards due to changes in NAS. The research for maturing these methodologies and developing prototypes to evaluate their effectiveness will continue in FY 2017.

The System Safety Management program addresses issues identified in several U.S. Government Accountability Office (GAO) studies (e.g., http://www.gao.gov/assets/310/304182.pdf and http://www.gao.gov/assets/600/590389.pdf) that call for the FAA to collect better data and improve its effort to identify and address safety issues.

Research projects in the System Safety Management program are necessary to increase system safety using data and other safety information. This will occur with the development of enhanced methods of data collection and analysis spanning a wide range of operational areas such as air traffic control, commercial aviation, general aviation, and rotorcraft. This allows the FAA to (a) identify system-level vulnerabilities through evaluating and developing aggregate level data and metrics, (b) determine indicators of performance (safety metrics) and processes to reliably identify potential risk, and (c) identify and assess risks associated with anticipated changes in procedures or technologies.

The System Safety Management program research outputs include developing methods, case studies, and guidance material that improve the capability to identify potential safety risks and apply proactive solutions to reduce aviation accidents and incidents.

<u>Terminal Area Safety</u>

The Terminal Area Safety program improves the safety of operations near or at an airport. It provides solutions to reduce fatal accidents in the terminal area through (a) improving flight crew response during upset and recovery with an effective indicator, (b) enabling safe helicopter approaches when using advanced vision systems, and (c) exploring consistent operational standards for a stable approach to reduce runway excursions. These projects address the principal causes of fatalities in the commercial jet fleet but also fill aviation safety research gaps identified in National Transportation and Safety Board (NTSB's) Safety Recommendations A-96-094 and A-01-069 available at (http://www.ntsb.gov/safetyrecs/private/QueryPage.aspx).

Research projects in the Terminal Area Safety program focus on developing training solutions and identifying effective technologies to mitigate the key causes of fatal accidents such as the loss of control, runway excursions, and runway overruns. These are the leading causes of fatalities in the worldwide commercial jet fleet as indicated in the *Boeing Annual Summary of Commercial Jet Airplane Accidents* that is based on corresponding International Civil Aviation Organization (ICAO), NTSB, and Flight Safety Foundation (FSF) definition of accidents and events (*Statistical Summary of Commercial Jet Airplane Accidents Worldwide Operations 1959 – 2013*).

In particular, an effective angle of attack display will increase the pilot's ability to detect, avoid, or recover from situations that may lead to loss of control and to diagnose an air data system (e.g., pilot or static system) failure. The helicopter safety research will investigate the use of advanced vision systems for increased day or night situational awareness and minimize the potential for controlled flight into terrain and collision with unknown obstacles. To reduce runway excursions, the NTSB recommended that the FAA define detailed parameters for a stabilized approach, and develop detailed criteria indicating when a missed approach should be performed. According to FSF research, up to 97 percent of unstable approaches in current operations continue landing (*Flight Safety Foundation Year in Review*, IASS 2011). The stable approach criteria research will assess the feasibility of NTSB's recommendation.

The Terminal Area Safety program outputs will be new operational guidance and data packages in support of training and standards that mitigate risk in the terminal area.

Major activities and accomplishments planned in FY 2017 include:

<u>System Safety Management</u>

Helicopter FDM for ASIAS

- Develop standardized helicopter FDM parameters related to fatal risk occurrence categories for undesired events across various helicopter mission segments.
- Develop prototype helicopter safety analysis tools to support reduction of fatal accident risk.

<u>Safety Oversight Management Systems</u> (SOMS)

- Develop initial user requirements and concept of operations for the SOMS prototype.
- Survey and review candidate methodologies for the SOMS technical framework.

- Support the FAA's Air Traffic Safety Oversight Service's (AOV) surveillance activities.

Integrated Domain Safety Risk Evaluation Tool (ID-SRET)

- Develop a model to integrate NAS critical system architecture information and associated safety data.
- Develop guidance for evaluating Safety Risk Management Documents and NAS change impact to support AOV's surveillance activities.

Terminal Area Safety

Helicopter Operational Safety Improvements Using Advanced Vision Systems

- Perform testing of selected helicopter advanced vision systems in an operational environment.
- Analyze experimental data and recommend certification or operational approval criteria for helicopter advanced vision systems.

Development of Stable Approach Criteria

- Develop statistical model by varying glideslope and track errors in a human-in-the-loop flight simulator.
- Conduct workshop to review the results and obtain feedback on feasibility of setting specific path and track tolerances.

Angle-of-Attack (AOA) Displays for Upset Recovery and Air Data System Failure Diagnosis

- Complete literature review on the subject of AOA indicator effectiveness and the types of indicators available for display of AOA.
- Identify quantitative standards to assess pilot recovery performance.

Why Do We Want/Need To Fund The Program At The Requested Level?

System Safety Management promotes system-wide access and sharing of aviation safety data and analysis tools within the aviation community by providing safety resources that are integrated with the operations of aviation industry stakeholders. Directed studies using ASIAS and other safety aviation data have led to the development and implementation of intervention strategies that are currently being monitored for effectiveness. The helicopter FDM data gathering and analysis project, i.e., expansion of ASIAS to helicopters, provides capabilities to develop data driven approaches to address helicopter safety issues. In the NTSB Public Hearing on Helicopter Emergency Medical Services, the NTSB recommended collection of flight, weather, and safety data for the prevention of accidents (Recommendation A-09-090), which highlights the value of the proactive approach to helicopter safety. In addition, the NTSB has two open recommendations (A-13-12 and A-13-13) on the installation and use of Flight Data Recorder Systems for Rotorcraft operating under commercial and general aviation rules available at (http://www.ntsb.gov/safetyrecs/private/QueryPage.aspx).

The ID-SRET and SOMS projects will improve AOV's ability to identify and analyze emerging safety issues in air traffic facilities, evaluate the safety impact of multiple National Airspace System changes, and evaluate the effectiveness of safety controls in place to manage safety risks. A 2013 Office of Inspector General (OIG) audit, i.e., Report Number: AV-2013-046, February 27, 2013, found that the increase in loss of separation events was due to an increase in actual ATC errors that contribute to the risk of collision rather than 'increased event reporting' given the FAA's recent implementation of automated systems to track separation loss events. The OIG's analysis of separation data indicates that the number of loss of separation events increased threefold between February and September 2012 from 64 to 190 events.

The Terminal Area Safety program improves continued operational safety. In FY 2017, two projects will address the number one and three causes of fatal accidents in the worldwide commercial jet fleet: loss of control in flight and runway excursion during landing (as reported in the 2004 through 2013 Statistical Summary of Commercial Jet Airplane Accidents Aviation Safety, Boeing Commercial Airplanes, August 2014) (http://www.boeing.com/news/techissues/pdf/statsum.pdf). The third project addresses the FSF top cause of runway accidents, which accounts for 30 percent of world commercial transport accidents, the top risk factor was go-around not conducted. These projects will develop and evaluate new methods and technologies to improve terminal area operational safety, and will produce output in support of changes in standards or policy.

Goals for FY 2017 Funding:

System Safety Management

- By 2018, expand the ID-SRET system model to include air traffic control procedures.
- By 2018, define the safety oversight and compliance model and develop the technical framework for the SOMS prototype.
- By 2019, complete the SOMS software prototype and supporting technology transfer package.
- By 2019, provide risk-based decision-making support tool to enhance AOV's oversight mission.
- By 2019, validate helicopter FDM analysis capabilities for Rotorcraft ASIAS.

Terminal Safety

- By 2018, determine the criteria for adoption of helicopter advanced vision systems for point-in-space instrument approach procedures.
- By 2019, develop guidance for operators to create consistent standard operating procedures for establishing the criteria for stabilized approaches.
- By 2020, determine the flight crew performance benefits of AOA displays for upset recovery and air data system failure diagnosis.

What Benefits Will Be Provided To The American Public Through This Request?

The flying public will benefit from increased helicopter operational safety. Long-term fatal accident rates for rotorcraft remain at an unacceptable level. Rotorcraft accidents span a wide range of operations as well as geographic diversity, including Air Tour and Heavy Lift operations in Hawaii, Emergency Medical Services operations in Kentucky and Missouri, training and private operations in Pennsylvania, and several others. While each accident may display different root causes, the inclusion of FDM research leading to more robust FDM programs will identify the precursors necessary to reduce accidents and incidents. The helicopter FDM data gathering and analysis project will enhance advanced analytical capabilities, methodologies, and data-sharing architecture leading to the identification of contributors and precursors to helicopter incidents and accidents. Cooperative efforts and guidance from industry-government teams will help reduce the helicopter accident rate.

The ID-SRET and SOMS projects will provide risk-based analysis capabilities that identify and assess emerging safety risk issues to support AOV's oversight mission. This will reduce the safety risk associated with loss of separation.

The Terminal Area Safety projects provide solutions to mitigate the key causes of fatal accidents in the terminal area. The benefits will result in reduction in upset incidences and loss-of-control accident rate, reduced runway excursions and less capacity reduction, and improved rotorcraft safety in low visibility conditions. For example, policy and guidance materials will be developed and published in defining minimum criteria for an effective angle-of-attack indicator to meet the intended function of improving flight crew response in upset prevention and recovery and in diagnosis of air data system failures. Parameters of feasible stabilized approach criteria will be published for incorporating into operator Operational Specifications. Guidance will be provided to helicopter operators for using advanced vision technologies in low light and low visibility conditions.

Detailed Justification for
A11.i Air Traffic Control/Technical Operations Human Factors

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Air Traffic Control/Technical Operations Human Factors – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.i Air Traffic Control/Technical Operations Human Factors	$5,400,000	$5,410,000	$6,165,000	+$755,000

What Is This Program And Why Is It Necessary?

What Is This Program And Why Is It Necessary?

The Air Traffic Control/Technical Operations (ATC/TO) Human Factors program provides ATO technical sponsors with timely and appropriate R&D products and consultation services that focus on improving the safety and efficiency of complex ATC systems, by measuring and enhancing individual and team performance of air traffic controllers and technical operations specialists. Five focus areas are: development and update of human factors standards; human factors efforts to optimize the controller and technical operations workforces; human factors efforts to reduce error and improve safety; human factors efforts to support integration of technology into the NAS; and development of recommendations and methods for enhancing human performance.

The integration of human considerations into the system acquisition process enhances user-system design, reduces life cycle ownership costs, improves safety, and optimizes individual and total system performance. Human Factors and Human System Integration accomplishes this by ensuring that the human is fully and continuously considered as part of the total system in the operation, development and/or acquisition of all systems. Human factors also contribute to development of improved training techniques and measurement methods for assessing human performance of air traffic controllers and technical operations personnel. Human performance is a key factor in total system performance, and enhancements to human performance will contribute to enhancing the total system's performance, reducing errors, and helping reduce life cycle ownership costs.

Our research enhances the FAA's Air Traffic Organization's (ATO) understanding of the roles that training, workforce planning and development, human performance in safety, and system design play in increasing efficiency and mitigating human error, a major contributor to loss of separation events and runway incursions. This program provides the only research resources available to the ATO regarding the human role in the ATC mission and provides research products related to the interactions between major air traffic system acquisition and the workforce, effective implementation of efficiency initiatives, the effectiveness of safety interventions, and development and evaluation of innovative training methods to meet the ATO's needs. The program, through the FAA's Program Management Office (PMO) coordination, strives to provide useful human factors research results that support the development and implementation of new technologies and procedures in the National Airspace System. Researchers are developing performance assessment methods that can be used to assess trainee knowledge, skill, and performance to improve accuracy and reliability of those assessments. Better performance assessments support improvements in expensive on-the-job controller training and performance-related safety concerns. The ATC/TO Human Factors program includes the following research activities:

- Developing and evaluating improved training methods to reduce the time and cost of training as well as increasing the probability of success for trainees.
- Developing and evaluating potential mitigations for human error related to air traffic safety for implementation by safety and operational organizations in the ATO.

- Providing direct laboratory support to acquisition program offices through rapid prototyping of candidate ATC displays; Human-In-The-Loop (HITL) simulations of systems under consideration; and providing human factors expertise during the development process.

The human factors program is necessary to assure that the human can function effectively with the equipment and software used to control traffic in the NAS. The program works with offices in the ATO to further articulate and support implementation of the requirements in FAA Order 9550.8 *Human Factors Policy*, specifically, that 'Human factors shall be systematically integrated into the planning and execution of the functions of all FAA elements and activities associated with system acquisitions and system operations. FAA endeavors shall emphasize human factors considerations to enhance system performance and capitalize upon the relative strengths of people and machines. These considerations shall be integrated at the earliest phases of FAA projects.' The program assures that the proper roles and responsibilities are assigned to the ATO workforce to assure that controller and technician capabilities are compatible with the advanced technology they use in their jobs, and that the resulting level of air traffic system performance meets operational requirements and fulfills the safety and efficiency objectives.

Among the most complex and prevalent problems facing aviation safety are those involving human error. To achieve quantifiable improvements in aviation safety and economic competitiveness, increasing emphasis is being placed on the human operator and those involved with the safe and efficient conduct of flight (e.g., supervisors, air traffic controllers, maintenance technicians). To achieve agency goals regarding safety, this program leads the human component portion of NAS safety and is responsible for proactively identifying the potential for human error and recommending mitigations to reduce the probability that people will make errors, minimize the impact of such errors, and enhance the potential for human operators and maintainers to arrest the error and recover in a timely manner. This program is providing products and guidance to the operational and safety communities to mitigate the top five safety hazards in the NAS and improve the analysis of undesired events to understand the causal and contributing factors leading to such events. The program also provides human factors expertise to support the Runway Safety Call to Action, the Runway Safety Root Cause Analysis Team (RCAT), and supports research to support mitigations for human factors aspects of runway incursion events.

This program emphasizes forming operational alliances with the ATC community to enhance human performance and reduce the probability of human error in the NAS. The operational community has requested research on the fundamentals of human factors such as controller visual scanning, memory limitations, and information processing. Neither ATC nor Technical Operations have access to human factors research to support their operational requirements, aside from this program.

The Air Traffic/Tech Ops Human Factors research program is improving methods to reduce the cost of training ATC Specialists (ATCS). Currently, candidates proceed through a substantial portion of the multi-year training program before a review determines that the candidate is unsuccessful. The program has provided research products to allow identification of potentially unsuccessful candidates earlier in the lengthy training program. Late washouts increase training costs and deplete staffing levels. Many air traffic facilities and the Air Traffic Organization's safety team have requested research to determine more effective and faster methods to train developmental and experienced controllers on the knowledge and skills needed to operate in these environments. The training research element of this program ensures that research and the subsequent output of these activities support effective and safe training by improving the on-the-job-training instructor's abilities to teach the complex cognitive skills of an ATCS.

When providing guidance to development programs for ATC and TO systems, the program emphasizes the application and utilization of research products that were previously developed under this program. The program will include the creation of human factors standards that can be incorporated directly into the requirements documents and specifications of FAA acquisition programs. We will update human factors guidance for implementing Acquisition Management System (AMS) policy as new capabilities proceed through the development cycle. Our human factors practitioners will review and provide input to formal AMS policy and procedures that systematically incorporate human factors into agency acquisition activities. The program ensures that system development incorporates research findings appropriately and at the most advantageous points in the development cycle. This includes serving as human factors expert advisers to requirements development, vendor selection, and test and evaluation teams occurring within the ATO. The program also provides human factors subject matter expertise to the Joint Resources Council and ensures that acquisitions have complied with human factors design requirements through the In-Service Decision review checklist process.

Examples of program successes include:

- The Human Factors Design Standard developed by this program is a robust document containing human factors design criteria that is cited in every FAA acquisition contract that has a human interface.
- The results of controller fatigue research are being implemented by the FAA fatigue risk management group to assure that safety is not compromised as a result of scheduling pressures.
- The prototype ATC workstations developed under the program are used as a test bed by major ATC acquisition programs for development of requirements or specifications for new and enhanced human-machine interfaces.

Major activities and accomplishments planned in FY 2017 include:

- Complete research on factors that contribute to training success, and transition research results into potential strategies that could increase the field training success rate of air traffic controllers (new hires and certified professional controllers-in-training) and maintainers.
- Complete the study of the effectiveness of FAA leadership training in the ATO, and make recommendations for improvement.
- Assess the utility of the MITRE Vectoring Tool and make recommendations about whether the tool can be used to make facility placement decisions for new air traffic controllers.

Why Do We Want/Need To Fund The Program At The Requested Level?

The ATC/TO Human Factors research program is primarily driven by requirements from the ATO to meet their research needs. Sponsoring organizations generate human factors research requirements that:

- Develop and evaluate potential mitigations for human error, for use by safety and operational organizations;
- Improve OJT methods to reduce time and cost of training while increasing the probability of training success for ATCS;
- Transition training research to practice in the operational ATC and Technical Operations communities; and,
- Support acquisition program efforts to design ATC systems, providing human factors engineering expertise, HF standards, prototypes, and conduct of human-in-the-loop simulations to support development of human factors standards, guidance, and recommendations to be applied during system design.

Goals for FY 2017 Funding:

- By FY 2018, develop training performance measures and standards to reduce attrition of controllers-in-training at ATC facilities.
- By FY 2018, develop and evaluate the suitability of objective assessments of electronics knowledge and skill levels of newly hired technical operations personnel.
- By FY 2018, develop recommendations for a design strategy to optimize presentation of air traffic control information on controller workstation displays, to allow the controller to quickly and accurately process the information.
- By FY 2018, complete development of an empirically validated color palette to guide selection of colors to be used on air traffic controller displays. The color palette must ensure that displayed

information is recognizable, discriminable, and legible for both personnel with normal color vision and color-vision deficient personnel.

- By FY 2019, develop a technical operations talent acquisition process, including selection tools for identifying applicant capabilities that match position-specific requirements, to support the ATO's technician workforce strategy goal of evolving the maintenance culture to align to the ATO's future maintenance operations concept.

One of the critical elements of this program relates to the human performance aspects of safety in the NAS. A review of the FAA ATC 'Top Five' safety concerns during recent years shows that all the issues involve controller performance. Decisions on the acquisition of new systems to enhance safety and the application of new or modified procedures to reduce the likelihood of human error should be based on human performance research that is the output of this program.

What Benefits Will Be Provided To The American Public Through This Request?

The NAS is a human-centered enterprise. The Human Factors research program provides products to enhance the quality of this service through the successful integration of the human into the total system.

Mastering key competencies and skill sets needed in the future is key to air traffic controllers and technical operations specialists being able to continue effectively performing their jobs. Succession planning and employee engagement will be critical for retaining or replacing the FAA's retiring employees. In addition, hiring and training will become increasingly important. We will implement workforce planning, competency-based hiring, and competency-based training to ensure FAA has a diverse and capable workforce; promote selfless leadership that focuses on performance and thrives on collaboration, while leveraging employee inclusion and engagement; and foster a culture of continuous learning and improvement among our employees.

Systems, including controls and displays used by controllers, must support the tasks of controllers so they can deliver the services - including the promised enhancements (i.e., benefits) - in a safe manner.

Improved Efficiency – This research program provides products that are intended to increase the probability of success in training, to make better use of FAA resources for training air traffic controllers and technical operations personnel.

Better Safety - The top five hazards in the NAS are all associated with human performance. This program improves human performance by reducing the likelihood of human error and increasing the probability that controllers and maintainers will successfully recover from undesired events.

Facilitate the Implementation of NextGen -Historically several FAA ATC systems have experienced major delays and cost overruns resulting from insufficient consideration of human factors in the design. In other cases, the intended operational benefits of the FAA's ATC systems were not realized due to low user acceptance and underutilization, caused by poor user interface design and inadequate training. This program provides the human factors research and expertise upon which FAA system development programs rely to ensure that FAA ATC/TO systems are accepted by the user community and utilized to achieve maximum operational benefit.

Detailed Justification for
A11.j Aeromedical Research

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Aeromedical Research – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.j Aeromedical Research	$8,300,000	$8,467,000	$9,538,000	+$1,071,000

What is this Program and Why is it Necessary?

The Aeromedical Research program develops new and innovative ways to support FAA regulatory and advisory missions to improve the safety of humans in civilian aerospace operations. Research personnel at the Civil Aerospace Medical Institute (CAMI) supporting this program discover methods and recommend strategies to enhance the safety, security, health, and optimum performance of the most important aspect of the National Airspace System (NAS), the human operator and the public, which she/he serves. CAMI is the only Federal entity that performs this work on behalf of the U.S. The Aerospace Medical Research program is formulated to keep abreast of emerging human safety risk issues such as those brought by the aging pilot population and changes in their health condition, advances in pharmacology, therapeutic tools, and surgical procedures. Improved aircraft materials, equipment, cabin configurations, life support systems, and evacuation assistive devices all may affect survival from an aircraft accident. The program has also been designed to address the complexity of software, technology, and systems integration practices as these continue to evolve. For example, advances in computational biology, modeling & simulation, and tools to facilitate the integration of very large data sets containing disparate information will lead to improved knowledge management and decision-making processes in aerospace medicine.

Aeromedical research is performed by in-house personnel of the Aerospace Medical Research Division of CAMI. The division has two research branches - the Bioaeronautical Sciences Research and the Protection & Survival Research. Bioaeronautical Sciences personnel perform research activities regarding pilot certification and performance, aircrew health, and other factors important to aerospace safety. For example, the Forensic Toxicology and Biochemistry research teams also serve as the primary national site for toxicology testing for federal agencies, including the FAA and the National Transportation Safety Board. The Functional Genomics research team is the pioneer in biomarker research pertinent to aviation safety, and the Knowledge Management research team supports all research efforts involving information technology. Protection and Survival personnel provide state-of-the-art information, procedures, and equipment evaluations relative to aircraft accident investigation, survivability, atmospheric and radiation risk data, health, and security of passengers and crewmembers during normal operations and emergency events. The Cabin Safety, Biodynamics, and Aerospace Physiology research teams are key contributors to the development of national and international aviation safety equipment standards and survival procedures. The Medical research team maintains numerous unique databases and information systems that facilitate the immediate aeromedical review of aircraft accidents; and the Numerical Sciences research team is the national source of expertise for cosmic radiation events of aeromedical concern. It also maintains the only repository of integrated civil aeromedical information that pre-dates safety management system concepts.

The human component of the aviation system is simultaneously the strongest and the weakest link in aerospace safety. Thus, the Aeromedical Research program conducts research to maximize the strengths of the human link and minimize inherent human weaknesses to prevent accidents and improve human safety and health in both commercial and general aviation operations.

Major activities and accomplishments planned in FY 2017 include:

Aerospace Medical Systems Analysis

- Meta-Analysis of Data on the Effects of Radiation Exposure on Aerospace Crew Members: investigate health effects of ionizing radiation – Technical Report, 30 September 2017

- Medical Certification
  - Determine the number of pilots who die while holding a valid medical certificate, versus having let their certificate expire, versus having been denied a certificate. Explore the association of selected medical certification pathology codes with these outcomes. In addition, determine longevity (age) compared to the general population. Deliverable: Technical Report, 30 September 2018

Accident Investigation and Prevention

- Benzodiazepines
  - Develop a forensic toxicology laboratory methodology to perform analysis of benzodiazepines in postmortem fluids and tissues using ultra performance liquid chromatography/mass spectrometry to address the prevalence of opiates found in civil aviation pilots involved in fatal aviation accidents. Deliverables: Forensic Toxicology Laboratory Methodology and Technical Report, 30 September 2017

- Comparative Evaluation of Forensic Toxicology Findings
  - Conduct a comparative evaluation of aviation accident pilot fatality toxicological findings of the CAMI laboratory with those reported by Medical Examiner and Coroner laboratories in the U.S. carrying out preliminary toxicological analysis of samples subsequently received by CAMI. Deliverable: Technical Report, 30 September 2019

- Assessment of the clinical effects of cabin altitude during air travel on patients with pulmonary disease
  - Evaluate the potential increased risks to compromised individuals and determine if there are gene and protein expression differences between smokers and non-smokers when exposed to altitude. Deliverable: Technical Report, 30 September 2018

Human Protection and Survival

- Performance Demonstrations of Photoluminescent Escape Path Exit Signs and Markers
  - Investigate the efficacy of signs and markers, some of which have not been validated, using photometric evaluations. Deliverable: Technical Report, 30 September 2018

- Safely Accommodating a Range of Occupant Sizes
  - Investigate the performance of typical and proposed aviation seating systems for a range of occupant sizes.
  - Identify new standards necessary to ensure a similar level of safety is afforded smaller occupants as is currently for mid-size occupants. Deliverable: Technical Report, 30 September 2019

- A Test of Worst-Case Scenarios Using Low Flow Passenger Oxygen Systems Covered Under Pending Deviation Requests
  - Conduct a study to determine if the flying public is afforded an equivalent level of safety to the Technical Standard Order 89a requirements (i.e., 40 percent minimum oxygen concentration for Class E masks) when lower oxygen flows are used. Deliverables: Research Protocol and Technical Report, 30 September 2017

CAMI Fire and Cabin Safety

- System Level Crashworthiness Injury Criteria and Certification Methodology
  - Determine the injury mechanisms and human impact tolerance levels that are specific to the aviation environment and the method to predict occupant injuries during a survivable crash.
  - Develop techniques to use advanced occupant models to accurately simulate human response to impact and predict potential injuries for all impact vectors and occupant sizes. Three deliverables: Technical Reports on 31 March 2018, 31 March 2019, 30 September 2020.
- Evacuation Equipment/Aids
  - Identify, assess, and develop improved evacuation equipment and evacuation aids for visual, aural and tactile aides (such as lighting, aural way-finding systems, and symbolic information media) to enhance rapid evacuation.
  - Develop additional guidance material and potential new regulatory requirements based on the results of the evacuation research.
  - Identify persuasive technology applications for development of aircraft evacuation. Deliverable: Technical Report, 30 September 2018
- Emergency Exit Operation and Location
  - Assess empirical data and, based on the impact on safety versus the regulatory requirements; generate additional policy or guidance to address nonstandard exit arrangements.
  - Summarize the influence of exit location and method of operation on evacuation capability, including consideration of fuselage size and exit disposal. Deliverables: Research Protocol, 31 March 2017 and Technical Report, 30 September 2018

Why Do We Want/Need To Fund The Program At The Requested Level?

The requested level of Aeromedical Research Program funding is necessary to perform the research work program and achieve the outcomes and deliverables specified above. The requested funding provides for scientific and research support personnel expenses for 57 federal full time employees (FTEs) as well as the maintenance and sustainment facilities, laboratories, hardware, software and other equipment necessary to perform the research.

Goals for FY 2017 Funding:

Aerospace Medical Systems Analysis

- By 2017, conduct Meta-Analysis of Data on the Effects of Radiation Exposure on Aerospace Crew Members
- By 2018, explore the association of selected medical certification pathology codes with deceased pilot medical certificate status data.

Accident Investigation and Prevention

- By 2017, develop a forensic toxicology laboratory methodology to perform analysis of benzodiazepines in postmortem fluids and tissues.
- By 2018, evaluate the potential increased risks of air travel cabin altitude exposure for individuals compromised with pulmonary disease.
- By 2019, conduct a comparative evaluation of aviation accident pilot fatality toxicological findings of the CAMI laboratory with those reported by Medical Examiner and Coroner laboratories in the U.S. carrying out preliminary toxicological analysis of samples subsequently received by CAMI.

Human Protection and Survival

- By 2017, conduct study to assess potential safety effects of deviations from required minimum oxygen concentration levels required in Technical Standard Order 89a for Class E oxygen masks
- By 2018, conduct photometric evaluations to investigate the efficacy of photo luminescent escape path signs and markers
- By 2019, identify new standards for aviation seating system designs to ensure similar safety levels for a range of occupant sizes

Fire and Cabin Safety

- By 2018, identify persuasive technology applications for development of aircraft evacuation.
- By 2018, summarize assessment of the influence of exit location and method of operation on evacuation capability, including consideration of fuselage size and exit disposal.
- By 2020, develop techniques to use advanced occupant models to accurately simulate human response to impact and predict potential injuries for all impact vectors and occupant sizes.

What Benefits Will Be Provided To The American Public Through This Request?

Aeromedical research output serves as the knowledge base for physicians, physiologists, human factors and other engineers, psychologists, educators, and numerous other academia, industry, and government professionals in the U.S. and abroad who are concerned with the NAS and the safety of humans in world aerospace operations.

Aeromedical research and expertise is required to gain knowledge, validate information, interpret its analysis, provide conclusions, and facilitate the execution of the resulting recommendations as required in the form of advisory material and regulatory documents. This expertise is fundamental to the continued technical and scientific discovery that would assure the future of the FAA as a world leader in human safety in aerospace operations. As such, it is critical to the regulatory mission of the FAA to maintain and enhance its in-house aeromedical research program, unique in the nation for civilian aviation operations, and a model sought by international civil aviation authorities. Academic research priorities are subject to the temporary nature of their mission and industry research activities are necessarily subject to corporate concerns relative to remaining competitive and realizing financial profit. On the other hand, the FAA aerospace medical research program (a) promotes collaborative scientific discovery, (b) allows for long-term high-risk research goals, and (c) ensures independent science and technology assessments in support of the regulatory mission of the FAA

Detailed Justification for
A11.k Weather Program

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Weather Program – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.k Weather Program	$14,847,000	$15,031,000	$17,976,000	+$2,945,000

What Is This Program And Why Is It Necessary?

The FAA's Weather Program performs applied research intended to mitigate the impact of weather on the National Airspace System (NAS). This program mitigates weather related NAS safety and/or traffic flow efficiency issues with a line of sight to operational exploitations. The applied research also supports the evolution of legacy weather capabilities that meet the weather information needs of today's NAS users into the capabilities that are being developed and deployed as NextGen decision-support weather tools. This work is frequently conducted in collaboration with the FAA's designated weather provider, the National Weather Service (NWS).

Advanced weather information is expected to enhance NAS safety and capacity by supporting better operational planning and decision-making by operational users including air traffic managers, flight dispatchers, and pilots. In the near and midterm, some research will support tools and methodologies used by NWS forecasters to improve the accuracy and relevancy of legacy weather products and services still mandated by FAA regulatory guidance and/or international agreement.

The Weather Program is planning modeling, simulation, and other innovative techniques are planned to answer performance requirements questions about the accuracy, timeliness, and presentation of weather information for use in air traffic and operational decisions.

The Weather Program leverages research activities with members of industry, academia, and other government agencies through interagency agreements, university grants, and memorandums of agreement. The Weather Program partners with the National Oceanic Atmospheric Administration (NOAA), Earth System Research Laboratory, and the NOAA's National Centers for Environmental Prediction and the Environmental Modeling Center to develop high resolution; rapidly updating models that have and continue to be implemented into NOAA/NWS operations. These modeling efforts result in enhanced diagnosis and forecasts of weather hazardous to aviation, including en route turbulence, convective weather, ground and in-flight icing and more. Future model development and implementation efforts in partnership with NOAA are planned to address these hazardous aviation weather phenomena on a global scale that will include coverage of oceanic airspace operations. Weather Program radar technique development efforts, in partnership with the NOAA National Severe Storms Laboratory (NSSL), have developed radar applications implemented onto NexRad that are enhancing in-flight icing, turbulence, and convective weather forecast capabilities. The Weather Program in partnership with NSSL developed a multi-radar multi-sensor capability that provides high-resolution three-dimensional radar grids for advanced weather detection and aviation forecast applications, running operationally at the NWS.

Weather Program icing efforts have developed in-flight and ground diagnosis and forecast capabilities, including the capability to differentiate between freezing rain and freezing drizzle. These results are being used in current research efforts to develop a terminal area ground and in-flight capability to provide icing and precipitation type information for use by Air Traffic Management (ATM). These efforts are being coordinated and leveraged with radar technique development at the NOAA, the NSSL, as well as the NASA Glenn Research Center, Icing Remote Sensing System program.

Weather Program turbulence research efforts have developed en-route CONUS turbulence forecast capabilities. These efforts have been coordinated with the radar technique development efforts at NOAA NSSL. Planned efforts will address the expansion of turbulence capabilities globally in harmonization with International Civil Aviation organization (ICAO) requirements. Additionally, using much of the research outlined above, the FAA is coordinating and leveraging with NOAA and NWS to develop a consistent set of gridded weather information for use in evolving NextGen ATM decisions and decision support tools.

In FY 2017, major accomplishments planned include:

<u>Aviation Weather Forecasting</u>

In-Flight Icing

- Transfer in-flight icing Alaska forecast & analysis capability to NWS for operational implementation.

Model Development and Enhancement

- Transition North American rapid refresh ensemble model to NWS supporting improved aviation hazard forecasts especially turbulence, icing, ceiling, and visibility (C&V).

Turbulence

- Transition an offshore precipitation capability for operational implementation that produces a real-time, rapid update estimate of precipitation for areas that lack radar coverage.

Convective Weather

- Transition offshore precipitation capability (radar-like analysis) user evaluation as well as inclusion of Gulf of Mexico and Atlantic domains.

Ceiling and Visibility

- Complete an initial evaluation of a national scale gridded forecast of CONUS ceiling and visibility conditions.

Volcanic Ash

- Complete evaluation report on use of a common platform for Volcanic Ash Advisory Centers to promote common situational awareness of volcanic ash products.

Quality Assessment

- Conduct scientific meteorological assessments of advanced turbulence, convective, oceanic, & in-flight icing products.

Advanced Weather Radar Techniques

- Implement into operational multi-radar multi-sensor (MRMS) system, dual polarization algorithms for distinguishing false radar returns; implement real-time data from radar sites in the Caribbean into MRMS.

Aviation Weather Demonstration and Evaluation Services

- Conduct assessment of advanced convective weather forecast features (probabilistic/multi-modal forecasts).

Validate Weather Requirements

- Improve and enhance modeling and simulation techniques to validate performance requirements for both direct and indirect weather dependencies.

Research for Immediate Operational Needs

- Derive significant meteorological information from grids in collaboration with the National Weather Service.

Aviation Safety Weather Research and Development

Mitigating the Ice Crystal Weather Threat to Aircraft Turbine Engines

- Conduct assessment of Part 33, Appendix D (utilized 1950s data) ice crystal envelopes for engine icing using combined database from flight campaigns to determine if an Appendix D revision, resulting in certification and testing to a different total ice water content.

Terminal Area Icing Weather Information for NextGen (TAIWIN)

- Develop preliminary algorithmic and technological capability to distinguish between freezing rain and freezing drizzle in the terminal area.

Convectively Induced Turbulence – Extent, Severity, and its Impact on Aviation

- Identify gaps from previous research and compile sensor data including next generation weather radar dual polarization radars, onboard sensors, etc.
- Commence assessment of methods to present information to users – primary focus GA.

Validation of Advanced Airborne Radar Weather Hazards Detection

- Complete report detailing initial validation test results to quantify advanced radar capabilities for detection of a variety of aviation weather hazards.

The Weather Program will continue to develop and enhance forecast capabilities and weather translation techniques to meet emerging NextGen requirements and operational improvements. This will include applied research in naturally occurring atmospheric hazards including turbulence, convective activity, icing, and restricted C&V. Additional forecast capabilities to address convectively induced turbulence will be developed to enhance en route safety and capacity. Alaska in-flight icing diagnosis and forecast capabilities and oceanic convective weather forecast needs for NextGen will also be developed. FAA national and international partnerships will continue in addressing mitigation of ice crystal weather threats to aircraft turbine engines.

Weather has been clearly identified as a having a significant impact on NAS efficiency and is clearly a factor in GA accidents. The NextGen Implementation Plan identifies improvements in the areas of weather detection and forecasting as well as dissemination. The Weather Program supports NextGen operational improvements and FAA Strategic goals (FY 2014-2018) related to efficiency, capacity, safety, and environmental impacts. Weather is frequently cited as a primary or secondary cause in accidents and injuries, per the national transportation safety board, turbulence is the leading cause of inflight injuries and the GA fatality rate in weather related accidents, on average is 35 percent (GA accounts for 75 percent of weather related accidents). There were more than 382,000 air carrier delay hours in 2014 due to weather resulting in more than $300 million in delay costs. Continued evolution of improved forecasting algorithms with applicability to achieving higher aviation safety and capacity during hazardous weather is needed. The Weather Program also supports the need to provide high quality weather observations and forecasts, often in conjunction with the NWS, uniquely designed to allow for rapid and effective decision making by ATM dispatchers and pilots to proactively select safe and optimal routes. Weather program initiatives whether benefitting commercial or GA, advancing science or facilitating integration into NAS decision support tools, are ultimately supporting the achievement of the NextGen weather vision.

Why Do We Want / Need To Fund The Program At The Requested Level?

Funding the Weather Program at the requested level would enable it to move forward effectively and provide capabilities and guidance to enhance NAS safety and capacity in collaboration with the office of Aviation Weather Safety and the National Weather Service.

Goals for FY 2017 Funding:

- By 2017, develop validated performance requirements for delivery to NWS for specific NextGen capabilities. FAA validates NAS weather information functional and performance requirements prior to NWS deployment, so this improves FAA's performance requirements validation modeling and simulation techniques and expedites the subsequent delivery of these requirements to the NWS.
- By 2017, transition an offshore precipitation capability for operational implementation that produces a real-time, rapid update estimate of precipitation for areas that lack radar coverage. The goal of this capability is to provide air traffic controllers with a real-time estimation of convection offshore where radar is not available, which is critical to enhanced offshore flight efficiency thru improved ATM decision making.
- By 2017, transition a global turbulence forecasting capability to the NWS. This is anticipated to reduce aircraft encounters with turbulence worldwide in collaboration with World Area Forecast Centers.
- By 2017, transition Alaska icing forecast and diagnosis capability to the NWS. These capabilities are anticipated to reduce the high rate of fatalities, injuries, and aircraft damage due to in-flight icing encounters.
- By 2017, complete an initial evaluation of a national scale gridded forecast of CONUS ceiling and visibility conditions. This effort in coordination with NWS will greatly enhance situational awareness, pre-flight planning, and decision making, reducing the sudden unsafe occurrence of visual flight rule flights into instrument flight rule conditions
- By 2017, develop a North American Rapid Refresh Ensemble weather forecast model. This will result in improved aviation hazard forecasts, especially for turbulence, icing, and ceiling and visibility.
- By 2017, develop dual polarization algorithms for the NWS operational Multi-Radar Multi-Sensor (MRMS) system and integrate real-time data from Caribbean radar sites into MRMS. This will enable MRMS to improve detection of aviation weather hazards and expand coverage outside of the CONUS.
- By 2018, transition CONUS in-flight icing forecast and analysis capability that includes liquid water content, drop-size distribution, and temperature, for implementation. This will improve aircraft specific icing forecasts and analyses.
- By 2018, transition North American Rapid Refresh Ensemble weather forecast model (13km) to the National Weather Service for operational implementation.
- By 2019, transition global-scale probabilistic convection guidance capability for implementation. This is anticipated to reduce aircraft encounters with convection worldwide in collaboration with World Area Forecast Centers.
- By 2020, transition High Resolution Rapid Refresh Ensemble weather forecast model (3km with 1km nests) to the National Weather Service for operational implementation. This will improve detection and forecast of aviation hazards in TRACON and Terminal Areas.
- By 2021, implement high-resolution ceiling and visibility analysis capability into Helicopter Emergency Medical Services (HEMS) Tool. This will improve safety of operations in areas with limited observation capabilities.

Through coordination with and prioritization by the FAA Office of Aviation Safety:

- By 2017, perform comprehensive service analyses on known or emerging safety hazards including convectively induced turbulence. Data from 1987 to 2008 shows that 84 percent of accidents involving single reciprocating engine aircraft encountering convective turbulence resulted in serious injuries or fatalities.
- By 2017, assess new or improved radar functionalities needed to revise standards and guidance of airborne radar. This is anticipated to reduce accidents and incidents associated with a variety of aviation weather hazards.

- By 2018, conduct research flight tests, for TAIWIN, in order to assess and validate data from numerical weather prediction models and weather radars. This will support information required for operational compliance of aircraft meet.
- By 2018, conduct research flight tests, for TAIWIN, in order to assess and validate data from numerical weather prediction models and weather radars. This will support information required for operational compliance of aircraft meeting the new super-cooled large droplet certification requirements.
- By 2019, service analysis results will support the development of new guidance for operations in and around convection as well as graphical products depicting the actual extent and impact of CIT.

What Benefits Will Be Provided To The American Public Through This Request?

This request will enable the Weather Program to continue to develop and enhance analysis and forecast capabilities that will benefit the American public. This will include applied research in naturally occurring atmospheric hazards including turbulence, convective activity, icing, and restricted ceiling and visibility. FAA will either deploy these capabilities on new or existing platforms and systems or by transition them to NWS platforms or procedures through FAA regulations. These benefits will include:

- Increased GA safety in Alaska, as focused efforts will target enhancements to in-flight icing, turbulence, and restricted ceilings and visibility diagnosis and forecasts.
- Enhancements to convective weather forecasts that will minimize gate-to-gate delays and improve efficiency of flights.
- Enhancements to turbulence analyses and forecasts to increase passenger comfort, safety of passengers and crew, safety of GA operations, and increased capacity in the NAS.
- Enhancements to icing analyses and forecasts to increase safety and decrease flight times especially for GA and commuter passengers.

Detailed Justification for
A11.l Unmanned Aircraft Systems Research

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Unmanned Aircraft Systems Research – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11. l Unmanned Aircraft Systems Research	$14,974,000	$17,635,000	$8,422,000	-$9,213,000

What Is This Program And Why Is It Necessary?

The Unmanned Aircraft Systems (UAS) Research program supports FAA efforts in implementing the Next Generation Air Transportation System (NextGen) by studying safety implications of new aircraft operational concepts and technology to the National Airspace System (NAS) and supporting the development of new and modified regulatory standards. The program's research activities focus on new technology assessments, methodology development, data collection and generation, laboratory and field validation, and technology transfer.

Safe, efficient, and timely integration of UAS into the NAS poses substantial technical challenges not only to the FAA but also to the aviation industry. UAS often use new or novel technologies to achieve unique operational capabilities that challenge the expectations of current NAS users. These unique capabilities have demonstrated potential to address commercial applications as well as scientific research needs. Integrating UAS in the NAS will potentially affect the entire NAS due to the various sizes of UAS (less than a foot up to the size of a commercial jet), a wide range of maximum take-off weight (less than a pound to the weight of a large jet), large performance disparities in reference to the existing certificated aircraft, and capabilities of operating in all classes of airspace. Even UAS weighing less than 100 pounds may be capable of operating in Class A airspace and the integration of a significant volume of UAS air traffic could potentially disrupt normal aircraft traffic flow and induce unknown safety hazards.

Research activities within the UAS Research program will generate technical information to support development of policies, guidance materials, and advisory circulars on using new or novel technologies to demonstrate regulatory compliance while operating UAS in the NAS. UAS-specific technical issues such as detect and avoid, datalink aircraft control and communications with air traffic control, and emergency response requirements, will also require research. UAS will also be integral to NextGen development and will help validate UAS Concept of Operations (CONOPS) integration requirements and meet UAS Roadmap goals.

FY 2017 funding will support the UAS program in conducting research on UAS technologies that directly impact the safety of the NAS. The FY 2017 portfolio of work will be focused on sense (detect) and avoid, control and communications, system safety criteria, modeling and simulation requirements, and research that will support the safe, efficient, and timely integration of UAS in the NAS within the 14 Code of Federal Regulations (CFR) regulatory framework. Additionally, funding will provide for engineering, technical, and management support of overall research activities.

Major activities and accomplishments planned in FY 2017 include:

<u>Detect and Avoid (DAA) Multi-Sensor Data Fusion Strategies</u>

- Develop the method used to choose the optimum sensor fusion strategy and select the optimum strategy from those that were evaluated.
- Develop the method used to determine the sensitivity of each data fusion performance parameter in transitioning from Special Activity Airspaces (SAA) function 1 (remain well clear) to function 2 (avoid collisions) and evaluate and document the respective sensitivities.

- Develop preliminary performance standards for UAS SAA systems to be considered for RTCA SC-228 Phase Two Minimum Operation Performance Standards.

UAS System Safety Criteria

- Perform sub-scale testing to examine potential changes in risk from ingestion of the small UAS components based on known foreign objects.
- Produce a Technical Report that will detail findings of the sub-scale testing.

UAS Maintenance, Modification, Repair, Inspection, Training, and Certification Considerations

- Complete UAS maintenance data preliminary analysis to detail maintenance, modification, inspection and repair processes of participating manufacturers and identify gaps from accepted practices of manned aircraft for rulemaking and policy development.
- Develop UAS maintenance technician training criteria and draft certification requirements and standards for UAS maintainers.
- Review UAS repair station criteria and identity gaps from accepted practices of manned aircraft.
- Develop UAS accidents/incidents data recording list to document UAS accidents/incidents caused by maintenance-related issues.
- Develop UAS maintenance mitigations simulation activity to examine air traffic control procedures and consequences for dealing with maintenance-induced failures and emergencies.

Small UAS Detect and Avoid Requirements Necessary for Limited Beyond Visual Line of Sight Operations

- Develop an operational framework for small UAS beyond visual line of sight operations, including operating constraints, a description of the operating environment and key stakeholder assumptions.
- Assess existing UAS DAA research, standards, sensor technology, and algorithms for applicability to UAS detect and avoid.
- Conduct a comparison of ground-based and airborne approaches to small UAS DAA and determine whether to develop requirements for one or both approaches.

UAS Command and Control Link Compatibility

- Conduct testing to quantify airborne and ground co-site compatibility.
- Conduct detailed studies and testing to validate Control and Non-Payload Communications (CNPC) coexistence compatibility and link budget loss margins.
- Conduct detailed studies and testing to validate CNPC airborne and ground radios performance with regard to static and dynamic spectrum resource-assignment process, frequency reuse and channelization issues.

UAS Human Factors Control Station Design Standards

- Develop recommended crewmember training and certification requirements to include pilots and other crewmembers.
- Develop minimum requirements and best operating practices for UAS control stations to ensure safe operations and integration of UAS operations.
- Establish minimum primary flight display layout and crew station layout requirements to prevent negative habit transfer and safely execute detect and avoid functions using timely and appropriate information.

UAS Navigation Performance, Accuracy, and Reliability

- Establish recommended standards and procedures for UAS navigation systems to support an acceptable level of safety.

- Develop technical data to support the development of standardized procedures for UAS arrival, departure, and en route operations based on UAS navigation criteria.
- Develop criteria for UAS navigation system certification and associated requirements for accuracy and interoperability in the NAS.

Why Do We Want/Need To Fund The Program At The Requested Level?

Research program plans beyond FY 2016 include the continued collection and analysis of UAS safety data from the test sites, completion of technical reports on multi-sensor surveillance data fusion, completion of the safety data analysis tools for the FAA's Air Traffic Organization safety oversight use, development and documentation of maintenance technician training and implementation requirements and continued collection and analysis of maintenance and maintenance-related accident and incident data. Some of this work (e.g., navigation performance and multi-sensor data fusion strategies) is scheduled for completion in FY 2017, but since this funding is available for three-years, research relating to maintenance, modification, repair, inspection, training, and related certification requirements is currently planned to continue through FY 2019.

Goals for FY 2017 Funding:

- By March of 2017, validate performance of command and non-payload communications in the presence of co-site interference from other aircraft systems to improve the reliability of UAS operations.
- By September of FY 2017, document detection (sense) and avoid system sensor fusion strategies for use in design, certification, and approval guidance.
- By FY 2017, conduct modeling, simulation, and analysis to determine the severity of airborne collisions with small UAS for general aviation and rotary-wing aircraft and examine ways to reduce the likelihood and severity of UAS collisions with people or property on the ground.
- By FY 2017, conduct maintenance simulations focused on UAS-ATC procedures, and support UAS certification efforts and aviation safety inspectors training. By February of 2018, conduct an assessment of existing UAS DAA research, standards, sensor technology, and algorithms for applicability to small UAS DAA.
- By March of 2018, complete the evaluation of current and/or proposed standardized RNP/RNAV/instrument approach/departure procedures for UAS on two or more UAS types.
- By FY 2018, conduct an assessment of existing UAS DAA research, standards, sensor technology, and algorithms for applicability to small UAS Detect and Avoid.
- By FY 2018, complete the evaluation of current and/or proposed standardized RNP/RNAV/instrument approach/departure procedures for two or more UAS types.

Demand for NAS access is growing from multiple operators including the U.S. Department of Defense, public use agencies, and the private sector. To standardize the certification processes and ultimately limit restrictions associated with UAS certification, the FAA needs to determine the parameters, operations, and procedures that define acceptable UAS behavior while maintaining the highest level of safety. Many challenges remain that must be overcome before the basis for certification and operations of UAS are standardized and made routine. This includes developing methods to support the integration of UAS into the NAS without causing delays, capacity reduction, or placing the public at risk. Extensive research is required to produce the appropriate safety case evidence.

What Benefits Will Be Provided To The American Public Through This Request?

The safe integration of unmanned aircraft into the NAS is a significant challenge. Current UAS research contributes and informs technical and regulatory standards, policy guidance, and operational procedures on which successful UAS integration depends. These research efforts significantly contribute to addressing the challenges of integrating UAS into the NAS by leveraging studies of UAS operations and associated technologies. These research programs will help develop unmanned aircraft systems, training and procedures that increase the safety of UAS operations and increase the confidence of the American public that UAS flights can be safely and efficiently integrated into national airspace. The research will facilitate approval and use of systems that prevent midair and near midair collisions and also help reduce the likelihood and severity of collisions with people or property on the ground. This research will also develop standards to mitigate human factor causes of incidents and accidents due to control station or pilot training design deficiencies. It will also develop and refine UAS maintenance, repair, modification and training practices to ensure appropriate maintenance practices are available to enhance the safety and efficiency of UAS operations.

Detailed Justification for
A11.m NextGen – Alternative Fuels for General Aviation

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – NextGen – Alternative Fuels for General Aviation – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.m NextGen – Alternative Fuels for General Aviation	$6,000,000	$7,000,000	$5,792,000	-$1,208,000

What Is This Program And Why Is It Necessary?

Approximately 167,000 General Aviation (GA) aircraft in the U.S. and 230,000 worldwide rely on 100LL Aviation Gasoline (avgas) for safe operation. 100LL is also the only remaining transportation fuel in the U.S. that contains the additive Tetraethyl Lead (TEL). TEL creates the very high octane levels required to prevent detonation (engine knock) in high power aircraft engines. Operation with inadequate fuel octane can result in engine failure and aircraft accidents. Previous research attempted to find a drop-in (no impact to the existing fleet) unleaded replacement fuel for 100LL. A drop-in fuel solution was not found. The impact on performance, operability, and compatibility with fuel system materials must be carefully evaluated before approving an alternative fuel. The use of replacement fuels with new compositions poses a significant challenge to maintaining the safety of the legacy fleet.

Petitions and potential litigation from environmental organizations regarding avgas containing lead are pressuring the Environmental Protection Agency to consider regulatory actions to eliminate or reduce lead emissions from aircraft. Similar regulatory actions are being considered around the world. In response to rapidly increasing concerns expressed by the GA community, the FAA Administrator chartered the Unleaded Aviation Transition Aviation Rulemaking Committee (UAT ARC), which issued their findings in a final report dated February 17, 2012. The report can be found at the following address: (http://www.faa.gov/about/initiatives/avgas/archive/2012-10-05/).

The UAT ARC Final Report provided five key recommendations and 14 additional recommendations to facilitate the transition to a fleet-wide replacement avgas. Three of the five UAT ARC recommendations related to the following research:

1. Establishment of a solicitation and selection process for candidate unleaded avgas for the centralized fuel testing program. This process should include an FAA review board with the technical expertise necessary to evaluate the feasibility of candidate fuels.

2. Centralized testing of candidate unleaded fuels at the FAA William J. Hughes Technical Center (WJHTC) funded by government and industry with in-kind contributions. Centralized assessment and testing would generate standardized qualification and certification data that can be used by the fuel developer/sponsor to support both ASTM specification development and FAA fleet-wide certification eliminating the need for redundant testing.

3. Establishment of a collaborative industry-government initiative referred to as the Piston Aviation Fuels Initiative (PAFI) to implement the UAT ARC recommendations in this report to facilitate the development and deployment of an unleaded avgas with the least impact on the existing piston-engine aircraft fleet. The overall objective of this initiative is to identify candidate unleaded avgas, to provide for the generation of qualification and certification data on those fuels, and to support fleet-wide certification of the most promising fuels.

These recommendations led to a defined process for the fuel transition called the aforementioned PAFI. The FAA and industry have joined to form the PAFI Steering Group (PSG) for the purpose of facilitating, coordinating, expediting, promoting, and overseeing the recommendations of the UAT ARC Final Report.

The role of the PSG includes providing supporting data and coordinating the activities of member organizations in support of the PAFI program.

The PAFI process defines a framework to evaluate potential candidate fuels in two distinct phases, with each phase having a preparatory and a project stage. Phase one involves laboratory, rig, fit-for-purpose, and initial engine testing, and Phase Two involves engine and aircraft testing. Phase One testing required development of standardized laboratory and rig testing methods as the traditional methods are not necessarily applicable to new fuels. In response to a solicitation released from the FAA's WJHTC, four successful fuel candidates were selected for Phase One testing at the FAA's WJHTC. This testing includes evaluation of the fuel cold flow ability, storage stability, fuel system dynamic rig performance, materials compatibility, emissions, toxicology, and initial engine performance. In early FY 2016, the results from the Phase One testing will be used to down select the fuels for entrance into Phase Two engine and aircraft testing. Under Phase Two, standardized engine and aircraft test methods for candidate test fuels will be developed and test support equipment will be established by the FAA's WJHTC to test the best candidate fuels. Standardized Phase Two test plans for engine and aircraft evaluation in the areas of operability, performance, detonation, and cold and hot weather operation are being developed in FY 2016. In FY 2017, Phase Two engine and airframe testing will be conducted by the FAA's WHJTC on the best candidate fuels. Additionally, funding will provide for engineering, technical, and management support of overall research activities.

Major activities and accomplishments planned in FY 2017 include:

- Test engine operability and performance of Phase 2 PAFI fuels.

Why Do We Want/Need To Fund The Program At The Requested Level?

The FAA funding requested in this program was the minimum level necessary to address the recommendations of the UAT ARC final report, to provide the necessary support to the PAFI initiative, and to comply with section 910 of the 2012 FAA Modernization and Reform Act. The latter requires the FAA to conduct research and development to facilitate the transition to unleaded aviation fuel for piston engine aircraft.

This requested funding is necessary to meet the PAFI timetable to transition the fleet to an unleaded avgas. FAA participation is critical to the PAFI initiative. The success of the industry program to develop and deploy an unleaded avgas with the least impact on the existing fleet depends heavily on the FAA successfully completing the research.

Goals for FY 2017 Funding:

- By early FY 2017, establish Phase two engine and aircraft test resources.
- By early FY 2019, complete all planned Phase two engine and aircraft testing on candidate unleaded fuels.

What Benefits Will Be Provided To The American Public Through This Request?

The FAA is the sole certification authority for the U.S. aviation community. This research program identifies, develops, and delivers safety research products and knowledge that respond to the regulatory and oversight needs of the FAA and ultimately reduce the aviation accident fatality rate. Research includes resolution of identified threats to aviation safety, preparation for the use of new technologies, and investigation of continued airworthiness issues.

General aviation is a significant and integral part of the U.S. economy creating millions of jobs and making a positive impact on the U.S. balance of trade. Directly or indirectly, GA accounted for over 1.25 million high-skills, high-wage jobs in professional services and manufacturing in 2005 (with collective earnings exceeding $53 billion) and contributed over $150 billion to the U.S. economy. This economic benefit is at risk unless the GA fleet transitions to a safe unleaded fuel.

This research program provides critical knowledge (through screening and testing) to assure the continued operational safety of aircraft using a new unleaded fuel. Successful transition to an unleaded fuel will improve the environment by eliminating airborne lead from aviation sources and help sustain a vibrant segment of the nation's economy.

Detailed Justification for
A11.n Commercial Space Transportation Safety

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – Commercial Space Transportation Safety – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A11.n Commercial Space Transportation Safety	-	$2,000,000	$2,953,000	+$953,000

What Is This Program And Why Is It Necessary?

The primary mission of the Commercial Space Transportation Office (AST) is to ensure the safety of the public, property, and national security and foreign policy interests of the U.S. during commercial launch and reentry operations. Additionally, AST encourages, facilitates, and promotes commercial space launches and reentries by the private sector. Safety, however, is clearly AST's top priority.

The unprecedented pace at which the industry is progressing technologically continues to accelerate to a range of operations that were only imagined just a few years ago. AST must conduct research on emerging space concepts, technologies, and operating techniques in order to keep safety at the forefront of these activities. The research program presented will allow the FAA to perform research in critical areas that are necessary to ensure that the FAA is adequately prepared to meet its public safety mission.

Autonomous safety and vehicle health monitoring systems, flyback boosters, and high-utilization, rapid turnaround operations with reusable space vehicles are just a few of the concepts and technologies that AST must address to keep pace with the growing range of commercial space transportation applications and activities. These activities include such diverse areas as small satellite deployment, the introduction of both orbital and suborbital commercial human spaceflight, and fully reusable orbital space vehicles where each booster stage individually reenters the atmosphere and lands under its own control.

Within this overall effort, AST must continue to find ways to improve the integration of commercial space operations into the National Airspace System (NAS). These approaches will safely reduce the amount of airspace that must be closed to other stakeholders, develop timely response capabilities to off-nominal scenarios, and quickly release airspace that is no longer affected. They are critical to the FAA's ability to facilitate the integration of spaceports that are located in the vicinity of major airports or complex airspace; improve management of space vehicle trajectories and hazard areas for return from orbit to land-based sites; and improve methods for leveraging the results of collision avoidance analyses for more efficient launch and reentry planning and NAS integration.

In light of these developments AST must remain at the forefront of advanced safety assessment methods to ensure public safety. To assure public safety, advanced modeling concepts and analytical tools are required in areas such as whole atmospheric modeling; explosive debris generation, dispersion, and mitigation in the airspace; and uncertainty modeling. There is a need for continued research into aircraft vulnerability to space-vehicle-breakup debris, including model development and refinement to reduce overly conservative airspace 'keep out' areas used to protect against a launch or reentry vehicle failure; and improved fragmentation models of structure such as composite propellant tanks to define appropriate public safety standoff distances.

Recognizing that Congress has tasked AST to 'encourage, facilitate and promote the continuous improvement of the safety of launch vehicles carrying humans,' AST must also add additional focus to research in advanced vehicle safety technologies and human spaceflight and physiological safety factors. Specific areas of research include improved understanding of proposed autonomous flight safety systems and exploration of mitigation factors to address their potential vulnerabilities and an improved understanding of crew safety systems proposed for space flight vehicles, including systems such as smoke and fire detection in microgravity environments, to both monitor the safety of the cabin environment and support necessary safety actions in the event of contingencies.

The program in FY 2017 includes both research conducted by the Center of Excellence for Commercial Space Transportation (COE CST) and additional research used to mature the COE CST concepts and address other key areas for commercial space operations and regulation. Of the requested FY 2017 funding, $1,000,000 will continue the activities of the COE CST, and the remaining $1,953,000 emphasizes maturing promising concepts and technologies for use in AST's ever-growing needs in analytical methods, systems and operations, and our regulatory framework, with a focus on safe and efficient integration of increased commercial space launch and reentry activity into the NAS, advanced safety assessment methods, advanced vehicle safety methodologies, and human spaceflight safety.

Major activities and accomplishments planned in 2017 include:

- <u>Research to facilitate safe and efficient integration</u>:
  - Assessment of advanced modeling concepts for safely reducing the size of aircraft hazard areas to support improved integration of commercial launch and reentry operations in the NAS. These concepts seek to use data from readily available sources, including historical and forecasted air traffic flow and volume data, in place of overly conservative assumptions in hazard area computations.
  - Improved management of space vehicle trajectories and airspace integration for return to land-based sites.
- Improved methods and algorithms for collision avoidance analysis for more efficient launch and re-entry planning and NAS integration, and increased understanding of the issues affecting the safety of launch and reentry operations will be developed and matured for use in practice by the FAA's AST.

- <u>Advanced safety assessment methods</u>:
  - Advanced modeling concepts, such as whole atmospheric modeling, explosive debris generation, dispersion and mitigation in the airspace, and uncertainty modeling, to assure public safety while improving the efficiency of air-space integration and the associated operations.
  - Continued research into aircraft vulnerability to space-vehicle-breakup debris, including model development and refinement to reduce over-conservatism applied to airspace 'keep out' areas used to protect against a launch or reentry vehicle failure.
  - Improved fragmentation models of advanced vehicle structures, such as composite propellant tanks, will be developed to define improvements to required public safety standoff distances.
  - Advanced study of break-up characteristics of space vehicles, such as hybrids or other new concepts currently under consideration.
  - Development of improved analytic and computational models to enhance the AST risk tools, such as the Risk Estimator for Suborbital Launch Vehicles (RESOLVe).
  - Exploration of advanced space flight data mining capabilities to inform safety assessments and identify emerging public safety issues.

- <u>Advanced vehicle safety technologies</u>:
  - AST must also add additional focus to research in advanced vehicle safety technologies including improved understanding of autonomous flight safety systems and exploration of mitigation factors to address their potential vulnerabilities.
  - Assessing the use of integrated vehicle health monitoring technologies, including reentry breakup recorders.

- Human sub-orbital spaceflight and physiological safety factors to improve the recently published best practices associated with commercial human spaceflight:
  - Developing a deeper understanding and application of the human factors affecting crew performance for new vehicle and systems concepts and applications, to support licensing and permit evaluations and improvements to guidance and regulatory standards.
  - Understanding crew safety systems proposed for suborbital space flight vehicles, including systems to monitor the cabin environment and support safety actions in the event of contingencies.
  - Collecting voluntary physiological data from sub-orbital human spaceflight participants and crew, including those participants who may possess common disease states (such as high blood pressure, diabetes, lower back injury, respiratory disease, etc.), to identify potential areas of concern and additional focus.

Why Do We Want / Need To Fund The Program At The Requested Level?

Protecting the safety of the uninvolved public and their property from the potential consequences of commercial space launches and reentries demands that the FAA keep pace with the emerging technologies and operational concepts coming from an exponentially growing industry. The areas discussed above highlight critical areas that must be addressed for the FAA to achieve this vital mission. Funding the program at the requested level will allow the FAA to continue to develop the portfolio of high-value research activities initiated by the program's 2016 request, and to begin using its initial products on advanced applications.

FY 2017 funding will support AST in conducting research on technologies addressing emerging safety issues. This important research will allow AST to keep pace with the dynamic commercial space transportation industry.

Goals for FY 2017 Funding:

- By 2017, assess various vehicle technologies used and proposed to ensure that each move forward, in the industry, is done with safety in mind, including requirements identification for new surveillance and vehicle health and status monitoring concepts for launch and reentry to improve safety and airspace integration.
- By 2018, promote the safe management of human space flight (tourism) including gathering physiological data from human spaceflight participants.
- By 2019, publish an advanced study of break-up characteristics for advanced space-flight vehicles that will support ensuring public safety.

What Benefits Will Be Provided To The American Public Through This Request?

AST has consistently conducted license and permit application evaluations resulting in determinations made within the statutorily mandated time limit to ensure the continued safety of the public. This record has been maintained while experiencing significant growth in the number of space launch systems, operators, and spaceports, significant growth in the complexity of operations, and the static numbers of staff. A viable research program will position the FAA to have increasingly timely guidance and regulations, and improve our responsiveness to this emerging sector. Similarly, the industry would benefit from improved techniques, practices, and technologies that result from a strong FAA commercial space research and development program.

Executive Summary – Economic Competitiveness, Activity A12

The Research, Engineering and Development (RE&D) Economic Competitiveness Activity (A12) is requesting $22,243,000 for FY 2017, an 8 percent increase over the enacted FY 2016 level of $20,589,000. This funding provides for a research work program that supports the "Improve Efficiency" research principle as specified in the NARP. This research activity aims to systematically expand and apply knowledge to produce useful materials, devices, systems, or methods that will improve access to and increase the capacity and efficiency of the Nation's aviation system. Programs within this activity align with FAA strategic priority – *"Deliver Benefits Through technology and Infrastructure".*

The request includes $8,609,000 for continued research within the Wake Turbulence Program (A12.a). The Wake Turbulence program seeks to explore and develop safe reductions to the existing air traffic control wake mitigation separations, thereby increasing National Airspace System (NAS) capacity and enabling more flights with less cost and delay.

The request also includes $1,000,000 to provide for an Information Security research program (A12.d). This is a new initiative in FY 2017 intended to explore methods and technologies to help prevent disruptive cyber incidents that may affect the Air Traffic Control (ATC) mission. The program also directly supports the Executive Order (EO) 13636 Improving Critical Infrastructure Cybersecurity and the Presidential Policy Directive (PPD)-21 Critical Infrastructure Security and Resilience, which defines Transportation Systems Sector as one of the 16 critical infrastructure sectors and aviation as an essential sub-sector.

Detailed Justification for
A12.a NextGen – Wake Turbulence

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – NextGen - Wake Turbulence Program – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A12.a NextGen – Wake Turbulence	$8,541,000	$8,541,000	$8,609,000	+$68,000

What Is This Program And Why Is It Necessary?

Air Traffic Control contributes to flight delays and aircraft operating costs. By developing safe reductions to the existing air traffic control wake mitigation separations, research and development is increasing the National Airspace System (NAS) , enabling more flights with less cost and delay. Based on the research from this program, wake separation standards have been modified by ATC Orders 7110.308A, 7110.316, 7110.659b and prior versions. The implementation of these orders has provided envisioned airport runway throughput capacity enhancements as measured by decreased departure runway queues, increased airport arrival rates and cost savings by major air carriers. Additional throughput capacity gains can be obtained by developing wake separation standards that adjust to the atmospheric conditions and the flight performance of the generating and following aircraft. These more complex solutions are currently being researched by this program. They are expected to increase NAS throughput capacity another five to seven percent above what can be achieved with the static standards being implemented as part of the FAA's Wake Re-Categorization (RECAT) and the Wake Turbulence Mitigation for Arrivals (WTMA) F&E projects. This program is also providing solutions for near term FAA operational needs such as what ATC wake separations should be applied behind the new Boeing 777X aircraft and what can be done to alleviate delays when a runway closure planned years in advance is now about to occur (i.e., Los Angeles International Airport).

Maintaining flight safety is a major focus of this research program. Developing safe, capacity efficient ATC wake mitigation separation procedures and standards requires measured wake transport data to validate the analytical and probabilistic models used in evaluating proposed changes in wake mitigation separation standards and procedures. Aircraft generated wakes are not visible and do not lend themselves to be sufficiently detected by today's ground based and air based surveillance systems. Currently the program has three wake data collection sites located close to major airports, using prototype LIDAR systems, to collect and compile measured tracks of aircraft generated wakes. This program is also accessing wake transport data collected in flight by the Canadian National Research Council and wake transport data collected by NASA and other research organizations. This collected data is being used to validate the outputs of wake transport and decay models being developed to evaluate proposed ATC wake separation procedures and standards, and in the real time wake transport prediction models being developed for use with ATC decision support tools.

Outputs of this research program that do not require any changes to the NAS infrastructure - such as separation standards for new aircraft (A380, 747-8/9, 787) and modification of jet blast mitigation procedures at New York's John F. Kennedy International Airport - go directly into operational use. Yearly, there are 25 to 100 new aircraft types recognized by International Civil Aviation Organization (ICAO) that the FAA must assess for wake turbulence categorization and for heavy and upper large aircraft the agency is responsible for determining the specific wake separation required in front of and behind the new aircraft. This work is accomplished via the NextGen – Wake Turbulence research program. Other outputs will require follow-on F&E programs, such as the ones named above, to translate the concepts of applying technology and wake science into subsystem components of ATC automation systems and aircraft avionics.

These outputs will positively move the following metrics used in measuring the system capacity of the NAS:

- Average daily airport capacity for the Core airports.
- Average taxi-time at Core airports.

- NAS on-time arrival rate at Core airports.
- Throughput (operations) at Core airports.

Major activities and accomplishments planned in FY 2017 include:

- Provide Boeing 737-Max series aircraft wake separations to ICAO and incorporate into ATC Orders and associated decision support automation.
- Develop a prototype controller decision support tool information display for use in dynamically reducing the required wake separations between aircraft in instrument approaches to a single runway.
- Complete development of the wake mitigation procedures to be applied to en route and transition airspace trajectory based operations.
- In collaboration with the FAA's Flight Standards Service, accomplish large scale flight data recorder screenings of an aircraft series for potential medium- to low-level wake encounter events, for use in establishing the statistical base for future assessments of ATC procedure changes.
- Complete revision of en-route aircraft wake turbulence generation fast time model, using data collected from en-route wake measurements.

Why Do We Want/Need To Fund The Program At The Requested Level?

This research program addresses the needs of the FAA Air Traffic Organization and works with the agency's Aviation Safety Organization to ensure new capacity-efficient procedures and technology solutions are safe in terms of wake encounter risk. The program also provides the knowledge based applied wake research, which has and will continue to enable incremental increases in airport and air corridor throughput capacity. It also provides analysis requested by airports (and associated air carriers) to determine if their runways can qualify for use of ATC wake mitigation procedures that would result in higher runway throughput capacity. The research program works with controllers, airlines, pilots, and aircraft manufacturers to include their recommendations and ensure training and implementation issues are addressed in the program's research from the start. Customers receiving direct benefit from this program include pilots, FAA ATC and Flight Standards organizations, air carriers, and airport operators. Stakeholders include the commercial pilot unions, FAA unions, other ICAO air navigation service providers, and aircraft manufacturers.

The NextGen – Wake Turbulence research program addresses both the FAA's near-term need (capacity enhancing wake mitigation procedures and processes) for enhancing current operations and developing wake mitigation solutions that will be required as FAA transitions to trajectory based and flexible terminal operations, which are being developed by the NextGen Separation Management and Improved Multiple Runway Operations portfolios.

Goals for FY 2017 Funding:

- By 2020, develop prototype procedures, processes, and applications of NextGen era capabilities that remove as much as flight safety allows the wake encounter hazard mitigation constraint on airport runway throughput capacity.
- By 2020, maintain and enhance (if required) measurement, modeling and analysis capabilities to evaluate, in terms of wake hazard generated and capability of surviving a wake encounter, new aircraft designs and new uses of existing aircraft.

What Benefits Will Be Provided To The American Public Through This Request?

Investing in the NextGen - Wake Turbulence Program provides the NextGen research and development for advanced wake mitigation processes and procedures that will be required to gain increased airport runway and air corridor throughput capacity both in the near- and far-term (2020 and beyond). More airport and air corridor throughput capacity translates into lower operating costs for air carriers and the ability to expand their business. For passengers, more throughput capacity translates into reduced flight delays, especially a reduction in flight delays associated with weather events. More available throughput will encourage air carriers to schedule additional flights – widening the flight choices for passengers and potential reduction of fares due to increased competition between air carriers. The benefits can also be realized in terms of more direct flight paths and a corresponding reduction in emissions and noise.

The Wake RECAT Phase 1.5 standards, based on the research and data collected by this program, implemented for ATC's use at multiple airports across the NAS, has resulted in up to a 15 percent increase in airport departure throughput capacity and up to a 10 percent increase in airport arrival throughput capacity (during instrument approach operations). The following are the benefits reported by Delta Air Lines concerning its Hartsfield-Jackson Atlanta International Airport (ATL) hub operations subsequent to the introduction of Re-Cat Phase 1.5 at ATL in June 2014:

- Taxi times have reduced; varies from half a minute to two minutes.
- Aircraft spend less time in the terminal airspace – reduction varies from half a minute to one minute
- These operating time reductions mean yearly cost savings in the Atlanta Hartsfield operations of $14.8 million (low side) to $38.1 million (high side). (Estimates are prior to 2015 fall in gas prices.)

The research by the NextGen – Wake Turbulence Program is now feeding necessary data and modeling results to drive the development of safe, more advanced throughput capacity efficient ATC wake mitigation procedures and standards that will add an additional five to seven percent throughput capacity to the NAS, with the resulting lessening of flight delays and decreases in flight costs.

Detailed Justification for
A12.b NextGen - Air Ground Integration Human Factors

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – NextGen - Air Ground Integration Human Factors – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A12.b NextGen – Air Ground Integration Human Factors	$9,697,000	$8,000,000	$8,575,000	+$575,000

What Is This Program And Why Is It Necessary?

The research program develops human factors scientific and technical information to address human performance related to error and automation; avionics, new technologies, and procedures; and air carrier training. As part of this effort, research addresses coordination among pilots and air navigation service providers (air traffic controllers), human system integration, and error management strategies to implement NextGen capabilities. The results of research are intended to support the development of standards, procedures, training, policy, and other guidance material required to implement the operational improvements anticipated by NextGen.

NextGen involves implementation of new complex systems and flight crew procedures. The NextGen - Air Ground Integration Human Factors program supports the FAA Aviation Safety certification and operational approval processes and also provides tools to address flight crew procedures, maintenance procedures, training development, and continuous safety monitoring. Specific human factors research activities in the Research and Development (R&D) program address advanced flight deck automation and air ground digital data communications technologies, as well as NextGen capabilities such as those derived from the use of Automatic Dependent Surveillance Broadcast (ADS-B) and NextGen procedures such as Area Navigation (RNAV) and Required Navigation Performance (RNP).

The FY 2017 research program develops human factors scientific and technical information to support the development of standards, procedures, training, policy, and other guidance material addressing human factors in ADS-B, Cockpit Displays of Traffic Information (CDTI) enabled applications, data communications, NextGen advanced instrument procedures, flight deck automation, and low visibility operations using advanced vision systems.

Planned human factors R&D efforts are addressing flight deck displays, message content, and procedures for disseminating data communications to support transfer of routine air traffic control clearances, route clearances and negotiations, reroute requests, transfer of voice frequency channels, exchange of near term hazardous weather information, and flight crew reports for appropriately equipped aircraft. Specific research plans are developed in coordination with FAA stakeholders including those in the aviation safety line of business including Flight Standards Service, and Air Traffic Organization program offices such as data communications, surveillance, and broadcast services, and offices within the NextGen organization.

The human factors research on flight crew error will advance scientific and technical information to enable successful implementation of the new human error regulation, 14 Code of Federal Regulation (CFR) 25.1302, *Installed Systems and Equipment for Use by the* Flightcrew, and will provide recommended guidance that is intended to aid aircraft certification personnel in their evaluation of automated functions against certification requirements. Likewise, research on pilot roles in human-automation interaction will inform guidance updates for flight deck information display requirements.

Avionics, New Technologies, and Procedures Human Factors research will lead to recommendations allowing FAA to continue to deliver operational benefits for users of advanced vision system technologies and ADS-B/CDTI NextGen applications, data communications, and RNAV, RNP instrument procedures under NextGen performance based navigation initiatives.

With the increase use of Unmanned Aircraft Systems (UAS) operations, a variety of issues arise that are distinctive to unmanned aircraft. Human factors research will build upon the prior work to establish a sufficient basis to determine the minimum necessary detect and avoid display information required for an UAS pilot to execute a maneuver for the aircraft. This is intended to remain clear and inform applicable regulatory guidance on the need for traffic information and specific flight path guidance to execute the remain well clear function.

Major activities and accomplishments planned in FY 2017 include:

- Complex Systems and Human Error
  - Provide recommendations and guidelines for regulatory and guidance material updates for pilot training, operational procedures, and flight deck design related to flight crew task management. Provide data to support guidance on compliance with human factors related regulations.
- Human Factors Guidelines for Advanced Instrument Procedure Design and Use
  - Provide updates to FAA orders and related guidance material to address:
    - Factors affecting procedure and chart complexity.
    - Human factors guidance for RNAV/RNP procedure designer.
    - Charting standards.
- Data Communications Human Factors
  - Provide recommendations to mitigate potential human factors issues that could limit data communications implementation in NextGen operations and to address key FAA considerations in international standards.
  - Provide message set revisions for International Civil Aviation Organization Operational Datalink Panel.
- Unmanned Aircraft Systems
  - Produce report documenting human factors requirements for traffic display for UAS detect and avoid capabilities, alerting symbology and timing requirements, minimum guidance for display information, and training recommendations.

Why Do We Want/Need To Fund The Program At The Requested Level?

Research supports development of policy, standards, and guidance required to design, approve, and operate NextGen equipment and procedures. To meet the requirements of new NextGen capabilities, human factors research supports updates to standards for pilot certification and training. Additionally, this research will include integrated evaluations of NextGen procedures and equipment to identify and recommend mitigations for air ground integration human factors challenges. In particular, these evaluations will address human performance aspects of multiple NextGen technologies, procedures, and capabilities operating at the same time. For example, the use of RNAV/RNP, ADS-B, and data communications for precision, multiple-aircraft dependent approaches will be evaluated.

Goals for FY 2017 Funding:

- By FY 2018, create a report with human factors recommendations and considerations for the design and evaluation of electronic chart software related to NextGen capabilities.
- By FY 2019, complete a technical report detailing results of experiment and implications for supporting regulatory guidance to address UAS traffic information and flight path guidance requirements.
- By FY 2019, create guidelines and recommendations for pilot performance impacts of using Enhanced Vision System on head down display for low visibility taxi (parallax, turns, complex intersections, crew coordination, etc.).

- By FY 2020, provide evaluation criteria, minimum requirements, recommendations, and best practices related to human factors/pilot interface issues for NextGen technologies and applications.
- By FY 2020, provide research-based input for planned amendment to the *Global Operational Data Link Manual* and the two procedures for Air Navigation Services – Air Traffic Management.
- By FY 2021, provide research-based information to support development of regulatory and guidance material that addresses evaluation of stereoscopic and head-worn glasses/displays.

This research provides human factors recommendations using scientific and technical information to assist aircraft certification service and flight standards service personnel in their evaluation of new technology and operational procedures that are necessary to achieve flight deck and integrated air-ground capabilities supporting NextGen applications.

The NextGen - Air Ground Integration Human Factors program supports the Department of Transportation's strategic goal of Safety and addresses flight deck and air traffic service provider integration for each operational improvement or NextGen application considered, with a focus on those issues that primarily affect the pilot side of the air-ground integration challenge. Through use of simulation, and demonstration, the program assesses interoperability of tools, develops design guidance, determines training requirements, and verifies procedures to support certification, flight standards, and the FAA's Air Traffic Organization's service units for ensuring safe, efficient, and effective human system integration in transition of NextGen capabilities.

What Benefits Will Be Provided To The American Public Through This Request?

A U.S. Congress, Office of Technology Assessment report titled 'Safe Skies for Tomorrow' concluded that long-term improvements in aviation safety will come from human factors solutions and that such solutions are established through consistent, long-term support for human factors research and development, analysis, and the application of human factors information. Human performance is often the largest contributor to system variability, so the implementation of advanced systems and the implementation of new procedures associated with NextGen will challenge the human components of the aviation system. Reviews of accidents and incidents have identified that human factors and human performance is a major factor in two thirds to three quarters of all civil aviation accidents. Specifically, research is required to ensure that system design, procedures, and training support the flightcrew functions, responsibilities, information needs, and interactions necessary for successful implementation of NextGen operational improvements, which often involve multiple new technologies operating in parallel.

Detailed Justification for
A12.c NextGen – Weather Technology in the Cockpit

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – NextGen - Weather Technology in the Cockpit – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A12.c NextGen – Weather Technology in the Cockpit	$4,048,000	$4,048,000	$4,059,000	+$11,000

What Is This Program And Why Is It Necessary?

The NextGen - Weather Technology in the Cockpit (WTIC) program is tasked with developing recommendations for a minimum weather service[1] needed to support sound pilot decision making and cockpit decision support tools (such as the Flight Management System (FMS)). The recommended Meteorological (MET) information will be ready for direct integration with decision support tools to support operations in the transformed National Airspace System (NAS). The WTIC program will determine and recommend standards and guidance for a Part 121/135 and a Part 91 minimum weather service. The program will define the necessary MET information, the associated parameters of the information (i.e., accuracy, latency, update rates), and presentation elements to safely and efficiently incorporate it into Collaborative Decision Making (CDM) relative to adverse weather decisions and Performance Based Navigation (PBN). The WTIC program in defining a recommended Part 91 minimum weather service will resolve or minimize previously identified and WTIC-identified General Aviation (GA) safety risks. The Part 91 minimum weather service will also address shortfalls in training and will include training updates associated with minimum weather service recommendations.

The minimum weather services - including the resulting standards and guidance recommended by the WTIC program - will enable NextGen weather-related goals including: reducing weather delays via increasing capacity and efficiency under adverse weather conditions, enhancing air traffic management and aircraft re-routing flexibility to avoid adverse weather, reducing safety risks to potentially lower the number of weather-related accidents and incidents, and reduction of emissions through lower fuel consumption from optimized routing and rerouting during adverse weather. In addition, WTIC will develop functional and performance requirements to support PBN operations far-term concepts. The WTIC program conducts demonstrations and evaluations for service and benefits quantification of new concepts and MET technologies for possible applications in NextGen.

The WTIC program will work closely with RTCA and other industry and stakeholder committees to further the program objectives and develop minimum systems standards. Demonstrations and flight evaluations will verify minimum weather service recommendations for airworthiness standards or recommended practices. The term 'minimum weather service' as used here is defined as the minimum weather information needed in cockpits along with the associated parameters of that information, such as reliability, accuracy, update rates, and spatial resolution. The minimum weather service will include rendering recommendations to reduce the likelihood of interpretation errors and recommendations for pilot training on cockpit MET technology and information.

The NAS mid-term concept of operations and numerous NextGen operational improvements have identified a need for additional or higher quality MET information in the cockpit or integrated with decision support tools. This MET information will enable NextGen operations and PBN to achieve planned benefits in adverse weather conditions.
For GA operations, the WTIC program is performing research to identify gaps of MET information in the cockpit that were recognized as causal factors in previously reported accidents or incidents and gaps of MET information in the cockpit that have potential of being a causal factor in a future GA accident or incident. The WTIC program is developing recommendations to resolve or reduce these MET information gaps to

potentially reduce the weather-related GA accident, fatality, and incident rates. In addition, the WTIC program is providing enhanced training on the minimum weather service recommendations and evolving cockpit MET technology. This training will include providing new pilot exam questions to resolve a stakeholder identified gap.

The WTIC program research will develop minimum standards and recommended guidance on the adoption of cockpit, ground, and communication technologies, practices, and procedures to enhance common Situational Awareness (SA). Common SA will be enhanced by reducing latency in cockpit MET information, standardizing MET information presentations, and recommending an efficient architecture to improve dissemination of MET information for uplink, downlink, and crosslink. A result of the enhanced common SA is that ground and air users will have access to the same information to support efficient CDM. The resolution or reduction of operational shortfalls attributable to MET information in the cockpit gaps by defining a minimum weather service supports NextGen goals for improved NAS efficiency and FAA goals to eliminate safety risks with the potential of being causal factors in future GA accidents.

Specific gaps and shortfalls being addressed by research under the WTIC program are:

- A lack of consistent MET information rendering in cockpits and of common weather SA with air traffic managers that may be causing inconsistent adverse weather decision making due to varying interpretations of weather conditions.
- Inadequate pilot training on MET information, its use, limitations, and new MET technology.
- Inefficiencies in weather related decision-making that may be due to the lack of appropriate and optimized MET information in the cockpit or deficient cockpit MET information specifications (accuracy, latency, required quality of service, etc.).
- Quantification of MET information bandwidth needs to support industry's development of a recommended architecture for disseminating MET information.
- Reducing unnecessary air space avoidance and associated capacity reductions resulting from a lack of timely, quantifiable, and objective turbulence information in the cockpit.
- The stagnantly high GA accident rate attributed to inadvertent flight from visual flight rules into Instrument Meteorological Conditions (IMC) or to GA pilots not maintaining safe separation from adverse weather.
- Safety risks and inefficient adverse weather avoidance in oceanic and other remote regions attributable to the lack of MET information in the cockpit in these regions.
- MET information rendering gaps and shortfalls that are causal factors in pilot misinterpretation of MET information, blindness to changing weather conditions, and high workloads to monitor and avoid adverse weather in tactical encounters.
- Inefficiencies in flight operations in adverse wind conditions attributable to the lack of enhanced wind information in the cockpit or integrated with cockpit decision support tools such as the FMS.

WTIC also supports the goal to reduce greenhouse emissions by reducing fuel consumption resulting from increased NAS capacity and enhancing adverse weather decision making to enable more efficient routing and rerouting during adverse weather conditions.

Major activities and accomplishments planned in FY 2017 include:

- Complete updates to the initial release of minimum weather service recommendations for mobile MET applications to incorporate advancements in technology and feedback from users.
- Complete trade studies and produce recommendations for resolutions to GA safety hazards identified in the previously accomplished gap analyses of causal factors of GA accidents, inadvertent transition to IMC and commercially available MET products.
- Complete phase 1 assessment of the feasibility and benefits of using crowd sourcing techniques to enhance selected cockpit MET information while reducing the bandwidth required for uplink.
- Produce MET exam questions for practice and training for GA pilot certification testing, and produce additional online GA self-study training courseware for MET information in the cockpit.

- Derive WTIC mid-term research requirements from the completed functional analysis performed on the WTIC mid-term concept of operations.
- Complete next phase of trade study assessments of providing probabilistic MET information to the cockpit to develop initial rendering and interface recommendations.
- Perform trade studies to develop recommendations to resolve previously identified operational shortfalls in oceanic and other remote regions.
- Complete study on pilot performance and decision making with planned advancements in MET automation and MET translation to identify any causal gaps or adverse impacts.
- Complete verification of initial set of FAR (Federal Aviation Regulation) Part 121 minimum weather service recommendations associated with weather notifications (alerting functions) to finalize the recommendations.
- Complete development of the Minimum Aviation Safety Performance Standards (MASPS) for meteorological data link services that defines system requirements to increase flight safety and efficiency. The MASPS will define system requirements for downlink and air-to-air data link of aircraft derived data to support various weather applications.

Why Do We Want/Need To Fund The Program At The Requested Level?

Research will enable the development of policy, standards, and guidance needed to safely implement weather technologies in the cockpit to provide shared SA and shared responsibilities. This will be done through the development of recommendations for a GA minimum weather service and a Part 121/135 minimum weather service.

Goals for FY 2017 Funding:

- By FY 2018, complete the third module of GA pilot MET-training courseware and internet training modules, and updates to associated weather questions for the pilot written exam.
- By FY 2019, complete oceanic flight demonstration to verify that associated minimum weather service recommendations resolve previously identified operational shortfalls in the oceanic and remote regions.
- By FY 2019, finalize GA minimum weather service attributes for GA alerting, probabilistic weather in the cockpit, and for presentation of uplinked and cross-linked MET information on legacy displays. These minimum weather service attributes successfully resolve their associated gaps.
- By FY 2019, develop finalized Part 121/135 minimum weather service attributes for enhanced wind information. These minimum weather service attributes successfully resolve their associated gaps and operational shortfalls.
- By FY 2020, complete mid-term and preliminary far-term operations shortfall and gap analyses to identify operational inefficiencies in the NAS associated with adverse weather conditions. Any newly identified gaps will be resolved by the development of Part 121/135 minimum weather service attributes in future years.
- By FY 2021, develop preliminary Part 121/135 minimum weather service recommendations for rendering MET information in the cockpit.
- By FY 2021, complete trade studies to identify technology advancement needs to enable resolution of identified mid-term operational inefficiencies in a NextGen environment.

The requested funding will provide sufficient inputs to the standards and guidance documents necessary to implement the minimum weather service that is needed to enable NextGen operational improvements and concepts of operation. It also provides a level of funding that supports developing information necessary for industry's technology development and aircraft equipage decisions.

One of the main objectives of the WTIC program is to provide for a common MET SA between the air and ground. WTIC is a cross cutting research program that makes every effort to ensure research is relevant to a variety of stakeholders both internally to the FAA and external to the government.

What Benefits Will Be Provided To The American Public Through This Request?

Adverse weather continues to be one of the major causes for GA accidents, incidents, and fatalities. In addition, adverse weather contributes to inefficiencies in NAS operations for commercial airlines as well as inflight injuries such as those attributed to turbulence. To enable safer GA operations, the WTIC program will recommend a cockpit GA minimum weather service that resolves safety-related MET information and MET technology gaps. The resolution of these safety-related gaps should result in the American Public seeing a reduction in the GA accident, incident, and fatality rates. For commercial aviation, the WTIC program will recommend a Part 121/135 minimum weather service to enable effective pilot collaboration in adverse weather decision making, which should result in the American Public having shorter or less flight delays attributable to adverse weather conditions. In addition, the enhanced efficiency should also result in reduced greenhouse emissions.

Detailed Justification for
A12.d NextGen – Information Security

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – NextGen – Information Security Program– Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A12.d NextGen – Information Security	-	-	$1,000,000	$1,000,000

What Is This Program And Why Is It Necessary?

The purpose of this program is to conduct research to help prevent disruptive cyber incidents that affect the Air Traffic Control (ATC) mission and improve resiliency in the event an incident does occur. While the current measures in place for the information security for the National Airspace System (NAS) are robust, the rapidly evolving capabilities of our potential adversaries and sharply decreasing costs of exploits necessitates some prudent exploration of advanced detection and defense capabilities for the NAS systems.

The program supports the FAA's overall cyber security capability development by researching advanced tools, techniques and processes that can be adapted for use in the NAS. The program also directly supports the Executive Order (EO) 13636 *Improving Critical Infrastructure Cybersecurity* and the Presidential Policy Directive (PPD)-21 *Critical Infrastructure Security and Resilience*, which defines Transportation Systems Sector as one of the 16 critical infrastructure sectors and aviation as an essential sub-sector.

Multiple recent external reports including Government Accountability Office (GAO)-15-370 – 'FAA Needs a More Comprehensive Approach to Address Cybersecurity As Agency Transitions to NextGen, April 2015,' GAO-15-221 – 'FAA Needs to Address Weaknesses in Air Traffic Control Systems, Jan 2015' and the National Research Council report 'A Review of the Next Generation Air Transportation System: Implications and Importance of System Architecture (2015), April 2015' point to the urgency of additional work in the area of cyber security for the NAS. The FAA has responded to many of the recommendations in these reports but several of the accepted recommendations require additional investigation and the rapidly evolving nature of the cyber threat demands more proactive research in identifying, evaluating, modifying, and deploying capabilities to suit the unique nature of the ATC systems supporting the NAS.

This program is sponsored by the FAA's Cybersecurity Steering Committee (CSC). The CSC has members from the Chief Information Officer's office, the FAA's Air Traffic Organization, the FAA's NextGen Organization, the FAA's Office of Security and Hazardous Materials, FAA's Office of Aviation Safety and the U.S. Department of Transportation. It is chaired by the FAA Chief Information Security Officer. The committee is thus able to look at aspects of cyber security for ATC across all domains and maximize the investments to provide the highest benefit for the agency.

Major activities and accomplishments planned in FY 2017 include:

- Explore applicability of self-adaptive systems and networks to improve resilience in the event of attempted cyber disruption.
- Research advanced big-data analytics approaches to detect and respond to advanced persistent threats and insider threats.
- Explore adoption of techniques to provide design assurance in mixed-trust environments.
- Develop an initial cyber testing capability that will help identify and quantify known risks.

Why Do We Want / Need To Fund The Program At The Requested Level?

The vast majority of the research effort in this area will be in adapting extremely useful foundational research on trustworthy systems - performed by partner agencies (i.e., Department of Defense, Department of Homeland Security, National Science Foundation) and other entities - to the unique needs of the FAA. The FAA has built out the cyber test facility for ATC at the William J. Hughes Technical Center and has the ability to rapidly configure the test environments to verify and validate adapted systems to ensure that they meet FAA's needs.

Goals for FY 2017 Funding:

- By 2018, identify the enabling technology to diminish cyber-attack impacts on the NAS with resilient self-adaptive techniques.
- By 2018, initiate the development of big data analytical capabilities for aggregating and correlating current operational, behavioral, and environmental data with the express intent of understanding, predicting and responding to cyber events.
- By 2018, establish roadmap, based on actual NextGen technology implementations, to improve the FAA's capability in operating a mixed-trust, massively interconnected network of systems and external domains of different levels of security pastures and controls.
- By 2018, develop an initial cyber testing capability that will help identify and quantify known risks.

What Benefits Will Be Provided To The American Public Through This Request?

The NAS is an integral part of the nation's critical infrastructure as identified in PPD-21. Maintaining the continued operations of the nation's air traffic management systems and preventing interruptions of the NAS functions are essential to provide the most efficient air travel system for and to ensure the safety of both air traveling public and the citizens on the ground. This NextGen Information Security research will enable the FAA to provide the necessary protections of the air traffic control services and associated functions from potential disruptive cyber events, specifically as the IP-network based and SOA NextGen technologies are being implemented.

Executive Summary – Environmental Sustainability, Activity A13

The Research, Engineering and Development (RE&D) Environmental Sustainability Activity (A13) is requesting $41,187,000 for FY 2017, a 2 percent decrease from the enacted FY 2016 level of $41,897,000. This funding provides for a research work program that supports the "Reduce Environmental Impacts" research principle as specified in the NARP. This research activity aims to systematically expand and apply knowledge to produce useful materials, devices, systems, or methods that will reduce aviation's environmental and energy impacts. Programs within this activity align with FAA strategic priority – *"Deliver Benefits Through technology and Infrastructure".*

The request includes $15,013,000 for continued research under the Environment and Energy Program (A13.a). This program explores and develops tools, models and analyses to help advance the understanding of the impacts of aviation, specifically from jet engines, on the environment while supporting the development of solutions to mitigate those impacts. To help advance the scientific understanding of noise impacts on social welfare and health the program will continue to enhance the Aviation Environmental Design Tool (AEDT) to add improved noise, emissions, and fuel burn estimation methodologies.

The request also includes $26,174,000 for continued research under the NextGen – Environmental Research – Aircraft Technologies, Fuels and Metrics Program (A13.b). In collaboration with industry and through the Continuous Lower Energy, Emissions, and Noise (CLEEN) program to focus on technology maturation to reduce current levels of aircraft noise, emissions that degrade air quality, greenhouse gas emissions, and energy use while also advancing sustainable alternative fuels for aviation use.

Detailed Justification for
A13.a Environment and Energy

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – Environment and Energy – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A13.a Environment and Energy	$14,921,000	$16,074,000	$15,013,000	-$1,061,000

What Is This Program And Why Is It Necessary?

The Environment and Energy (E&E) program is studying the impacts of aviation, specifically from jet engines, on the environment while providing analysis to support the development of solutions to mitigate those impacts. At the core of the program is the development and use of an integrated aviation environmental tool suite. This tool suite is built upon a sound scientific understanding - which is also being developed as a part of this program - of aviation noise and emissions; as well as their environmental, health, and welfare impacts. The program is using these models and knowledge to inform decision-making on policies and technology development relating to aviation's energy use and environmental impacts.

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

Noise is the most immediately objectionable impact of aviation, and an impact demanding considerable Federal resources (e.g., Grants-in-Aid for Airports Appropriation (AIP) grant set aside of up to $300 million annually). Potentially outdated AIP research underpins determinations of aircraft noise impacts, land use compatibility guidelines, and federally funded noise mitigation. Additional noise research effort is needed to reflect public sensitivity to current air traffic conditions; guide mitigation funding and local land use planning near airports; and assure the U.S. response to aircraft noise keeps pace with NextGen needs and international efforts. The E&E program is supporting the FAA's noise research roadmap.

The research funded by this program will ensure issues are identified, impacts measured and appropriate mitigation measures instituted. There are also important interrelationships and trade-offs among impacts due to noise, emissions, and energy that need to be understood and quantified when developing environmental mitigation strategies. The development of an interdisciplinary approach that considers the interdependencies among energy use, aircraft noise, and various air pollutant emissions is a key element for this research program. The goal is to develop a more complete understanding of the complex interdependencies that exist among aircraft noise, fuel burn, and emissions as well as their health and welfare impacts and to translate this knowledge into an integrated environmental modeling framework that is used to evaluate policy and technological options to mitigate the environmental impacts and energy use from aviation.

The FAA's Office of Environment and Energy is developing a comprehensive suite of software tools to facilitate thorough consideration of aviation's environmental effects, this effort is known as the Aviation Environmental Tool Suite. The main goal of this effort is to develop a critically needed ability to characterize and quantify the interdependencies among aviation-related noise and emissions, impacts on health and welfare, and industry and consumer costs, under different policy, technology, operational, and market scenarios. The key to the tool suite is the Aviation Environmental Design Tool (AEDT), which can model the noise, fuel burn and exhaust emissions consequences that result from aircraft operations from the airport gate through ground movements, takeoff, climb out, cruise, approach, and landing to the aircraft's final destination. AEDT has replaced the legacy tools of the FAA for environmental compliance, Noise Integration Routing System (NIRS), Emission and Dispersion Modeling System (EDMS) and Integrated Noise Model (INM). The E&E program is providing the necessary knowledge and tools to evaluate all of the options being considered by the aviation community to mitigate environmental impacts of aviation, operational procedures, aircraft and engine technologies, alternative fuels, improved operational procedures, and environmental policies and standards. These could all enable an increase in capacity while reducing environmental impacts thus ensuring we have an aviation system that is a model for sustainable growth.

Major activities and accomplishments planned in FY 2017 include:

- Advance the understanding of noise impacts on social welfare and health.
- Improve ability to model the air quality impacts of aviation emissions, including the costs of social welfare and health consequences.
- Refine methods for estimation of aircraft contribution to climate change and implement them in analytical tools.
- Enhance the aviation environmental tool suite to improve its ability to calculate environmental consequences and impacts of aviation.
- Analyze mitigation options for reducing environmental impacts including policy measures and standards being developed at the International Civil Aviation Organization Committee on aviation environmental protection (ICAO CAEP).

Why Do We Want/Need To Fund The Program At The Requested Level?

The E&E program helps achieve NextGen goals to increase mobility by reducing environmental impacts of aviation in absolute terms, including those relating to community noise, air quality, and global climate change. This program provides the fundamental knowledge and tools that support the NextGen Implementation Plan. The efforts within the E&E program complement activities to reduce the environmental impacts of aviation through aircraft technology, alternative fuels, and operations as well as environmental operational assessments and environmental management systems development that are being carried out under NextGen investments.

Goals for FY 2017 Funding:

- By 2017, complete engine exhaust particulate matter measurements that are required to support the ICAO CAEP standard.
- By 2017, advance the scientific understanding of noise impacts on social welfare and health.
- By 2017, refine methods for estimating aircraft contribution to climate change and implement them in analytical tools for use in informing decision-making and enabling solution development.
- By 2018, advance air quality modeling capabilities to capture global impacts of aviation emissions to inform decision-making and enable solution development.
- By 2018, release Aviation Environmental Design Tool (AEDT) Version 3 with improved noise, emissions, and fuel burn estimation methodologies.
- By 2019, explore appropriate metric for community exposure to aircraft noise.
- By 2019, develop improved analytical tool and methodologies for cost-benefit analysis of both domestic and international policy options and scenarios.
- By 2019, complete analyses to support the development of a new engine exhaust particulate matter standard in ICAO CAEP.
- By 2019, complete analyses to inform the development of a global market based measure for international aviation.

This program funds activities that support the U.S. leadership position on international environmental negotiations for standard setting and policymaking. These include, but are not limited to, the development, release, and subsequent support of AEDT for integrated noise, emissions, and fuel burn analysis; analyses to inform the development of a global market based measure for international aviation; and sampling and measurement program for aircraft particulate matter emissions. The program expands our understanding of source level aircraft noise and emissions as well as their impacts, which will in turn inform the development of environmental mitigation solutions.

What Benefits Will Be Provided To The American Public Through This Request?

This request would continue the successful research that has been carried out by the E&E program. This funding would continue efforts to advance our scientific understanding of the environmental impacts of aviation, developing tools to quantify these impacts, and then using the tools to inform policy making regarding the environmental impacts of aviation. Much of the research in this program to improve the underlying science is carried out via the Aviation Sustainability Center (ASCENT), a leading aviation cooperative research organization with a broad portfolio of contributions. ASCENT is building on the success of the Partnership for AiR Transportation Noise and Emissions Reduction (or, PARTNER) Center of Excellence (http://web.mit.edu/aeroastro/partner/) as highlighted in their 10-year symposium (http://web.mit.edu/aeroastro/partner/reports/public-symposium-2013.pdf.).

The program has enabled the development of AEDT to quantify the integrated fuel burn, noise, and emissions consequences of aviation as well as the aviation portfolio management tool (APMT) to convert these consequences into impacts on the community. AEDT version 2b (AEDT2b) was publicly released in May 2015 and is now the FAA's standard noise and emissions model replacing the NIRS, INM, and EDMS. Funds from this program would ensure the continued development and maintenance of AEDT2b.

During the ICAO CAEP/8 and CAEP/9 meetings - which took place in 2010 and 2013, respectively - AEDT and APMT were used to inform the U.S. positions on the internationally negotiated nitrogen oxide and noise stringencies. These funds would ensure the U.S. has the scientific information to make informed decisions on a carbon dioxide standard, a particulate matter standard, and a global market based measure for aviation; all of which are currently being developed in ICAO CAEP. Each of these could have a multi-billion dollar impact on the aviation industry and on the health and welfare of the American public.

Detailed Justification for
A13.b NextGen – Environmental Research – Aircraft Technologies, Fuels and Metrics

What Is The Request And What Funds Are Currently Spent On The Program?

FY 2017 – NextGen – Environmental Research – Aircraft Technologies, Fuels and Metrics Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A13.b NextGen – Environmental Research – Aircraft Technologies, Fuels and Metrics	$23,014,000	$25,823,000	$26,174,000	+$351,000

What Is This Program And Why Is It Necessary?

The program is developing solutions to reduce the impacts associated with aviation noise and exhaust emissions, and increasing energy efficiency and availability. In collaboration with industry, the program will accelerate the maturation of engine and airframe technologies to reduce aviation noise, fuel use, and emissions that impact air quality and climate change. It will also provide test data, analyses, and methodologies to overcome barriers to the adoption of alternative jet fuels that could serve as drop-in replacements for today's petroleum-derived turbine engine fuels. This will lead to faster deployment of these fuels and the faster realization of the accompanying environmental improvements and economic development that will come with this new industry. The NextGen – Environmental Research – Aircraft Technologies, Fuels, and Metrics program is providing the FAA with funding to accelerate the maturation of aircraft and engine technologies and develop alternative jet fuels.

The maturation of aircraft and engine technologies, as well as the development of alternative jet fuels are key components of the NextGen environmental strategy to overcome the challenges environment and energy are presenting to aviation. The other components of the strategy include efforts to better understand the extent of the problem associated with aviation noise and emissions; develop and field new operational enhancements, aircraft and air traffic management technologies and policies to achieve near-term and long-term solutions. The vast majority of improvements in environmental performance over the last three decades have come from enhancements in engine and airframe design. It is expected that a combination of technologies, air traffic management, sustainable alternative jet fuels, and policy measures will be required to provide sufficient environmental protection to ensure sustained aviation growth.

The main focus of the NextGen – Environmental Research – Aircraft Technologies, Fuels, and Metrics program is the Continuous Lower Energy, Emissions, and Noise (CLEEN) program. The CLEEN Program is focused on technology maturation to reduce current levels of aircraft noise, emissions that degrade air quality, greenhouse gas emissions, and energy use while also advancing sustainable alternative fuels for aviation use. Since its inception in 2010, the CLEEN Program has been successful in maturating technologies to enter into service sooner than what the industry has anticipated. For example, the low emissions engine combustor has met and exceeded the CLEEN goal for nitrous oxide reductions. Other demonstrated CLEEN technologies have showed significant progress toward the fuel burn and noise reduction goals. This program also provides funding for the alternative jet fuel testing and analysis efforts of the Aviation Sustainability Center (ASCENT), the FAA center of excellence (COE) for alternative jet fuels and environment, which is a leading aviation cooperative research organization co-led by Washington State University and Massachusetts Institute of Technology (http://ascent.aero). It also collaborates efforts of the commercial aviation alternative fuels initiative (CAAFI) to focus the efforts of commercial aviation to engage with the emerging alternative fuels industry (http://caafi.org). The CLEEN Program, ASCENT and CAAFI are all contributing to the farm to fly 2.0 efforts, which are coordinated with industry, the U.S. Department of Agriculture, and the U.S. Department of Energy to support the development of one billion gallons of jet biofuel production capacity and use by the U.S. aviation enterprise by 2018.

In FY 2017, the NextGen – Environmental Research – Aircraft Technologies, Fuels, and Metrics program will continue to advance system design, integration, and testing of CLEEN aircraft technologies for accelerated progress towards flight demonstration and system-wide assessments within the second phase of the CLEEN program (CLEEN II). For alternative jet fuels, activities will focus on safety, operability, performance, and environmental assessments for qualification of renewable alternative fuels to secure the American Society of Testing and Materials (ASTM) International approval and to streamline the approval process. Activities will also be conducted to assess production capacity and fleet infusion of alternative fuels. Additionally, funding will provide for engineering, technical, and management support of overall research activities.

Major activities and accomplishments planned in FY 2017 include:

- Continue the second round of CLEEN activities (CLEEN II) in year three to assess and demonstrate aircraft and engine technologies that can reduce fuel burn, emissions, and noise.
- Support the approval of additional alternative jet fuel pathways via ASTM International.
- Support the inclusion of environmental and economic evaluations of alternative jet fuels into tools and databases for use by government, industry and academia.

Why Do We Want/Need To Fund The Program At The Requested Level?

The NextGen – Environmental Research – Aircraft Technologies, Fuels, and Metrics program is helping the FAA achieve its mission to ensure a safe, efficient and environmentally sound global air transportation system by reducing environmental impacts of aviation in absolute terms, including those relating to community noise, air quality and global climate change. The program is focused on maturing aircraft technologies that can reduce aircraft noise, emissions that degrade air quality, greenhouse gas emissions, and fuel use and advancing alternative jet fuels.

The NextGen – Environmental Research – Aircraft Technologies, Fuels, and Metrics program supports the Department of Transportation strategic goal of Environmental Sustainability by accelerating the maturation and subsequent use by industry of environmentally beneficial aircraft and engine technologies and developing environmentally sustainable alternative jet fuels.

Goals for FY 2017 Funding:

- By 2017, demonstrate certifiable aircraft and engine technologies via CLEEN II that reduce noise levels, Landing and Takeoff cycle (LTO), nitrogen oxide emissions, and fuel burn.
- By 2017, evaluate regional alternative jet fuel supply chains to identify the key barriers to the development and deployment of sustainable 'drop-in' alternative jet fuels to help meet the U.S. government aspirational goal of enabling 1 billion gallons of alternative jet fuel use by aviation in the near term.
- By 2018, develop methods to streamline the ASTM approval process for alternative jet fuels.
- Through 2019, support testing to ensure the approval of at least one alternative jet fuel type per year.
- By 2019, advance the understanding of alternative jet fuel composition and environmental performance to enable the production of alternative fuels with lower emissions.
- By 2019, utilize internationally agreed upon methodology to develop lifecycle greenhouse gas emissions of alternative jet fuels for use by ICAO CAEP.

This program has had considerable success in transitioning technologies that will reduce the environmental impact of aviation and sustained funding will ensure that these successes continue.

In the area of technology maturation, the CLEEN Program, which is a key component of the NextGen – Environmental Research – Aircraft Technologies, Fuels, and Metrics Program, has worked with partners in industry to mature numerous technologies from concept validation to being ready for industry adoption and incorporation into the fleet. These include a ceramic matrix composite core exhaust nozzle for reduced fuel burn and noise, an advanced lean burn combustor for reduced landing and takeoff nitrogen oxide (NO_x)

emissions, and high temperature engine core components that will enable more efficient engine design. Additionally, the CLEEN Program has demonstrated wing adaptive trailing edge technology through flight testing, demonstrating aerodynamic benefits that will lead to fuel burn savings and potentially aircraft noise reduction. Efforts continue in CLEEN's development of technologies to enhance the benefits of ultrahigh bypass ratio geared turbofan architecture through continued fan model wind tunnel testing and upcoming engine testing which could provide noise, emissions and fuel burn benefits. Finally, CLEEN has completed wind tunnel testing to mature the blade designs for open rotor engine architectures, which hold large fuel burn reduction potential. These successful maturation and demonstration efforts have moved each of these technologies closer to successful transition into commercial products that will provide environmental benefit in the fleet.

In the area of alternative jet fuels, this program has directly contributed to the certification by ASTM International of three alternative jet fuels made using fischer-tropsch synthesis, the Hydro Processed Esters and Fatty Acids (HEFA) fuel and sugar fermentation processes. There are an additional six fuels currently under testing and evaluation via FAA funded programs. It has also funded the development of research that quantified the life cycle greenhouse gas emissions benefit of alternative jet fuels made from these and other processes. This research was subsequently used by the Environmental Protection Agency as a part of their rulemaking to include HEFA fuels within their Renewable Fuel Standard program. Finally, this program also provides funding to the CAAFI, which is focusing the efforts of commercial aviation to engage the emerging alternative fuels industry. It enables its diverse participants, representing all the leading stakeholders in the field of aviation, to build relationships, share and collect data, identify resources, and direct research, development and deployment of alternative jet fuels.

What Benefits Will Be Provided To The American Public Through This Request?

This program would enable continued success in the CLEEN Program to mature aircraft and engine technologies. The CLEEN Program has enabled a low emissions combustor technology to enter service in 2016 in an engine with almost 8,000 orders already placed. The CLEEN Program also anticipates another CLEEN engine technology will have more than 4,000 orders placed after 2020. As additional new aircraft and engine products are announced by industry, there will be many more orders placed for products that were matured via the CLEEN Program. Additional details on the first phase of the CLEEN Program are available at (http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=16814).

With continued funding, the second phase of the CLEEN Program will be able to partner with industry to mature technologies with the result being a fleet of aircraft with lower noise, emissions and fuel burn. Specifically, the technology goals of the second phase of the CLEEN Program are to develop and demonstrate certifiable engine technology that reduces:

- Noise levels by 32 decibels cumulative, relative to the Stage Four standard.
- Aircraft fuel burn by 40 percent relative to year 2000 best-in-class in-service aircraft.
- LTO cycle, NOx emissions by 70 percent below the international civil aviation organization standard adopted in 2010.

The work of CLEEN, CAAFI and ASCENT to develop alternative jet fuels via fuel testing, integrated analysis and coordination would also continue and help to ensure that aviation has a sustainable source of energy.

By reducing the environmental impact of aviation through new technologies and alternative fuels, this funding helps to ensure the continued growth of aviation while also reducing the impacts of aviation noise and emissions on airport communities as well as on the public at large. By removing barriers to the deployment of alternative jet fuels, this program would support the development of a new industry thus providing economic development as well as environmental benefit.

Executive Summary – Mission Support, Activity A14

The Research, Engineering and Development (RE&D) Mission Support Activity (A14) is requesting $6,200,000 for FY 2017, an 11 percent increase over the enacted FY 2016 level of $5,545,000. This activity provides funding for cross-cutting programs that enable development, performance and program evaluation of the research portfolio. Thus this activity supports all agency and departmental strategic priorities.

The request includes $2,788,000 for the System Planning and Resource Management Program (A14.a)—a program that engages and collaborates with aviation research stakeholders within and external to the agency to effect long term research strategic planning, programming, budgeting and the conduct of independent program review.

The request also includes $3,412,000 for the William J. Hughes Technical Center Laboratory Facility (A14.b). This program sustains specialized research facilities to emulate and evaluate field conditions and thus support research program execution. Included among these are, simulation facilities, airborne laboratories, and the Human Factors (HF) laboratories located at the William J. Hughes Technical Center (WJHTC).

Detailed Justification for
A14.a System Planning and Resource Management

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – System Planning and Resource Management – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A14.a System Planning and Resource Management	$2,100,000	$2,100,000	$2,788,000	+$688,000

What Is This Program And Why Is It Necessary?

This activity produces the National Aviation Research Plan (NARP), an annual strategic plan for FAA Research and Development (R&D); administers the congressionally mandated (P.L. 100-591 Section 6 Advisory Committee) Research, Engineering and Development Advisory Committee (REDAC) and provides program advocacy and outreach.

Ongoing activities will manage FAA's Research, Engineering, and Development (R,E,&D) portfolio, meet the President's criteria for R&D, increase program efficiency, and maintain management and operating costs.

The REDAC reviews FAA research commitments annually and provides guidance for future R,E,&D investments. The members of this committee and its associated subcommittees are subject matter experts drawn from various associations, user groups, corporations, government agencies, universities, and research centers. Their combined presence in the REDAC fulfills a congressional requirement for FAA R&D to be mindful of aviation community and stakeholder input.

This program provides the support for the FAA to formulate their annual R,E,&D portfolio and submit the mandatory plan for the FAA research and development to Congress each year.

FAA will continue supporting the work of the REDAC in its task to advise the Administrator on the R&D portfolio. In particular, it will seek the counsel and guidance of the committee for the FY 2018 R&D portfolio, review the proposed FY 2018 portfolio prior to submission of the budget requirements to the Department of Transportation (DOT) and seek the committee's guidance during the execution of the R&D portfolio. The agency will publish, as required by Congress, the National Aviation Research Plan (NARP) and submit it to Congress concurrent with the FY 2017 President's budget request.

The program will review the President's R&D criteria, ensuring that the agency's R&D program remains viable and meets national priorities. It will also publish program activities and accomplishments, as well as foster external review of and encourage customer input to the R&D program. Additionally, funding will provide for engineering, technical, and management support of overall research activities.

Major activities and accomplishments planned in FY 2017 include:

<u>R&D Portfolio Development</u>

- Prepare the FY 2019 R,E&D budget submission.
- Manage FAA's R,E&D portfolio to meet efficiency goals.
- Obtain REDAC recommendations on planned R&D investments for FY 2019.
- Support the REDAC in its preparation of other reports, as requested by the FAA.
- Deliver the 2017 NARP to Congress with the President's FY 2018 budget request.

<u>Research Collaboration</u>

- Conduct the 2016 International Conference on research in air transportation.

- Conduct planning for the 2017 International ATM R&D Seminar.

Why Do We Want / Need To Fund The Program At The Requested Level?

Goals for FY 2017 Funding:

- Maintain an R,E&D management workforce of no more than 10 percent of the total R,E&D workforce, each year through FY 2019.
- Control expenditures of the REDAC to less than 1/10 of one percent of the total R,E&D budget, each year through FY 2019.

What Benefits Will Be Provided To The American Public Through This Request?

This program provides the support for the FAA to formulate their annual R,E&D portfolio and submit the mandatory planning documents for the FAA research and develop to Congress each year. Through the management of the FAA REDAC, this program facilitates an independent, expert review of the FAA's R&D portfolio that provides meaningful recommendations for the FAA to refine and improve their portfolio. This results in a more effective research program that will benefit the public by making aviation safer and smarter and enhancing the U.S. global leadership in aviation.

Detailed Justification for
A14.b William J. Hughes Technical Center Laboratory Facility

What Is The Request And What Funds Are Currently Spent on the Program?

FY 2017 – William J. Hughes Technical Center Laboratory Facility – Budget Request

Program Activity	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
A14.b William J. Hughes Technical Center Laboratory Facility	$3,410,000	$3,445,000	$3,412,000	-$33,000

What Is This Program And Why Is It Necessary?

This program sustains research facilities located at the William J. Hughes Technical Center Laboratory (WJHTC) to support Research and Development (R&D) program goals. These programs require specialized facilities to emulate and evaluate field conditions. The R&D programs require flexible, high-fidelity laboratories to perform full mission, ground-to-air and Human-In-The-Loop (HITL) simulations. The R&D laboratories are comprised of the simulation facilities, the flight program's airborne laboratories, and the Human Factors (HF) laboratory.

R&D programs require specialized facilities to emulate and evaluate field conditions. Researchers measure baseline human performance using existing air traffic controller configurations and changes in performance when new systems or procedures are introduced to evaluate HF issues. These laboratories include integrated cockpits and air traffic controller workstation capabilities (simulated and real) to evaluate the system and human components that can only be addressed in a full mission end-to-end simulation environment. Airborne and navigation projects require flying laboratories, aircraft used for research and development, which are specially instrumented and reconfigurable to support a variety of projects. Human factors projects require flexible, high-fidelity laboratories to perform full-mission, HITL simulations.

The R&D laboratories are fully integrated with the WJHTC field support laboratories. This allows for an extremely high fidelity environment supporting R&D of the current day, NextGen, and transitioning current to future, for example mixed equipage and adjacent site deployment.

It is necessary to modify, upgrade, and sustain the R&D laboratory infrastructure and provide support services to support the R&D program goals.

The simulation branch supports development and test programs at the WJHTC by generating realistic traffic for engineering, operational, and HF evaluations of National Airspace System (NAS) equipment, procedures, and operations. The Target Generation Facility (TGF) simulates air traffic equipment including the radar and interfacility interfaces for end-to-end gate-to-gate configuration controlled test capability. TGF generated targets can operate under pilot control or prescribed paths depending on study needs. Simulation pilots are provided by the simulation branch and include a cadre of current and retired airline and commercial pilots. The simulation branch also maintains several cockpit simulators of transport category and General Aviation (GA) aircraft. At present, simulators for the B-737-800, A-321, Embraer 175, and two GA aircraft are operational. All cockpit simulators are integrated with TGF and are capable of acting as interactive targets in NAS simulations.

The Flight Program Branch accepts flight test missions from various research, development, test, and evaluation Agency programs. These efforts include aircraft modifications, testing equipment integration, aircraft maintenance, data collection, detailed flight test planning, and mission risk analysis; along with actual flight tests.

The FAA R&D Flight Program serves many customers throughout the FAA and encompasses aircraft operations, aircraft maintenance, aircraft engineering and modifications, and aircraft tracking. The program currently operates, modifies, and maintains six aircraft that act as airborne laboratories. These aircraft are operated under Federal Aviation Regulations 91 and maintained by an in-house FAA certificated repair station. The R&D Flight Program is equipped to perform flight test anywhere in the U.S. and can and has, under the appropriate circumstances, conducted flight tests anywhere in the world.

The R&D Flight Program continues to support the multiple programs, including, but not limited to automatic dependent surveillance broadcast, Global Positioning System (GPS), GPS Satellite Based Augmentation System, GPS Ground Based Augmentation System, Unmanned Aircraft Systems (UAS), Airborne Collision Avoidance System, aircraft surveillance, navigation, communications and safety.

The R&D and HF Laboratory (RDHFL) conducts research to acquire a better understanding of the role that a human plays in current and future aviation systems. This research environment is specifically designed to measure and assess human performance and workload. Additionally, the RDHFL investigates how new technologies should be integrated into air traffic control and Airway Facilities systems. The cost of funding HF research during the design and development phase of a project is offset by the significant reduction in cost during implementation.

The RDHFL has supported a number of legacy system and NextGen projects in many areas of research including NextGen Terminal Radar Approach Control (TRACON) (Human Factors Division), en route data communications (data communications program office), modular NextGen TRACON facilities (NextGen Facilities Program), separation management (advanced operational concepts division), tower ground surveillance (HF division), UAS, wildlife HF mitigation simulation, weather simulations, virtual reality demonstrations and many more. Funding provides for the engineering, technical, equipment, licenses and management support to sustain existing capabilities and also develop and integrate new capabilities in support of research activities.

The RDHFL will continue to provide the necessary resources to conduct robust and high fidelity HITL air traffic simulations. These resources include hardware and software as well as the expertise to properly administer them. Personnel resources include software developers, network administrators, and engineers who are responsible for administering and upgrading the research infrastructure.

Major activities and accomplishments planned in FY 2017 include:

Simulation Facilities

- Provide simulated test environments for ongoing research such as for UAS in the NAS, and commercial space vehicle research.
- Achieve a fully integrated weather and traffic simulation capability on the simulators' window visual systems and on the avionics weather displays – is manifested as turbulence in the simulator motion bases. Traffic will be displayed on all visual systems including Traffic Alert and Collision Avoidance System and traffic information service avionics and depicted on air traffic situation displays.

Flight Program's Airborne Laboratories

- Provide the appropriate flying laboratory to meet the needs of our flight test customer. The flight program will be provided appropriately with trained flight crew, maintained aircraft, and fueled aircraft; at the location required for testing for the period of time requested, in addition to any modifications to the test aircraft required by the program.

Concepts and Systems Integration – HF

- Provide the necessary resources, including equipment and personnel, to maintain the HF Laboratory in a state of readiness to conduct HF simulations.
- Enhance the HITL air traffic control simulation platform to include project specific prototypes and data collection capabilities.

Why Do We Want/Need To Fund The Program At The Requested Level?

The WJHTC Laboratory Facility program supports research facilities located at the WJHTC. These facilities consist of the TGF, the cockpit simulation facility; the Flight Program's Airborne Laboratories, and the RDHFL.

FAA will work to provide an integrated laboratory platform for the purpose of demonstrating operational procedures, defining human and system performance requirements, full-mission demonstrations integrating NextGen air and ground capabilities for pilot separation responsibility and controller efficiencies, and analysis, evaluation, and validation of R&D milestones. The funding provides for project support, engineering support, aircraft fuel costs, pilot certification and training, equipment and software hardware licenses for support tools.

Goals for FY 2017 Funding:

Simulation Facilities

- By 2018, achieve an integrated weather and traffic simulation capability in the cockpit simulation facility.
- By 2019, update the target generation facility simulator to support pluggable modules for flight dynamics, and navigation models.

Flight Program's Airborne Laboratories

- By 2017, the Flight Program will strive to maintain an aircraft availability of greater than eighty percent.

Concepts and Systems Integration – Research, Development and HF Laboratory

- By 2017, demonstrate an integrated HITL simulation capability with other technical center laboratories.
- By 2017, develop and integrate new NAS capabilities into the laboratories baseline simulation infrastructure.

What Benefits Will Be Provided To The American Public Through This Request?

Simulation Facilities

The capability developed by the simulation branch will enable the research of complex problems due to weather, UAS, and commercial space flight in a controlled laboratory environment. The fully integrated facilities will enable research from the ground and airborne elements for a complete simulation capability. The capital investment will be offset by the cost savings of performing this research in simulation rather than the use of live aircraft. Moreover, the safety of simulation will allow the study of the extremes that would not be possible in live flight conditions.

Flight Program's Airborne Laboratories

The Flight Program provides airborne flight tests in support of research, development, test and evaluation of all NAS related systems, especially Surveillance, Navigation, Communications, and Safety.

Concepts and Systems Integration – HF Laboratory

The benefit of doing proactive HF research on proposed changes to the NAS is to identify human performance issues early in the concept development phase. Human Factors related issues resolved prior to implementation result in cost savings and ensure that the agency's safety standards for air traffic control operations are met.

INSERT TAB HERE:

3D. GRANTS-IN-AID FOR AIRPORTS

GRANTS-IN-AID FOR AIRPORTS

(LIQUIDATION OF CONTRACT AUTHORIZATION)

(LIMITATION ON OBLIGATIONS)

(AIRPORT AND AIRWAY TRUST FUND)

For liquidation of obligations incurred for grants-in-aid for airport planning and development, and noise compatibility planning and programs as authorized under subchapter I of chapter 471 and subchapter I of chapter 475 of title 49, United States Code, and under other law authorizing such obligations; for procurement, installation, and commissioning of runway incursion prevention devices and systems at airports of such title; for grants authorized under section 41743 of title 49, United States Code; and for inspection activities and administration of airport safety programs, including those related to airport operating certificates under section 44706 of title 49, United States Code, $3,500,000,000, to be derived from the Airport and Airway Trust Fund and to remain available until expended: Provided, That none of the funds under this heading shall be available for the planning or execution of programs the obligations for which are in excess of $2,900,000,000 in fiscal year 2017, notwithstanding section 47117(g) of title 49, United States Code: Provided further, That none of the funds under this heading shall be available for the replacement of baggage conveyor systems, reconfiguration of terminal baggage areas, or other airport improvements that are necessary to install bulk explosive detection systems: Provided further, That notwithstanding any other provision of law, of funds limited under this heading, not more than $107,691,000 shall be obligated for administration, not less than $15,000,000 shall be available for the Airport Cooperative Research Program, and not less than $31,375,000 shall be available for Airport Technology Research.

Program and Financing
(in millions of dollars)

Identification code: 69-8106-0-7-402	FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
Obligations by program activity:			
0001 Grants-in-aid for airports	3,355	3,192	2,746
0002 Personnel and related expenses	107	107	108
0003 Airport technology research	30	31	31
0005 Small community air service	7	5	. . . .
0006 Airport Cooperative Research	15	15	15
0100 Total direct program	3,514	3,350	2,900
0799 Total direct obligations	3,514	3,350	2,900
0801 Grants-in-aid for Airports (Airport and Airway Trust Fund) Reimbursable	. . . .	1	1
0900 Total new obligations	3,514	3,351	2,901
Budgetary Resources:			
Unobligated balance:			
1000 Unobligated balance carried forward, Oct 1	144	16	16
1001 Discretionary unobligated balance brought fwd, Oct 1	144	1	. . . .
1021 Recoveries of prior year unpaid obligations	165	. . . .	. . . .
1050 Unobligated balance (total)	309	16	16
Budget Authority:			
Appropriations, discretionary:			
1101 Appropriation (special or trust fund)	3,200	3,600	3,500
1137 Appropriation applied to liquidate contract authority	-3,200	-3,600	-3,500
Contract authority, mandatory:			
1600 Contract authority (Reauthorization)	3,350	3,350	3,350
1600 Contract authority (49 USC 48112)	130	. . . .	. . . .
1620 Contract authority and/or unobligated balance of contract authority permanently reduced	-260	. . . .	. . . .
1640 Contract authority, mandatory (total)	3,220	3,350	3,350
Spending authority from offsetting coll., Discretionary:			
1700 Collected	1	1	1
1900 Budget authority (total)	3,221	3,351	3,351
1930 Total Budgetary Resources Available	3,530	3,367	3,367
Memorandum (non-add) entries:			
1941 Unexpired unobligated balance, end of year	16	16	466
Change in obligated balances:			
Unpaid obligations:			
3000 Unpaid obligations, brought forward, Oct 1	5,210	5,418	5,353
3010 Obligations incurred, unexpired accounts	3,514	3,351	2,901
3020 Outlays (gross)	-3,141	-3,416	-3,367
3040 Recoveries of prior year unpaid obligations, unexpired	-165	. . . .	. . . .
3050 Unpaid obligations, end of year	5,418	5,353	4,887
Memorandum (non-add) entries:			
3100 Obligated balance, start of year	5,210	5,418	5,353
3200 Obligated balance, end of year	5,418	5,353	4,887
Budget authority and outlays, net:			
Discretionary:			
4000 Budget authority, gross	1	1	1
Outlays, gross:			
4010 Outlays from new discretionary authority	316	446	397
4011 Outlays from discretionary balances	2,825	2,970	2,970
4020 Outlays, gross (total)	3,141	3,416	3,367
Offsets against gross budget authority and outlays:			
Offsetting collections (collected) from:			
4033 Non-federal sources	-1	-1	-1

	Mandatory:			
4090	Budget authority, gross	3,220	3,350	3,350
4180	Budget authority, net (total)	3,220	3,350	3,350
4190	Outlays, net (total)	3,140	3,415	3,366
	Memorandum (non-add) entries:			
5052	Obligated balance, SOY: Contract authority	3,744	3,764	3,514
5053	Obligated balance, EOY: Contract authority	3,764	3,514	3,364
5061	Limitation on obligations (Transportation Trust Funds)	3,513	3,350	2,900

Subchapter I of chapter 471, title 49, U.S. Code provides for airport improvement grants, including those emphasizing capacity development, safety and security needs; and chapter 475 of title 49 provides for grants for aircraft noise compatibility planning and programs. The FY 2017 budget request proposes to lower funding for the airport grants program to $2.9 billion, offset in part by eliminating passenger and cargo entitlement funding for large hub airports. To assist those airports that need the most help, the Administration proposes to focus Federal grants to support smaller commercial and general aviation airports that do not have access to additional revenue or other outside sources of capital. The Budget also proposes to allow all commercial service airports to increase the non-Federal Passenger Facility Charge, thereby giving airports greater flexibility to generate their own revenue. The combination of these changes to the AIP and PFC programs will allow airports to effectively transition to a reduced AIP level without hindering their ability to meet existing capital needs of the national airport system.

Object Classification
(in millions of dollars)

Identification code: 69-8106-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Direct obligations:			
	Personnel compensation			
11.1	Full-time permanent	65	67	68
11.3	Other than full-time permanent	1	1	1
11.5	Other personnel compensation	1	1	1
11.9	Total personnel compensation	67	69	70
12.1	Civilian personnel benefits	21	21	21
21.0	Travel and transportation of persons	2	3	3
23.2	Rental payments to others	1	1	1
25.1	Advisory and assistance services	27	25	26
25.2	Other services from non-Federal sources	2	9	10
25.3	Other services from Federal sources	22	12	12
25.4	Operation and maintenance of facilities	....	1	1
25.7	Operation and maintenance of equipment	4	5	8
26.0	Supplies and materials	1	1	1
31.0	Equipment	3	1	1
32.0	Land and Structures	....	1	1
41.0	Grants, subsidies, and contributions	3,358	3,196	2,745
94.0	Financial Transfers	6	5	....
99.0	Direct obligations	3,514	3,350	2,900
99.0	Reimbursable obligations	....	1	1
99.9	Total new obligations	3,514	3,351	2,901

Employment Summary

Identification code: 69-8106-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
1001	Direct: Civilian full-time equivalent employment	579	609	610
2001	Reimbursable: Civilian full-time equivalent employment	. . . .	1	2

GRANTS-IN-AID FOR AIRPORTS
(Legislative proposal, not subject to PAYGO)

Program and Financing
(in millions of dollars)

Identification code: 69-8106-2-7-402	FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
Budgetary Resources:			
Budget authority:			
Contract authority, mandatory:			
1600 Contract Authority (Reauthorization)	....	....	-450
1900 Budget authority (total)	....	....	-450
1930 Total budgetary resources available	....	....	-450
Memorandum (non-add) entries:			
1941 Unexpired unobligated balance, end of year	....	....	-450
Budgetary authority and outlays, net:			
Mandatory:			
4090 Budget authority, gross	....	....	-450
4180 Budget authority, net (total)	....	....	-450
4190 Outlays, net (total)	....	....	-450

EXHIBIT III-1

GRANTS-IN-AID FOR AIRPORTS
Summary by Program Activity
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

	FY 2015 ACTUAL	FY 2016 ENACTED	FY 2017 REQUEST	CHANGE FY 2016-2017
Grants-in-Aid for Airports	3,192,650	3,191,900	2,745,934	-445,966
Personnel & Related Expenses	107,100	107,100	107,691	591
Airport Technology Research	29,750	31,000	31,375	375
Airport Cooperative Research	15,000	15,000	15,000	0
Small Community Air Service	$ 5,500	$ 5,000		-5,000
TOTAL	$ 3,350,000	$ 3,350,000	$ 2,900,000	$ (450,000)
FTEs				
Direct Funded	579	609	610	1
Reimbursable, allocated, other	0	1	2	1

Program and Performance Statement

This account provides funds for planning and developing a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with due consideration for economics, environmental compatibility, local proprietary rights and safeguarding the public investment.

EXHIBIT III-1a

GRANTS-IN-AID FOR AIRPORTS
SUMMARY ANALYSIS OF CHANGE FROM FY 2016 TO FY 2017
Appropriations, Obligation Limitations, and Exempt Obligations
($000)

ITEM	Change from FY 2016 to FY 2017 $000	Change from FY 2016 to FY 2017 FTE
FY 2016 Enacted	3,350,000	609
Administrative Adjustments to Base:		-
Annualization of FY 2016 FTE	74	
Annualization of FY 2016 Pay Raise	292	
FY 2017 Pay Raise	1,079	
Less two compensable days	-686	
Working Capital Fund	8	
Non-Pay Inflation	632	
SUBTOTAL, ADJUSTMENTS TO BASE	**1,398**	**-**
PROGRAM REDUCTIONS		
Reduction to Admin, Airports Technology Research, and Airport Cooperative Research program contracts	-580	
Reduction in Airport grants	-445,966	
Reduction in transfer to Small Community Air Service	-5,000	
SUBTOTAL, PROGRAM REDUCTIONS	**-451,546**	**-**
NEW OR EXPANDED PROGRAMS:		
Requesting two additional FTP (2 half FTE's) - one position for an Airport Law Attorney/Advisor, and one position for an Airport Safety Analyst.	148	1
SUBTOTAL, NEW OR EXPANDED PROGRAMS	**148**	**1**
FY 2017 REQUEST	**2,900,000**	**610**

[This page intentionally left blank]

Executive Summary: Grants-in-Aid for Airports

What Is The Request And What Funds are Currently Spent on the Program?

For FY 2017, FAA requests $2.7 billion to fund the Grants-in-Aid for Airports program, also known as the Airport Improvement Program (AIP). The Budget focuses the traditional Federal grants to support smaller commercial and general aviation airports that do not have access to additional revenue or other outside sources of capital. At the same time, the budget proposes to increase the non-Federal Passenger Facility Charge (PFC) limit from $4.50 to $8.00 and eliminates passenger and cargo entitlement funding for large hub airports but maintains discretionary eligibility. The Budget proposal would allow all commercial service airports to increase the Passenger Facility Charge, thereby giving airports greater flexibility to generate their own capital funding sources. The grants-in-aid program enables FAA to advance important safety, capacity, efficiency, and environmental improvements at more than 514 airports supporting commercial service and more than 2,800 general aviation airports that provide critical functions at the national, regional, and local level.

What Is this Program and Why is it Necessary?

The AIP provides grants to local and state airport authorities to help ensure the safety, capacity, efficiency, and environmental stewardship of U.S. airports. Through the AIP, the agency funds a range of activities to assist in airport development, preservation of critical facilities, economic competitiveness, and environmental sustainability.

The FAA identifies public-use airports for the national transportation system and the National Plan of Integrated Airport Systems (NPIAS). These public use airports support scheduled air carrier service at more than 514 commercial service airports. In addition to the scheduled passenger and cargo service, the airport system serves a diverse range of functions at approximately 2,800 general aviation airports that support emergency medical services and disaster response, flight training, law enforcement support, agricultural activities, and business/corporate activities. The proposed AIP funding level will provide sufficient funding for virtually all high-priority safety, security, preservation, capacity, and environmental projects.

Why Do We Want/Need To Fund The Program At The Requested Level?

The principal tool FAA uses to establish the Airports Capital Improvement Program (ACIP) is the 5-year development needs identified in the NPIAS. The latest NPIAS, which was published in September 2014, identified over $33.5 billion in capital needs over the 5-year period from 2015-2019. The FAA funds capital projects that support system safety, capacity, and environmental projects and the highest priority needs in the NPIAS. The NPIAS reflects a 21 percent decrease from the preceding NPIAS report (published in September 2012 and covering the 5-year period from 2013-2017).

At the requested AIP funding level in 2017, based on current law the FAA would be able to fund capital needs that support system safety, capacity, and environmental projects. This depends upon the assumption that the formulas in the Authorization are permitted to take effect when the funding level is below $3,200,000,000. Should adjustments be made to preserve formula calculations similar to a program that is more than $3,200,000,000, it would have a detrimental impact to the amount of AIP Discretionary funds available. Subsequently, this would hinder FAA's ability to fund the highest priority needs in the NPIAS. The proposed approach is to reduce the funding level responsibly, by allowing the formula changes to take effect as currently written in law.

What Benefits will be Provided to the American Public Through This Request?

The FAA has a very high level of confidence in the effectiveness of the program. The investment of AIP funds in the national system of airports improves the safety and enhances the capacity and sustainability of the system. We work closely with airports and the state aeronautical agencies to monitor the condition of critical airfield infrastructure, and can draw direct connections between our efforts and improvements in safety, capacity, efficiency, and environmental responsibility. Through the AIP, the FAA helps ensure there is a safe and reliable system of airports to support the needs of the traveling public, as well as basic community needs such as emergency medical services and disaster response, flight training, law enforcement support, agricultural activities, and business/corporate activities.

GRANTS-IN-AID FOR AIRPORTS

Grants-in-Aid for Airports (AATF)

($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2016 Enacted	**3,191,900**	**0**	**0**
Adjustments to Base	**0**	**0**	**0**
Program Level with PFC reforms			
1. Grants-in-Aid for Airports	-445,966		
Increases/Decreases	**-445,966**	**0**	**0**
FY 2017 Request	**2,745,934**	**0**	**0**

Detailed Justification for Grants-in-Aid for Airports

What Is The Request And What Will We Get For The Funds?

FY 2017 Grants-in-Aid for Airports Budget Request ($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
Salaries and Expenses				
Program Costs	3,192,650	3,191,900	2,745,934	-445,966
Total	**$ 3,192,650**	**$ 3,191,900**	**$ 2,745,934**	**-445,966**
FTE	**0**	**0**	**0**	**0**

For FY 2017, FAA requests $2.746 billion to fund the Grants-in-Aid for Airports program (AIP). This is a decrease of $446 million from the FY 2016 level.

The Budget focuses the traditional Federal grants to support medium hub, smaller commercial service, and general aviation airports that have more limited access to additional revenue or other outside sources of capital. The proposed increase to the non-Federal Passenger Facility Charge (PFC) limit from $4.50 to $8.00 and eliminated passenger and cargo entitlement funding for large hub airports with maintained discretionary eligibility coincides with this focus. The Budget proposal allows all commercial service airports greater flexibility to generate their own funding sources. The grants-in-aid program enables FAA to advance important safety, capacity, efficiency and environmental improvements at more than 500 airports supporting commercial service and more than 2,800 general aviation airports that provide critical functions at the national, regional and local level.

The request allows the agency to continue supporting the following key initiatives:

- Reduce the risk of runway incursions by reconfiguring taxiways, perimeter service roads and other facilities;
- Preserve or enhance the safety of critical airfield and other airport infrastructure at airports nationwide;
- Continue to conduct wildlife hazard assessments and develop wildlife hazard management plans;
- Implement Safety Management Systems;
- Preserve or enhance airfield capacity and efficiency at airports nationwide;
- Mitigate the environmental impacts of aviation including noise mitigation, land use compatibility planning and air and water quality improvements;
- Support airport sustainability programs and projects; and
- Continue to support research and development in airport technology;
- Improve Runway Safety Areas (RSA) that do not conform to FAA standards, and
- Continue to support airport security improvements where applicable.

The FAA continues to award AIP grants that enable airports to conform to our RSA standards. The agency's long-term goal is to eliminate airport conditions that contribute to accidents and enhance the margin of operating safety by improving RSAs. By the start of FY 2016, we will have brought at least 98 percent of the AIP funded RSAs requiring geometric improvement and 60 percent of the F&E funded RSAs at certificated airports up to meet standards or to the extent it is practicable to meet the standard. Our goal remains to complete the F&E funded RSA improvements by the end of 2018. We are also working closely with the FAA units administering the F&E budget to relocate FAA-owned Navigational Aid Systems (NAVAIDS) from RSAs or making them frangible.

AIP will continue to support funding for capacity and efficiency enhancements throughout the system, including the full range of commercial service (primary) airports and smaller (non-primary) airports nationwide. AIP will accomplish this by providing financial and technical support to regional and metropolitan system plans, airport master plans and environmental reviews, and by directing funding toward the construction and preservation of runways, runway extensions, and airfield reconfigurations. We will also strive to increase the safety, security, and capacity of the global civil aerospace system in an environmentally sound manner.

AIP funds will continue supporting environmental mitigation and sustainability measures including noise mitigation and emission reduction through:

- Residential and school sound insulation programs;
- Property acquisition;
- Land use compatibility planning; and
- Air quality improvement projects as part of the Voluntary Airport Low Emission (VALE) and Zero Emission Vehicle (ZEV) programs.
- Water quality improvement projects including wetlands mitigation and drainage improvements such as glycol containment and treatment systems where required.

Additional environmental AIP activities include supporting sustainability initiatives including:

- Energy efficiency projects;
- Recycling, waste reduction, and reuse studies;
- Integrating sustainability into airport planning; and
- Airport environmental management systems (EMS).

In FY 2017, the Office of Airports (ARP) will continue to implement environmental streamlining provisions for capacity enhancement projects at congested airports, aviation safety projects, and aviation security projects as specified by Congress in 49 U.S.C. 47171 et seq. Commissioning of new commercial service runways is dependent on the timely completion of environmental reviews.

Funding will be used to mitigate significant aviation noise impacts through the purchase and relocation of residences and businesses, soundproofing residential homes or buildings used for educational or medical purposes, and purchase and installation of noise barriers or monitoring systems.

Security projects required by statute or regulation carry a high priority for AIP funding. Projects providing for the security of passengers and other persons in the terminal, as well as the terminal buildings themselves, are treated equally with projects to secure aircraft and the aircraft operations area. ARP will continue to work with both airport owners and Transportation Security Administration (TSA) representatives in identifying airport security requirements and discussing appropriate funding sources. The most common type of security project supported by AIP funding is the installation of access control equipment. This includes perimeter fencing, security gates, security lighting, and cameras.

Funding in FY 2017 will support the following key outputs and outcomes:

- Reconfigured taxiways, perimeter service roads and other facilities reduce the risk of runway incursions;
- Conduct wildlife hazard assessments and develop wildlife hazard management plans;
- Implement Safety Management Systems (SMS) by funding airport SMS manuals and implementation plans;
- Reconstructed and rehabilitated runways, taxiways and aprons will preserve the nation's critical aviation infrastructure and prevent the risk of foreign object debris damage to aircraft from cracked or broken pavement surfaces;
- Continue to support research and development in airport technology;
- Air quality improvement and noise mitigation projects that reduce air and noise pollution; and
- Incorporation of sustainability as a core function of airport planning.

What Is This Program and Why is it Necessary?

The Grants-in-Aid for Airports program supports the Department of Transportation's (DOT) State-of-Good Repair goal, contributing toward the outcome of an increased proportion of infrastructure assets in good condition. We also support DOT's Safety goal through our efforts to "reduce transportation-related injuries and fatalities." We additionally support DOT's Economic Competitiveness goal, with resources dedicated to two outcomes: "Maximum economic returns on transportation policies" and "A competitive air transportation system responsive to consumer needs." This program also significantly contributes toward DOT's Environmental Sustainability goal, contributing toward the reduction of transportation-related pollution and impacts on ecosystems.

State of Good Repair

The AIP provides grants to local and state airport authorities to maintain critical facilities, including runways, taxiways, aircraft parking areas (aprons) as well as many other airport facilities, systems and equipment. For example, AIP provides funds to ensure that no less than 93 percent of runways at more than 3,328 airports included in the NPIAS are maintained in excellent, good or fair condition. In FY 2014, 966 of the 984 commercial service and primary runways were maintained in excellent, good, or fair condition.

Safety

The AIP provides grants to local and state airport authorities to help ensure the safety, capacity and efficiency of U.S. airports. Through the AIP, the agency funds a range of activities to assist in airport development, preservation of critical facilities, economic competitiveness, and environmental sustainability. The AIP also supports the DOT Safety goal by providing funding for safety-related development at airports that benefit both commercial service and general aviation operations. For example, AIP provides funds to airports to make improvements that help reduce runway incursions caused by vehicle/pedestrian deviations or by pilot error due to confusing geometry; to accelerate improvements to RSAs that do not meet current standards; and other similarly high priority projects.

Economic Competitiveness

The AIP supports the DOT Economic Competitiveness through the following outcomes:

- Maximum economic returns on transportation policies and investments; and
- A competitive air transportation system responsive to consumer needs.

By funding airport infrastructure projects that provide access to the National Aviation System in order to maintain a competitive air transportation system responsive to consumer needs, AIP contributes to economic competitiveness. For example, the AIP directs funding investments toward capacity development projects at airports ranging from the largest and most congested airline hubs serving some of the largest metropolitan areas to smaller urban areas and down to airports that enable critical access for emergency medical services to isolated communities.

Environmental Sustainability

The AIP supports the DOT Environmental Sustainability goal, "Reduction in transportation-related air, water and noise pollution and impacts on ecosystems" outcome by funding projects and programs that help reduce transportation-related impacts on air quality, water quality, noise, and other impacts on ecosystems. For example, the AIP supports projects to reduce ozone emissions in Environmental Protection Agency-designated nonattainment areas; to support sustainability planning; support airport sustainability initiatives and developing sustainability best practices; implement Environmental Management Systems to ensure that FAA operations protect the environment and meet statutory and regulatory environmental requirements; and reduce the number of people exposed to significant noise. The FAA will also be taking steps to address water quality, energy efficiency, solid-waste recycling and other enhancements to environmental sustainability.

Anticipated accomplishments for the AIP grant program in 2017 include:

- Reconfigure taxiways, perimeter service roads and other facilities to reduce the risk of runway incursions;
- Fund infrastructure development projects to meet airport safety and design standards;
- Ensure that 93 percent of runways at more than 3,328 airports in the NPIAS are maintained in excellent, good or fair condition;

- Fund all approved Runway Safety Action Team (RSAT) recommendations identified in the ACIP;
- Fund capacity projects identified in the ACIP;
- Fund continued support of the Military Airport Program;
- Fund Voluntary Airport Low Emission (VALE) and Zero-Emission Vehicle (ZEV) program initiatives to improve air quality by helping airports reduce emissions from mobile and stationary ground sources; and
- Incorporate sustainability principles into airport master planning and continue funding sustainable airport master planning
- Fund eligible energy efficiency projects.
- Fund airport recycling plans as an element of airport master plans or master plan updates.

The aviation system plays a critical role in the success, strength, and growth of the U.S. economy. Approximately 610,576 active pilots, 209,034 general aviation aircraft, and 6,727 air carrier jets rely upon the U.S. airport system. The economic impacts of the air traffic control system are well-documented in FAA's report on "The Economic Impact of Civil Aviation on the US Economy," published in June 2014. It states that, in 2012, aviation accounted for 5.4% of our gross domestic product (GDP), contributed $1.5 trillion in total economic activity, and supported 11.8 million jobs.

Airport infrastructure, particularly airfield facilities, is exposed to constant heavy use and harsh environmental conditions. Runways, taxiways, and aprons are designed to withstand the heavy equipment that operates on them, but even so these facilities require frequent maintenance and rehabilitation in order to remain in good working condition. Runways and taxiways have to be kept clear of snow, ice, and ponding water that can jeopardize aircraft directional control or braking action. Chemicals and plowing, as well as freeze-thaw cycles, all take a toll on runways, taxiways, and other paved areas. The smallest bit of broken asphalt or concrete can represent a major safety hazard to aircraft accelerating on takeoff or maintaining directional control after landing.

The vast majority of public-use airports in the United States are owned and operated by municipal, county or state government agencies, or by independent public authorities. They are required to follow strict rules in establishing rates and charges for the airlines and other users in order to recover their operating and maintenance costs.

Through AIP, the agency funds a range of activities to ensure the safety and capacity of U.S. airports. The FAA identifies public-use airports that are important to the national transportation system, including those airports in the NPIAS. These public use airports support scheduled air carrier service at approximately 514 airports (known as commercial service airports). In addition to the scheduled passenger and cargo service, the airport system serves a diverse range of functions at approximately 2,800 general aviation airports. These airports support emergency medical services and disaster response, flight training, law enforcement support, agricultural activities, and business/corporate activities.

The 63 Large and Medium hub airports account for about 88 percent of all passenger enplanements. While weather is a major source of delay, substantial congestion is also the result of inadequate infrastructure capacity at several airports that have been consistently delay-prone. With the critical support of AIP, constructing new or extended runways, taxiways, and airfield reconfiguration continues to be an important part of efforts to improve the operational efficiency of the NAS. Since FY 2000, 16 new runways, 4 runway extensions, and 2 airfield reconfigurations have opened allowing more than 2 million additional annual operations.

AIP supports vital technical and financial assistance for planning, environmental analysis, and construction/rehabilitation of runways, taxiways, and aprons as well as other measures to expand and make more efficient use of airports. The AIP funding plan will reflect a special emphasis to increase capacity and improve the airport arrival efficiency rate. AIP funding of the following airport projects contributes to these projects:

- Construct, rehabilitate or overlay existing runways, taxiways, and aprons;
- Extend runways, taxiways, and aprons;
- Construct/improve terminal buildings;
- Acquire and install visual approach aids;

- Acquire and install Instrument Landing Systems (ILS);
- Acquire and install weather-reporting equipment;
- Bring pavement and other facilities up to design standards; and
- Construct new airports/heliports.

Why Do We Want/Need To Fund The Program At The Requested Level?

Every other year, FAA is required to develop a five-year prospective analysis of capital needs and submit it to Congress as part of the NPIAS. The capital projects included in the NPIAS consistently exceed the annual available funding for the AIP. Projects are routinely broken into smaller phases or deferred to a future year until funding can be identified. The latest NPIAS, published in September 2014, identified over $33.5 billion in estimated capital needs over the 5-year period from 2015-2019.

At the requested level of AIP funding, and assuming the existing statutory provisions are allowed to function as currently written in the law, the FAA would be able to fund capital needs that support system safety, capacity, environmental projects, and the highest priority needs in the NPIAS. Should this not occur, the primary impact would be on AIP Discretionary funds—the funding category over which FAA has the greatest degree of control to address the highest priority system needs. Any reduction would impact FAA's ability to fund the highest priority needs in the NPIAS.

What Benefits will be Provided to the American Public Through This Request?

The FAA works closely with commercial service airports and with state aeronautical agencies to monitor the physical condition of airport infrastructure, particularly the critical airfield facilities. This gives FAA real-time information about capital funding needs and priorities, the effectiveness of funded projects, and the utilization of the airports. One of the core performance objectives of AIP is to maintain at least 93 percent of the runways at NPIAS airports in good, fair or excellent condition. The FAA's funding decisions consider a number of factors including the physical condition of airport facilities as well as historical, current and projected activity levels. The FAA also reports annually to Congress on how the funds have been used and the benefits of those investments in terms of increased safety, capacity, efficiency, and environmental compatibility.

The investment of AIP funds in the NAS has direct benefits, improving the safety and capacity of the system. The AIP program also assists airports to become more environmentally friendly and reduces the impact of airport activities on its communities.

<u>Safety</u>
We have several metrics that show the AIP investment is improving or maintaining safety. For example, we have a target to maintain 93 percent of the runway pavement in excellent, good, or fair condition for the paved runways in the NPIAS through 2016. Periodic maintenance of runways, particularly resurfacing, has proven a cost effective way to delay the need for major runway rehabilitation. The FAA funds a broad range of capital infrastructure development at most NPIAS airports; however, airports are generally responsible for funding periodic and ongoing maintenance. More significant rehabilitation, resurfacing or reconstruction projects may be funded through a variety of funding sources, including AIP grants, PFC revenues, airport revenues and/or other funding sources. Deferred or delayed maintenance creates an increased risk of damage to aircraft and is a safety concern for the travelling public, increasing both the scope and cost of eventual rehabilitation or reconstruction.

The installation of the enhanced taxiway centerline marking, the use of end-around taxiways, and improvements in surface geometry all are addressing the need to maintain a focus on reducing runway incursions. The investment in improving RSAs and installing Engineered Materials Arresting Systems (EMAS) beds has also shown to be effective in safely stopping aircraft when they overrun the runway. EMAS installations have already enabled nine successful overrun arrestments with minimal or no damage to the aircraft, and no injuries to over 243 total occupants. The latest arrestment came at Palm Beach International, Florida in October 2013 when an overrunning Cessna Citation was safely stopped.

<u>Economic Competitiveness</u>

Since FY 2000, 25 airfield projects have opened at 21 busy hub airports . These include 16 new runways, 3 taxiways, 4 runway extensions, 2 airfield reconfigurations. The projects have provided these airports with the potential to accommodate more than 2 million additional annual operations and decrease average delay per operation by about 5 minutes.

Environmental Sustainability

AIP funds have assisted airports to become more environmentally friendly. AIP funds assist airport owners to improve land use compatibility near airports through the acquisition of non-compatible residences and sound insulation of residences, schools, and hospitals. From 2005 through 2013, approximately 136,000 people have benefited by their relocation from a noise impacted area or through sound attenuation programs designed to reduce the noise exposure on residences, schools, or hospitals.

The VALE Program addresses air quality by helping airports reduce emissions from all mobile and stationary ground sources. The FAA has invested $173 million in VALE clean airport technology, funding 86 VALE projects through the AIP program from 2005 through 2015. In 2016, FAA expects to fund 8-10 additional VALE projects totaling approximately $20 million. VALE initiatives will reduce ozone emissions by approximately 800 tons per year, which is equivalent to removing over 44,000 cars and trucks from the road annually. In the long run, the ZEV program will provide air quality benefits by providing funds for airports to purchase zero emission vehicles.

Explanation of Funding Changes for Grants-in-Aid for Airports

	Dollars ($000)	FTE
Grants-in-aid for Airports (Net change from FY 2016 Enacted)	**-445,966**	**0**
Overview: For FY 2017, the Associate Administrator for Airports requests $2.7 billion to meet the mission of planning and developing a safe and efficient national airport system. This represents a decrease of $446 million from the FY 2016 enacted budget.		
Discretionary Adjustments		
Grants-in-Aid for Airports The $2.7 billion requested for AIP will enable FAA to meet all national priorities for safety, security, capacity, and environmental mitigation across all size airports. The Budget focuses the traditional Federal grants to support Medium hub, smaller commercial service and general aviation airports that have more limited access to additional revenue or other outside sources of capital. At the same time, the budget continues to support increased Passenger Facility Charge (PFC) limit from $4.50 to $8.00 and eliminated entitlement funding for large hub airports with limited discretionary eligibility. Thereby, the Budget envisions giving the large hub airports greater flexibility to generate their own revenue and providing a PFC increase to all other commercial service airports as well.	-445,966	0

GRANTS-IN-AID FOR AIRPORTS

Personnel and Related Expenses

($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2016 Enacted	**107,100**	**583**	**583.0**
Adjustments to Base			
1. Annualization of FY 2016 pay raise	277		
2. Pay Inflation	1,022		
3. Non-pay Inflation	219		
4. Two less compensable days	-650		
5. WCF Increase	8		
Total Adjustments to Base	**876**	**0**	**0.0**
Other Adjustments			
Discretionary decrease to service contracts	-433		
Total Other Adjustments	**-433**	**0**	**0.0**
New or Expanded Programs			
Requesting two additional FTP (two .5 FTE's) - one position for an Airport Law Attorney/Advisor, and one position for an Airport Safety Analyst	148	2	1.0
Total Discretionary Increases	**148**	**2**	**1**
FY 2017 Request	**107,691**	**585**	**584.0**

Detailed Justification for Personnel and Related Expenses

What Is The Request And What Will We Get For The Funds?

FY 2017 Personnel and Related Expenses Budget Request ($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
Salaries and Expenses	83,576	85,168	85,965	797
Program Costs	23,524	21,932	21,726	(206)
Total	**$ 107,100**	**$ 107,100**	**$ 107,691**	**$ 591**
FTE	**583**	**583**	**584**	**1**

For FY 2017, the Associate Administrator for Airports requests $107.7 million, 585 positions and 584 FTEs to cover the administrative expenses for the ARP, an increase of $591 thousand over the FY 2016 enacted level. The request allows ARP to fulfill its mission of leadership in planning and developing a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with consideration for economics, environmental compatibility, local proprietary rights, and safeguarding the public investment.

Two new positions are requested in FY 2017. These include:

Airport Law Attorney Advisor – Funding is requested for 1 position/0.5 FTE in FY 2017. The workload in the airport finance area of airport compliance such as airline/airport rates and charges disputes, airport revenue diversion issues, and airport closures and transfers has been steadily growing in size and complexity. We project that this trend will continue because of increasing financial disputes between airports and airlines. In addition, this position would support the strategic initiatives for laying the foundation for the NAS and risk based decision-making and more effective early dispute resolution of the projected increasing number of airport grant compliance complaints under 14 CFR Part 16.

Airport Safety Analyst – Funding is requested for 1 position/0.5 FTE in FY 2017. Civil Unmanned Aerial Systems (UAS) is expected to increase substantially as the technology develops. This introduces a number of safety concerns about integrating UAS into the NAS and into airports. The FAA is also developing rules to address the use of UAS. These proposed rules will require extensive coordination with all FAA organizations. This large new initiative has significantly increased the workload in ARP, as we support rulemaking, policy development, and creating internal guidance. UAS also overlaps all directorates within ARP. The ARP organization requires a senior analyst to be the ARP focal point for all FAA UAS activities. This includes representing ARP on the UAS workgroups that are working on UAS integration into the NAS and on the UAS rulemaking initiatives. It also includes coordinating and developing UAS issues with airports, Air Traffic, Aviation Safety, and airport associations. This position is expected to coordinate within all areas of the Office of Airports, as well as with senior leadership, associations, and the general public.

What Is The Program and Why is it Necessary?

ARP provides leadership in planning and developing a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with consideration for economics, environmental compatibility, local proprietary rights, and safeguarding the public investment.

This program supports DOT's State-of-Good Repair goal (maintaining the percentage of airport runways in excellent, good, or fair condition); Safety goal (Reduction in transportation related injuries and fatalities), Economic Competitiveness goal (Maximum economic returns on transportation policies and investments and Competitive air transportation system responsive to consumer needs); and Environmental Sustainability goal (Reduction in transportation-related air, water and noise pollution and impacts on ecosystems).

ARP is responsible for the regulatory oversight and inspection of certificated commercial service airports. In FY 2017, we will continue emphasizing efforts to reduce runway incursions caused by vehicle/pedestrian deviations. This will require ensuring airports maintain effective driver training programs as well as implementing approved RSAT recommendations. Another significant initiative is implementation of SMS at airports to harmonize with International Civil Aviation Organization (ICAO) standards. Further, AIP provides priority consideration for funding safety-related development for airports that benefit both commercial service and general aviation operations.

ARP will continue to support capacity and efficiency enhancements throughout the system, including the full range of commercial service (primary) airports and smaller, non-primary airports nationwide, by providing financial and technical support to regional and metropolitan system plans, airport master plans and environmental reviews, and by directing AIP funding toward the construction and preservation of runways, runway extensions, and airfield reconfigurations. In FY 2017, ARP expects to issue approximately 2,000 new AIP grants to airport sponsors and continues to administer the AIP to ensure the timely and efficient use of federal funds. ARP would also continue to administer the Passenger Facility Charge (PFC) program, which involves a significant existing workload that we anticipate will increase even further if the proposed PFC increase is approved. We will also strive to increase the safety, security, and capacity of the global civil aerospace system in an environmentally sound manner.

Anticipated 2017 accomplishments include:

- Administer the AIP by issuing new grants and continuing to administer existing grants at airports nationwide in support of safety, capacity, efficiency and environmental objectives;
- Administer the PFC program by monitoring the consultation process, reviewing applications and amendments for projects at commercial service airports nationwide in support of safety, capacity, efficiency and environmental objectives;
- Publish up to 6 Advisory Circular (AC) updates;
- Continue publishing and updating guidance on environmental sustainability initiatives;
- Continue reconfiguring taxiways to reduce runway incursions;
- Continue to fund RSA Improvements;
- Continue implementation of Airport SMS;
- Continue to support airports in conducting Wildlife Hazard Assessments and Wildlife Management Plans;
- Develop plans for improving airports with nonstandard geometry such as taxiway separation;
- Limit serious Runway Incursions by vehicles or pedestrians (category A and B) to 3 or less;
- Continue implementation of AGIS;
- Manage and execute Part 139 Airport Safety Certification program;
- Meet Part 16 compliance schedules;
- Assist with integration of Unmanned Arial Systems (UAS) into the NAS;
- Integrate SMS into FAA airport planning and environmental processes and guidance;
- Support the President's initiative for E-Government by participating and providing resources to the Grants.gov and DOT grants portal initiative;
- Establish and implement ARP performance target for administering AIP based on identified Best Practices and Program Review;
- Maximize the return on AIP investments by increasing the disbursement rate for AIP grants; and
- Manage and execute the Part 150 (noise compatibility) program.

ARP is responsible for all airport program matters pertaining to standards for airport design, construction, maintenance, operations, safety, and data, including ensuring adequacy of the substantive aspects of FAA rulemaking actions relating to the certification of airports. We also provide national airport planning and environmental requirements, airport grants, property transfers, Passenger Facility Charge (PFC) program administration, and ensure adequacy of the substantive aspects of FAA rulemaking actions relating to these programs. ARP ensures compliance with federal airport grant and surplus property obligations, economic regulatory oversight, and executive direction and oversight of regional activities. This office serves as the first level decision maker for adjudication of complaints filed against airports under 14 C.F.R. Part 16. Additionally, this office has oversight of strategic planning, performance and technical training for headquarters and field operations.

Why Do We Want/Need To Fund The Program At The Requested Level?

The FY 2017 requested funding amount is required to continue supporting the establishment and maintenance of high safety standards for U.S. airports. High standards reduce risks and contribute directly to a reduction in fatal accidents.

From 2000 through 2008, the number of airports receiving AIP grants (as well as PFC applications and amendment approvals) significantly increased while staffing levels remained constant. Staffing for field offices remained the same throughout that period and to accommodate, field operations have relied upon airport sponsors to complete grant documentation and self-certify compliance with grant assurances. The program is carefully monitoring compliance audits, user complaints, and sponsor action which have led to corrective action in some cases.

Many airports that were built decades ago (before current safety standards were established) have confusing geometry intersections with runways or other taxiways that can lead to loss of pilot situational awareness, and result in runway incursions. Often these confusing intersections have multiple taxiways involved. There are also instances where taxiways do not have the required separation from runways, increasing the risks associated with surface operations. We analyzed confusing taxiway geometry, prioritized hotspots, and are developing cost estimates for mitigating confusing geometry. Approximately $20,500,000 of AIP funds in FY 2017 will be used to reconfigure confusing or non-standard taxiways, supported in large part by AIP grants.

The cost for the analysis was based on the workload to identify and inventory confusing and non-standard taxiways, develop databases, and analyze taxiway risk at approximately 5,000 public use airports (recognizing that AIP grants may be considered only for the 3,330 airports included in the NPIAS). Continuing contractor support will be required to develop improvement plans and schedules for all the projects, and to track and report on progress. This project will be a long term effort (ten or more years) to improve taxiways and eliminate hot spots where runway incursions occur.

What Benefits will be Provided to the American Public Through This Request?

ARP has established a number of measures to monitor and optimize performance and efficiency. For example, we track the labor cost to administer the AIP and PFC programs. We make extensive use of customized labor reporting codes in order to track how much time we spend on each of our technical programs and administrative responsibilities. Then we combine that labor data with other direct and indirect costs compared against key output measures in order to analyze our organizational efficiency. We periodically review our progress against efficiency goals, and we review the metrics and target levels to ensure that we are continuing to evaluate our own efficiency.

In addition, ARP actively monitors the actual outcomes of our various program areas. For example, we monitor runway incursions caused by vehicle or pedestrian deviations to determine trends and root causes. Vehicle pedestrian deviations (VPDs) have remained flat the past two years, but we believe this continued focus on VPDs has contributed to preventing their numbers from rising. As another example, we can draw a direct connection between the efforts of our personnel and the condition of critical airfield infrastructure (runways and taxiways).

Explanation of Funding Changes for Personnel & Related Expenses

	Dollars ($000)	FTE
Personnel and Related Expenses (Net change from FY 2016 enacted)	**591**	**1**
Overview: For FY 2017, the Associate Administrator for Airports requests $107.7 million to meet its mission of providing leadership in planning and developing a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with consideration for economics, environmental compatibility, local proprietary rights, and safeguarding the public investment. Covering the administrative expenses for the Office of Airports, this request represents an increase of $591 thousand from the FY 2016 enacted.		
Adjustments to Base		
Annualization of the FY 2016 Pay Raise: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.3 percent.	277	
FY 2017 Pay Inflation: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	1,022	
FY 2017 Non-Pay Inflation: This increase is for the FY 2017 percent GDP price index (year over year) of 1 percent. This is based on the most recent economic assumptions.	219	
FY 2017 Two Less Compensable Days: This decrease is for the 260 Compensable days in FY 2017 vs. 262 days in FY 2016.	-650	
Working Capital Fund: This cost adjustment is requested to support the Department of Transportation's (DOT) Working Capital Fund (WCF) profile. Adjustments are being made to best align each office's resources within their expected WCF costs.	8	
Other Changes		
One Additional FTE (2 FTP's): Requesting two additional FTP (2 half FTE's) - one position for an Airport Law Attorney/Advisor, and one position for an Airport Safety Analyst.	148	1
Reduction to Contracts: Reducing contracts to offset mandatory inflation costs and to redistribute funding to partially offset new FTE.	-433	

This page intentionally left blank.

GRANTS-IN-AID FOR AIRPORTS

Airport Technology Research

($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2016 Enacted	**31,000**	**24**	**23.5**
Adjustments to Base			
1. Annualization of FY 2016 Hiring	74		0.5
2. Annualization of FY 2016 Pay Raises	13		
3. Pay Inflation	46		
4. Non-pay Inflation	271		
5. Two Less compensatory days	-29		
Total Adjustments to Base	**375**	**0**	**0.5**
FY 2017 Request	**31,375**	**24**	**24.0**

Detailed Justification for Airport Technology Research

What Is The Request And What Will We Get For The Funds?

FY 2017 Airport Technology Research Budget Request ($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
Salaries and Expenses	3,738	3,864	3,975	111
Program Costs	26,012	27,136	27,400	264
Total	**$ 29,750**	**$ 31,000**	**$ 31,375**	**$ 375**
FTE	**23**	**23.5**	**24**	**0.5**

For FY 2017, the Associate Administrator for Airports requests $31.3 million, 24 positions and 24 FTE to fund the Airport Technology Research program. This is required to support the execution and management of a program that has 25 sub-programs and almost 100 on-going complex projects.

Public demand for a quieter and cleaner environment is putting increasing pressures on our national system of airports that undermine their ability to expand and to accommodate modernization initiatives that will enhance safety, capacity and efficiency. Aircraft noise is one of the principal environmental obstacles to optimizing airport system capacity and reducing congestion and delays at the largest and busiest airports. In addition, about 30 percent of U.S. commercial service airports are in either non-attainment areas or maintenance areas for national air quality standards. Air quality issues are increasingly a major impediment in being able to undertake significant infrastructure projects in a timely and cost-effective manner, and initiatives that help reduce operational emissions can play a key role in enabling time-sensitive capital projects.

In FY 2017 we will continue the airport environmental research program that began in FY 2016. The requested funding level of $1 million for airport environmental research will continue to support research exploring ways airports can reduce noise and emissions impacts and how standards can be updated to ensure continuity of operations by adapting to changing climate. Research projects include the continuation of creating enhanced conceptual procedure layouts for performance based navigation (PBN) operations and evaluating and improving the accuracy of noise level reduction testing by analyzing and validating fixed decibel adjustment values. In FY 2017, funding will also be directed to the solutions identified in the FY 2016 synthesis and analysis of environmental issues to engage with the community and address their concerns. Research will be continued to understand climate change impacts on existing airport infrastructure in order to accurately assess possible impacts to airports and future needs to ensure resiliency during climate change.

In FY 2017, our efforts in the area of software and database integration will be underway with the primary focus on taking all of the Airport Pavement related software programs and integrating them with each other to be used as a web based system tool. This effort includes approximately $900,000 in Airport R&D funding and will include approximately 6 programs, including: COMFAA 3.0, FAARFIELD 1.4, ProGroove, ProFAA, BAKFAA 7 ProVAL and FAA PAVEAIR. This will provide the end users a suite of FAA software tools that can be run off the internet, from one location. All Airport Pavement and Airport Safety related websites will be upgraded to current format requirements and ensure compliance with FAA standards. In addition, this effort will also include integration of all ATR developed data bases (bird strike, FOD detection, Airport Pavement management systems) into one location to ensure compliance with FAA standards, to improve the overall functionality of the data bases, and promote public access and sharing of the data.

This work will support research in the areas of airport pavement, airport marking and lighting, airport rescue and firefighting, airport planning and design, wildlife hazard mitigation, runway surface technology, aircraft noise annoyance data and sleep disturbance around airport, heated pavements, and visual guidance. The results of this research are used in updating Advisory Circulars, manuals, and technical specifications that airports rely on when expending AIP grant funds. We will also continue the program to conduct noise measurements across airport communities and concurrent public surveys and sleep disturbance studies to collect data that will be used to guide national aviation noise policy, determinations of community impacts from aircraft noise, federal land use compatibility guidelines around airports, and noise mitigation funding.

The table below summarizes the research activities funded by this request.

FY 2017 ATR Research Projects ($000)

Research Project	FY 2017 Request
Airport Planning	1,400
Airport Design	1,600
Airport Safety Data Mining	500
Airport Rescue and Fire Fighting	3,000
Wildlife Hazard Mitigation	2,500
Visual Guidance	1,500
Runway Surface Technology and Aircraft Braking	1,100
Airport Safety and Surveillance Sensors	1,500
Noise Programs	750
Airport Research Taxiway	450
National Airport Pavement Test Facility	3,000
National Airport Pavement Materials Research Center	1,200
Field Instrumentation & Testing	900
Improved Paving Materials	2,299
Pavement Design and Evaulation	1,200
NDT Technology	1,600
Software Programs	900
Extending Pavement Life	1,000
Airport Environmental Research	1,000
Subtotal--Contracts	**27,400**
FTE's/Other Misc	3,975
TOTAL	**31,375**

The FY 2017 request reflects completion of several projects, continuation of most projects, and modification in the research direction as necessary.

Funding in FY 2017 will support the following key outputs and outcomes:

- Develop the definition of overload conditions for asphalt and concrete airport pavements to replace current standards.
- Release of an improved version of COMFAA 3.0. COMFAA will have improved functionality for the analysis of pavement overload conditions.
- Additional data collection and analysis as required from mid and large hub airports for the extended pavement life program.
- Continue the refinement and the integration of a searchable airport pavement database to provide pavement engineers with a national airport pavement registry to assess how pavements constructed of specific thickness and materials and exposed to known climate and traffic loads performed over the life of the pavement.
- Continue the development of a Life Cycle Assessment (LCA) of airport pavement standards. The pavement engineer will have the capability to evaluate the cradle to grave concept for the pavement construction and maintenance costs as part of the initial pavement design.

- Continue the research of airport pavement technologies to develop a procedure to use the technologies to provide airport managers and pavement engineers a dependable method to assess the condition of the pavement from the surface to the subgrade and estimate the remaining pavement life.

- Improve runway intersection design grading criteria will be developed based on the collected longitudinal and transverse profiles to improvement the ride quality of intersecting runways.

- Complete the second round of testing for warm mix asphalts using the National Airport Pavement Materials and Research Center (NAPMRC).

- Continue the evaluation of nanoparticles in both asphalt and concrete mix designs.

- Continue to upgrade the FAA NextGen pavement materials research lab.

- Continue to evaluate green technologies for use in airfield pavements.

- Continue to develop green material specifications for use in airfield pavements.

- Continue study of emerging technologies for detecting and deterring hazardous wildlife species on or near airports.

- Continue to implement habitat modification strategies for reducing and controlling hazardous wildlife species at airports.

- Continue the airport environmental research that started in FY 2016 and that will focus on the environmental impacts of new airport pavement and airport safety related developments, and also focus on new techniques for mitigating environmental issues like noise, emissions, storm water runoff, wildlife compatibility, land use.

- Continue to conduct research on new technologies and techniques that can improve airport lighting, signs, and markings to help improve situational awareness and help reduce surface incidents, accidents, and incursions while improving capacity.

- Complete the rehabilitation of the decommissioned Taxiway C at Cape May County Airport as part of an effort to construct a one-of-a-kind test bed that will be used by ATR to evaluate numerous airport pavement and airport safety technologies.

- Continue the analysis from surveying airport communities to collect noise annoyance and sleep disturbance data.

- Continue aircraft noise annoyance and sleep disturbance data and create new dose-response curves for annoyance.

- Complete collection of data for taxiway centerline deviation for airplanes in design group I, analyze data collected for airplanes in design group II, initiate runway centerline study for design group V.

- Continue to maintain the airport safety database and update the mitigation plan for the top 5 risk areas.

- Continue research to identify low cost ground surveillance sensors that can be integrated together to provide a low cost surveillance solution to airport operators.

- Continue research into the performance of aircraft Anti-Skid Brake Systems (ASBS) on contaminated runway surfaces. Incorporate mathematical models, for processing of performance data, into B727 Aircraft Computer System. Conduct brake testing of B727 Aircraft on low friction surfaces to determine the accuracy of the mathematical model for accurately predicting stopping distances. It is anticipated that the mathematical model would ultimately be incorporated into a flying aircraft for further evaluation under actual landing conditions.

- Continue research into development of technology for effectively heating of airport runway and taxiway surfaces to prevent snow and ice accumulation. This research will include continued evaluation of alternative power sources (e.g. geothermal and solar) and methods of heat transfer. The anticipated product from this research will be development of feasible and practical alternatives for heating of airport runways and taxiways for prevention of snow and ice accumulation.

- Continue to improve aircraft rescue and firefighting tactics to combat fires involving aircraft with multiple passenger decks carrying up to 800 passengers. The product of this research will be a simulation model for predicting fuel dispersion in survivable accidents and improved firefighting agent discharge technologies. .Provide improved Aircraft Rescue and Fire Fighting (ARFF) training material for firefighting tactics for the unique characteristics of cargo aircraft fires. The data from the full-scale live fire testing of cargo aircraft will be utilized to update the existing FAA produced training DVDs and Advisory Circulars.

- Continue research to investigate state-of-the-art firefighting technologies, including high pressure and ultra-high pressure firefighting systems, to determine if they offer any operational and performance benefits over traditional fire-fighting systems.

What Is The Program and Why Is It Necessary?

Safety

The research conducted within the Airport Safety Technology Research Program directly supports FAA's Advisory Circular system, which is the principal means by which FAA communicates with the nation's airport planners, designers, operators, and equipment manufacturers. These Advisory Circulars (commonly referred to as AC's) present the standards used in the design, construction, installation, maintenance, and operation of airports and airport equipment. Additionally, the AC provides current advice on airport operational and safety topics. To date, the research conducted within the Airport Safety Technology Research Program has provided the necessary technical data to support hundreds of ACs that have been published on a wide range of technical subjects. These technical subjects include airport design standards, visual guidance aids such as lighting marking, or navigational aids, airport rescue and firefighting equipment and procedures, pavement surface conditions, wildlife mitigation and detection, airport capacity enhancements, pavement friction, and snow and ice mitigation. Some examples of the research include:

- **Foreign Object Debris** (FOD) detection research efforts will be conducted to evaluate new detection technologies, conduct a FOD characterization study, and also develop a national FOD database that can be used to track safety issues related to FOD.

- **Taxiway Deviation** research efforts will continue to better understand the ability of large aircraft to operate on airports that are only designed to handle smaller aircrafts.

- **Cargo Aircraft Interior Fire Suppression** research program will develop better tactical guidance for ARFF departments responding to interior fire emergencies on cargo aircraft. This will be accomplished through full-scale, live fire testing of various Unit Load Devices (ULDs) types and configurations in aircraft main deck and lower deck holds.

- **Advanced Composite Material Cutting** is a project to determine the effectiveness of the fire service rescue saw and a variety of available blades on traditional and new commercial aircraft skin materials. With this shift toward advanced material structures over traditional aluminum structures the tools firefighters use must be evaluated to ensure they will continue to be as effective as they are now.

- **New Airfield Lighting Infrastructure** is an effort focused on identifying an efficient and standardized airfield lighting infrastructure that supports the operation of new light sources including Light Emitting Diodes (LEDs). The new system architecture will provide potential resolutions to issues that have arisen with the implementation of the LED fixtures in the current airfield lighting infrastructure.

- **Low Cost Surface Surveillance Framework** is a research effort initiated to assess the efficacy of using localized surveillance sensors to provide real-time situational awareness of aircraft and vehicle movements in the non-movement area at airports without the use of Surface Movement Radars (SMR). This effort is focused on how these systems can be employed to enhance operational capability and safety.

- **Heated Pavements Initiative** promises that if runway surfaces can be efficiently and economically heated, the buildup of snow can be avoided, thereby eliminating the need for snow removal operations. Promising methods include geothermal heat exchangers, solar energy, nano-technology, and other innovative techniques to generate heat.

- **Airport Noise and Sleep Annoyance** research has been initiated to expand the scope of an airport noise and sleep annoyance study to either validate or update long-established standards that the FAA uses to determine the noise levels around an airport at which the public perceives that the noise from aircraft becomes a nuisance.

Wildlife habitat management research results are published in a widely distributed manual. The FAA's wildlife strike database and website provides information about wildlife habitat management and hazardous species control and serves as a repository of incidents and accidents involving wildlife strikes around the nation. The FAA continues to evaluate emerging and adapted technologies, to detect and deter birds and provide timely alerts to airport personnel regarding hazardous bird activity. Research will continue to develop improved FOD detection and management techniques. Ongoing research is also conducted in aircraft rescue and firefighting technology leading to more efficient firefighting techniques for post-crash fire protection of both the conventional aluminum constructed aircraft as well as newer advanced composite material construction.

Past research also led to the development of EMAS that have been installed at 74 runway ends at 47 airports and have safely stopped overrunning aircraft in at least 9 separate instances. There are new entrants in the EMAS area, and the FAA will continue to evaluate the new concepts and demonstrations proposed by these new entrants.

State of Good Repair

The pavement research leads to updates in pavement design and constructions standards and improvements in pavement maintenance techniques that keep airport runways and taxiways in good or better condition.

The research conducted is producing significant benefits in increased safety and potential cost savings. In support of capacity, the research results from the NAPTF and the National Airport Pavement Materials and Research Center are providing technical data needed to validate new material specifications and design standards and to assure compatibility between aircraft and airport runways worldwide. The cooperative research and development agreement and collaboration with international research organizations has led to the creation of many innovative, FAA-developed software programs that have changed the way airport pavements are designed and evaluated. Some examples include:

- **FAARFIELD**, or FAA Rigid and Flexible Iterative Elastic Layer Design, provides a simpler way for airport designers to determine the needed thickness of airport pavements. It also helps meet the standards for different airplanes, and models the thicknesses needed to handle the mix of aircraft traffic. It has the potential to save FAA and airport authorities tens of millions of dollars in airport pavement redesign efforts.

- **ProFAA**, a runway profile data analysis software program, is an innovative method that allows users to calculate roughness and simulate aircraft response to obtain a better understanding of overall pavement life and aircraft fatigue.

- **COMFAA** 3.0 computes Aircraft Classification Numbers following the internationally mandated ICAO standard. A library of common aircraft types is provided and the user can also define arbitrary gear configurations. The program is valuable for computing the Pavement Classification Number (PCN) for any mix of aircraft traffic, which an airport may currently or in the future experience.

- **BAKFAA** 2.0 is a program designed to be used with falling-weight deflectometer (FWD) equipment as part of a pavement evaluation program. BAKFAA reads the data from a variety of FWD devices and returns back calculated layer properties. The computational engine in BAKFAA is LEAF (Layered Elastic Analysis – FAA). LEAF is built into FAARFIELD, but can also be downloaded and run separately under BAKFAA. The FAA has made the Visual BasicTM source code for BAKFAA and LEAF available for programmers to run LEAF from their own applications.

- **FAA PAVEAIR** is a web-based airport pavement management system that provides users with historic current information about airport pavement construction, maintenance and management. The program offers users a planning tool capable of modeling airport pavement surface degradation due to external effects such as traffic and the environment. The program can be used with other FAA pavement applications, such as BAKFAA and COMFAA, to give users input to determine repair scheduling and strategies. It has been developed for installation and use on a stand-alone personal computer, a private network, an intranet and the internet. An implementation of the internet version of FAA PAVEAIR is hosted and supported on a server at the William J. Hughes Technical Center and is accessible from the FAA PAVEAIR website.

- **High Tire Pressure Testing (HTPT)** - NAPTF has completed three cycles of testing the effects of tire pressure on asphalt pavement in conjunction with the Airport Technology group of Boeing Commercial Airplanes. The full scale tests determined that by increasing tire pressure from 210 psi (1.45 MPa) to 245 psi (1.66 MPa) had an insignificant effect on the amount of rutting caused by trafficking at two different wheel loads on two different asphalt mixes but increasing wheel load caused a significant increase in rutting on asphalt pavements. This testing is helping to support a revised tire pressure classification for ICAO standards.

- **Design of Pavements for 40-year Life project** – The current 20-year design life for pavements is specified in FAA AC. In order to support the potential extension of pavement life, the R&D effort will modify the existing pavement design program, FAARFIELD, to accommodate the new pavement life standard. This modification will include better modeling of pavement remaining life, quantification of design reliability based on available pavement management data, estimation of fatigue life, and revised procedures for reporting PCN.

- **"Green" Pavement Technology** research will examine several technologies, such as warm mix asphalt, recycled asphalt pavement (RAP) mixes and asphalt mixes with recycled asphalt shingles as well as using recycled products in unbound base courses. The results will offer long-lasting and low-cost pavements.

Environmental Sustainability

In FY 2017, FAA will continue to analyze the effects of aircraft noise near representative U.S. airports. The results of this work will be used to guide national aviation noise policy, determinations of community noise impacts, land use guidelines around airports, and mitigation funding. The FAA will also advance guidance related to energy reduction and solid-waste recycling programs.

Environmental Research: In FY 2017 we will continue with the airport environmental research program that started in FY 2016.

Anticipated 2017 accomplishments include:

- Continue assessment of operational integration of Bird Radar system into airport operations at Boston Logan International Airport;
- Complete collection of taxiway deviation data at a design group I airport;
- Initiate runway centerline deviation study data at design group V airports;
- Continue the Runway Incursion Mitigation program to reduce the number of runway incursions at US airports;
- Initiate evaluation to determine the effectiveness of current firefighting agents on aviation biofuels;
- Initiate evaluation of compressed air foam firefighting systems including small and large scale live fire testing;
- Initiate research into new clean, replacement firefighting agents;
- Continue evaluation of proposed new lighting technologies utilizing the Airport Technology Research Taxiway;
- Complete evaluation of new electrical infrastructure for LED lighting circuits;
- Complete demonstration of baseline Low Cost Surface Surveillance Framework project;
- Complete first round of full scale tests of warm mix asphalt pavements;
- Complete the construction of Construction Cycle 9, asphalt pavement test section, at NAPTF;
- Continue improvements upon and update the pavement design procedures (FAARFIELD) based on full scale data from NAPTF and airport instrumentation sites;
- Continue conducting technical workshops of all FAA analysis design and programs (PROFAA, FAARFIELD, BAKFAA, LEDFAA and FAA PAVEAIR);
- Continue development of increasing pavement design life from 20 to 40 years for large hub airports;
- Complete third round of full-scale tests of crack mitigating layer on reflective cracking test rig at the NAPTF;
- Continue development of all FAA Pavement software to windows presentation foundation so all programs will be web-based systems;
- Development of a web-based application for FAA PAVEAIR as a suite of FAA analysis tools (PROFAA, FAARFIELD, BAKFAA, LEDFAA);
- Continue full scale testing of "green" paving materials with Accelerated Pavement Test (APT) machine;

- Complete second round of pavement tests at the National Airport Pavement Materials and Research Center (NAPMRC);
- Continue the population of the airport pavement data warehouse;
- Continue the development of the LCCA airport pavement standard and incorporate into the pavement data warehouse;
- Continue to assess airport pavement technologies to estimate remaining pavement life;
- Complete in-service testing of New LED lighting circuits at a large and a small airport;
- Continue evaluation of new linear LED lighting fixtures at a medium size airport.

Why Do We Want / Need To Fund The Program At The Requested Level?

The funds are requested to continue the ongoing research and the new research activities programmed for FY 2017. A reduction in funding would mean decreased contract support and would defer or cancel some project activities.

What Benefits will be Provided to the American Public Through This Request?

The research initiatives supported by this funding are crucial to continued maintenance and enhancement of safety for the traveling public; accessibility and competitive access for communities of every size throughout the nation; and environmental sustainability which benefits both the traveling public (by enabling airports to be well-positioned to support critical infrastructure projects) and neighboring communities (by helping airports minimize their environmental effects on surrounding areas).

The Airport Technology Research Program is reviewed every six months by FAA's Research, Engineering and Development Committee's (REDAC) Subcommittee on Airports. The Subcommittee has members from airports, aircraft manufacturers, Airline Pilots Association (ALPA), and airport associations. The Subcommittee is briefed on both ongoing research and planned research and offers recommendations to ensure the research program is responsive to the needs of FAA and the airport community.

Each research project is sponsored by an FAA headquarters engineer that prepares the research requirements, reviews the research plan, and approves the completed deliverables. The success of the research is reflected in our ability to issue updated and new program guidance. For example, based on research and evaluation we issued performance specifications for bird radars and FOD detection systems.

Explanation of Funding Changes for Airport Technology Research (ATR)

	Dollars ($000)	FTE
Airport Technology Research (Net change from FY 2016 enacted)	**375**	**.5**
Overview: For FY 2017, the Associate Administrator for Airports requests $31.3 million, 24 positions and 24 FTE to conduct research in the areas of airport pavement, airport marking and lighting, airport rescue and firefighting, airport planning and design, wildlife hazard mitigation, runway surface technology, and visual guidance. The results of this research are used in updating Advisory Circulars, manuals, and technical specifications that airports rely on when expending AIP grant funds.		
Adjustments to Base		
Annualization of FY 2016 Hiring: This increase is required to account for the remaining six months of one FTE that was hired in FY 2016. The first six months was allocated in the FY 2016 enacted budget.	74	.5
Annualization of the FY 2016 Pay Raise: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.3 percent.	13	
FY 2017 Pay Inflation: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	46	
FY 2017 Non-Pay Inflation: This increase is for the FY 2017 percent GDP price index (year over year) of 1 percent. This is based on the most recent economic assumptions.	271	
FY 2017 Two Less Compensable Days: This decrease is for the 260 Compensable days in FY 2017 vs. 262 days in FY 2016.	-29	

GRANTS-IN-AID FOR AIRPORTS

Airport Cooperative Research

($ in Thousands)

Item Title	Dollars	FTP	FTE
FY 2016 Enacted	**15,000**	**2**	**2.0**
Adjustments to Base			
1. Annualization of FY 2016 Pay Raises	3		
2. Pay Inflation	10		
3. Non-pay Inflation	141		
4. Two Less compensatory days	-7		
Total Adjustments to Base	**148**	**0**	**0.0**
Discretionary Increases/ Decreases			
1. Decrease in contracts	-148		
Total Discretionary Adjustments	**-148**	**0**	**0.0**
FY 2017 Request	**15,000**	**2**	**2.0**

Detailed Justification for Airport Cooperative Research Program

What Is The Request And What Will We Get For The Funds?

FY 2017 Airport Cooperative Research Program ($000)

Program Activity	FY 2015 Actual	FY 2016 Enacted	FY 2017 Request	Difference from FY 2016 Enacted
Salaries and Expenses	813	856	864	8
Program Costs	14,187	14,144	14,137	-8
Total	**$ 15,000**	**$ 15,000**	**$ 15,000**	**$ -**
FTE	**2**	**2**	**2**	**0**

For FY 2017, the FAA requests $15 million. Pay inflation will be absorbed within the requested level.

Funding in FY 2017 will support the following key outputs and outcomes:

- Airport Cooperative Research Program (ACRP) will select approximately 30 research topics to fund in FY 2017. Research reports will be for research studies that develop handbooks and best practices and other research that will provide information for airport owners, operators, and consultants in the areas of airport safety, airport management and financing, airport environmental and sustainability, airport planning.

What Is The Program and Why is it Necessary?

This program supports DOT's Safety goal (Reduction in transportation-related injuries and fatalities), Economic Competitiveness goal (Maximum economic returns on transportation policies and investments), and Environmental Sustainability goal (Reduction in transportation-related air, water and noise pollution and impacts on ecosystems).

ACRP was authorized by section 712 of Vision 100 – Century of Aviation Reauthorization Act. The Secretary of Transportation signed a Memorandum of Agreement among DOT, FAA, and National Academy of Sciences to implement the ACRP. The Secretary also appointed the 13 members of the ACRP Oversight Committee. The Transportation Research Board (TRB) of the National Academy administers the program. The ACRP Oversight Committee has met every six months to review progress and select additional topics to fund. Over 100 submitted topics will be reviewed at the July 2016 meeting and the most promising topics selected for subsequent contract award. The ACRP Oversight Committee selects the highest rated topics, subject to the funds available, to proceed to contract solicitation and award. The TRB appoints expert technical panels for each selected project. The technical panels convert the topics into requests for proposals to select contractors to perform the research. The panels also monitor each project to ensure it stays on track and meets project deliverables.

ACRP conducts research studies that provide information to airports in the form of handbooks and best practices among other research on issues of interest to airports in the areas of safety, airport management, airport financing, airport sustainability, and airport planning. Recent ACRP reports published included such studies as:

- Recycling Best Practices
- Guidebook for Treating Airport Storm Water Containing Deicers
- Operational and Business Continuity for Prolonged Airport Disruptions
- Guidebook on Integrating GIS in Emergency Management at Airports
- Safety Risk Management for Airports
- Improving Terminal Design
- Apron Planning and Design Guidebook

Anticipated FY 2017 accomplishments include:

- ACRP Board of Governors will meet to select projects to fund in 2016;
- TRB will appoint project technical panels for new projects selected in FY 2016; and
- ACRP will award contracts for the topics selected for funding in FY 2017.

The ACRP was established by Congress to conduct research on issues common to airports but that is not being done under other federal research programs and is not capable of being done by individual airports. The research is selected from topics submitted by airports and the aviation community. The ACRP Oversight Committee consists of airport executives, airport associations, and federal agencies that ensure the projects selected will benefit airports and will not duplicate ongoing federal research.

Why Do We Want/Need To Fund The Program At The Requested Level?

The airport community and the airport associations have been strong supporters of ACRP. Congress approved increasing ACRP in FY 2009 by $5 million to a total of $15 million with the additional money being focused on airport environmental research.

Each year ACRP receives approximately 150 suggested topics for research. Each study costs on average about $300,000. Reducing funds below the $15 million request will result in fewer studies.

What Benefit will be Provided to the American Public Through This Request?

The Airport Cooperative Research Program (ACRP) is a national resource for the airport industry, fulfilling the vital needs of airport practitioners by providing industry driven research at no cost to airports of all sizes across the country and beyond. After eight years in operation, ACRP has engaged thousands of public- and private-sector airport practitioners, academia, consultants, advocates, and students to identify the airport industry's most pressing challenges and fund research to document, mitigate, and create tools to help surmount and avoid those challenges.

We know the program has been effective since the airport community submits over 100 topics for research each year. We also track the ACRP performance by the number of research studies underway and the number of reports published. We have also improved the methods of dissemination used to make the published reports available to airports and consultants using electronic methods and web based availability, and to develop statistics on the number of requests for ACRP reports.

ACRP's broad mission is to provide resources to support applied research on a wide variety of issues faced by airport practitioners, including all levels of professional staff within the airport community, from CEOs, airport managers, and executive directors to mid-level managers and nonsupervisory technical and professional staff to trainees, students, and interns. These professionals represent airports, suppliers, public safety agencies, airlines, airport tenants, local and regional government authorities, industry associations, research and consulting firms, and many other stake holders in the airport community. Each of these practitioners has different interests and responsibilities, and each is an integral part of this cooperative research effort. ACRP offers many opportunities for airport practitioners to support and benefit from its work.

In addition to publishing reports on industry-driven research priorities, ACRP works to ensure that these products reach those who need them most. These efforts have reached several thousand stakeholders through e-videos, webinars, workshops, speaker presentations, and publications on applied results.

Explanation of Funding Changes for Airport Cooperative Research Program (ACRP)

	Dollars ($000)	FTE
Airport Cooperative Research Program (Net change from FY 2016 enacted)	**0**	
Overview: For FY 2017, we maintain the Airport Cooperative Research Program at the FY 2016 level of $15 million. There is a discretionary reduction in contracts to offset the pay and non-pay inflation.		
Adjustments to Base		
Annualization of the FY 2016 Pay Raise: This increase is required to provide for the remaining quarter of the FY 2016 government-wide pay raise of 1.3 percent. The factor used is (0.25) of 1.3 percent.	3	
FY 2017 Pay Inflation: This increase is required to provide for costs associated with base salary increases (January to September) resulting from the proposed government-wide pay raise. The factor used is (0.75) of 1.6 percent.	10	
FY 2017 Non-Pay Inflation: This increase is for the FY 2016 percent GDP price index (year over year) of 1.0 percent. This is based on the most recent economic assumptions.	141	
FY 2017 Two Less Compensable Days: This decrease is for the 260 Compensable days in FY 2017 vs. 262 days in FY 2016.	-7	
Discretionary Adjustments		
ACRP Discretionary Decrease in contracts: There is a discretionary reduction in contracts to offset inflationary costs.	-148	

AIRPORT IMPROVEMENT PROGRAM
Grants-in-Aid to Airports Planned Distribution
$000

	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request
Formula Grants			
Primary Airports	841,214	832,383	361,684
Cargo Service Airports	111,743	111,717	96,108
Alaska	21,345	21,345	10,673
States (General Aviation)	638,530	638,380	494,268
Carryover (from Formula Grants)	701,092	680,652	667,402
Subtotal, Formula Grants	2,313,924	2,284,477	1,630,135
Discretionary Grants			
Discretionary Set-Aside: Noise Compatibility	135,749	141,077	267,089
Discretionary Set-Aside: Reliever	2,560	2,660	0
Discretionary Set-Aside: Military Airport Program	15,514	16,123	30,524
C/S/S/N (Capacity/Safety/Security/Noise)	175,524	182,412	349,124
Discretionary -- AATF	58,508	60,804	116,375
Subtotal, Discretionary Grants	387,855	403,076	763,112
Small Airport Fund	490,871	504,347	352,687
Total Grants	**3,192,650**	**3,191,900**	**2,745,934**

Passenger Facility Charge (PFC) Approved Locations
As of September 30, 2015
(Whole Dollars)
PFC APPROVED LOCATIONS

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Anchorage	AK	Ted Stevens Anchorage International	ANC	M	$3.00	10/1/2000	12/1/2026	$ 116,243,173
Anchorage	AK	Ted Stevens Anchorage International	ANC	M	$3.00	10/1/2000	12/1/2026	$ 116,243,173
Fairbanks	AK	Fairbanks International	FAI	S	$4.50	4/1/2004	10/1/2026	38,413,252
Fairbanks	AK	Fairbanks International	FAI	S	$4.50	4/1/2004	10/1/2026	38,413,252
Fairbanks	AK	Fairbanks International	FAI	S	$3.00	10/1/2000	4/1/2004	**
Fairbanks	AK	Fairbanks International	FAI	S	$3.00	10/1/2000	4/1/2004	**
Juneau	AK	Juneau International	JNU	N	$4.50	8/1/2001	5/1/2017	16,760,866
Juneau	AK	Juneau International	JNU	N	$4.50	8/1/2001	5/1/2017	16,760,866
Juneau	AK	Juneau International	JNU	N	$3.00	10/1/1998	2/1/2001	**
Juneau	AK	Juneau International	JNU	N	$3.00	10/1/1998	2/1/2001	**
Ketchikan	AK	Ketchikan International	KTN	N	$4.50	8/1/2001	4/1/2018	6,644,400
Ketchikan	AK	Ketchikan International	KTN	N	$4.50	8/1/2001	4/1/2018	6,644,400
Ketchikan	AK	Ketchikan International	KTN	N	$3.00	2/1/1999	8/1/2001	**
Ketchikan	AK	Ketchikan International	KTN	N	$3.00	2/1/1999	8/1/2001	**
Sitka	AK	Sitka Rocky Gutierrez	SIT	N	$4.50	7/1/2007	9/1/2013	1,375,000
Sitka	AK	Sitka Rocky Gutierrez	SIT	N	$4.50	7/1/2007	9/1/2013	1,375,000
Birmingham	AL	Birmingham - Shuttlesworth International	BHM	S	$4.50	10/1/2008	2/1/2031	212,563,127
Birmingham	AL	Birmingham - Shuttlesworth International	BHM	S	$4.50	10/1/2008	2/1/2031	212,563,127
Birmingham	AL	Birmingham - Shuttlesworth International	BHM	S	$3.00	12/1/2003	10/1/2008	**
Birmingham	AL	Birmingham - Shuttlesworth International	BHM	S	$3.00	12/1/2003	10/1/2008	**
Birmingham	AL	Birmingham - Shuttlesworth International	BHM	S	$3.00	8/1/1997	11/1/2003	**
Birmingham	AL	Birmingham - Shuttlesworth International	BHM	S	$3.00	8/1/1997	11/1/2003	**
Dothan	AL	Dothan Regional	DHN	N	$4.50	8/1/2001	12/1/2020	5,515,948
Dothan	AL	Dothan Regional	DHN	N	$4.50	8/1/2001	12/1/2020	5,515,948
Dothan	AL	Dothan Regional	DHN	N	$3.00	2/1/1998	8/1/2001	**
Dothan	AL	Dothan Regional	DHN	N	$3.00	2/1/1998	8/1/2001	**
Huntsville	AL	Huntsville International - Carl T. Jones Field	HSV	S	$4.50	9/1/2004	8/1/2024	64,094,932
Huntsville	AL	Huntsville International - Carl T. Jones Field	HSV	S	$4.50	9/1/2004	8/1/2024	64,094,932
Huntsville	AL	Huntsville International - Carl T. Jones Field	HSV	S	$3.00	6/1/1992	9/1/2004	**
Huntsville	AL	Huntsville International - Carl T. Jones Field	HSV	S	$3.00	6/1/1992	9/1/2004	**
Mobile	AL	Mobile Regional	MOB	N	$3.00	6/1/2013	10/1/2017	15,898,655
Mobile	AL	Mobile Regional	MOB	N	$3.00	6/1/2013	10/1/2017	15,898,655
Mobile	AL	Mobile Regional	MOB	N	$3.00	3/1/2005	5/1/2013	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Mobile	AL	Mobile Regional	MOB	N	$3.00	3/1/2005	5/1/2013	**
Mobile	AL	Mobile Regional	MOB	N	$3.00	12/1/1997	7/1/2004	**
Mobile	AL	Mobile Regional	MOB	N	$3.00	12/1/1997	7/1/2004	**
Montgomery	AL	Montgomery Regional (Dannelly Field)	MGM	N	$4.50	5/1/2005	1/1/2027	28,599,933
Muscle Shoals	AL	Northwest Alabama Regional	MSL	GA	$4.50	4/1/2009	7/1/2027	583,538
Muscle Shoals	AL	Northwest Alabama Regional	MSL	GA	$4.50	4/1/2009	7/1/2027	583,538
Muscle Shoals	AL	Northwest Alabama Regional	MSL	GA	$3.00	12/1/2004	4/1/2009	**
Muscle Shoals	AL	Northwest Alabama Regional	MSL	GA	$3.00	12/1/2004	4/1/2009	**
Muscle Shoals	AL	Northwest Alabama Regional	MSL	GA	$3.00	6/1/1992	10/1/2003	**
Muscle Shoals	AL	Northwest Alabama Regional	MSL	GA	$3.00	6/1/1992	10/1/2003	**
Bentonville	AR	Northwest Arkansas Regional	XNA	S	$4.50	4/1/2001	6/1/2040	125,025,221
Bentonville	AR	Northwest Arkansas Regional	XNA	S	$4.50	4/1/2001	6/1/2040	125,025,221
Bentonville	AR	Northwest Arkansas Regional	XNA	S	$3.00	12/1/1998	4/1/2001	**
Bentonville	AR	Northwest Arkansas Regional	XNA	S	$3.00	12/1/1998	4/1/2001	**
Fayetteville	AR	Drake Field	FYV	GA	$3.00	1/1/1996	1/1/2001	2,221,887
Fayetteville	AR	Drake Field	FYV	GA	$3.00	1/1/1996	1/1/2001	2,221,887
Fort Smith	AR	Fort Smith Regional	FSM	N	$4.50	2/1/2008	12/1/2019	7,734,286
Fort Smith	AR	Fort Smith Regional	FSM	N	$4.50	2/1/2008	12/1/2019	7,734,286
Fort Smith	AR	Fort Smith Regional	FSM	N	$3.00	8/1/1994	2/1/2008	**
Fort Smith	AR	Fort Smith Regional	FSM	N	$3.00	8/1/1994	2/1/2008	**
Little Rock	AR	Bill and Hillary Clinton National/ Adams Field	LIT	S	$4.50	9/1/2001	8/1/2016	96,004,276
Little Rock	AR	Bill and Hillary Clinton National/ Adams Field	LIT	S	$4.50	9/1/2001	8/1/2016	96,004,276
Little Rock	AR	Bill and Hillary Clinton National/ Adams Field	LIT	S	$3.00	5/1/1995	9/1/2001	**
Little Rock	AR	Bill and Hillary Clinton National/ Adams Field	LIT	S	$3.00	5/1/1995	9/1/2001	**
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	4/1/2015	11/1/2017	2,173,538
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	4/1/2015	11/1/2017	2,173,538
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	7/1/2008	5/1/2014	**
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	7/1/2008	5/1/2014	**
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	9/1/2001	3/1/2005	**
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$4.50	9/1/2001	3/1/2005	**
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$3.00	2/1/1995	9/1/2001	**
Texarkana	AR	Texarkana Regional-Webb Field	TXK	N	$3.00	2/1/1995	9/1/2001	**
Pago Pago	AS	Pago Pago International	PPG	N	$4.50	6/1/2006	12/1/2020	7,563,954
Pago Pago	AS	Pago Pago International	PPG	N	$4.50	6/1/2006	12/1/2020	7,563,954
Pago Pago	AS	Pago Pago International	PPG	N	$4.50	9/1/2001	9/1/2005	**
Pago Pago	AS	Pago Pago International	PPG	N	$4.50	9/1/2001	9/1/2005	**
Pago Pago	AS	Pago Pago International	PPG	N	$3.00	7/1/1995	6/1/2000	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Pago Pago	AS	Pago Pago International	PPG	N	$3.00	7/1/1995	6/1/2000	**
Bullhead City	AZ	Laughlin/Bullhead International	IFP	N	$2.00	1/1/2014	1/1/2025	2,951,578
Bullhead City	AZ	Laughlin/Bullhead International	IFP	N	$2.00	1/1/2014	1/1/2025	2,951,578
Bullhead City	AZ	Laughlin/Bullhead International	IFP	N	$2.00	5/1/2008	10/1/2012	**
Flagstaff	AZ	Flagstaff Pulliam	FLG	N	$4.50	9/1/2012	11/1/2017	3,572,998
Flagstaff	AZ	Flagstaff Pulliam	FLG	N	$4.50	9/1/2012	11/1/2017	3,572,998
Flagstaff	AZ	Flagstaff Pulliam	FLG	N	$3.00	12/1/1992	9/1/2012	**
Flagstaff	AZ	Flagstaff Pulliam	FLG	N	$3.00	12/1/1992	9/1/2012	**
Mesa	AZ	Phoenix-Mesa Gateway	IWA/ AZA	S	$4.50	11/1/2008	1/1/2023	53,451,561
Mesa	AZ	Phoenix-Mesa Gateway	IWA/ AZA	S	$4.50	11/1/2008	1/1/2023	53,451,561
Peach Springs	AZ	Grand Canyon West	1G4/ PGS	N	$3.00	6/1/2008	1/1/2024	9,922,946
Peach Springs	AZ	Grand Canyon West	1G4/ PGS	N	$3.00	6/1/2008	1/1/2024	9,922,946
Peach Springs	AZ	Grand Canyon West	1G4/ PGS	N	$3.00	9/1/2004	9/1/2006	**
Peach Springs	AZ	Grand Canyon West	1G4/ PGS	N	$3.00	9/1/2004	9/1/2006	**
Phoenix	AZ	Phoenix Sky Harbor International	PHX	L	$4.50	7/1/2002	12/1/2035	2,929,773,835
Phoenix	AZ	Phoenix Sky Harbor International	PHX	L	$4.50	7/1/2002	12/1/2035	2,929,773,835
Phoenix	AZ	Phoenix Sky Harbor International	PHX	L	$3.00	4/1/1996	4/1/2002	**
Phoenix	AZ	Phoenix Sky Harbor International	PHX	L	$3.00	4/1/1996	4/1/2002	**
Tucson	AZ	Tucson International	TUS	S	$4.50	10/1/2006	9/1/2017	144,656,372
Tucson	AZ	Tucson International	TUS	S	$4.50	10/1/2006	9/1/2017	144,656,372
Tucson	AZ	Tucson International	TUS	S	$3.00	2/1/1998	10/1/2006	**
Tucson	AZ	Tucson International	TUS	S	$3.00	2/1/1998	10/1/2006	**
Yuma	AZ	Yuma MCAS/Yuma International	NYL/ YUM	N	$4.50	11/1/2007	6/1/2022	5,330,039
Yuma	AZ	Yuma MCAS/Yuma International	NYL/ YUM	N	$4.50	11/1/2007	6/1/2022	5,330,039
Yuma	AZ	Yuma MCAS/Yuma International	NYL/ YUM	N	$4.50	10/1/2005	4/1/2007	**
Yuma	AZ	Yuma MCAS/Yuma International	NYL/ YUM	N	$4.50	10/1/2005	4/1/2007	**
Yuma	AZ	Yuma MCAS/Yuma International	NYL/ YUM	N	$3.00	12/1/1993	10/1/2005	**
Yuma	AZ	Yuma MCAS/Yuma International	NYL/ YUM	N	$3.00	12/1/1993	10/1/2005	**
Arcata/Eurek a	CA	Arcata	ACV	N	$4.50	10/1/2011	1/1/2019	6,725,034
Arcata/Eurek a	CA	Arcata	ACV	N	$4.50	10/1/2011	1/1/2019	6,725,034
Arcata/Eurek a	CA	Arcata	ACV	N	$4.50	12/1/2005	8/1/2011	**
Arcata/Eurek a	CA	Arcata	ACV	N	$4.50	12/1/2005	8/1/2011	**
Arcata/Eurek a	CA	Arcata	ACV	N	$4.50	7/1/2005	10/1/2005	**
Arcata/Eurek a	CA	Arcata	ACV	N	$4.50	7/1/2005	10/1/2005	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Arcata/Eureka	CA	Arcata	ACV	N	$4.50	6/1/2003	3/1/2005	**
Arcata/Eureka	CA	Arcata	ACV	N	$4.50	6/1/2003	3/1/2005	**
Arcata/Eureka	CA	Arcata	ACV	N	$3.00	4/1/1998	6/1/2003	**
Arcata/Eureka	CA	Arcata	ACV	N	$3.00	4/1/1998	6/1/2003	**
Arcata/Eureka	CA	Arcata	ACV	N	$3.00	11/1/1994	11/1/1997	**
Arcata/Eureka	CA	Arcata	ACV	N	$3.00	11/1/1994	11/1/1997	**
Arcata/Eureka	CA	Arcata	ACV	N	$3.00	2/1/1993	3/1/1994	**
Arcata/Eureka	CA	Arcata	ACV	N	$3.00	2/1/1993	3/1/1994	**
Bakersfield	CA	Meadows Field	BFL	N	$4.50	5/1/2002	1/1/2021	12,089,390
Bakersfield	CA	Meadows Field	BFL	N	$4.50	5/1/2002	1/1/2021	12,089,390
Bakersfield	CA	Meadows Field	BFL	N	$3.00	6/1/1995	5/1/2002	**
Bakersfield	CA	Meadows Field	BFL	N	$3.00	6/1/1995	5/1/2002	**
Burbank	CA	Bob Hope	BUR	M	$4.50	3/1/2019	9/1/2020	239,220,396
Burbank	CA	Bob Hope	BUR	M	$4.50	3/1/2019	9/1/2020	239,220,396
Burbank	CA	Bob Hope	BUR	M	$3.00	8/1/2016	3/1/2019	**
Burbank	CA	Bob Hope	BUR	M	$3.00	8/1/2016	3/1/2019	**
Burbank	CA	Bob Hope	BUR	M	$4.50	4/1/2003	8/1/2016	**
Burbank	CA	Bob Hope	BUR	M	$4.50	4/1/2003	8/1/2016	**
Burbank	CA	Bob Hope	BUR	M	$3.00	9/1/1994	4/1/2003	**
Burbank	CA	Bob Hope	BUR	M	$3.00	9/1/1994	4/1/2003	**
Carlsbad	CA	McCellan-Palomar	CRQ/ CLD	N	$4.50	1/1/2009	2/1/2043	4,947,065
Carlsbad	CA	McCellan-Palomar	CRQ/ CLD	N	$4.50	1/1/2009	2/1/2043	4,947,065
Chico	CA	Chico Municipal	CIC	N	$4.50	12/1/2010	12/1/2014	707,290
Chico	CA	Chico Municipal	CIC	N	$4.50	12/1/2010	12/1/2014	707,290
Chico	CA	Chico Municipal	CIC	N	$3.00	11/1/2001	12/1/2009	**
Chico	CA	Chico Municipal	CIC	N	$3.00	11/1/2001	12/1/2009	**
Chico	CA	Chico Municipal	CIC	N	$3.00	6/1/1999	2/1/2001	**
Chico	CA	Chico Municipal	CIC	N	$3.00	6/1/1999	2/1/2001	**
Chico	CA	Chico Municipal	CIC	N	$3.00	12/1/1993	9/1/1998	**
Chico	CA	Chico Municipal	CIC	N	$3.00	12/1/1993	9/1/1998	**
Crescent City	CA	Jack McNamara Field	CEC	N	$4.50	12/1/2014	2/1/2021	899,295
Crescent City	CA	Jack McNamara Field	CEC	N	$4.50	12/1/2014	2/1/2021	899,295
Crescent City	CA	Jack McNamara Field	CEC	N	$4.50	6/1/2003	10/1/2014	**
Crescent City	CA	Jack McNamara Field	CEC	N	$4.50	6/1/2003	10/1/2014	**
Crescent City	CA	Jack McNamara Field	CEC	N	$3.00	1/1/2001	6/1/2003	**
Crescent City	CA	Jack McNamara Field	CEC	N	$3.00	1/1/2001	6/1/2003	**
Crescent City	CA	Jack McNamara Field	CEC	N	$3.00	9/1/1998	6/1/2000	**
Crescent City	CA	Jack McNamara Field	CEC	N	$3.00	9/1/1998	6/1/2000	**
Fresno	CA	Fresno Yosemite International	FAT	S	$4.50	12/1/2004	1/1/2020	55,936,482
Fresno	CA	Fresno Yosemite International	FAT	S	$4.50	12/1/2004	1/1/2020	55,936,482
Fresno	CA	Fresno Yosemite International	FAT	S	$3.00	12/1/1996	12/1/2004	**
Fresno	CA	Fresno Yosemite International	FAT	S	$3.00	12/1/1996	12/1/2004	**
Imperial	CA	Imperial County	IPL	CS	$4.50	4/1/2003	4/1/2030	892,781
Imperial	CA	Imperial County	IPL	CS	$4.50	4/1/2003	4/1/2030	892,781
Inyokern	CA	Inyokern	IYK	CS	$4.50	3/1/2009	3/1/2019	994,460
Inyokern	CA	Inyokern	IYK	CS	$4.50	3/1/2009	3/1/2019	994,460

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Inyokern	CA	Inyokern	IYK	CS	$4.50	9/1/2006	2/1/2009	**
Inyokern	CA	Inyokern	IYK	CS	$4.50	9/1/2006	2/1/2009	**
Inyokern	CA	Inyokern	IYK	CS	$3.00	4/1/2004	10/1/2004	**
Inyokern	CA	Inyokern	IYK	CS	$3.00	4/1/2004	10/1/2004	**
Inyokern	CA	Inyokern	IYK	CS	$3.00	3/1/1993	3/1/2003	**
Inyokern	CA	Inyokern	IYK	CS	$3.00	3/1/1993	3/1/2003	**
Long Beach	CA	Long Beach/Daugherty Field	LGB	S	$4.50	5/1/2008	4/1/2034	178,418,777
Long Beach	CA	Long Beach/Daugherty Field	LGB	S	$4.50	5/1/2008	4/1/2034	178,418,777
Long Beach	CA	Long Beach/Daugherty Field	LGB	S	$3.00	8/1/2003	5/1/2008	**
Long Beach	CA	Long Beach/Daugherty Field	LGB	S	$3.00	8/1/2003	5/1/2008	**
Los Angeles	CA	Los Angeles International	LAX	L	$4.50	10/1/2019	10/1/2023	3,095,759,661
Los Angeles	CA	Los Angeles International	LAX	L	$4.50	10/1/2019	10/1/2023	3,095,759,661
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	3/1/2019	10/1/2019	**
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	3/1/2019	10/1/2019	**
Los Angeles	CA	Los Angeles International	LAX	L	$4.50	7/1/2003	3/1/2019	**
Los Angeles	CA	Los Angeles International	LAX	L	$4.50	7/1/2003	3/1/2019	**
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	2/1/1998	7/1/2003	**
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	2/1/1998	7/1/2003	**
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	7/1/1993	1/1/1996	**
Los Angeles	CA	Los Angeles International	LAX	L	$3.00	7/1/1993	1/1/1996	**
Mammoth Lakes	CA	Mammoth Yosemite	MMH	N	$4.50	11/1/2009	5/1/2016	721,401
Mammoth Lakes	CA	Mammoth Yosemite	MMH	N	$4.50	11/1/2009	5/1/2016	721,401
Mammoth Lakes	CA	Mammoth Yosemite	MMH	N	$3.00	9/1/1995	9/1/2005	**
Mammoth Lakes	CA	Mammoth Yosemite	MMH	N	$3.00	9/1/1995	9/1/2005	**
Modesto	CA	Modesto City County-Harry Sham Field	MOD	N	$4.50	8/1/2008	12/1/2015	838,748
Modesto	CA	Modesto City County-Harry Sham Field	MOD	N	$4.50	8/1/2008	12/1/2015	838,748
Modesto	CA	Modesto City County-Harry Sham Field	MOD	N	$3.00	8/1/1994	3/1/2005	**
Modesto	CA	Modesto City County-Harry Sham Field	MOD	N	$3.00	8/1/1994	3/1/2005	**
Monterey	CA	Monterey Regional	MRY	N	$4.50	5/1/2006	1/1/2017	15,988,180
Monterey	CA	Monterey Regional	MRY	N	$4.50	5/1/2006	1/1/2017	15,988,180
Monterey	CA	Monterey Regional	MRY	N	$4.50	7/1/2003	4/1/2006	**
Monterey	CA	Monterey Regional	MRY	N	$4.50	7/1/2003	4/1/2006	**
Monterey	CA	Monterey Regional	MRY	N	$3.00	1/1/1994	7/1/2003	**
Monterey	CA	Monterey Regional	MRY	N	$3.00	1/1/1994	7/1/2003	**
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	1/1/2027	2/1/2030	968,955,946
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	1/1/2027	2/1/2030	968,955,946
Oakland	CA	Metropolitan Oakland International	OAK	M	$4.50	5/1/2003	1/1/2027	**
Oakland	CA	Metropolitan Oakland International	OAK	M	$4.50	5/1/2003	1/1/2027	**
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	9/1/1999	5/1/2003	**
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	9/1/1999	5/1/2003	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	9/1/1992	6/1/1999	**
Oakland	CA	Metropolitan Oakland International	OAK	M	$3.00	9/1/1992	6/1/1999	**
Ontario	CA	Ontario International	ONT	M	$2.00	1/1/2013	10/1/2021	242,436,929
Ontario	CA	Ontario International	ONT	M	$2.00	1/1/2013	10/1/2021	242,436,929
Ontario	CA	Ontario International	ONT	M	$4.50	11/1/2007	1/1/2013	**
Ontario	CA	Ontario International	ONT	M	$4.50	11/1/2007	1/1/2013	**
Ontario	CA	Ontario International	ONT	M	$3.00	7/1/1998	11/1/2007	**
Ontario	CA	Ontario International	ONT	M	$3.00	7/1/1998	11/1/2007	**
Ontario	CA	Ontario International	ONT	M	$3.00	7/1/1993	12/1/1996	**
Ontario	CA	Ontario International	ONT	M	$3.00	7/1/1993	12/1/1996	**
Oxnard	CA	Oxnard	OXR	GA	$4.50	1/1/2002	3/1/2011	631,115
Oxnard	CA	Oxnard	OXR	GA	$4.50	1/1/2002	3/1/2011	631,115
Palm Springs	CA	Palm Springs International	PSP	S	$4.50	1/1/2002	7/1/2029	88,415,656
Palm Springs	CA	Palm Springs International	PSP	S	$4.50	1/1/2002	7/1/2029	88,415,656
Palm Springs	CA	Palm Springs International	PSP	S	$3.00	9/1/1992	1/1/2002	**
Palm Springs	CA	Palm Springs International	PSP	S	$3.00	9/1/1992	1/1/2002	**
Redding	CA	Redding Municipal	RDD	N	$4.50	8/1/2007	2/1/2018	3,469,598
Redding	CA	Redding Municipal	RDD	N	$4.50	8/1/2007	2/1/2018	3,469,598
Redding	CA	Redding Municipal	RDD	N	$4.50	4/1/2002	4/1/2007	**
Redding	CA	Redding Municipal	RDD	N	$4.50	4/1/2002	4/1/2007	**
Redding	CA	Redding Municipal	RDD	N	$3.00	4/1/1997	4/1/2002	**
Redding	CA	Redding Municipal	RDD	N	$3.00	4/1/1997	4/1/2002	**
Sacramento	CA	Sacramento International	SMF	M	$4.50	9/1/2003	11/1/2034	953,252,732
Sacramento	CA	Sacramento International	SMF	M	$4.50	9/1/2003	11/1/2034	953,252,732
Sacramento	CA	Sacramento International	SMF	M	$3.00	2/1/2003	9/1/2003	**
Sacramento	CA	Sacramento International	SMF	M	$3.00	2/1/2003	9/1/2003	**
Sacramento	CA	Sacramento International	SMF	M	$4.50	1/1/2002	2/1/2003	**
Sacramento	CA	Sacramento International	SMF	M	$4.50	1/1/2002	2/1/2003	**
Sacramento	CA	Sacramento International	SMF	M	$3.00	4/1/1993	1/1/2002	**
Sacramento	CA	Sacramento International	SMF	M	$3.00	4/1/1993	1/1/2002	**
San Diego	CA	San Diego International	SAN	L	$4.50	8/1/2003	11/1/2037	1,505,498,165
San Diego	CA	San Diego International	SAN	L	$4.50	8/1/2003	11/1/2037	1,505,498,165
San Diego	CA	San Diego International	SAN	L	$3.00	10/1/1995	8/1/2003	**
San Diego	CA	San Diego International	SAN	L	$3.00	10/1/1995	8/1/2003	**
San Francisco	CA	San Francisco International	SFO	L	$4.50	10/1/2001	3/1/2026	1,715,963,018
San Francisco	CA	San Francisco International	SFO	L	$4.50	10/1/2001	3/1/2026	1,715,963,018
San Jose	CA	Norman Y. Mineta San Jose International	SJC	M	$4.50	4/1/2001	5/1/2029	1,067,932,847
San Jose	CA	Norman Y. Mineta San Jose International	SJC	M	$4.50	4/1/2001	5/1/2029	1,067,932,847
San Jose	CA	Norman Y. Mineta San Jose International	SJC	M	$3.00	9/1/1992	4/1/2001	**
San Jose	CA	Norman Y. Mineta San Jose International	SJC	M	$3.00	9/1/1992	4/1/2001	**
San Luis Obispo	CA	San Luis County Regional	SBP	N	$4.50	6/1/2014	2/1/2019	12,864,091
San Luis Obispo	CA	San Luis County Regional	SBP	N	$4.50	6/1/2014	2/1/2019	12,864,091
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	6/1/2011	6/1/2014	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	6/1/2011	6/1/2014	**
San Luis Obispo	CA	San Luis County Regional	SBP	N	$4.50	9/1/2002	6/1/2011	**
San Luis Obispo	CA	San Luis County Regional	SBP	N	$4.50	9/1/2002	6/1/2011	**
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	6/1/1995	9/1/2002	**
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	6/1/1995	9/1/2002	**
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	2/1/1993	2/1/1995	**
San Luis Obispo	CA	San Luis County Regional	SBP	N	$3.00	2/1/1993	2/1/1995	**
Santa Ana	CA	John Wayne Airport -Orange County	SNA	M	$4.50	7/1/2006	1/1/2022	321,351,002
Santa Ana	CA	John Wayne Airport -Orange County	SNA	M	$4.50	7/1/2006	1/1/2022	321,351,002
Santa Barbara	CA	Santa Barbara Municipal	SBA	N	$4.50	11/1/2003	7/1/2039	36,388,365
Santa Barbara	CA	Santa Barbara Municipal	SBA	N	$4.50	11/1/2003	7/1/2039	36,388,365
Santa Barbara	CA	Santa Barbara Municipal	SBA	N	$3.00	1/1/1998	11/1/2003	**
Santa Barbara	CA	Santa Barbara Municipal	SBA	N	$3.00	1/1/1998	11/1/2003	**
Santa Maria	CA	Santa Maria Public/Capt G Allan Hancock Field	SMX	N	$4.50	10/1/2007	10/1/2028	5,380,346
Santa Maria	CA	Santa Maria Public/Capt G Allan Hancock Field	SMX	N	$4.50	10/1/2007	10/1/2028	5,380,346
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$4.50	7/1/2013	4/1/2026	10,494,854
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$4.50	7/1/2013	4/1/2026	10,494,854
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$4.50	5/1/2008	4/1/2013	**
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$4.50	5/1/2008	4/1/2013	**
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$4.50	4/1/2001	4/1/2005	**
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$4.50	4/1/2001	4/1/2005	**
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$3.00	5/1/1993	4/1/2001	**
Santa Rosa	CA	Charles M. Schultz - Sonoma County	STS	N	$3.00	5/1/1993	4/1/2001	**
South Lake Tahoe	CA	Lake Tahoe	TVL	GA	$3.00	8/1/1992	3/1/2007	169,838
South Lake Tahoe	CA	Lake Tahoe	TVL	GA	$3.00	8/1/1992	3/1/2007	169,838
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	9/1/2013	6/1/2017	2,233,712
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	9/1/2013	6/1/2017	2,233,712
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	9/1/2009	9/1/2012	**
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	9/1/2009	9/1/2012	**
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	2/1/2007	8/1/2009	**
Stockton	CA	Stockton Metropolitan	SCK	N	$4.50	2/1/2007	8/1/2009	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Alamosa	CO	San Luis Valley Regional/Bergman Field	ALS	CS	$3.00	3/1/1997	5/1/2024	288,836
Alamosa	CO	San Luis Valley Regional/Bergman Field	ALS	CS	$3.00	3/1/1997	5/1/2024	288,836
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$4.50	1/1/2005	6/1/2019	15,323,529
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$4.50	1/1/2005	6/1/2019	15,323,529
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$4.50	5/1/2003	8/1/2004	**
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$4.50	5/1/2003	8/1/2004	**
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$3.00	7/1/1995	5/1/2003	**
Aspen	CO	Aspen-Pitkin County/Sardy Field	ASE	N	$3.00	7/1/1995	5/1/2003	**
Colorado Springs	CO	City of Colorado Springs Municipal	COS	S	$3.00	3/1/1993	5/1/2016	71,346,942
Colorado Springs	CO	City of Colorado Springs Municipal	COS	S	$3.00	3/1/1993	5/1/2016	71,346,942
Cortez	CO	Cortez Municipal	CEZ	CS	$4.50	3/1/2008	3/1/2016	539,150
Cortez	CO	Cortez Municipal	CEZ	CS	$4.50	3/1/2008	3/1/2016	539,150
Cortez	CO	Cortez Municipal	CEZ	CS	$3.00	11/1/1999	3/1/2008	**
Cortez	CO	Cortez Municipal	CEZ	CS	$3.00	11/1/1999	3/1/2008	**
Denver	CO	Denver International	DEN	L	$4.50	4/1/2001	2/1/2029	3,217,485,200
Denver	CO	Denver International	DEN	L	$4.50	4/1/2001	2/1/2029	3,217,485,200
Denver	CO	Denver International	DEN	L	$3.00	7/1/1992	4/1/2001	**
Denver	CO	Denver International	DEN	L	$3.00	7/1/1992	4/1/2001	**
Durango	CO	Durango-La Plata County	DRO	N	$4.50	9/1/2013	4/1/2016	16,308,728
Durango	CO	Durango-La Plata County	DRO	N	$4.50	9/1/2013	4/1/2016	16,308,728
Durango	CO	Durango-La Plata County	DRO	N	$4.50	11/1/2011	8/1/2012	**
Durango	CO	Durango-La Plata County	DRO	N	$4.50	11/1/2011	8/1/2012	**
Durango	CO	Durango-La Plata County	DRO	N	$4.50	6/1/2005	4/1/2011	**
Durango	CO	Durango-La Plata County	DRO	N	$4.50	6/1/2005	4/1/2011	**
Durango	CO	Durango-La Plata County	DRO	N	$3.00	9/1/1997	3/1/2003	**
Durango	CO	Durango-La Plata County	DRO	N	$3.00	9/1/1997	3/1/2003	**
Durango	CO	Durango-La Plata County	DRO	N	$3.00	2/1/1995	8/1/1997	**
Durango	CO	Durango-La Plata County	DRO	N	$3.00	2/1/1995	8/1/1997	**
Eagle	CO	Eagle County Regional	EGE	N	$4.50	7/1/2009	7/1/2024	22,869,216
Eagle	CO	Eagle County Regional	EGE	N	$4.50	7/1/2009	7/1/2024	22,869,216
Eagle	CO	Eagle County Regional	EGE	N	$3.00	6/1/2009	7/1/2009	**
Eagle	CO	Eagle County Regional	EGE	N	$3.00	6/1/2009	7/1/2009	**
Eagle	CO	Eagle County Regional	EGE	N	$4.50	4/1/2001	6/1/2009	**
Eagle	CO	Eagle County Regional	EGE	N	$4.50	4/1/2001	6/1/2009	**
Eagle	CO	Eagle County Regional	EGE	N	$3.00	9/1/1993	4/1/2001	**
Eagle	CO	Eagle County Regional	EGE	N	$3.00	9/1/1993	4/1/2001	**
Fort Collins-Loveland	CO	Fort Collins-Loveland Municipal	FNL	N	$4.50	2/1/2012	3/1/2015	2,223,679
Fort Collins-Loveland	CO	Fort Collins-Loveland Municipal	FNL	N	$4.50	2/1/2012	3/1/2015	2,223,679
Fort Collins-Loveland	CO	Fort Collins-Loveland Municipal	FNL	N	$4.50	8/1/2004	12/1/2011	**
Fort Collins-Loveland	CO	Fort Collins-Loveland Municipal	FNL	N	$3.00	10/1/1993	5/1/1999	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Fort Collins-Loveland	CO	Fort Collins-Loveland Municipal	FNL	N	$3.00	10/1/1993	5/1/1999	**
Grand Junction	CO	Grand Junction Regional	GJT	N	$4.50	9/1/2006	1/1/2024	20,737,334
Grand Junction	CO	Grand Junction Regional	GJT	N	$4.50	9/1/2006	1/1/2024	20,737,334
Grand Junction	CO	Grand Junction Regional	GJT	N	$3.00	4/1/1993	9/1/2006	**
Grand Junction	CO	Grand Junction Regional	GJT	N	$3.00	4/1/1993	9/1/2006	**
Gunnison	CO	Gunnison-Crested Butte Regional	GUC	N	$4.50	4/1/2001	1/1/2023	4,214,518
Gunnison	CO	Gunnison-Crested Butte Regional	GUC	N	$4.50	4/1/2001	1/1/2023	4,214,518
Gunnison	CO	Gunnison-Crested Butte Regional	GUC	N	$3.00	11/1/1993	4/1/2001	**
Gunnison	CO	Gunnison-Crested Butte Regional	GUC	N	$3.00	11/1/1993	4/1/2001	**
Hayden	CO	Yampa Valley	HDN	N	$4.50	7/1/2001	7/1/2018	9,369,120
Hayden	CO	Yampa Valley	HDN	N	$4.50	7/1/2001	7/1/2018	9,369,120
Hayden	CO	Yampa Valley	HDN	N	$3.00	11/1/1993	7/1/2001	**
Hayden	CO	Yampa Valley	HDN	N	$3.00	11/1/1993	7/1/2001	**
Montrose	CO	Montrose Regional	MTJ	N	$4.50	11/1/2010	3/1/2017	5,677,691
Montrose	CO	Montrose Regional	MTJ	N	$4.50	11/1/2010	3/1/2017	5,677,691
Montrose	CO	Montrose Regional	MTJ	N	$4.50	8/1/2006	8/1/2010	**
Montrose	CO	Montrose Regional	MTJ	N	$4.50	8/1/2006	8/1/2010	**
Montrose	CO	Montrose Regional	MTJ	N	$4.50	8/1/2003	6/1/2006	**
Montrose	CO	Montrose Regional	MTJ	N	$4.50	8/1/2003	6/1/2006	**
Montrose	CO	Montrose Regional	MTJ	N	$3.00	11/1/1993	8/1/2003	**
Montrose	CO	Montrose Regional	MTJ	N	$3.00	11/1/1993	8/1/2003	**
Pueblo	CO	Pueblo Memorial	PUB	CS	$4.50	3/1/2015	4/1/2036	1,229,111
Pueblo	CO	Pueblo Memorial	PUB	CS	$4.50	3/1/2015	4/1/2036	1,229,111
Pueblo	CO	Pueblo Memorial	PUB	CS	$3.00	11/1/1993	12/1/2014	**
Pueblo	CO	Pueblo Memorial	PUB	CS	$3.00	11/1/1993	12/1/2014	**
Steamboat Springs	CO	Steamboat Springs/Bob Adams	SBS		$3.00	4/1/1993	6/1/1997	159,576
Steamboat Springs	CO	Steamboat Springs/Bob Adams	SBS		$3.00	4/1/1993	6/1/1997	159,576
Telluride	CO	Telluride Regional	TEX	CS	$4.50	4/1/2002	1/1/2019	7,047,037
Telluride	CO	Telluride Regional	TEX	CS	$4.50	4/1/2002	1/1/2019	7,047,037
Telluride	CO	Telluride Regional	TEX	CS	$3.00	2/1/1993	4/1/2002	**
Telluride	CO	Telluride Regional	TEX	CS	$3.00	2/1/1993	4/1/2002	**
New Haven	CT	Tweed-New Haven	HVN	N	$4.50	5/1/2006	7/1/2020	4,177,603
New Haven	CT	Tweed-New Haven	HVN	N	$4.50	5/1/2006	7/1/2020	4,177,603
New Haven	CT	Tweed-New Haven	HVN	N	$4.50	10/1/2001	7/1/2005	**
New Haven	CT	Tweed-New Haven	HVN	N	$4.50	10/1/2001	7/1/2005	**
New Haven	CT	Tweed-New Haven	HVN	N	$3.00	12/1/1993	4/1/1998	**
New Haven	CT	Tweed-New Haven	HVN	N	$3.00	12/1/1993	4/1/1998	**
Windsor Locks	CT	Bradley International	BDL	M	$4.50	7/1/2020	12/1/2021	321,060,686
Windsor Locks	CT	Bradley International	BDL	M	$4.50	7/1/2020	12/1/2021	321,060,686
Windsor Locks	CT	Bradley International	BDL	M	$3.00	3/1/2020	7/1/2020	**
Windsor Locks	CT	Bradley International	BDL	M	$3.00	3/1/2020	7/1/2020	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Windsor Locks	CT	Bradley International	BDL	M	$4.50	5/1/2001	3/1/2020	**
Windsor Locks	CT	Bradley International	BDL	M	$4.50	5/1/2001	3/1/2020	**
Windsor Locks	CT	Bradley International	BDL	M	$3.00	9/1/1997	8/1/2000	**
Windsor Locks	CT	Bradley International	BDL	M	$3.00	9/1/1997	8/1/2000	**
Windsor Locks	CT	Bradley International	BDL	M	$3.00	7/1/1996	1/1/1997	**
Windsor Locks	CT	Bradley International	BDL	M	$3.00	7/1/1996	1/1/1997	**
Windsor Locks	CT	Bradley International	BDL	M	$3.00	10/1/1993	12/1/1995	**
Windsor Locks	CT	Bradley International	BDL	M	$3.00	10/1/1993	12/1/1995	**
Wilmington	DE	New Castle County	ILG	N	$4.50	7/1/2014	5/1/2017	1,810,089
Wilmington	DE	New Castle County	ILG	N	$4.50	7/1/2014	5/1/2017	1,810,089
Daytona Beach	FL	Daytona Beach International	DAB	N	$4.50	11/1/2005	3/1/2020	29,469,817
Daytona Beach	FL	Daytona Beach International	DAB	N	$4.50	11/1/2005	3/1/2020	29,469,817
Daytona Beach	FL	Daytona Beach International	DAB	N	$3.00	2/1/2002	11/1/2005	**
Daytona Beach	FL	Daytona Beach International	DAB	N	$3.00	2/1/2002	11/1/2005	**
Daytona Beach	FL	Daytona Beach International	DAB	N	$3.00	7/1/1993	8/1/2001	**
Daytona Beach	FL	Daytona Beach International	DAB	N	$3.00	7/1/1993	8/1/2001	**
Fort Lauderdale	FL	Fort Lauderdale/Hollywood International	FLL	L	$4.50	10/1/2005	8/1/2031	1,882,636,787
Fort Lauderdale	FL	Fort Lauderdale/Hollywood International	FLL	L	$4.50	10/1/2005	8/1/2031	1,882,636,787
Fort Lauderdale	FL	Fort Lauderdale/Hollywood International	FLL	L	$3.00	1/1/1995	10/1/2005	**
Fort Lauderdale	FL	Fort Lauderdale/Hollywood International	FLL	L	$3.00	1/1/1995	10/1/2005	**
Fort Myers	FL	Southwest Florida International	RSW	M	$4.50	11/1/2003	1/1/2020	321,614,452
Fort Myers	FL	Southwest Florida International	RSW	M	$3.00	11/1/1992	11/1/2003	**
Gainesville	FL	Gainesville Regional	GNV	N	$4.50	1/1/2014	9/1/2015	7,491,644
Gainesville	FL	Gainesville Regional	GNV	N	$4.50	1/1/2014	9/1/2015	7,491,644
Gainesville	FL	Gainesville Regional	GNV	N	$4.50	1/1/2003	2/1/2013	**
Gainesville	FL	Gainesville Regional	GNV	N	$4.50	1/1/2003	2/1/2013	**
Gainesville	FL	Gainesville Regional	GNV	N	$3.00	7/1/2000	2/1/2002	**
Gainesville	FL	Gainesville Regional	GNV	N	$3.00	7/1/2000	2/1/2002	**
Jacksonville	FL	Jacksonville International	JAX	M	$4.50	5/1/2003	11/1/2024	349,921,296
Jacksonville	FL	Jacksonville International	JAX	M	$4.50	5/1/2003	11/1/2024	349,921,296
Jacksonville	FL	Jacksonville International	JAX	M	$3.00	4/1/1994	5/1/2003	**
Jacksonville	FL	Jacksonville International	JAX	M	$3.00	4/1/1994	5/1/2003	**
Key West	FL	Key West International	EYW	S	$4.50	10/1/2005	7/1/2019	22,653,781
Key West	FL	Key West International	EYW	S	$4.50	10/1/2005	7/1/2019	22,653,781
Key West	FL	Key West International	EYW	S	$4.50	6/1/2003	7/1/2005	**
Key West	FL	Key West International	EYW	S	$4.50	6/1/2003	7/1/2005	**
Key West	FL	Key West International	EYW	S	$3.00	12/1/1997	6/1/2003	**
Key West	FL	Key West International	EYW	S	$3.00	12/1/1997	6/1/2003	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Key West	FL	Key West International	EYW	S	$3.00	3/1/1993	8/1/1996	**
Key West	FL	Key West International	EYW	S	$3.00	3/1/1993	8/1/1996	**
Marathon	FL	Marathon	MTH	GA	$3.00	3/1/1993	6/1/1998	390,001
Melbourne	FL	Melbourne International	MLB	N	$4.50	12/1/2009	3/1/2019	11,080,917
Melbourne	FL	Melbourne International	MLB	N	$3.00	5/1/1997	12/1/2009	**
Miami	FL	Miami International	MIA	L	$4.50	1/1/2002	10/1/2037	2,597,130,503
Miami	FL	Miami International	MIA	L	$3.00	11/1/1994	1/1/2002	**
Naples	FL	Naples Municipal	APF	GA	$3.00	2/1/2002	5/1/2004	991,336
Naples	FL	Naples Municipal	APF	GA	$3.00	2/1/2002	5/1/2004	991,336
Naples	FL	Naples Municipal	APF	GA	$3.00	2/1/1995	2/1/2001	**
Naples	FL	Naples Municipal	APF	GA	$3.00	2/1/1995	2/1/2001	**
Orlando	FL	Orlando International	MCO	L	$3.00	7/1/2034	8/1/2038	2,789,050,258
Orlando	FL	Orlando International	MCO	L	$3.00	7/1/2034	8/1/2038	2,789,050,258
Orlando	FL	Orlando International	MCO	L	$4.50	6/1/2031	7/1/2034	**
Orlando	FL	Orlando International	MCO	L	$4.50	6/1/2031	7/1/2034	**
Orlando	FL	Orlando International	MCO	L	$4.50	12/1/2025	6/1/2028	**
Orlando	FL	Orlando International	MCO	L	$4.50	12/1/2025	6/1/2028	**
Orlando	FL	Orlando International	MCO	L	$3.00	6/1/2019	12/1/2025	**
Orlando	FL	Orlando International	MCO	L	$3.00	6/1/2019	12/1/2025	**
Orlando	FL	Orlando Sanford International	SFB	S	$4.00	9/1/2011	11/1/2022	44,341,609
Orlando	FL	Orlando International	MCO	L	$4.50	4/1/2007	6/1/2019	**
Orlando	FL	Orlando International	MCO	L	$4.50	4/1/2007	6/1/2019	**
Orlando	FL	Orlando Sanford International	SFB	S	$2.00	12/1/2003	9/1/2011	**
Orlando	FL	Orlando Sanford International	SFB	S	$1.00	3/1/2001	12/1/2003	**
Orlando	FL	Orlando International	MCO	L	$3.00	2/1/1993	4/1/2007	**
Orlando	FL	Orlando International	MCO	L	$3.00	2/1/1993	4/1/2007	**
Panama City	FL	Northwest Florida Beaches International	ECP/ PFN	S	$4.50	5/1/2004	4/1/2039	48,700,720
Panama City	FL	Northwest Florida Beaches International	ECP/ PFN	S	$4.50	5/1/2004	4/1/2039	48,700,720
Panama City	FL	Panama City - Bay County International	ECP/ PFN	S	$3.00	2/1/1994	5/1/2004	**
Panama City	FL	Panama City - Bay County International	ECP/ PFN	S	$3.00	2/1/1994	5/1/2004	**
Pensacola	FL	Penscola Gulf Coast Regional	PNS	S	$4.50	12/1/2002	10/1/2031	144,489,392
Pensacola	FL	Penscola Gulf Coast Regional	PNS	S	$3.00	2/1/1993	12/1/2002	**
Sarasota	FL	Sarasota/Bradenton International	SRQ	S	$4.50	5/1/2002	2/1/2022	75,384,399
Sarasota	FL	Sarasota/Bradenton International	SRQ	S	$3.00	9/1/1992	5/1/2002	**
St Petersburg	FL	St Petersburg-Clearwater International	PIE	S	$4.50	11/1/2006	6/1/2017	21,496,813
St Petersburg	FL	St Petersburg-Clearwater International	PIE	S	$3.00	5/1/2005	11/1/2006	**
Tallahassee	FL	Tallahassee Regional	TLH	N	$4.50	10/1/2002	9/1/2022	48,020,187
Tallahassee	FL	Tallahassee Regional	TLH	N	$3.00	2/1/1993	10/1/2002	**
Tampa	FL	Tampa International	TPA	L	$3.00	10/1/2020	10/1/2035	1,298,745,444
Tampa	FL	Tampa International	TPA	L	$4.50	6/1/2002	10/1/2020	**
Tampa	FL	Tampa International	TPA	L	$3.00	10/1/1993	6/1/2002	**
Valparaiso	FL	Eglin AFB	VPS	N	$4.50	6/1/2002	4/1/2025	47,010,379
Valparaiso	FL	Eglin AFB	VPS	N	$3.00	1/1/2001	6/1/2002	**
West Palm	FL	Palm Beach International	PBI	M	$4.50	7/1/2008	8/1/2021	258,303,466

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Beach								
West Palm Beach	FL	Palm Beach International	PBI	M	$3.00	4/1/1994	7/1/2008	**
Albany	GA	Southwest Georgia Regional	ABY	N	$4.50	7/1/2008	6/1/2016	2,445,999
Albany	GA	Southwest Georgia Regional	ABY	N	$4.50	2/1/2003	2/1/2008	**
Albany	GA	Southwest Georgia Regional	ABY	N	$3.00	6/1/1999	2/1/2003	**
Albany	GA	Southwest Georgia Regional	ABY	N	$3.00	9/1/1995	6/1/1998	**
Athens	GA	Athens/Ben Epps	AHN	GA	$3.00	8/1/1997	1/1/2002	165,615
Atlanta	GA	Hartsfield-Jackson Atlanta Internatiional	ATL	L	$4.50	4/1/2001	6/1/2023	4,302,778,054
Atlanta	GA	Hartsfield-Jackson Atlanta Internatiional	ATL	L	$3.00	5/1/1997	4/1/2001	**
Augusta	GA	Augusta Regional @ Bush Field	AGS	N	$4.50	7/1/2001	11/1/2027	31,734,394
Augusta	GA	Augusta Regional @ Bush Field	AGS	N	$3.00	9/1/1999	7/1/2001	**
Brunswick	GA	Brunswick Golden Isles	BQK	N	$4.50	11/1/2003	4/1/2017	1,673,438
Brunswick	GA	Brunswick Golden Isles	BQK	N	$3.00	5/1/2001	11/1/2003	**
Columbus	GA	Columbus	CSG	N	$4.50	8/1/2012	3/1/2015	2,999,088
Columbus	GA	Columbus	CSG	N	$4.50	2/1/2010	4/1/2012	**
Columbus	GA	Columbus	CSG	N	$4.50	6/1/2003	11/1/2006	**
Columbus	GA	Columbus	CSG	N	$3.00	8/1/2000	6/1/2003	**
Columbus	GA	Columbus	CSG	N	$3.00	12/1/1993	9/1/1995	**
Macon	GA	Middle Georgia Regional	MCN	GA	$4.50	3/1/2002	5/1/2011	1,052,392
Savannah	GA	Savannah/ Hilton Head International	SAV	S	$4.50	5/1/2010	10/1/2017	71,313,791
Savannah	GA	Savannah/ Hilton Head International	SAV	S	$3.00	2/1/2010	5/1/2010	**
Savannah	GA	Savannah/ Hilton Head International	SAV	S	$4.50	4/1/2001	2/1/2010	**
Savannah	GA	Savannah/ Hilton Head International	SAV	S	$3.00	7/1/1992	4/1/2001	**
Valdosta	GA	Valdosta Regional	VLD	N	$4.50	4/1/2014	4/1/2016	1,811,907
Valdosta	GA	Valdosta Regional	VLD	N	$4.50	6/1/2011	1/1/2014	**
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	8/1/2009	7/1/2010	**
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	11/1/2006	1/1/2007	**
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	2/1/2006	5/1/2006	**
Valdosta	GA	Valdosta Regional	VLD	N	$4.50	6/1/2001	9/1/2004	**
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	4/1/2000	6/1/2001	**
Valdosta	GA	Valdosta Regional	VLD	N	$3.00	3/1/1993	10/1/1999	**
Agana	GU	Guam International	GUM	S	$4.50	11/1/2002	3/1/2025	258,370,758
Agana	GU	Guam International	GUM	S	$3.00	2/1/1993	11/1/2002	**
Hilo	HI	Hilo International	ITO	S	$4.50	2/1/2014	7/1/2026	18,332,649
Hilo	HI	Hilo International	ITO	S	$4.50	11/1/2008	1/1/2010	**
Hilo	HI	Hilo International	ITO	S	$3.00	2/1/2007	11/1/2008	**
Honolulu	HI	Honolulu International	HNL	L	$4.50	11/1/2008	7/1/2026	499,034,489
Honolulu	HI	Honolulu International	HNL	L	$3.00	10/1/2004	11/1/2008	**
Kahului	HI	Kahului	OGG	M	$4.50	11/1/2008	7/1/2026	130,614,541
Kahului	HI	Kahului	OGG	M	$3.00	10/1/2004	11/1/2008	**
Kailua/Kona	HI	Kona International @ Keohole	KOA	S	$4.50	11/1/2008	7/1/2026	41,126,552
Kailua/Kona	HI	Kona International @ Keohole	KOA	S	$3.00	10/1/2004	11/1/2008	**
Lihue	HI	Lihue	LIH	S	$4.50	11/1/2008	7/1/2026	29,885,717
Lihue	HI	Lihue	LIH	S	$3.00	10/1/2004	11/1/2008	**
Burlington	IA	Southeast Iowa Regional	BRL	CS	$4.50	9/1/2001	11/1/2028	941,789
Burlington	IA	Southeast Iowa Regional	BRL	CS	$3.00	7/1/1997	9/1/2001	**
Cedar Rapids	IA	The Eastern Iowa	CID	S	$4.50	5/1/2004	10/1/2025	60,866,105
Cedar Rapids	IA	The Eastern Iowa	CID	S	$4.50	6/1/2002	3/1/2004	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Cedar Rapids	IA	The Eastern Iowa	CID	S	$3.00	1/1/1995	6/1/2002	**
Des Moines	IA	Des Moines International	DSM	S	$4.50	8/1/2001	4/1/2022	84,132,492
Des Moines	IA	Des Moines International	DSM	S	$3.00	3/1/1994	8/1/2001	**
Dubuque	IA	Dubuque Regional	DBQ	N	$4.50	5/1/2001	2/1/2033	7,568,350
Dubuque	IA	Dubuque Regional	DBQ	N	$3.00	1/1/1993	5/1/2001	**
Fort Dodge	IA	Fort Dodge Regional	FOD	CS	$4.50	1/1/2002	4/1/2011	484,901
Fort Dodge	IA	Fort Dodge Regional	FOD	CS	$3.00	3/1/1995	9/1/2001	**
Mason City	IA	Mason City Municipal	MCW	CS	$4.50	8/1/2003	12/1/2017	1,310,907
Mason City	IA	Mason City Municipal	MCW	CS	$4.50	10/1/2001	4/1/2003	**
Mason City	IA	Mason City Municipal	MCW	CS	$3.00	2/1/1996	10/1/2001	**
Sioux City	IA	Sioux Gateway/Col. Bud Day Field	SUX	N	$4.50	11/1/2004	7/1/2021	4,510,580
Sioux City	IA	Sioux Gateway/Col. Bud Day Field	SUX	N	$4.50	3/1/2002	1/1/2004	**
Sioux City	IA	Sioux Gateway/Col. Bud Day Field	SUX	N	$3.00	2/1/1995	3/1/2002	**
Sioux City	IA	Sioux Gateway/Col. Bud Day Field	SUX	N	$3.00	6/1/1993	6/1/1994	**
Spencer	IA	Spencer Municipal	SPW	GA	$3.00	9/1/1995	3/1/2006	77,638
Waterloo	IA	Waterloo Regional	ALO	N	$4.50	7/1/2001	8/1/2020	2,787,312
Waterloo	IA	Waterloo Regional	ALO	N	$3.00	9/1/1999	7/1/2001	**
Waterloo	IA	Waterloo Regional	ALO	N	$3.00	6/1/1994	6/1/1998	**
Boise	ID	Boise Air Terminal/ Gowen Field	BOI	S	$4.50	8/1/2001	9/1/2015	109,930,856
Boise	ID	Boise Air Terminal/ Gowen Field	BOI	S	$3.00	8/1/1994	8/1/2001	**
Hailey	ID	Friedman Memorial	SUN	N	$4.50	6/1/2005	7/1/2028	6,987,776
Hailey	ID	Friedman Memorial	SUN	N	$3.00	3/1/1995	6/1/2005	**
Hailey	ID	Friedman Memorial	SUN	N	$3.00	9/1/1993	10/1/1994	**
Idaho Falls	ID	Idaho Falls Regional	IDA	N	$4.50	4/1/2001	10/1/2023	3,968,437
Idaho Falls	ID	Idaho Falls Regional	IDA	N	$3.00	10/1/2000	4/1/2001	**
Idaho Falls	ID	Idaho Falls Regional	IDA	N	$3.00	2/1/1998	10/1/2000	**
Idaho Falls	ID	Idaho Falls Regional	IDA	N	$3.00	1/1/1993	1/1/1998	**
Lewiston	ID	Lewiston-Nez Perce County	LWS	N	$4.50	5/1/2001	3/1/2019	5,230,210
Lewiston	ID	Lewiston-Nez Perce County	LWS	N	$3.00	5/1/1994	5/1/2001	**
Pocatello	ID	Pocatello Regional	PIH	N	$4.50	5/1/2001	1/1/2017	2,583,889
Pocatello	ID	Pocatello Regional	PIH	N	$3.00	9/1/1994	5/1/2001	**
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	$4.50	7/1/2007	6/1/2017	2,744,589
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	$4.50	6/1/2001	6/1/2007	**
Twin Falls	ID	Joslin Field - Magic Valley Regional	TWF	N	$3.00	11/1/1992	6/1/2001	**
Belleville	IL	Scott AFB/Midamerica	BLV	N	$3.00	11/1/2005	3/1/2047	7,000,000
Bloomington	IL	Central Illinois Regional Airport at Bloomington-Normal	BMI	N	$4.50	4/1/2001	6/1/2018	29,245,583
Bloomington	IL	Central Illinois Regional Airport at Bloomington-Normal	BMI	N	$3.00	11/1/1994	4/1/2001	**
Champaign/ Urbana	IL	University of Illinois-Willard	CMI	N	$4.50	10/1/2005	6/1/2019	7,707,325
Champaign/ Urbana	IL	University of Illinois-Willard	CMI	N	$3.00	12/1/1995	2/1/2004	**
Chicago	IL	Chicago Midway International	MDW	L	$4.50	1/1/2007	11/1/2053	2,244,468,143
Chicago	IL	Chicago O'Hare International	ORD	L	$4.50	4/1/2001	12/1/2038	6,539,483,985

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Chicago	IL	Chicago Midway International	MDW	L	$3.00	9/1/1993	1/1/2007	**
Chicago	IL	Chicago O'Hare International	ORD	L	$3.00	9/1/1993	4/1/2001	**
Decatur	IL	Decatur	DEC	CS	$4.50	6/1/2006	3/1/2019	732,628
Marion	IL	Williamson County Regional	MWA	N	$4.50	9/1/2005	3/1/2016	509,499
Moline	IL	Quad City International	MLI	S	$4.50	1/1/2002	7/1/2037	55,655,811
Moline	IL	Quad City International	MLI	S	$3.00	12/1/1994	1/1/2002	**
Peoria	IL	General Downing - Peoria International	PIA	N	$4.50	11/1/2008	9/1/2023	28,880,056
Peoria	IL	General Downing - Peoria International	PIA	N	$4.50	2/1/2007	8/1/2008	**
Peoria	IL	General Downing - Peoria International	PIA	N	$4.50	7/1/2001	2/1/2007	**
Peoria	IL	General Downing - Peoria International	PIA	N	$3.00	12/1/1994	7/1/2001	**
Quincy	IL	Quincy Regional-Baldwin Field	UIN	N	$4.50	1/1/2008	3/1/2019	902,993
Quincy	IL	Quincy Regional-Baldwin Field	UIN	N	$3.00	11/1/2005	1/1/2008	**
Quincy	IL	Quincy Regional-Baldwin Field	UIN	N	$3.00	11/1/1997	6/1/2005	**
Quincy	IL	Quincy Regional-Baldwin Field	UIN	N	$3.00	10/1/1994	7/1/1997	**
Rockford	IL	Chicago/ Rockford International	RFD	N	$4.50	6/1/2007	5/1/2021	7,452,340
Rockford	IL	Chicago/ Rockford International	RFD	N	$3.00	5/1/1997	6/1/2007	**
Rockford	IL	Chicago/ Rockford International	RFD	N	$3.00	10/1/1992	10/1/1996	**
Springfield	IL	Abraham Lincoln Capital	SPI	N	$4.50	5/1/2002	7/1/2021	8,509,863
Springfield	IL	Abraham Lincoln Capital	SPI	N	$3.00	6/1/1992	5/1/2002	**
Evansville	IN	Evansville Regional	EVV	N	$4.50	12/1/2008	11/1/2018	7,685,703
Evansville	IN	Evansville Regional	EVV	N	$4.50	8/1/2007	11/1/2008	**
Fort Wayne	IN	Fort Wayne International	FWA	N	$4.50	12/1/2005	7/1/2017	24,614,599
Fort Wayne	IN	Fort Wayne International	FWA	N	$3.00	7/1/1993	12/1/2005	**
Indianapolis	IN	Indianapolis International	IND	M	$3.00	9/1/2022	10/1/2022	524,907,605
Indianapolis	IN	Indianapolis International	IND	M	$4.50	4/1/2001	9/1/2022	**
Indianapolis	IN	Indianapolis International	IND	M	$3.00	9/1/1993	4/1/2001	**
South Bend	IN	South Bend	SBN	N	$4.50	7/1/2011	7/1/2029	40,172,802
South Bend	IN	South Bend	SBN	N	$3.00	11/1/1994	7/1/2011	**
Garden City	KS	Garden City Regional	GCK	N	$4.50	10/1/2013	10/1/2022	770,628
Hays	KS	Hays Regional	HYS	N	$4.50	4/1/2015	5/1/2018	188,142
Manhattan	KS	Manhattan Regional	MHK	N	$4.50	3/1/2002	5/1/2025	4,499,903
Manhattan	KS	Manhattan Regional	MHK	N	$3.00	10/1/1998	3/1/2002	**
Topeka	KS	Forbes Field	FOE	CS	$4.50	8/1/2007	3/1/2023	823,720
Wichita	KS	Wichita Mid-Continent	ICT	S	$4.50	11/1/2010	4/1/2046	199,528,281
Wichita	KS	Wichita Mid-Continent	ICT	S	$4.50	7/1/2007	9/1/2009	**
Wichita	KS	Wichita Mid-Continent	ICT	S	$4.50	5/1/2005	6/1/2007	**
Wichita	KS	Wichita Mid-Continent	ICT	S	$3.00	12/1/1994	5/1/2005	**
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$4.50	1/1/2013	3/1/2020	590,732,357
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$3.00	5/1/2009	1/1/2013	**
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$4.50	8/1/2003	5/1/2009	**
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$3.00	7/1/2001	8/1/2003	**
Covington	KY	Cincinnati/Northern Kentucky International	CVG	M	$3.00	6/1/1994	8/1/2000	**
Lexington	KY	Blue Grass	LEX	S	$4.50	12/1/2003	2/1/2038	100,206,268
Lexington	KY	Blue Grass	LEX	S	$3.00	8/1/2003	12/1/2003	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Lexington	KY	Blue Grass	LEX	S	$4.50	6/1/2001	6/1/2003	**
Lexington	KY	Blue Grass	LEX	S	$3.00	11/1/1993	6/1/2001	**
Louisville	KY	Louisville International - Standiford Field	SDF	S	$3.00	8/1/2015	10/1/2016	107,968,773
Louisville	KY	Louisville International - Standiford Field	SDF	S	$4.50	12/1/2010	8/1/2015	**
Louisville	KY	Louisville International - Standiford Field	SDF	S	$3.00	10/1/2008	12/1/2010	**
Louisville	KY	Louisville International - Standiford Field	SDF	S	$4.50	9/1/2008	10/1/2008	**
Louisville	KY	Louisville International - Standiford Field	SDF	S	$3.00	10/1/2006	9/1/2008	**
Louisville	KY	Louisville International - Standiford Field	SDF	S	$4.50	3/1/2006	10/1/2006	**
Louisville	KY	Louisville International - Standiford Field	SDF	S	$3.00	5/1/1997	3/1/2006	**
Paducah	KY	Barkley Regional	PAH	N	$4.50	5/1/2014	9/1/2024	2,115,419
Paducah	KY	Barkley Regional	PAH	N	$3.00	3/1/1994	5/1/2014	**
Alexandria	LA	Alexandria International	AEX	N	$4.50	1/1/2002	12/1/2022	10,284,927
Alexandria	LA	Alexandria International	AEX	N	$3.00	5/1/1999	1/1/2002	**
Baton Rouge	LA	Baton Rouge Metropolitan, Ryan Field	BTR	S	$4.50	10/1/2005	7/1/2031	81,359,236
Baton Rouge	LA	Baton Rouge Metropolitan, Ryan Field	BTR	S	$3.00	12/1/1992	10/1/2005	**
Lafayette	LA	Lafayette Regional	LFT	N	$4.50	8/1/2008	12/1/2014	12,527,078
Lafayette	LA	Lafayette Regional	LFT	N	$4.50	5/1/2005	4/1/2008	**
Lafayette	LA	Lafayette Regional	LFT	N	$4.50	4/1/2002	1/1/2005	**
Lafayette	LA	Lafayette Regional	LFT	N	$3.00	4/1/2001	4/1/2002	**
Lafayette	LA	Lafayette Regional	LFT	N	$3.00	9/1/1995	9/1/1998	**
Lake Charles	LA	Lake Charles Regional	LCH	N	$4.50	5/1/2005	5/1/2017	3,470,558
Lake Charles	LA	Lake Charles Regional	LCH	N	$3.00	3/1/2001	5/1/2005	**
Monroe	LA	Monroe Regional	MLU	N	$4.50	11/1/2008	6/1/2036	17,759,504
Monroe	LA	Monroe Regional	MLU	N	$4.50	4/1/2003	9/1/2007	**
New Orleans	LA	Louis Armstrong New Orleans International	MSY	M	$3.00	2/1/2026	9/1/2043	965,553,986
New Orleans	LA	Louis Armstrong New Orleans International	MSY	M	$4.50	4/1/2002	2/1/2026	**
New Orleans	LA	Louis Armstrong New Orleans International	MSY	M	$3.00	6/1/1993	4/1/2002	**
Shreveport	LA	Shreveport Regional	SHV	N	$4.50	2/1/2015	2/1/2020	29,841,354
Shreveport	LA	Shreveport Regional	SHV	N	$4.50	11/1/2002	9/1/2014	**
Shreveport	LA	Shreveport Regional	SHV	N	$3.00	2/1/1994	11/1/2002	**
Boston	MA	General Edward Lawrence Logan International	BOS	L	$4.50	10/1/2005	10/1/2024	1,549,173,256
Boston	MA	General Edward Lawrence Logan International	BOS	L	$3.00	11/1/1993	10/1/2005	**
Hyannis	MA	Barnstable Municipal-Boardman/Polando Field	HYA	N	$2.00	3/1/2011	10/1/2024	2,573,600
Nantucket	MA	Nantucket Memorial	ACK	N	$4.50	7/1/2014	5/1/2024	6,942,081
Worcester	MA	Worcester Regional	ORH	CS	$3.00	9/1/1999	12/1/2011	1,635,753
Worcester	MA	Worcester Regional	ORH	CS	$3.00	10/1/1992	10/1/1997	**
Baltimore	MD	Baltimore/Washington International Thurgood Marshall	BWI	L	$4.50	6/1/2002	3/1/2028	1,553,937,203
Baltimore	MD	Baltimore/Washington International Thurgood	BWI	L	$3.00	10/1/1992	6/1/2002	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
		Marshall						
Hagerstown	MD	Hagerstown Regional-Richard A Henson Field	HGR	N	$4.50	4/1/2013	4/1/2013	429,244
Hagerstown	MD	Hagerstown Regional-Richard A Henson Field	HGR	N	$4.50	1/1/2004	8/1/2007	**
Hagerstown	MD	Hagerstown Regional-Richard A Henson Field	HGR	N	$4.50	3/1/2002	1/1/2004	**
Hagerstown	MD	Hagerstown Regional-Richard A Henson Field	HGR	N	$3.00	8/1/1999	3/1/2002	**
Salisbury	MD	Salisbury-Ocean City Wicomico Regional	SBY	N	$4.50	3/1/2008	2/1/2017	3,465,277
Salisbury	MD	Salisbury-Ocean City Wicomico Regional	SBY	N	$3.00	2/1/2002	3/1/2008	**
Wiley Ford	MD	Greater Cumberland Reg	CBE	GA	$3.00	10/1/1999	6/1/2006	144,345
Wiley Ford	MD	Greater Cumberland Reg	CBE	GA	$3.00	7/1/1994	7/1/1999	**
Bangor	ME	Bangor International	BGR	N	$4.50	12/1/2010	5/1/2018	16,535,603
Bangor	ME	Bangor International	BGR	N	$3.00	6/1/1995	9/1/2010	**
Portland	ME	Portland International Jetport	PWM	S	$4.50	2/1/2009	4/1/2040	165,807,186
Portland	ME	Portland International Jetport	PWM	S	$3.00	2/1/1994	2/1/2009	**
Presque Isle	ME	Northern Maine Regional Airport at Presque Isle	PQI	N	$4.50	8/1/2010	1/1/2018	599,151
Presque Isle	ME	Northern Maine Regional Airport at Presque Isle	PQI	N	$4.50	9/1/2004	6/1/2009	**
Rockland	ME	Knox County Regional	RKD	N	$4.50	1/1/2012	7/1/2016	167,250
Alpena	MI	Alpena County Regional	APN	N	$4.50	12/1/2005	1/1/2019	476,857
Alpena	MI	Alpena County Regional	APN	N	$3.00	8/1/2001	12/1/2005	**
Detroit	MI	Detroit Metropolitan Wayne County	DTW	L	$4.50	10/1/2001	2/1/2034	3,134,966,084
Detroit	MI	Coleman A Young Municipal	DET	GA	$3.00	1/1/2000	3/1/2004	240,053
Detroit	MI	Detroit Metropolitan Wayne County	DTW	L	$3.00	1/1/1993	10/1/2001	**
Escanaba	MI	Delta County	ESC	N	$4.50	4/1/2006	1/1/2016	930,234
Escanaba	MI	Delta County	ESC	N	$4.50	3/1/2004	1/1/2006	**
Escanaba	MI	Delta County	ESC	N	$3.00	10/1/2001	3/1/2004	**
Escanaba	MI	Delta County	ESC	N	$3.00	8/1/1998	7/1/2000	**
Escanaba	MI	Delta County	ESC	N	$3.00	2/1/1993	11/1/1997	**
Flint	MI	Bishop International	FNT	S	$4.50	10/1/2001	8/1/2024	43,725,415
Flint	MI	Bishop International	FNT	S	$3.00	9/1/1993	10/1/2001	**
Grand Rapids	MI	Gerald R. Ford International	GRR	S	$4.50	11/1/2005	6/1/2023	103,977,929
Grand Rapids	MI	Gerald R. Ford International	GRR	S	$3.00	12/1/1992	11/1/2005	**
Hancock	MI	Houghton County Memorial	CMX	N	$4.50	7/1/2005	8/1/2016	1,763,814
Hancock	MI	Houghton County Memorial	CMX	N	$3.00	10/1/1999	7/1/2005	**
Hancock	MI	Houghton County Memorial	CMX	N	$3.00	7/1/1996	7/1/1999	**
Hancock	MI	Houghton County Memorial	CMX	N	$3.00	7/1/1993	3/1/1996	**
Iron Mountain Kingsford	MI	Ford	IMT	N	$3.00	9/1/1995	6/1/2004	176,029
Ironwood	MI	Gogebic-Iron County	IWD	CS	$4.50	6/1/2007	2/1/2026	219,080
Ironwood	MI	Gogebic-Iron County	IWD	CS	$3.00	8/1/1993	10/1/2006	**
Kalamazoo	MI	Kalamazoo/Battle Creek Internaitonal	AZO	N	$4.50	9/1/2008	9/1/2024	22,503,006
Kalamazoo	MI	Kalamazoo/Battle Creek Internaitonal	AZO	N	$4.50	10/1/2006	4/1/2008	**
Kalamazoo	MI	Kalamazoo/Battle Creek Internaitonal	AZO	N	$4.50	1/1/2005	8/1/2006	**
Kalamazoo	MI	Kalamazoo/Battle Creek	AZO	N	$3.00	1/1/2001	1/1/2005	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
		Internaitonal						
Kalamazoo	MI	Kalamazoo/Battle Creek Internaitonal	AZO	N	$3.00	4/1/1997	6/1/2000	**
Lansing	MI	Capital Region International	LAN	N	$4.50	7/1/2002	4/1/2028	30,496,100
Lansing	MI	Capital Region International	LAN	N	$3.00	10/1/1993	7/1/2002	**
Manistee	MI	Manistee County-Blacker	MBL	GA	$4.50	6/1/2008	11/1/2040	388,986
Marquette	MI	Sawyer International	SAW/ MQT	N	$4.50	5/1/2015	5/1/2017	4,039,472
Marquette	MI	Sawyer International	SAW/ MQT	N	$4.50	3/1/2012	3/1/2015	**
Marquette	MI	Sawyer International	SAW/ MQT	N	$4.50	8/1/2008	8/1/2011	**
Marquette	MI	Sawyer International	SAW/ MQT	N	$4.50	10/1/2006	5/1/2008	**
Marquette	MI	Sawyer International	SAW/ MQT	N	$4.50	1/1/2003	9/1/2006	**
Marquette	MI	Sawyer International	SAW/ MQT	N	$4.50	7/1/2002	1/1/2003	**
Marquette	MI	Sawyer International	SAW/ MQT	N	$3.00	4/1/1998	7/1/2002	**
Marquette	MI	Marquette County	MQT	N	$3.00	12/1/1992	12/1/1996	451,211
Muskegon	MI	Muskegon County	MKG	N	$4.50	5/1/2004	11/1/2020	5,013,088
Muskegon	MI	Muskegon County	MKG	N	$3.00	5/1/1994	5/1/2004	**
Pellston	MI	Pellston Regional Airport of Emmet County	PLN	N	$4.50	7/1/2011	7/1/2024	2,381,289
Pellston	MI	Pellston Regional Airport of Emmet County	PLN	N	$3.00	12/1/1997	7/1/2011	**
Pellston	MI	Pellston Regional Airport of Emmet County	PLN	N	$3.00	3/1/1993	9/1/1997	**
Saginaw	MI	MBS International	MBS	N	$4.50	7/1/2007	9/1/2024	14,475,397
Saginaw	MI	MBS International	MBS	N	$3.00	2/1/1997	7/1/2007	**
Sault Ste. Marie	MI	Chippewa County International	CIU	N	$4.50	11/1/2005	7/1/2020	1,050,115
Traverse City	MI	Cherry Capital	TVC	N	$4.50	2/1/2011	2/1/2016	12,965,897
Traverse City	MI	Cherry Capital	TVC	N	$4.50	10/1/2003	12/1/2010	**
Traverse City	MI	Cherry Capital	TVC	N	$4.50	1/1/2002	10/1/2003	**
Traverse City	MI	Cherry Capital	TVC	N	$3.00	1/1/1997	1/1/2002	**
Bemidji	MN	Bemidji Regional	BJI	N	$4.50	6/1/2006	2/1/2016	1,553,759
Bemidji	MN	Bemidji Regional	BJI	N	$4.50	2/1/2002	8/1/2005	**
Bemidji	MN	Bemidji Regional	BJI	N	$3.00	11/1/1996	2/1/2002	**
Brainerd	MN	Brainerd Lakes Regional	BRD	N	$4.50	7/1/2001	8/1/2033	2,147,011
Brainerd	MN	Brainerd Lakes Regional	BRD	N	$3.00	8/1/1993	7/1/2001	**
Duluth	MN	Duluth International	DLH	N	$4.50	4/1/2005	10/1/2020	12,466,783
Duluth	MN	Duluth International	DLH	N	$4.50	4/1/2002	11/1/2004	**
Duluth	MN	Duluth International	DLH	N	$3.00	10/1/1994	4/1/2002	**
Grand Rapids	MN	Grand Rapids/Itasca County	GPZ	GA	$4.50	10/1/2001	1/1/2007	151,263
Grand Rapids	MN	Grand Rapids/Itasca County	GPZ	GA	$3.00	12/1/1997	10/1/2001	**
Hibbing	MN	Range Regional	HIB	N	$4.50	7/1/2003	11/1/2017	800,036
Hibbing	MN	Range Regional	HIB	N	$3.00	6/1/1996	7/1/2003	**
International Falls	MN	Falls International	INL	N	$4.50	11/1/2005	3/1/2033	1,909,923
International Falls	MN	Falls International	INL	N	$4.50	6/1/2002	6/1/2005	**
International Falls	MN	Falls International	INL	N	$3.00	12/1/1994	6/1/2002	**
Minneapolis	MN	Minneapolis-St Paul	MSP	L	$4.50	4/1/2001	5/1/2019	

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
		International/Wold-Chamberlain						1,583,072,484
Minneapolis	MN	Minneapolis-St Paul International/Wold-Chamberlain	MSP	L	$3.00	6/1/1992	4/1/2001	**
Rochester	MN	Rochester International	RST	N	$4.50	3/1/2002	1/1/2017	11,074,911
Rochester	MN	Rochester International	RST	N	$3.00	5/1/1996	3/1/2002	**
St. Cloud	MN	St. Cloud Regional	STC	N	$4.50	7/1/2002	10/1/2020	1,147,578
St. Cloud	MN	St. Cloud Regional	STC	N	$3.00	2/1/2000	7/1/2002	**
Thief River Falls	MN	Thief River Falls Regional	TVF	GA	$4.50	6/1/2003	6/1/2023	636,828
Columbia	MO	Columbia Regional	COU	N	$4.50	11/1/2002	12/1/2026	2,949,763
Joplin	MO	Joplin Regional	JLN	N	$4.50	4/1/2003	6/1/2016	889,664
Kansas City	MO	Kansas City International	MCI	M	$3.00	5/1/2018	4/1/2021	451,075,740
Kansas City	MO	Kansas City International	MCI	M	$4.50	8/1/2005	5/1/2018	**
Kansas City	MO	Kansas City International	MCI	M	$3.00	3/1/1996	8/1/2005	**
Springfield	MO	Springfield-Branson National	SGF	N	$4.50	1/1/2007	1/1/2036	96,200,309
Springfield	MO	Springfield-Branson National	SGF	N	$4.50	9/1/2005	3/1/2006	**
Springfield	MO	Springfield-Branson National	SGF	N	$4.50	5/1/2004	8/1/2005	**
Springfield	MO	Springfield-Branson National	SGF	N	$4.50	5/1/2001	1/1/2004	**
Springfield	MO	Springfield-Branson National	SGF	N	$3.00	7/1/1998	5/1/2001	**
Springfield	MO	Springfield-Branson National	SGF	N	$3.00	11/1/1993	5/1/1997	**
St Louis	MO	Lambert-St Louis International	STL	M	$4.50	12/1/2001	4/1/2026	1,078,029,934
St Louis	MO	Lambert-St Louis International	STL	M	$3.00	12/1/1992	12/1/2001	**
Rota Island	MP	Benjamin Taisacan Mangiona International	GRO/ ROP	N	$4.50	1/1/2005	6/1/2021	1,777,742
Saipan	MP	Francisco C. Ada/Saipan International	GSN/ SPN	S	$4.50	1/1/2005	6/1/2021	29,573,280
Tinian Island	MP	Tinian International	TNI/ TIQ	CS	$4.50	1/1/2005	6/1/2021	1,705,526
Columbus	MS	Golden Triangle Regional	GTR	N	$4.50	4/1/2001	10/1/2019	3,847,108
Columbus	MS	Golden Triangle Regional	GTR	N	$3.00	8/1/1992	4/1/2001	**
Greenville	MS	Mid Delta Regional	GLH	CS	$4.50	9/1/2012	1/1/2023	453,780
Greenville	MS	Mid Delta Regional	GLH	CS	$4.50	12/1/2005	8/1/2011	**
Greenville	MS	Mid Delta Regional	GLH	CS	$4.50	4/1/2005	12/1/2005	**
Greenville	MS	Mid Delta Regional	GLH	CS	$3.00	8/1/2003	4/1/2005	**
Greenville	MS	Mid Delta Regional	GLH	CS	$3.00	4/1/2003	8/1/2003	**
Greenville	MS	Mid Delta Regional	GLH	CS	$3.00	10/1/1998	2/1/2003	**
Gulfport	MS	Gulfport-Biloxi International	GPT	N	$4.50	5/1/2003	1/1/2028	66,424,061
Gulfport	MS	Gulfport-Biloxi International	GPT	N	$3.00	6/1/2002	5/1/2003	**
Gulfport	MS	Gulfport-Biloxi International	GPT	N	$3.00	12/1/2001	6/1/2002	**
Gulfport	MS	Gulfport-Biloxi International	GPT	N	$3.00	7/1/1992	8/1/2001	**
Hattiesburg	MS	Hattiesburg-Laurel Regional	PIB	N	$4.50	6/1/2001	1/1/2017	1,108,865
Hattiesburg	MS	Hattiesburg-Laurel Regional	PIB	N	$3.00	7/1/1992	6/1/2001	**
Jackson	MS	Jackson-Medgar Wiley Evers International	JAN	S	$4.50	10/1/2003	2/1/2031	88,407,168
Jackson	MS	Jackson-Medgar Wiley Evers International	JAN	S	$3.00	5/1/1993	10/1/2003	**
Meridian	MS	Key Field	MEI	N	$4.50	10/1/2005	10/1/2020	1,755,017
Meridian	MS	Key Field	MEI	N	$4.50	12/1/2001	5/1/2004	**
Meridian	MS	Key Field	MEI	N	$3.00	3/1/1997	12/1/2001	**
Meridian	MS	Key Field	MEI	N	$3.00	11/1/1992	8/1/1996	**
Tupelo	MS	Tupelo Regional	TUP	CS	$4.50	4/1/2003	12/1/2018	1,743,189
Tupelo	MS	Tupelo Regional	TUP	CS	$3.00	11/1/1994	4/1/2003	**
Billings	MT	Billings Logan International	BIL	S	$3.00	4/1/1994	9/1/2014	20,137,489

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Bozeman	MT	Bozeman Yellowstone International	BZN	S	$4.50	3/1/2009	7/1/2028	40,344,326
Bozeman	MT	Bozeman Yellowstone International	BZN	S	$3.00	8/1/1993	3/1/2009	**
Butte	MT	Bert Mooney	BTM	N	$4.50	3/1/2010	3/1/2018	2,370,324
Butte	MT	Bert Mooney	BTM	N	$3.00	11/1/2007	3/1/2010	**
Butte	MT	Bert Mooney	BTM	N	$3.00	7/1/2006	8/1/2007	**
Butte	MT	Bert Mooney	BTM	N	$3.00	7/1/1994	6/1/2006	**
Great Falls	MT	Great Falls International	GTF	N	$4.50	7/1/2002	6/1/2021	15,904,080
Great Falls	MT	Great Falls International	GTF	N	$3.00	11/1/1992	7/1/2002	**
Helena	MT	Helena Regional	HLN	N	$4.50	8/1/2002	2/1/2016	6,225,949
Helena	MT	Helena Regional	HLN	N	$3.00	4/1/1993	8/1/2002	**
Kalispell	MT	Glacier Park International	GPI/FCA	N	$4.50	4/1/2005	11/1/2017	11,831,052
Kalispell	MT	Glacier Park International	GPI/FCA	N	$3.00	12/1/1993	4/1/2005	**
Missoula	MT	Missoula International	MSO	N	$4.50	4/1/2001	2/1/2019	24,934,316
Missoula	MT	Missoula International	MSO	N	$3.00	9/1/1992	4/1/2001	**
West Yellowstone	MT	Yellowstone	WYS	CS	$4.50	6/1/2011	6/1/2025	277,202
Asheville	NC	Asheville Regional	AVL	N	$4.50	10/1/2007	4/1/2024	29,552,251
Asheville	NC	Asheville Regional	AVL	N	$4.50	4/1/2007	9/1/2007	**
Asheville	NC	Asheville Regional	AVL	N	$4.50	10/1/2002	11/1/2006	**
Asheville	NC	Asheville Regional	AVL	N	$3.00	12/1/1994	10/1/2002	**
Charlotte	NC	Charlotte/Douglas International	CLT	L	$3.00	11/1/2004	2/1/2022	1,068,639,989
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$4.00	5/1/2015	8/1/2020	9,291,259
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$4.00	3/1/2013	6/1/2013	**
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$4.00	7/1/2009	10/1/2012	**
Fayetteville	NC	Fayetteville Regional/Grannis Field	FAY	N	$3.00	11/1/2000	2/1/2006	**
Greensboro	NC	Piedmont Triad International	GSO	S	$4.50	9/1/2011	5/1/2022	43,872,158
Greenville	NC	Pitt-Greenville	PGV	N	$4.50	4/1/2001	1/1/2016	3,678,959
Greenville	NC	Pitt-Greenville	PGV	N	$3.00	10/1/1997	4/1/2001	**
Jacksonville	NC	Albert J. Ellis	OAJ	N	$4.50	2/1/2012	4/1/2029	13,108,394
Jacksonville	NC	Albert J. Ellis	OAJ	N	$3.00	11/1/2011	2/1/2012	**
Jacksonville	NC	Albert J. Ellis	OAJ	N	$3.00	2/1/2009	11/1/2011	**
Jacksonville	NC	Albert J. Ellis	OAJ	N	$3.00	3/1/2005	1/1/2009	**
Jacksonville	NC	Albert J. Ellis	OAJ	N	$3.00	9/1/1999	8/1/2000	**
Jacksonville	NC	Albert J. Ellis	OAJ	N	$3.00	1/1/1996	10/1/1998	**
New Bern	NC	Coastal Carolina Regional	EWN	N	$4.50	11/1/2003	10/1/2025	11,160,275
New Bern	NC	Coastal Carolina Regional	EWN	N	$3.00	2/1/1997	11/1/2003	**
Raleigh	NC	Raleigh-Durham International	RDU	M	$4.50	10/1/2004	9/1/2032	772,690,405
Raleigh	NC	Raleigh-Durham International	RDU	M	$3.00	4/1/2003	10/1/2004	**
Wilmington	NC	Wilmington International	ILM	S	$4.50	5/1/2003	8/1/2024	33,180,719
Wilmington	NC	Wilmington International	ILM	S	$3.00	6/1/1998	5/1/2003	**
Wilmington	NC	Wilmington International	ILM	S	$3.00	2/1/1994	9/1/1996	**
Bismarck	ND	Bismarck Municipal	BIS	N	$4.50	4/1/2002	6/1/2018	14,881,807
Bismarck	ND	Bismarck Municipal	BIS	N	$3.00	6/1/1998	4/1/2002	**
Bismarck	ND	Bismarck Municipal	BIS	N	$3.00	7/1/1996	7/1/1997	**
Dickinson	ND	Dickinson - Theodore Roosevelt Regional	DIK	N	$4.50	4/1/2014	6/1/2020	714,384
Fargo	ND	Hector International	FAR	S	$4.50	8/1/2002	3/1/2018	25,911,798

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Fargo	ND	Hector International	FAR	S	$3.00	1/1/1997	8/1/2002	**
Grand Forks	ND	Grand Forks International	GFK	N	$4.50	1/1/2009	9/1/2020	10,251,697
Grand Forks	ND	Grand Forks International	GFK	N	$4.50	5/1/2004	10/1/2008	**
Grand Forks	ND	Grand Forks International	GFK	N	$4.50	4/1/2001	6/1/2003	**
Grand Forks	ND	Grand Forks International	GFK	N	$3.00	5/1/1997	4/1/2001	**
Grand Forks	ND	Grand Forks International	GFK	N	$3.00	2/1/1993	8/1/1996	**
Minot	ND	Minot International	MOT	N	$4.50	2/1/2002	10/1/2020	16,760,900
Minot	ND	Minot International	MOT	N	$3.00	3/1/1999	2/1/2002	**
Minot	ND	Minot International	MOT	N	$3.00	3/1/1994	7/1/1998	**
Williston	ND	Sloulin Field International	ISN	N	$4.50	4/1/2013	2/1/2026	2,825,713
Grand Island	NE	Central Nebraska Regional	GRI	N	$4.50	5/1/2001	1/1/2030	5,248,737
Grand Island	NE	Central Nebraska Regional	GRI	N	$3.00	2/1/1999	4/1/2001	**
Kearney	NE	Kearney Regional	EAR	N	$4.50	10/1/2011	4/1/2016	422,978
Kearney	NE	Kearney Regional	EAR	N	$4.50	9/1/2007	7/1/2011	**
Kearney	NE	Kearney Regional	EAR	N	$4.00	11/1/2005	9/1/2007	**
Scottsbluff	NE	Western Nebraska Regional/ William B. Heilig Field	BFF	N	$4.50	7/1/2004	7/1/2024	1,299,534
Scottsbluff	NE	Western Nebraska Regional/ William B. Heilig Field	BFF	N	$3.00	3/1/2000	3/1/2003	**
Lebanon	NH	Lebanon Municipal	LEB	N	$4.50	10/1/2014	6/1/2018	970,751
Lebanon	NH	Lebanon Municipal	LEB	N	$4.50	10/1/2007	5/1/2014	**
Lebanon	NH	Lebanon Municipal	LEB	N	$4.50	11/1/2003	5/1/2006	**
Lebanon	NH	Lebanon Municipal	LEB	N	$3.00	8/1/1995	8/1/2002	**
Manchester	NH	Manchester	MHT	S	$4.50	1/1/2008	12/1/2022	189,980,151
Manchester	NH	Manchester	MHT	S	$3.00	1/1/1993	1/1/2008	**
Atlantic City	NJ	Atlantic City International	ACY	S	$4.50	9/1/2014	3/1/2025	57,765,575
Atlantic City	NJ	Atlantic City International	ACY	S	$4.50	4/1/2009	8/1/2014	**
Atlantic City	NJ	Atlantic City International	ACY	S	$4.50	12/1/2005	4/1/2009	**
Atlantic City	NJ	Atlantic City International	ACY	S	$3.00	10/1/1999	12/1/2005	**
Newark	NJ	Newark Liberty International	EWR	L	$4.50	4/1/2006	7/1/2018	1,297,410,937
Newark	NJ	Newark Liberty International	EWR	L	$3.00	10/1/1992	4/1/2006	**
Trenton	NJ	Trenton Mercer	TTN	N	$4.50	5/1/2004	6/1/2018	9,658,403
Trenton	NJ	Trenton Mercer	TTN	N	$3.00	1/1/2001	5/1/2004	**
Albuquerque	NM	Albuquerque International Sunport	ABQ	M	$4.50	7/1/2011	10/1/2017	169,822,308
Albuquerque	NM	Albuquerque International Sunport	ABQ	M	$3.00	7/1/1996	7/1/2011	**
Farmington	NM	Four Corners Regional	FMN	N	$3.00	6/1/2003	5/1/2017	661,102
Roswell	NM	Roswell International Air Center	ROW	N	$4.50	3/1/2008	4/1/2022	2,420,266
Roswell	NM	Roswell International Air Center	ROW	N	$4.50	6/1/2005	2/1/2008	**
Roswell	NM	Roswell International Air Center	ROW	N	$3.00	6/1/2004	6/1/2005	**
Roswell	NM	Roswell International Air Center	ROW	N	$4.50	2/1/2004	6/1/2004	**
Roswell	NM	Roswell International Air Center	ROW	N	$3.00	4/1/1999	2/1/2004	**
Elko	NV	Elko Regional	EKO	N	$4.50	11/1/2003	2/1/2021	6,790,017
Elko	NV	Elko Regional	EKO	N	$3.00	9/1/1998	11/1/2003	**
Las Vegas	NV	McCarran International	LAS	L	$4.50	10/1/2008	11/1/2053	4,563,146,058
Las Vegas	NV	McCarran International	LAS	L	$4.00	1/1/2007	10/1/2008	**
Las Vegas	NV	McCarran International	LAS	L	$3.00	9/1/2006	1/1/2007	**
Las Vegas	NV	McCarran International	LAS	L	$4.50	11/1/2004	9/1/2006	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Las Vegas	NV	McCarran International	LAS	L	$3.00	6/1/1992	11/1/2004	**
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	12/1/2007	9/1/2017	191,971,288
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	7/1/2007	12/1/2007	**
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	4/1/2005	7/1/2007	**
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	12/1/2004	4/1/2005	**
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	10/1/2004	12/1/2004	**
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	2/1/2003	10/1/2004	**
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	6/1/2002	2/1/2003	**
Reno	NV	Reno/Tahoe International	RNO	S	$4.50	8/1/2001	6/1/2002	**
Reno	NV	Reno/Tahoe International	RNO	S	$3.00	1/1/1994	2/1/2001	**
Albany	NY	Albany International	ALB	S	$4.50	9/1/2009	2/1/2020	116,740,338
Albany	NY	Albany International	ALB	S	$3.00	3/1/1994	9/1/2009	**
Binghamton	NY	Greater Binghamton/Edwin A. Link Field	BGM	N	$4.50	5/1/2008	6/1/2019	9,984,409
Binghamton	NY	Greater Binghamton/Edwin A. Link Field	BGM	N	$4.50	7/1/2006	2/1/2008	**
Binghamton	NY	Greater Binghamton/Edwin A. Link Field	BGM	N	$4.50	9/1/2002	7/1/2006	**
Binghamton	NY	Greater Binghamton/Edwin A. Link Field	BGM	N	$3.00	11/1/1993	9/1/2002	**
Buffalo	NY	Buffalo Niagara International	BUF	M	$4.50	8/1/2007	1/1/2016	170,425,633
Buffalo	NY	Buffalo Niagara International	BUF	M	$3.00	8/1/1992	8/1/2007	**
Elmira	NY	Elmira/Corning Regional	ELM	N	$4.50	5/1/2008	10/1/2020	7,640,812
Elmira	NY	Elmira/Corning Regional	ELM	N	$3.00	12/1/2004	1/1/2008	**
Islip	NY	Long Island MacArthur	ISP	S	$4.50	9/1/2005	7/1/2017	70,928,028
Islip	NY	Long Island MacArthur	ISP	S	$3.00	12/1/1994	9/1/2005	**
Ithaca	NY	Ithaca Tompkins Regional	ITH	N	$4.50	3/1/2009	2/1/2018	7,550,437
Ithaca	NY	Ithaca Tompkins Regional	ITH	N	$3.00	1/1/1993	3/1/2009	**
Jamestown	NY	Chautauqua County/Jamestown	JHW	CS	$4.50	9/1/2004	3/1/2018	730,945
Jamestown	NY	Chautauqua County/Jamestown	JHW	CS	$3.00	6/1/1993	8/1/2002	**
Massena	NY	Massena International - Richards Field	MSS	CS	$3.00	4/1/1996	4/1/2061	163,429
New York	NY	LaGuardia	LGA	L	$4.50	4/1/2006	1/1/2019	1,033,785,779
New York	NY	John F. Kennedy International	JFK	L	$4.50	4/1/2006	1/1/2019	1,659,155,623
New York	NY	John F. Kennedy International	JFK	L	$3.00	10/1/1992	4/1/2006	**
New York	NY	LaGuardia	LGA	L	$3.00	10/1/1992	4/1/2006	**
Newburgh	NY	Stewart International	SWF	N	$4.50	7/1/2010	10/1/2019	18,100,816
Newburgh	NY	Stewart International	SWF	N	$4.50	5/1/2007	9/1/2007	**
Newburgh	NY	Stewart International	SWF	N	$4.50	3/1/2002	11/1/2005	**
Newburgh	NY	Stewart International	SWF	N	$3.00	11/1/1995	3/1/2002	**
Ogdensburg	NY	Ogdensburg International	OGS	CS	$3.00	4/1/1996	12/1/2019	125,050
Plattsburgh	NY	Plattsburgh International	PBG	N	$4.50	1/1/2009	2/1/2043	39,561,720
Plattsburgh	NY	Clinton County	PLB	N	$3.00	6/1/2001	4/1/2003	230,975
Plattsburgh	NY	Clinton County	PLB	N	$3.00	7/1/1993	3/1/2001	**
Rochester	NY	Greater Rochester International	ROC	S	$4.50	9/1/2004	9/1/2027	118,547,358
Rochester	NY	Greater Rochester International	ROC	S	$3.00	12/1/1997	9/1/2004	**
Saranac Lake	NY	Adirondack Regional	SLK	CS	$4.50	2/1/2011	6/1/2033	591,574
Saranac Lake	NY	Adirondack Regional	SLK	CS	$3.00	8/1/1994	9/1/2007	**
Syracuse	NY	Syracuse Hancock International	SYR	S	$4.50	4/1/2007	8/1/2026	126,921,592

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Syracuse	NY	Syracuse Hancock International	SYR	S	$4.50	11/1/2005	2/1/2007	**
Syracuse	NY	Syracuse Hancock International	SYR	S	$4.50	10/1/2002	8/1/2005	**
Syracuse	NY	Syracuse Hancock International	SYR	S	$3.00	10/1/1995	1/1/2002	**
Utica	NY	Oneida County	UCA		$3.00	8/1/1997	6/1/2010	1,298,631
White Plains	NY	Westchester County	HPN	S	$4.50	12/1/2001	5/1/2014	41,646,537
White Plains	NY	Westchester County	HPN	S	$3.00	2/1/1993	12/1/2001	**
Akron	OH	Akron-Canton Regional	CAK	S	$4.50	9/1/2002	1/1/2019	53,537,202
Akron	OH	Akron-Canton Regional	CAK	S	$3.00	9/1/1992	9/1/2002	**
Cleveland	OH	Cleveland-Hopkins International	CLE	M	$4.50	3/1/2002	9/1/2023	590,917,465
Cleveland	OH	Cleveland-Hopkins International	CLE	M	$3.00	11/1/1992	3/1/2002	**
Columbus	OH	Port Columbus International	CMH	M	$4.50	4/1/2002	6/1/2025	451,567,027
Columbus	OH	Port Columbus International	CMH	M	$3.00	10/1/1992	4/1/2002	**
Dayton	OH	James M Cox Dayton International	DAY	S	$4.50	9/1/2001	4/1/2019	130,832,848
Dayton	OH	James M Cox Dayton International	DAY	S	$3.00	10/1/1994	9/1/2001	**
Toledo	OH	Toledo Express	TOL	N	$4.50	7/1/2001	12/1/2017	16,674,815
Toledo	OH	Toledo Express	TOL	N	$3.00	7/1/1997	7/1/2001	**
Toledo	OH	Toledo Express	TOL	N	$3.00	9/1/1993	9/1/1996	**
Youngstown	OH	Youngstown-Warren Regional	YNG	N	$4.50	4/1/2007	2/1/2030	3,185,313
Youngstown	OH	Youngstown-Warren Regional	YNG	N	$3.00	8/1/1997	2/1/2002	**
Youngstown	OH	Youngstown-Warren Regional	YNG	N	$3.00	5/1/1994	7/1/1996	**
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$4.50	11/1/2007	4/1/2017	3,810,326
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$4.50	9/1/2004	10/1/2005	**
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$4.50	6/1/2002	3/1/2004	**
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$3.00	1/1/1998	8/1/2000	**
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$3.00	1/1/1994	4/1/1996	**
Lawton	OK	Lawton-Fort Sill Regional	LAW	N	$2.00	8/1/1992	1/1/1994	**
Oklahoma City	OK	Will Rogers World	OKC	S	$4.50	4/1/2010	12/1/2020	136,283,571
Oklahoma City	OK	Will Rogers World	OKC	S	$3.00	7/1/1997	4/1/2010	**
Tulsa	OK	Tulsa International	TUL	S	$4.50	8/1/2010	4/1/2033	202,441,498
Tulsa	OK	Tulsa International	TUL	S	$3.00	1/1/1997	8/1/2010	**
Tulsa	OK	Tulsa International	TUL	S	$3.00	8/1/1992	3/1/1996	**
Eugene	OR	Mahlon Sweet Field	EUG	S	$4.50	6/1/2001	2/1/2020	36,176,156
Eugene	OR	Mahlon Sweet Field	EUG	S	$3.00	11/1/1993	6/1/2001	**
Klamath Falls	OR	Klamath Falls	LMT	N	$4.50	4/1/2012	10/1/2023	2,132,265
Klamath Falls	OR	Klamath Falls	LMT	N	$4.50	5/1/2004	12/1/2011	**
Klamath Falls	OR	Klamath Falls	LMT	N	$4.50	4/1/2001	5/1/2004	**
Klamath Falls	OR	Klamath Falls	LMT	N	$3.00	3/1/2000	4/1/2001	**
Medford	OR	Rogue Valley International - Medford	MFR	N	$4.50	4/1/2001	8/1/2026	34,832,860
Medford	OR	Rogue Valley International - Medford	MFR	N	$3.00	7/1/1993	4/1/2001	**
North Bend	OR	Southwest Oregon Regional	OTH	N	$4.50	8/1/2001	2/1/2021	3,077,968
North Bend	OR	Southwest Oregon Regional	OTH	N	$3.00	2/1/1994	8/1/2001	**
Pendleton	OR	Eastern Oregon Regional at Pendleton	PDT	CS	$4.50	10/1/2009	12/1/2016	486,540
Pendleton	OR	Eastern Oregon Regional at Pendleton	PDT	CS	$3.00	12/1/1995	10/1/2009	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Portland	OR	Portland International	PDX	L	$4.50	10/1/2001	12/1/2034	1,154,650,335
Portland	OR	Portland International	PDX	L	$3.00	7/1/1992	10/1/2001	**
Redmond	OR	Roberts Field	RDM	N	$4.50	3/1/2007	7/1/2040	33,531,050
Redmond	OR	Roberts Field	RDM	N	$4.50	12/1/2003	12/1/2006	**
Redmond	OR	Roberts Field	RDM	N	$4.50	11/1/2001	12/1/2003	**
Redmond	OR	Roberts Field	RDM	N	$3.00	10/1/1993	11/1/2001	**
Allentown	PA	Lehigh Valley International	ABE	N	$4.50	9/1/2003	8/1/2018	44,975,522
Allentown	PA	Lehigh Valley International	ABE	N	$4.50	11/1/2001	1/1/2003	**
Allentown	PA	Lehigh Valley International	ABE	N	$3.00	6/1/2001	11/1/2001	**
Allentown	PA	Lehigh Valley International	ABE	N	$3.00	11/1/1992	2/1/2001	**
Altoona	PA	Altoona-Blair County	AOO	CS	$4.50	12/1/2008	12/1/2018	622,764
Altoona	PA	Altoona-Blair County	AOO	CS	$3.00	7/1/2000	12/1/2008	**
Altoona	PA	Altoona-Blair County	AOO	CS	$3.00	1/1/1997	10/1/1999	**
Altoona	PA	Altoona-Blair County	AOO	CS	$3.00	5/1/1993	2/1/1996	**
Bradford	PA	Bradford Regional	BFD	GA	$4.50	5/1/2003	11/1/2017	653,341
Bradford	PA	Bradford Regional	BFD	GA	$3.00	8/1/1995	5/1/2003	**
Du Bois	PA	Dubois Regional	DUJ	CS	$4.50	4/1/2004	10/1/2018	712,049
Du Bois	PA	Dubois Regional	DUJ	CS	$4.50	4/1/2001	11/1/2003	**
Du Bois	PA	Dubois Regional	DUJ	CS	$3.00	6/1/1995	4/1/2001	**
Erie	PA	Erie International/Tom Ridge Field	ERI	N	$4.50	7/1/2005	2/1/2025	15,928,448
Erie	PA	Erie International/Tom Ridge Field	ERI	N	$4.50	8/1/2003	1/1/2005	**
Erie	PA	Erie International/Tom Ridge Field	ERI	N	$3.00	12/1/1997	5/1/2001	**
Erie	PA	Erie International/Tom Ridge Field	ERI	N	$3.00	10/1/1992	6/1/1997	**
Harrisburg	PA	Harrisburg International	MDT	S	$4.50	1/1/2003	7/1/2034	136,117,114
Harrisburg	PA	Harrisburg International	MDT	S	$3.00	2/1/1997	1/1/2003	**
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$4.50	7/1/2007	2/1/2016	943,831
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$4.50	5/1/2001	1/1/2007	**
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$3.00	12/1/1997	5/1/2001	**
Johnstown	PA	John Murtha Johnstown-Cambria County	JST	CS	$3.00	11/1/1993	12/1/1996	**
Lancaster	PA	Lancaster	LNS	GA	$4.50	7/1/2013	7/1/2017	530,949
Lancaster	PA	Lancaster	LNS	GA	$3.00	2/1/1995	2/1/2009	**
Latrobe	PA	Arnold Palmer Regional	LBE	N	$4.50	7/1/2013	7/1/2025	11,107,518
Latrobe	PA	Arnold Palmer Regional	LBE	N	$3.00	3/1/1996	7/1/2013	**
Philadelphia	PA	Philadelphia International	PHL	L	$4.50	3/1/2013	5/1/2021	1,564,269,848
Philadelphia	PA	Philadelphia International	PHL	L	$3.00	2/1/2013	3/1/2013	**
Philadelphia	PA	Philadelphia International	PHL	L	$4.50	4/1/2001	2/1/2013	**
Philadelphia	PA	Philadelphia International	PHL	L	$3.00	9/1/1992	4/1/2001	**
Pittsburgh	PA	Pittsburgh International	PIT	M	$4.50	12/1/2004	12/1/2024	526,772,676
Pittsburgh	PA	Pittsburgh International	PIT	M	$3.00	10/1/2001	12/1/2004	**
Reading	PA	Reading Regional/Carl A Spaatz Field	RDG	GA	$3.00	12/1/1994	7/1/2008	1,006,653
State College	PA	University Park	UNV/ SCE	N	$4.50	11/1/2003	7/1/2019	11,633,487
State College	PA	University Park	UNV/ SCE	N	$3.00	11/1/1992	11/1/2003	**
Wilkes-Barre	PA	Wilkes-Barre/Scranton	AVP	N	$4.50	5/1/2001	7/1/2033	19,621,097

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
		International						
Wilkes-Barre	PA	Wilkes-Barre/Scranton International	AVP	N	$3.00	12/1/1997	5/1/2001	**
Wilkes-Barre	PA	Wilkes-Barre/Scranton International	AVP	N	$3.00	12/1/1993	6/1/1997	**
Williamsport	PA	Williamsport Regional	IPT	N	$4.50	11/1/2013	9/1/2028	1,857,488
Williamsport	PA	Williamsport Regional	IPT	N	$3.00	5/1/1997	11/1/1998	**
Aguadilla	PR	Rafael Hernandez	BQN	N	$4.50	12/1/2005	4/1/2015	9,828,476
Aguadilla	PR	Rafael Hernandez	BQN	N	$3.00	3/1/1993	5/1/1996	**
Ponce	PR	Mercedita	PSE	N	$3.00	3/1/1993	9/1/1998	866,000
San Juan	PR	Luis Munoz Marin International	SJU	M	$4.50	12/1/2005	9/1/2027	594,010,551
San Juan	PR	Luis Munoz Marin International	SJU	M	$3.00	3/1/1993	12/1/2005	**
Providence	RI	Theodore Francis Green State	PVD	M	$4.50	9/1/2006	7/1/2028	261,935,756
Providence	RI	Theodore Francis Green State	PVD	M	$3.00	2/1/1994	9/1/2006	**
Charleston	SC	Charleston AFB/International	CHS	S	$4.50	3/1/2010	7/1/2039	189,546,679
Columbia	SC	Columbia Metropolitan	CAE	S	$4.50	12/1/2001	10/1/2028	70,528,884
Columbia	SC	Columbia Metropolitan	CAE	S	$3.00	11/1/1993	12/1/2001	**
Florence	SC	Florence Regional	FLO	N	$4.50	12/1/2014	2/1/2018	1,496,592
Florence	SC	Florence Regional	FLO	N	$3.00	12/1/1999	2/1/2000	**
Florence	SC	Florence Regional	FLO	N	$3.00	12/1/1995	11/1/1999	**
Hilton Head Island	SC	Hilton Head	HXD/ HHH	N	$4.50	5/1/2012	6/1/2023	5,934,148
Hilton Head Island	SC	Hilton Head	HXD/ HHH	N	$3.00	12/1/2000	10/1/2007	**
Hilton Head Island	SC	Hilton Head	HXD/ HHH	N	$3.00	2/1/1994	6/1/2000	**
Myrtle Beach	SC	Myrtle Beach International	MYR	S	$4.50	6/1/2010	1/1/2032	119,254,552
Myrtle Beach	SC	Myrtle Beach International	MYR	S	$4.50	8/1/2001	8/1/2007	**
Myrtle Beach	SC	Myrtle Beach International	MYR	S	$3.00	10/1/1996	8/1/2001	**
Aberdeen	SD	Aberdeen Regional	ABR	N	$4.50	1/1/2002	4/1/2019	1,753,949
Aberdeen	SD	Aberdeen Regional	ABR	N	$3.00	1/1/2000	1/1/2002	**
Pierre	SD	Pierre Regional	PIR	N	$4.50	9/1/2009	9/1/2016	788,346
Pierre	SD	Pierre Regional	PIR	N	$4.50	2/1/2003	7/1/2009	**
Rapid City	SD	Rapid City Regional	RAP	N	$4.50	6/1/2006	3/1/2034	34,932,281
Rapid City	SD	Rapid City Regional	RAP	N	$3.00	6/1/2000	6/1/2006	**
Rapid City	SD	Rapid City Regional	RAP	N	$3.00	8/1/1997	1/1/2000	**
Bristol	TN	Tri-Cities Regional TN/VA	TRI	N	$4.50	7/1/2007	2/1/2017	14,258,051
Bristol	TN	Tri-Cities Regional TN/VA	TRI	N	$3.00	2/1/1997	7/1/2007	**
Chattanooga	TN	Lovell Field	CHA	N	$4.50	2/1/2005	7/1/2020	30,003,382
Chattanooga	TN	Lovell Field	CHA	N	$3.00	11/1/2004	2/1/2005	**
Chattanooga	TN	Lovell Field	CHA	N	$4.50	4/1/2001	11/1/2004	**
Chattanooga	TN	Lovell Field	CHA	N	$3.00	7/1/1994	4/1/2001	**
Jackson	TN	McKellar-Sipes Regional	MKL	CS	$4.50	10/1/2002	6/1/2025	332,248
Knoxville	TN	McGhee Tyson	TYS	S	$4.50	10/1/2003	9/1/2023	103,771,921
Knoxville	TN	McGhee Tyson	TYS	S	$3.00	1/1/1994	10/1/2003	**
Memphis	TN	Memphis International	MEM	M	$3.00	8/1/1992	1/1/1997	53,700,000
Nashville	TN	Nashville International	BNA	M	$4.50	5/1/2015	11/1/2016	316,018,164
Nashville	TN	Nashville International	BNA	M	$3.00	9/1/2010	5/1/2015	**
Nashville	TN	Nashville International	BNA	M	$4.50	12/1/2009	9/1/2010	**
Nashville	TN	Nashville International	BNA	M	$3.00	1/1/1993	12/1/2009	**
Abilene	TX	Abilene Regional	ABI	N	$4.50	9/1/2002	3/1/2024	7,953,116
Abilene	TX	Abilene Regional	ABI	N	$3.00	1/1/1998	9/1/2002	**
Amarillo	TX	Rick Husband Amarillo International	AMA	S	$4.50	12/1/2008	7/1/2018	19,200,000
Austin	TX	Austin-Bergstrom International	AUS	M	$4.50	4/1/2004	5/1/2020	353,389,005

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Austin	TX	Austin-Bergstrom International	AUS	M	$3.00	7/1/1995	4/1/2004	**
Austin	TX	Robert Mueller Municipal	AUS	M	$3.00	2/1/1994	2/1/1995	**
Austin	TX	Robert Mueller Municipal	AUS	M	$2.00	11/1/1993	2/1/1994	**
Beaumont/Port Arthur	TX	Jack Brooks Regional	BPT	N	$4.50	3/1/2002	10/1/2021	4,543,341
Beaumont/Port Arthur	TX	Jack Brooks Regional	BPT	N	$3.00	9/1/1994	3/1/2002	**
Brownsville	TX	Brownsville/South Padre Island International	BRO	N	$4.50	5/1/2003	2/1/2024	8,178,196
Brownsville	TX	Brownsville/South Padre Island International	BRO	N	$3.00	10/1/1997	5/1/2003	**
College Station	TX	Easterwood Field	CLL	N	$4.50	4/1/2001	5/1/2018	6,776,641
College Station	TX	Easterwood Field	CLL	N	$3.00	7/1/1996	4/1/2001	**
Corpus Christi	TX	Corpus Christi International	CRP	N	$4.50	3/1/2003	1/1/2027	49,700,114
Corpus Christi	TX	Corpus Christi International	CRP	N	$3.00	3/1/1994	3/1/2003	**
Dallas	TX	Dallas Love Field	DAL	M	$3.00	5/1/2024	12/1/2024	360,073,924
Dallas	TX	Dallas Love Field	DAL	M	$4.50	2/1/2010	5/1/2024	**
Dallas	TX	Dallas Love Field	DAL	M	$3.00	2/1/2008	2/1/2010	**
Dallas-Ft Worth	TX	Dallas/Ft Worth International	DFW	L	$4.50	5/1/2017	9/1/2034	5,655,256,130
Dallas-Ft Worth	TX	Dallas/Ft Worth International	DFW	L	$3.00	3/1/2017	5/1/2017	**
Dallas-Ft Worth	TX	Dallas/Ft Worth International	DFW	L	$4.50	7/1/2002	3/1/2017	**
Dallas-Ft Worth	TX	Dallas/Ft Worth International	DFW	L	$3.00	2/1/1997	7/1/2002	**
Dallas-Ft Worth	TX	Dallas/Ft Worth International	DFW	L	$3.00	5/1/1994	6/1/1996	**
Del Rio	TX	Del Rio International	DRT	N	$4.50	2/1/2010	6/1/2020	403,739
El Paso	TX	El Paso International	ELP	S	$4.50	6/1/2013	8/1/2016	94,435,175
El Paso	TX	El Paso International	ELP	S	$4.50	8/1/2010	5/1/2013	**
El Paso	TX	El Paso International	ELP	S	$3.00	1/1/1997	8/1/2010	**
Harlingen	TX	Valley International	HRL	N	$4.50	8/1/2009	2/1/2017	26,162,693
Harlingen	TX	Valley International	HRL	N	$4.50	12/1/2007	7/1/2009	**
Harlingen	TX	Valley International	HRL	N	$3.00	11/1/1998	12/1/2007	**
Houston	TX	William P. Hobby	HOU	M	$4.50	3/1/2015	8/1/2017	163,517,150
Houston	TX	George Bush Intercontinental/ Houston	IAH	L	$4.50	3/1/2015	1/1/2028	1,372,445,143
Houston	TX	George Bush Intercontinental/ Houston	IAH	L	$3.00	12/1/2008	3/1/2015	**
Houston	TX	William P. Hobby	HOU	M	$3.00	11/1/2006	3/1/2015	**
Killeen	TX	Robert Gray AAF	GRK/ ILE	N	$4.50	6/1/2006	11/1/2018	11,723,460
Killeen	TX	Robert Gray AAF	GRK/ ILE	N	$4.50	12/1/2003	1/1/2006	**
Killeen	TX	Killeen Municipal	GRK/ ILE	N	$4.50	5/1/2001	8/1/2003	**
Killeen	TX	Killeen Municipal	GRK/ ILE	N	$3.00	4/1/1995	5/1/2001	**
Killeen	TX	Killeen Municipal	GRK/ ILE	N	$3.00	1/1/1993	11/1/1994	**
Laredo	TX	Laredo International	LRD	N	$4.50	6/1/2009	1/1/2026	14,156,604

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Laredo	TX	Laredo International	LRD	N	$3.00	10/1/1993	6/1/2009	**
Longview	TX	East Texas Regional	GGG	N	$4.50	9/1/2012	9/1/2023	2,350,343
Longview	TX	East Texas Regional	GGG	N	$3.00	9/1/2002	9/1/2012	**
Longview	TX	East Texas Regional	GGG	N	$3.00	9/1/1996	4/1/2002	**
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$4.50	6/1/2008	3/1/2020	46,791,521
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$3.00	2/1/2007	6/1/2008	**
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$2.00	2/1/2005	2/1/2007	**
Lubbock	TX	Lubbock Preston Smith International	LBB	S	$3.00	10/1/1993	2/1/2005	**
McAllen	TX	McAllen Miller International	MFE	N	$4.50	6/1/2011	1/1/2023	29,874,804
McAllen	TX	McAllen Miller International	MFE	N	$3.00	4/1/1998	6/1/2011	**
Midland	TX	Midland International	MAF	S	$4.50	11/1/2014	5/1/2018	44,988,527
Midland	TX	Midland International	MAF	S	$3.00	1/1/2014	11/1/2014	**
Midland	TX	Midland International	MAF	S	$4.50	9/1/2004	1/1/2014	**
Midland	TX	Midland International	MAF	S	$3.00	1/1/1993	9/1/2004	**
San Angelo	TX	San Angelo Regional/Mathis Field	SJT	N	$4.50	4/1/2002	8/1/2018	4,954,307
San Angelo	TX	San Angelo Regional/Mathis Field	SJT	N	$3.00	5/1/1993	4/1/2002	**
San Antonio	TX	San Antonio International	SAT	M	$4.50	10/1/2007	7/1/2025	463,710,203
San Antonio	TX	San Antonio International	SAT	M	$3.00	11/1/2001	10/1/2007	**
Tyler	TX	Tyler Pounds Regional	TYR	N	$4.50	9/1/2003	9/1/2017	6,121,799
Tyler	TX	Tyler Pounds Regional	TYR	N	$3.00	3/1/1994	9/1/2003	**
Victoria	TX	Victoria Regional	VCT	CS	$4.50	1/1/2002	3/1/2016	829,737
Victoria	TX	Victoria Regional	VCT	CS	$3.00	1/1/1999	1/1/2002	**
Victoria	TX	Victoria Regional	VCT	CS	$3.00	12/1/1994	8/1/1998	**
Waco	TX	Waco Regional	ACT	N	$4.50	10/1/2001	5/1/2018	5,245,955
Waco	TX	Waco Regional	ACT	N	$3.00	11/1/1995	10/1/2001	**
Wichita Falls	TX	Sheppard AFB/Wichita Falls Municipal	SPS	N	$4.50	10/1/2008	8/1/2058	9,607,509
Cedar City	UT	Cedar City Regional	CDC	N	$4.50	2/1/2012	3/1/2024	621,704
Cedar City	UT	Cedar City Regional	CDC	N	$4.50	2/1/2007	10/1/2011	**
Salt Lake City	UT	Salt Lake City International	SLC	L	$4.50	4/1/2001	10/1/2022	1,009,980,729
Salt Lake City	UT	Salt Lake City International	SLC	L	$3.00	12/1/1994	4/1/2001	**
St George	UT	St George Municipal	DXZ/ SGU	N	$4.50	6/1/2003	6/1/2017	3,788,970
St George	UT	St George Municipal	DXZ/ SGU	N	$3.00	5/1/1998	9/1/2002	**
Wendover	UT	Wendover	ENV	GA	$3.00	8/1/1996	10/1/1999	142,300
Arlington	VA	Ronald Reagan Washington National	DCA	L	$4.50	5/1/2001	2/1/2023	1,025,567,305
Arlington	VA	Ronald Reagan Washington National	DCA	L	$3.00	11/1/1993	5/1/2001	**
Chantilly	VA	Washington Dulles International	IAD	L	$4.50	5/1/2001	12/1/2038	2,442,654,150
Chantilly	VA	Washington Dulles International	IAD	L	$3.00	1/1/1994	5/1/2001	**
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$4.50	8/1/2010	1/1/2017	13,905,600
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$4.50	2/1/2005	1/1/2010	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$4.50	1/1/2005	2/1/2005	**
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$3.00	4/1/1995	1/1/2005	**
Charlottesville	VA	Charlottesville-Albemarle	CHO	N	$2.00	9/1/1992	10/1/1993	**
Lynchburg	VA	Lynchburg Regional/Preston Glenn Field	LYH	N	$4.50	6/1/2002	1/1/2022	6,735,946
Lynchburg	VA	Lynchburg Regional/Preston Glenn Field	LYH	N	$3.00	9/1/2000	6/1/2002	**
Lynchburg	VA	Lynchburg Regional/Preston Glenn Field	LYH	N	$3.00	7/1/1995	7/1/1996	**
Newport News	VA	Newport News/Williamsburg International	PHF	N	$4.50	7/1/2010	12/1/2037	25,434,294
Newport News	VA	Newport News/Williamsburg International	PHF	N	$3.00	10/1/2006	7/1/2007	**
Norfolk	VA	Norfolk International	ORF	S	$4.50	9/1/2010	5/1/2019	128,108,120
Norfolk	VA	Norfolk International	ORF	S	$3.00	5/1/1997	1/1/2010	**
Richmond	VA	Richmond International	RIC	S	$4.50	1/1/2005	3/1/2025	169,972,887
Richmond	VA	Richmond International	RIC	S	$3.00	5/1/1994	1/1/2005	**
Roanoke	VA	Roanoke Regional/Woodrum Field	ROA	N	$4.50	11/1/2005	3/1/2016	21,092,477
Roanoke	VA	Roanoke Regional/Woodrum Field	ROA	N	$3.00	2/1/2005	11/1/2005	**
Roanoke	VA	Roanoke Regional/Woodrum Field	ROA	N	$4.50	12/1/2001	2/1/2005	**
Roanoke	VA	Roanoke Regional/Woodrum Field	ROA	N	$3.00	9/1/1998	12/1/2001	**
Staunton	VA	Shenandoah Valley Regional	SHD	N	$4.50	6/1/2007	9/1/2017	642,846
Staunton	VA	Shenandoah Valley Regional	SHD	N	$3.00	12/1/2001	12/1/2006	**
Charlotte Amalie	VI	Cyril E. King	STT	S	$4.50	4/1/2012	3/1/2019	41,284,663
Charlotte Amalie	VI	Cyril E. King	STT	S	$3.00	8/1/2004	4/1/2012	**
Charlotte Amalie	VI	Cyril E. King	STT	S	$3.00	12/1/1995	12/1/2002	**
Charlotte Amalie	VI	Cyril E. King	STT	S	$3.00	3/1/1993	8/1/1995	**
Christiansted	VI	Henry E. Rohlsen	STX	N	$3.00	10/1/2011	7/1/2016	9,339,163
Christiansted	VI	Henry E. Rohlsen	STX	N	$3.00	12/1/1996	7/1/2003	**
Christiansted	VI	Henry E. Rohlsen	STX	N	$3.00	3/1/1993	4/1/1996	**
Burlington	VT	Burlington International	BTV	S	$4.50	12/1/2009	4/1/2017	51,967,646
Burlington	VT	Burlington International	BTV	S	$4.50	9/1/2003	10/1/2009	**
Burlington	VT	Burlington International	BTV	S	$3.00	4/1/1997	9/1/2003	**
Bellingham	WA	Bellingham International	BLI	S	$4.50	10/1/2010	10/1/2027	38,188,548
Bellingham	WA	Bellingham International	BLI	S	$4.50	6/1/2005	7/1/2010	**
Bellingham	WA	Bellingham International	BLI	S	$4.50	7/1/2002	6/1/2005	**
Bellingham	WA	Bellingham International	BLI	S	$3.00	1/1/2000	7/1/2002	**
Bellingham	WA	Bellingham International	BLI	S	$3.00	3/1/1999	1/1/2000	**
Bellingham	WA	Bellingham International	BLI	S	$3.00	7/1/1993	8/1/1998	**
Friday Harbor	WA	Friday Harbor	FRD/ FHR	GA	$3.00	2/1/2001	7/1/2016	517,077
Moses Lake	WA	Grant County International	MWH	GA	$4.50	11/1/2005	1/1/2016	470,000
Moses Lake	WA	Grant County International	MWH	GA	$3.00	3/1/1999	11/1/2005	**
Pasco	WA	Tri-Cities	PSC	N	$4.50	10/1/2001	4/1/2039	55,831,261
Pasco	WA	Tri-Cities	PSC	N	$3.00	11/1/1993	10/1/2001	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Port Angeles	WA	William R. Fairchild International	CLM	GA	$3.00	7/1/2012	4/1/2022	1,000,156
Port Angeles	WA	William R. Fairchild International	CLM	GA	$3.00	9/1/1996	10/1/2011	**
Port Angeles	WA	William R. Fairchild International	CLM	GA	$3.00	8/1/1993	5/1/1995	**
Pullman	WA	Pullman/Moscow Regional	PUW	N	$4.50	11/1/2013	6/1/2069	11,352,608
Pullman	WA	Pullman/Moscow Regional	PUW	N	$4.50	10/1/2005	9/1/2013	**
Pullman	WA	Pullman/Moscow Regional	PUW	N	$4.50	1/1/2002	10/1/2005	**
Pullman	WA	Pullman/Moscow Regional	PUW	N	$3.00	2/1/2000	1/1/2002	**
Pullman	WA	Pullman/Moscow Regional	PUW	N	$3.00	6/1/1994	2/1/1996	**
Seattle	WA	Seattle-Tacoma International	SEA	L	$4.50	10/1/2001	11/1/2028	2,167,378,460
Seattle	WA	Seattle-Tacoma International	SEA	L	$3.00	11/1/1992	10/1/2001	**
Spokane	WA	Spokane International	GEG	S	$4.50	4/1/2003	11/1/2017	134,678,692
Spokane	WA	Spokane International	GEG	S	$3.00	6/1/1993	4/1/2003	**
Walla Walla	WA	Walla Walla Regional	ALW	N	$4.50	10/1/2001	10/1/2019	3,745,775
Walla Walla	WA	Walla Walla Regional	ALW	N	$3.00	11/1/1993	10/1/2001	**
Wenatchee	WA	Pangborn Memorial	EAT	N	$4.50	5/1/2010	8/1/2016	3,879,313
Wenatchee	WA	Pangborn Memorial	EAT	N	$4.50	5/1/2003	4/1/2010	**
Wenatchee	WA	Pangborn Memorial	EAT	N	$4.50	7/1/2002	2/1/2003	**
Wenatchee	WA	Pangborn Memorial	EAT	N	$3.00	6/1/1998	7/1/2002	**
Wenatchee	WA	Pangborn Memorial	EAT	N	$3.00	8/1/1993	10/1/1995	**
Yakima	WA	Yakima Air Terminal/McAllister Field	YKM	N	$4.50	4/1/2011	8/1/2017	4,851,251
Yakima	WA	Yakima Air Terminal/McAllister Field	YKM	N	$3.00	6/1/2000	4/1/2011	**
Yakima	WA	Yakima Air Terminal/McAllister Field	YKM	N	$3.00	5/1/1999	6/1/2000	**
Yakima	WA	Yakima Air Terminal/McAllister Field	YKM	N	$3.00	2/1/1993	2/1/1999	**
Appleton	WI	Outagamie County Regional	ATW	N	$4.50	9/1/2008	5/1/2017	20,417,560
Appleton	WI	Outagamie County Regional	ATW	N	$3.00	4/1/2008	9/1/2008	**
Appleton	WI	Outagamie County Regional	ATW	N	$4.50	6/1/2006	4/1/2008	**
Appleton	WI	Outagamie County Regional	ATW	N	$3.00	7/1/1994	6/1/2006	**
Eau Claire	WI	Chippewa Valley Regional	EAU	N	$4.50	8/1/2006	6/1/2024	2,147,974
Eau Claire	WI	Chippewa Valley Regional	EAU	N	$4.50	12/1/2001	1/1/2006	**
Eau Claire	WI	Chippewa Valley Regional	EAU	N	$3.00	2/1/1996	12/1/2001	**
Green Bay	WI	Austin Straubel International	GRB	N	$4.50	3/1/2002	10/1/2020	46,299,787
Green Bay	WI	Austin Straubel International	GRB	N	$3.00	3/1/1993	3/1/2002	**
La Crosse	WI	La Crosse Municipal	LSE	N	$4.50	4/1/2001	3/1/2024	11,300,240
La Crosse	WI	La Crosse Municipal	LSE	N	$3.00	7/1/1994	4/1/2001	**
Madison	WI	Dane County Regional - Truax Field	MSN	S	$4.50	11/1/2001	10/1/2023	92,211,569
Madison	WI	Dane County Regional - Truax Field	MSN	S	$3.00	9/1/1993	11/1/2001	**
Milwaukee	WI	General Mitchell International	MKE	M	$3.00	2/1/2020	4/1/2028	394,620,217
Milwaukee	WI	General Mitchell International	MKE	M	$4.50	11/1/2012	2/1/2020	**
Milwaukee	WI	General Mitchell International	MKE	M	$3.00	5/1/1995	11/1/2012	**
Mosinee	WI	Central Wisconsin	CWA	N	$4.50	9/1/2007	9/1/2016	11,255,100
Mosinee	WI	Central Wisconsin	CWA	N	$3.00	11/1/1993	9/1/2007	**
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	$4.50	9/1/2001	9/1/2016	2,520,771
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	$3.00	6/1/1996	9/1/2001	**
Rhinelander	WI	Rhinelander-Oneida County	RHI	N	$3.00	1/1/1994	4/1/1996	**
Charleston	WV	Yeager	CRW	N	$4.50	11/1/2001	6/1/2018	25,641,516
Charleston	WV	Yeager	CRW	N	$3.00	8/1/1993	11/1/2001	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
Clarksburg	WV	North Central West Virginia	CKB	N	$4.50	5/1/2004	5/1/2054	3,101,233
Clarksburg	WV	North Central West Virginia	CKB	N	$4.50	4/1/2001	8/1/2002	**
Clarksburg	WV	North Central West Virginia	CKB	N	$3.00	3/1/1994	10/1/1995	**
Huntington	WV	Tri-State/Milton J. Ferguson Field	HTS	N	$4.50	7/1/2012	10/1/2017	5,431,449
Huntington	WV	Tri-State/Milton J. Ferguson Field	HTS	N	$3.00	5/1/2009	6/1/2012	**
Huntington	WV	Tri-State/Milton J. Ferguson Field	HTS	N	$3.00	12/1/1995	12/1/2008	**
Lewisburg	WV	Greenbrier Valley	LWB	CS	$4.50	4/1/2011	1/1/2025	1,104,958
Morgantown	WV	Morgantown Municipal-Walter L. Bill Hart Field	MGW	N	$4.50	6/1/2009	1/1/2026	1,170,454
Morgantown	WV	Morgantown Municipal-Walter L. Bill Hart Field	MGW	N	$4.50	6/1/2004	3/1/2008	**
Morgantown	WV	Morgantown Municipal-Walter L. Bill Hart Field	MGW	N	$4.50	1/1/2002	6/1/2004	**
Morgantown	WV	Morgantown Municipal-Walter L. Bill Hart Field	MGW	N	$2.00	12/1/1994	1/1/2002	**
Morgantown	WV	Morgantown Municipal-Walter L. Bill Hart Field	MGW	N	$2.00	12/1/1992	1/1/1994	**
Parkersburg	WV	Mid-Ohio Valley Regional	PKB	CS	$4.50	8/1/2003	9/1/2016	592,034
Parkersburg	WV	Mid-Ohio Valley Regional	PKB	CS	$3.00	5/1/1999	8/1/2002	**
Casper	WY	Casper/ Natrona County International	CPR	N	$3.00	3/1/2012	5/1/2019	5,763,921
Casper	WY	Casper/ Natrona County International	CPR	N	$4.50	6/1/2003	3/1/2012	**
Casper	WY	Casper/ Natrona County International	CPR	N	$4.50	4/1/2001	6/1/2003	**
Casper	WY	Casper/ Natrona County International	CPR	N	$3.00	9/1/1993	4/1/2001	**
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field	CYS	N	$4.50	9/1/2014	9/1/2024	1,804,637
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field	CYS	N	$4.50	1/1/2007	9/1/2012	**
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field	CYS	N	$4.50	4/1/2001	1/1/2007	**
Cheyenne	WY	Cheyenne Regional/Jerry Olson Field	CYS	N	$3.00	11/1/1993	4/1/2001	**
Cody	WY	Yellowstone Regional	COD	N	$4.50	9/1/2005	6/1/2018	2,095,401
Cody	WY	Yellowstone Regional	COD	N	$4.50	7/1/2003	4/1/2005	**
Cody	WY	Yellowstone Regional	COD	N	$4.50	7/1/2001	7/1/2003	**
Cody	WY	Yellowstone Regional	COD	N	$3.00	8/1/1997	7/1/2001	**
Gillette	WY	Gillette-Campbell County	GCC	N	$4.50	1/1/2005	3/1/2017	1,915,492
Gillette	WY	Gillette-Campbell County	GCC	N	$4.50	12/1/2001	6/1/2004	**
Gillette	WY	Gillette-Campbell County	GCC	N	$3.00	9/1/1993	12/1/2001	**
Jackson	WY	Jackson Hole	JAC	N	$4.50	4/1/2001	9/1/2041	39,749,014
Jackson	WY	Jackson Hole	JAC	N	$3.00	8/1/1993	4/1/2001	**
Laramie	WY	Laramie Regional	LAR	N	$4.50	6/1/2013	6/1/2017	563,891
Laramie	WY	Laramie Regional	LAR	N	$4.50	12/1/2006	4/1/2013	**
Laramie	WY	Laramie Regional	LAR	N	$3.00	12/1/2000	8/1/2001	**
Laramie	WY	Laramie Regional	LAR	N	$3.00	8/1/1996	10/1/2000	**
Riverton	WY	Riverton Regional	RIW	N	$4.50	4/1/2001	3/1/2045	1,754,285
Riverton	WY	Riverton Regional	RIW	N	$3.00	5/1/1995	4/1/2001	**
Rock Springs	WY	Rock Springs-Sweetwater County	RKS	N	$4.50	4/1/2006	12/1/2025	2,009,268
Rock Springs	WY	Rock Springs-Sweetwater	RKS	N	$3.00	4/1/1995	4/1/2006	**

Associated City	State	Airport Name	LOC ID	Hub size	Level	Start Date	Expiration Date	Total PFC Approved
		County						
Sheridan	WY	Sheridan County	SHR	N	$4.50	10/1/2008	8/1/2035	1,388,712
Sheridan	WY	Sheridan County	SHR	N	$4.50	12/1/2001	9/1/2008	**
Sheridan	WY	Sheridan County	SHR	N	$3.00	3/1/1996	12/1/2001	**
Worland	WY	Worland Municipal	WRL	CS	$4.50	8/1/2008	7/1/2022	265,060
Worland	WY	Worland Municipal	WRL	CS	$4.50	1/1/2003	3/1/2008	**
NOTES:								
Collections at locations noted by * in the amount were prematurely stopped due to FAA processing errors.								
** Amount shown on line imediately above the double asterisk is the total approved collections at this location at both the $3 and $4.50 levels.								

Letter of Intent (LOI) Commitments by Fiscal Year

State	City	Airport Name	Hub Type		Discretionary 2016	Entitlement 2016
AK	Anchorage	Ted Stevens Anchorage International	M		1,000,000	0
CA	Los Angeles	Los Angeles International	L		11,000,000	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	L		20,000,000	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)	L		20,000,000	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]	L		25,000,000	0
NY	New York	John F Kennedy International	L		7,000,000	0
OH	Cleveland	Cleveland-Hopkins International	M		0	3,535,000
OH	Columbus	Port Columbus International	M		10,000,000	2,144,000
PA	Philadelphia	Philadelphia International	L		27,000,000	7,000,000
TX	Dallas	Dallas Love Field	M		7,000,000	900,000
VA	Washington	Washington Dulles International	L		9,000,000	0
		Total			137,000,000	13,579,000

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2017	Entitlement 2017	Discretionary 2018	Entitlement 2018
AK	Anchorage	Ted Stevens Anchorage International	0	0	0	0
CA	Los Angeles	Los Angeles International	11,000,000	0	11,000,000	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	20,000,000	0	20,000,000	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)	20,000,000	0	20,000,000	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]	25,000,000	0	35,000,000	0
NY	New York	John F Kennedy International	0	0	0	0
OH	Cleveland	Cleveland-Hopkins International	0	658,991	0	0
OH	Columbus	Port Columbus International	1,928,463	1,703,869	0	0
PA	Philadelphia	Philadelphia International	22,000,000	0	26,000,000	0
TX	Dallas	Dallas Love Field	7,000,000	900,000	0	0
VA	Washington	Washington Dulles International	0	0	0	0
		Total	106,928,463	3,262,860	112,000,000	0

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2019	Entitlement 2019	Discretionary 2020	Entitlement 2020
AK	Anchorage	Ted Stevens Anchorage International	0	0	0	0
CA	Los Angeles	Los Angeles International	11,000,000	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	20,000,000	0	20,000,000	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)	20,000,000	0	20,000,000	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]	45,000,000	0	45,000,000	0
NY	New York	John F Kennedy International	0	0	0	0
OH	Cleveland	Cleveland-Hopkins International	0	0	0	0
OH	Columbus	Port Columbus International	0	0	0	0
PA	Philadelphia	Philadelphia International	30,000,000	0	32,000,000	0
TX	Dallas	Dallas Love Field	0	0	0	0
VA	Washington	Washington Dulles International	0	0	0	0
		Total	126,000,000	0	117,000,000	0

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2021	Entitlement 2021	Discretionary 2022	Entitlement 2022
AK	Anchorage	Ted Stevens Anchorage International	0	0	0	0
CA	Los Angeles	Los Angeles International	0	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	20,000,000	0	10,000,000	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)	0	0	0	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]	25,000,000	0	25,000,000	0
NY	New York	John F Kennedy International	0	0	0	0
OH	Cleveland	Cleveland-Hopkins International	0	0	0	0
OH	Columbus	Port Columbus International	0	0	0	0
PA	Philadelphia	Philadelphia International	40,000,000	0	40,000,000	0
TX	Dallas	Dallas Love Field	0	0	0	0
VA	Washington	Washington Dulles International	0	0	0	0
		Total	85,000,000	0	75,000,000	0

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2023	Entitlement 2023	Discretionary 2024	Entitlement 2024
AK	Anchorage	Ted Stevens Anchorage International	0	0	0	0
CA	Los Angeles	Los Angeles International	0	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	0	0	0	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)	0	0	0	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]	20,000,000	0	20,000,000	0
NY	New York	John F Kennedy International	0	0	0	0
OH	Cleveland	Cleveland-Hopkins International	0	0	0	0
OH	Columbus	Port Columbus International	0	0	0	0
PA	Philadelphia	Philadelphia International	40,000,000	0	41,000,000	0
TX	Dallas	Dallas Love Field	0	0	0	0
VA	Washington	Washington Dulles International	0	0	0	0
		Total	60,000,000	0	61,000,000	0

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2025	Entitlement 2025	Discretionary 2026	Entitlement 2026
AK	Anchorage	Ted Stevens Anchorage International	0	0	0	0
CA	Los Angeles	Los Angeles International	0	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	0	0	0	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)	0	0	0	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]	20,000,000	0	20,000,000	0
NY	New York	John F Kennedy International	0	0	0	0
OH	Cleveland	Cleveland-Hopkins International	0	0	0	0
OH	Columbus	Port Columbus International	0	0	0	0
PA	Philadelphia	Philadelphia International	26,000,000	0	26,000,000	0
TX	Dallas	Dallas Love Field	0	0	0	0
VA	Washington	Washington Dulles International	0	0	0	0
		Total	46,000,000	0	46,000,000	0

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name	Discretionary 2027	Entitlement 2027	Discretionary 2028	Entitlement 2028
AK	Anchorage	Ted Stevens Anchorage International	0	0	0	0
CA	Los Angeles	Los Angeles International	0	0	0	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International	0	0	0	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)	0	0	0	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]	0	0	0	0
NY	New York	John F Kennedy International	0	0	0	0
OH	Cleveland	Cleveland-Hopkins International	0	0	0	0
OH	Columbus	Port Columbus International	0	0	0	0
PA	Philadelphia	Philadelphia International	25,000,000	0	10,000,000	0
TX	Dallas	Dallas Love Field	0	0	0	0
VA	Washington	Washington Dulles International	0	0	0	0
		Total	25,000,000	0	10,000,000	0

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

Letter of Intent (LOI) Commitments by Fiscal Year (Cont'd)

State	City	Airport Name			Discretionary Total	Entitlement Total
AK	Anchorage	Ted Stevens Anchorage International			1,000,000	0
CA	Los Angeles	Los Angeles International			44,000,000	0
FL	Fort Lauderdale	Fort Lauderdale/Hollywood International			130,000,000	0
IL	Chicago	Chicago O'Hare International (OMP Phase 1)			100,000,000	0
IL	Chicago	Chicago O'Hare International (OMB Completion Phase)[1]			305,000,000	0
NY	New York	John F Kennedy International			7,000,000	0
OH	Cleveland	Cleveland-Hopkins International			0	4,193,991
OH	Columbus	Port Columbus International			11,928,463	3,847,869
PA	Philadelphia	Philadelphia International			385,000,000	7,000,000
TX	Dallas	Dallas Love Field			14,000,000	1,800,000
VA	Washington	Washington Dulles International			9,000,000	0
		Total			1,006,928,463	16,841,860

[1] On December 23, 2015, The Office of the Secretary of Transportation notified Congress that we are considering an amendment that would add $60 million to the LOI from FY 2022 through FY 2026. The above payment schedule does not include the $60 million.

INSERT TAB HERE:

3E. OTHER INFORMATION

FACILITIES AND EQUIPMENT, RECOVERY ACT

Program and Financing
(in millions of dollars)

Identification code: 69-1304-0		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Change in obligated balances:			
	Unpaid Obligations:			
3000	Unpaid Obligations, brought forward, Oct 1:	1	1	1
3050	Unpaid Obligations, end of year	1	1	1
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	1	1	1
3200	Obligated balance, end of year	1	1	1

The American Recovery and Reinvestment Act of 2009 provided $200 million to Federal Aviation Administration's (FAA) Facilities & Equipment account, which finances major capital investments related to modernizing and improving air traffic control and airway facilities, equipment, and systems. Funds were appropriated from the General Fund of the U.S. Treasury and available for obligation through 2010. The funding is being used to upgrade, modernize, and improve FAA power systems, air route traffic control centers, air traffic control towers, terminal radar approach control facilities, and navigation and landing equipment.

AVIATION USER FEES

Special and Trust Fund Receipts
(in millions of dollars)

Identification code: 69-5422-0-2-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
0100	Balance, start of year	20	8	16
0198	Rounding adjustment	-1	......	......
0199	Balance, start of year	19	8	16
	Receipts:			
	Current Law:			
1110	Aviation User Fees, Overflight Fees	100	111	104
2000	Total: Balances and receipts	119	119	120
	Appropriations:			
	Current Law:			
2101	Aviation User Fees	-119	-111	-104
2132	Essential Air Service and Rural Airport Improvement Fund	8	8	......
2199	Total current law appropriations	-111	-103	-104
2999	Total appropriations	-111	-103	-104
5099	Balance, end of year	8	16	16

Program and Financing
(in millions of dollars)

Identification code: 69-5422-0-2-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Obligations by program activity:			
0001	Other Collections	16	......	......
0100	Direct program activities, subtotal	16	......	......
0900	Total new obligations	16	......	......
	Budgetary resources:			
	Unobligated balance:			
1000	Unobligated balance brought forward, Oct 1	2	2	2
1050	Unobligated balance (total)	2	2	2
	Budget authority:			
	Appropriations, mandatory:			
1201	Appropriations (special or trust fund)	119	111	104
1220	Appropriations Transferred to other accounts [69-5423]	-103	-111	-104
1260	Appropriations, mandatory (total)	16	......	......
1900	Budget authority (total)	16	.....	......
1930	Total budgetary resources available	18	2	2
	Memorandum (non-add) entries:			
1941	Unexpired unobligated balance, end of year	2	2	2
	Change in obligated balance:			
	Unpaid obligations:			
3000	Unpaid Obligations, brought forward, Oct1	1	......	......
3010	Obligations incurred, unexpired accounts.	16	......	......
3020	Outlays (gross)	-17	.....	......
	Memorandum (non-add) entries:			
3100	Obligated balance, start of the year	1	.....	......
	Budget authority and outlays, net:			
	Mandatory:			
4090	Budget authority, gross	16	......	......
	Outlays, gross:			
4100	Outlays from new mandatory authority	16	.....	......
4101	Outlays from mandatory balances	1	.....	......

4110	Outlays, gross (total)	17	.....	......
4180	Budget authority, net (total)	16	.....	......
4190	Outlays, net (total)	17	.....	......

The Federal Aviation Reauthorization Act of 1996 (P.L. 104–264) authorized the collection of user fees for air traffic control and related services provided by the Federal Aviation Administration to aircraft that neither take off nor land in the United States, commonly known as overflight fees. The Budget estimates that $104 million in overflight fees will be collected in 2017.

AVIATION INSURANCE REVOLVING FUND

Program and Financing
(in millions of dollars)

Identification code: 69-4120-0-3-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Obligations by program activity:			
0801	Program administration	1	1	1
0802	Insurance Claims	1	......	......
0803	Refunds	5	1	......
0900	Total new obligations	7	2	1
	Budget resources:			
	Unobligated balance:			
1000	Unobligated balance brought forward, Oct. 1	2,145	2,132	2,159
	Budget authority:			
	Spending authority form offsetting collections, mandatory:			
1800	Collected	-6	29	53
1930	Total budgetary resources available	2,139	2,161	2,212
	Memorandum (non-add) entries:			
1941	Unexpired unobligated balance, end of year	2,132	2,159	2,211
	Change in obligated balance:			
	Unpaid obligations:			
3000	Unpaid obligations, brought forward, Oct. 1 (gross)	2	1	2
3010	Obligations incurred, unexpired accounts	7	2	1
3020	Outlays (gross)	-8	-1	-1
3050	Unpaid obligations, end of year	1	2	2
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	2	1	2
3200	Obligated balance, end of year	1	2	2
	Budget authority and outlays net:			
	Mandatory:			
4090	Budget authority, gross	-6	29	53
	Outlay, gross:			
4100	Outlays from new mandatory authority	......	1	1
4101	Outlays from mandatory balances	8	.....	.....
4110	Outlays, gross (total)	8	1	1
	Offsets against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
4121	Interest on Federal securities	10	-29	-53
4123	Non-Federal sources	-4	......	......
4130	Offsets against gross budget authority and outlays (total)	6	-29	-53
4170	Outlays, net (mandatory)	14	-28	-52
4190	Outlays, net (total)	14	-28	-52
	Memorandum (non-add) entries:			
5000	Total investments, SOY: Federal securities: Par value	2,137	2,126	2,140
5001	Total investments, EOY: Federal securities: Par value	2,126	2,140	2,192

The fund provides direct support for the aviation insurance program (chapter 443 of title 49, U.S. Code). In December 2014, Congress sunset part of the aviation insurance program. Specifically, Congress returned U.S. air carriers to the commercial aviation market for all of their war risk insurance coverage by ending the FAA's authority to provide war risk insurance for a premium. Pursuant to 49 USC 44305, the FAA may provide insurance without premium at the request of the Secretary of Defense or the head of a department, agency, or instrumentality designated by the President when the Secretary of Defense or the designated head agrees to indemnify the Secretary of Transportation against all losses covered by the insurance. The "non-premium" aviation insurance program is authorized through December 31, 2018.

Object Classification
(in millions of dollars)

Identification code: 69-4120-0-3-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Reimbursable obligations:			
11.1	Personnel Compensation: Full time permanent.......................	1	1	1
42.0	Projected Insurance Claims and indemnities	1	......	......
44.0	Refunds	5	1	......
99.9	Total new obligations	7	2	1

Employment Summary

Identification code: 69-4120-0-3-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
2001	Reimbursable Civilian full-time equivalent employment.....	4	4	4

ADMINISTRATIVE SERVICES FRANCHISE FUND

Program and Financing
(in millions of dollars)

Identification code: 69-4562-0-4-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Obligations by program activity:			
0801	Accounting Services	71	49	50
0804	Information Services	112	124	125
0806	Multi Media	3	4	4
0807	FLLI (formerly CMEL/Training)	8	10	10
0808	International Training	3	4	4
0810	Logistics	215	198	200
0811	Aircraft Maintenance	72	65	64
0812	Acquisition	8	7	7
0900	Total new obligations	492	461	464
	Budgetary Resources:			
	Unobligated balance:			
1000	Unobligated balance brought forward, Oct 1	186	185	203
1021	Recoveries of prior year unpaid obligations	40	....	....
1050	Unobligated balance (total)	226	185	203
	Budget authority:			
	Spending authority from offsetting collections, discretionary:			
1700	Collected	449	479	478
1701	Change in uncollected payments, federal sources	2	....	....
1750	Spending auth from offsetting collections, disc (total)	451	479	478
1930	Total budgetary resources available	677	664	681
	Memorandum (non-add) entries:			
1941	Unexpired unobligated balance, end of year	185	203	217
	Change in obligated balances:			
	Unpaid obligations:			
3000	Unpaid obligations, brought forward, Oct 1	176	173	171
3010	Obligations incurred, unexpired accounts	492	461	464
3020	Outlays (gross)	-455	-463	-481
3040	Recoveries of prior year unpaid obligations unexpired	-40	....	....
3050	Unpaid obligations, end of year	173	171	154
	Uncollected payments:			
3060	Uncollected pymts, Fed sources, brought forward, Oct 1	2	....	....
3070	Change in Uncollected pymts, fed sources, unexpired	-2	....	....
	Memorandum (non-add) entries:			
3100	Obligated balance, start of year	178	173	171
3200	Obligated balance, end of year	173	171	154
	Budget authority and Outlays, net:			
	Discretionary:			
4000	Budget authority, gross	451	479	478
	Outlays gross:			
4010	Outlays from new discretionary authority	338	326	325
4011	Outlays from discretionary balances	117	137	156
4020	Outlays, gross (total)	455	463	481
	Offsets against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
4030	Federal sources	-448	-479	-478
4033	Non-Federal sources	-1	....	....
4040	Offsets against gross budget authority and outlays (total)	-449	-479	-478
	Additional offsets against gross budget authority only:			
4050	Change in uncollected pmts, Fed sources unexpired	-2	....	....

4080	Outlays, net (discretionary)	6	-16	3
4180	Budget authority, net (total)	....	....	....
4190	Outlays, net (total)	6	-16	3

In 1997, the Federal Aviation Administration (FAA) established a franchise fund to finance operations where the costs for goods and services provided are charged to the users on a fee-for-service basis. The fund improves organizational efficiency and provides better support to FAA's internal and external customers. The activities included in this franchise fund are: training, accounting, travel, duplicating services, multi-media services, information technology, materiel management (logistics), and aircraft maintenance.

Object Classification
(in millions of dollars)

Identification code: 69-4562-0-4-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Reimbursable obligations:			
11.1	Personnel compensation: Full-time permanent	127	139	142
12.1	Civilian personnel benefits	43	50	50
21.0	Travel and transportation of persons	5	6	6
22.0	Transportation of things	6	5	5
23.3	Communications, utilities, and miscellaneous charges	13	12	12
25.2	Other services from non-Federal sources	216	154	155
26.0	Supplies and materials	74	87	86
31.0	Equipment	7	7	7
42.0	Insurance claims and indemnities	1	1	1
99.9	Total new obligations	492	461	464

Employment Summary

Identification code: 69-4562-0-4-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
2001	Reimbursable civilian full-time equivalent employment	1,645	1,823	1,822

AIRPORT AND AIRWAY TRUST FUND

Program and Financing
(in millions of dollars)

Identification code: 69-8103-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Memorandum (non-add) entries:			
5000	Total investments, start of year: Federal securities: Par value	12,759	12,716	11,444
5001	Total investments, end of year: Federal securities: Par value	12,716	11,444	10,299

Section 9502 of Title 26, U.S. Code, provides for amounts equivalent to the funds received in the U.S. Treasury for the passenger ticket tax and certain other taxes paid by airport and airway users to be transferred to the Airport and Airway Trust Fund. In turn, appropriations are authorized from this fund to meet obligations for airport improvement grants, Federal Aviation Administration facilities and equipment, research, operations, payment to air carriers, and for the Bureau of Transportation Statistics Office of Airline Information.

The status of the fund is as follows:

Status of Funds (in millions of dollars)

Identification code: 69-8103-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Unexpended balance, start of year:			
0100	Balance, start of year	14,187	14,071	14,277
0999	Total balance, start of year	14,187	14,071	14,277
	Cash Income during the year:			
	Current law:			
	Receipts			
1110	Excise Taxes, Airport and Airway Trust Fund	14,268	14,351	15,063
1130	Grants-in-aid for Airports (Airport and Airway Trust Fund)	1	1	1
1130	Facilities and Equipment (Airport and Airway and Airport Trust Fund)	34	36	36
1150	Interest, Airport and Airway Trust Fund	274	264	303
1160	Facilities and Equipment (Airport and Airway Trust Fund)	28	16	16
1160	Research, Engineering and Development (Airport and Airway Trust Fund)	3	3	3
1199	Income under present law	14,608	14,671	15,422
1999	Total cash income	14,608	14,671	15,422
	Cash outgo during year:			
	Current law:			
2100	Payments to Air Carriers (021-04-8301-0)	-146	-160	-160
2100	Trust Fund Share of FAA Activities (Airport and Airway Trust Fund)(021-12-8104-0)	-8,595	-7,922	-7,608
2100	Grants-in-aid for Airports (Airport and Airway Trust Fund) (021-12-8106-0)	-3,141	-3,416	-3,367
2100	Facilities and Equipment (Airport and Airway Trust Fund) (021-12-8107-0)	-2,681	-2,787	-2,959
2100	Research, Engineering and Development (Airport and Airway Trust Fund) (021-12-8108-0)	-159	-180	-188
2199	Outgo under current law (-)	-14,722	-14,465	-14,282
2999	Total Cash outgo (-)	-14,722	-14,465	-14,282

	Surplus Deficit:			
3110	Excluding interest	-388	-58	837
3120	Interest	274	264	303
3199	Subtotal, surplus or deficit	-114	206	1,140
	Manual Adjustments:			
3298	Rounding adjustment	-2	.....	.....
3299	Total adjustments	-2	.....	.....
	Unexpended balance, end of year:			
4100	Uninvested balance (net), end of year	1,355	2,833	5,118
4200	Airport and Airway Trust Fund	12,716	11,444	10,299
4999	Total balance, end of year	14,071	14,277	15,417

TRUST FUND SHARE OF FAA ACTIVITIES
(AIRPORT AND AIRWAY TRUST FUND)

Program and Financing
(in millions of dollars)

Identification code: 69-8104-0-7-402		FY 2015 Actual	FY 2016 Estimate	FY 2017 Estimate
	Obligations by program activity:			
0001	Payment to Operations	8,595	7,922	7,608
0900	Total new obligations (object class 94.0)	8,595	7,922	7,608
	Budgetary resources:			
	Appropriations, discretionary:			
	Budge authority:			
1101	Appropriations (special or trust fund).	8,595	7,922	7,608
1930	Total budgetary resources available	8,595	7,922	7,608
	Change in obligated balance:			
	Unpaid obligations:			
3010	Obligations incurred, unexpired accounts	8,595	7,922	7,608
3020	Outlays (gross):	-8,595	-7,922	-7,608
	Budget authority and outlays, net:			
	Discretionary:			
4000	Budget authority, gross	8,595	7,922	7,608
	Outlays, gross:			
4010	Outlays from new discretionary authority	8,595	7,922	7,608
4180	Budget authority, net (total)	8,595	7,922	7,608
4190	Outlays, net (total)	8,595	7,922	7,608

For 2017, the Budget proposes $9,994 million for Federal Aviation Administration Operations, of which $7,608 million would be provided from the Airport and Airway Trust Fund.

FAA ADMINISTRATIVE PROVISIONS - REQUESTED

Sec. 110. The Administrator of the Federal Aviation Administration shall reimburse amounts made available to satisfy 49 U.S.C. 41742(a)(1) from fees credited under 49 U.S.C. 45303 and any amount remaining in such account at the close of that fiscal year may be made available to satisfy section 41742(a)(1) for the subsequent fiscal year.

- In order to satisfy 49 U.S.C. 41742(a)(1), at the beginning of each fiscal year FAA makes available to the Essential Air Services (EAS) program funding from the Facilities & Equipment (F&E) account. This provision ensures that the F&E account is reimbursed from the over-flight fees collected and is needed in order to continue the practice in FY 2017.

Sec. 111. Amounts collected under section 40113(e) of title 49, United States Code, shall be credited to the appropriation current at the time of collection, to be merged with and available for the same purposes of such appropriation.

- As authorized under 49 USC 40113(e), the FAA may provide safety-related training and operational services to foreign aviation authorities with or without reimbursement. While FAA generally enforces a prepayment policy for reimbursable goods and services provided to foreign countries or international organizations, many have laws or regulations similar to the U.S. that prohibit advance payments. In those instances, FAA often receives payments for services provided during a fiscal year after that year has ended. This provision allows FAA to use the funds for additional technical assistance work that cannot be prepaid, instead of returning the funds to a lapsed appropriation.

Sec. 112. None of the funds in this Act shall be available for paying premium pay under subsection 5546(a) of title 5, United States Code, to any Federal Aviation Administration employee unless such employee actually performed work during the time corresponding to such premium pay.

- The provision stems from past legal action taken by air traffic controllers to receive premium pay for a full shift, even if only part of the shift was eligible for premium pay. The FAA recommends retaining this provision as a GP that would apply to all FAA accounts. FAA also recommends keeping this provision for FY 2016 in order to minimize potential payroll liability.

Sec. 113. None of the funds in this Act may be obligated or expended for an employee of the Federal Aviation Administration to purchase a store gift card or gift certificate through use of a Government-issued credit card.

- This provision prohibits FAA employees from using a government-issued credit card to purchase a store gift card or gift certificate. FAA recommends retaining this provision as a GP that would apply to all FAA accounts.

Sec. 114. None of the funds in this Act may be obligated or expended for retention bonuses for an employee of the Federal Aviation Administration without the prior written approval of the Assistant Secretary for Administration of the Department of Transportation.

- The FY 2016 budget proposes to retain the provision that all FAA retention bonuses continue to be approved by the Assistant Secretary for Administration.

GENERAL PROVISIONS—THIS ACT

Sec. 404. (a) Except as otherwise provided in this Act, none of the funds provided in this Act, provided by previous appropriations Acts to the agencies or entities funded in this Act that remain available for obligation or expenditure in fiscal year 2017, or provided from any accounts in the Treasury derived by the collection of fees and available to the agencies funded by this Act, shall be available for obligation or expenditure through a reprogramming of funds that:

(1) creates a new program;
(2) eliminates a program, project, or activity;
(3) increases funds or personnel for any program, project, or activity for which funds have been denied or restricted by the Congress;
(4) proposes to use funds directed for a specific activity by either the House or Senate Committees on Appropriations for a different purpose;
(5) augments existing programs, projects, or activities in excess of $5,000,000 or 10 percent, whichever is less;
(6) reduces existing programs, projects, or activities by $5,000,000 or 10 percent, whichever is less; or
(7) creates, reorganizes, or restructures a branch, division, office, bureau, board, commission, agency, administration, or department different from the budget justifications submitted to the Committees on Appropriations or the table accompanying the explanatory statement accompanying this Act, whichever is more detailed, unless notice is transmitted to the House and Senate Committees on Appropriations: Provided, That not later than 60 days after the date of enactment of this Act, each agency funded by this Act shall submit a report to the Committees on Appropriations of the Senate and of the House of Representatives to establish the baseline for application of reprogramming and transfer authorities for the current fiscal year: Provided further, That the report shall include:

(A) a table for each appropriation with a separate column to display the prior year enacted level, the President's budget request, adjustments made by Congress, adjustments due to enacted rescissions, if appropriate, and the fiscal year enacted level;
(B) a delineation in the table for each appropriation and its respective prior year enacted level by object class and program, project, and activity as detailed in the budget appendix for the respective appropriation; and
(C) an identification of items of special congressional interest.

(b) Notwithstanding any other transfer restriction under this Act, not to exceed 10 percent of any appropriation made available for the current fiscal year for the Federal Aviation Administration by this Act or provided by previous appropriations Acts may be transferred between such appropriations for the Federal Aviation Administration, but no such appropriation except as otherwise specifically provided, shall be increased by more than 10 percent by any such transfer: Provided, That funds transferred under this section shall be treated as a reprogramming of funds under subsection (a) and shall not be available for obligation unless the Committees on Appropriations of the Senate and the House of Representatives are notified 15 days in advance of such transfer: Provided further, that any transfer from an amount made available for obligation as discretionary grants-in-aid for airports pursuant to section 47117(f) of title 49, United States Code shall be deemed as obligated for grants-in-aid for airports under part B of subtitle VII of title 49, United States Code for the purposes of complying with the limitation on incurring obligations in this appropriations Act or any other appropriations Act under the heading "Grants-in-Aid for Airports."

- In keeping with the set of core principles that will guide us through the upcoming reauthorization, the FY 2017 budget requests additional budget flexibility. While the FAA has long benefited from the ability to seek congressional approval to reprogram limited amounts within budget accounts contained in Section 404(a), there has traditionally been no flexibility at the account level. This new authority in Section 404(b) will allow the FAA to request the transfer of up to 10 percent of any appropriation across accounts, provided that no account is increased by more than 10 percent. Such a transfer would be subject to approval by both congressional Committees on Appropriations.

FAA Administrative Provisions - Deleted

The following FAA Administrative Provisions from the FY 2016 Consolidated Appropriations Act are not reflected in the FY 2017 budget request. These provisions are generally restrictive or proscriptive in nature, impeding FAA's flexibility to provide the safest, most efficient, and most cost effective services to the aviation community.

[SEC. 110. None of the funds in this Act may be used to compensate in excess of 600 technical staff-years under the federally funded research and development center contract between the Federal Aviation Administration and the Center for Advanced Aviation Systems Development during fiscal year 2016.]

[SEC. 111. None of the funds in this Act shall be used to pursue or adopt guidelines or regulations requiring airport sponsors to provide to the Federal Aviation Administration without cost building construction, maintenance, utilities and expenses, or space in airport sponsor-owned buildings for services relating to air traffic control, air navigation, or weather reporting: Provided, That the prohibition of funds in this section does not apply to negotiations between the agency and airport sponsors to achieve agreement on "below-market" rates for these items or to grant assurances that require airport sponsors to provide land without cost to the FAA for air traffic control facilities.]

[SEC. 116. The Secretary shall apportion to the sponsor of an airport that received scheduled or unscheduled air service from a large certified air carrier (as defined in part 241 of title 14 Code of Federal Regulations, or such other regulations as may be issued by the Secretary under the authority of section 41709) an amount equal to the minimum apportionment specified in 49 U.S.C. 47114(c), if the Secretary determines that airport had more than 10,000 passenger boardings in the preceding calendar year, based on data submitted to the Secretary under part 241 of title 14, Code of Federal Regulations.]

[SEC. 118. Notwithstanding any other provision of law, none of the funds made available under this Act or any prior Act may be used to implement or to continue to implement any limitation on the ability of any owner or operator of a private aircraft to obtain, upon a request to the Administrator of the Federal Aviation Administration, a blocking of that owner's or operator's aircraft registration number from any display of the Federal Aviation Administration's Aircraft Situational Display to Industry data that is made available to the public, except data made available to a Government agency, for the noncommercial flights of that owner or operator.]

[SEC. 119. None of the funds in this Act shall be available for salaries and expenses of more than nine political and Presidential appointees in the Federal Aviation Administration.]

[SEC. 119A. None of the funds made available under this Act may be used to increase fees pursuant to section 44721 of title 49, United States Code, until the FAA provides to the House and Senate Committees on Appropriations a report that justifies all fees related to aeronautical navigation products and explains how such fees are consistent with Executive Order 13642.]

[SEC. 119B. None of the funds in this Act may be used to close a regional operations center of the Federal Aviation Administration or reduce its services unless the Administrator notifies the House and Senate Committees on Appropriations not less than 90 full business days in advance.]

[SEC. 119C. None of the funds appropriated or limited by this Act may be used to change weight restrictions or prior permission rules at Teterboro airport in Teterboro, New Jersey.]

FEDERAL AVIATION ADMINISTRATION

OPERATIONS

ESTIMATES		APPROPRIATIONS	
2006	[1, 2] 8,201,000,000	2006	[3, 4] 8,104,140,000
2007	[5] 8,366,000,000	2007	[6] 8,374,374,217
2008	[7] 8,725,783,000	2008	[8] 8,740,000,000
2009	[9] 8,998,461,700	2009	[10] 9,046,167,000
2010	[11] 9,335,798,000	2010	[12, 13] 9,351,400,000
2011	[14] 9,793,000,000	2011	[15] 9,516,172,000
2012	[16] 9,823,000,000	2012	[17] 9,653,395,000
2013	[18] 9,517,948,000	2013	[19] 9,653,395,000
		2013 Sequester (P.L.112-240)	[20] -485,623,489
		2013 Rescission (P.L. 113-6)	[21] -19,307,790
2014	[22] 9,707,000,000	2014	[26] $9,651,422,000
2015	[23] 9,750,000,000	2015	[27] $9,740,700,000
2016	[24] 9,915,000,000	2016	[28] $9,909,724,000
2017	[25] 9,994,352,000		

[1] Includes $6,500,000,000 from the Airport and Airway Trust Fund.
[2] Includes $150,000,000 for Flight Service Station A-76 Competition.
[3] Reflects 1.0 percent across-the-board rescission per P.L. 109-148.
[4] Includes $5,541,000,000 from Airport and Airway Trust Fund.
[5] Includes $5,445,000,000 from Airport and Airway Trust Fund.
[6] Includes $5,627,900,000 from Airport and Airway Trust Fund
[7] Includes $6,243,027,000 from Airport and Airway Trust Fund. FAA did not request funding for this account in FY 2008. Funding was requested in the proposed Safety and Operations and Air Traffic Organization accounts. The Operations amount is shown here for comparative purposes.
[8] Includes $6,397,061,000 from Airport and Airway Trust Fund.
[9] Includes $6,280,973,000 from Airport and Airway Trust Fund. FAA did not request funding for this account in FY 2009. Funding was requested in the proposed Safety and Operations and Air Traffic Organization accounts. The Operations amount is shown here for comparative purposes.
[10] Includes $5,238,005,000 from Airport and Airway Trust Fund. Also includes $3.7 million transfer from the U.S. Department of State.
[11] Includes $6,207,798,000 from Airport and Airway Trust Fund.
[12] Includes $4,000,000,000 from Airport and Airway Trust Fund.
[13] Includes $1,300,000 transfer from the U.S. Department of State
[14] Includes $6,064,000,000 from Airport and Airway Trust Fund
[15] Reflects as rescission of $19,066,000 per P.L. 112-55. Includes $4,549,882,000 from Airport and Airway Trust Fund. Also includes $2.3 million transfer from the U.S. Department of State
[16] Includes $4,958,000,000 from Airport and Airway Trust Fund
[17] Includes $5,060,694,000 from Airport and Airway Trust Fund
[18] Includes $6,721,000,000 from Airport and Airway Trust Fund
[19] Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013.
[20] FY 2013 funds sequestered pursuant to the Budget Control Act of 2011 as Amended by The American Taxpayer Relief Act of 2012 (P.L. 112-240).
[21] Reflects a 0.20 percent across-the-board rescission per P.L. 113-6.
[22] Includes $6,484,000,000 from the Airport and Airway Trust Fund
[23] Includes $9,040,850,000 from the Airport and Airway Trust Fund
[24] Includes $8,595,000,000 from the Airport and Airway Trust Fund
[25] Includes $7,608,000,000 from the Airport and Airway Trust Fund
[26] Includes $6,495,208,000 from the Airport and Airway Trust Fund
[27] Includes $8,595,000,000 from the Airport and Airway Trust Fund.
[28] Includes $7,922,000,000 from the Airport and Airway Trust Fund.

FEDERAL AVIATION ADMINISTRATION

FACILITIES AND EQUIPMENT (AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES		APPROPRIATIONS	
2006	2,448,000,000	2006	[1] 2,514,600,000
		2006	[2] 40,600,000
2007	2,503,000,000	2007	2,517,520,000
2008	[3] 2,461,566,000	2008	2,513,611,000
2009	[4] 2,723,510,000	2009	2,742,095,000
		2009 Supplemental (P.L.111-5)	[5] 200,000,000
2010	2,925,202,000	2010	[6] 2,928,315,000
2011	2,970,000,000	2011	[7] 2,730,731,000
2012	[8] 3,120,000,000	2012	2,730,731,074
2013	2,850,000,000	2013	[9] 2,730,731,074
		2013 Supplemental (P.L. 113-2)	[10] 30,000,000
		2013 Sequester (P.L.11-240)	[11] -141,642,505
		2013 Rescission (P.L. 113-6)	[12] 5,461,462
2014	2,777,798,000	2014	2,600,000,000
2015	2,603,700,000	2015	2,600,000,000
2016	2,855,000,000	2016	2,855,000,000
2017	2,838,000,000		

[1] Reflects 1.0 percent across-the-board rescission, per P. L. 109-148.
[2] Hurricane Supplemental fund per P.L. 109-148
[3] FAA did not request funding for this account in FY 2008. Funding was requested in the proposed Safety and Operations and Air Traffic Organization accounts. The Facilities and Equipment amount is shown here for comparative purposes.
[4] FAA did not request funding for this account in FY 2009. Funding was requested in the proposed Safety and Operations and Air Traffic Organization accounts. The Facilities amount is shown here for comparative purposes.
[5] American Recovery and Reinvestment Act Supplemental per P.L. 111-5, from the General Fund.
[6] Reflects $7,888,294 rescission of prior year authority per P.L. 111-226.
[7] Reflects a rescission of $5,472,000 per P.L. 112-55.
[8] Includes $250,000,000 of mandatory General Fund from the Administration's Infrastructure proposal.
[9] Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013.
[10] Hurricane Sandy Emergency Supplemental, P.L. 113-2
[11] FY 2013 funds sequestered pursuant to the Budget Control Act of 2011 as Amended by The American Taxpayer Relief Act of 2012 (P.L. 112-240). Includes $2,770,000 in offsetting collections.
[12] Reflects a 0.20 percent across-the-board rescission per P.L. 113-6.

FEDERAL AVIATION ADMINISTRATION

RESEARCH, ENGINEERING, AND DEVELOPMENT

ESTIMATES		APPROPRIATIONS	
2006	130,000,000	2006	[1]136,620,000
2007	130,000,000	2007	130,234,000
2008	[2]140,000,000	2008	146,828,000
2009	[3]171,028,000	2009	171,000,000
2010	180,000,000	2010	190,500,000
2011	190,000,000	2011	[4]169,660,000
2012	190,000,000	2012	167,556,000
2013	180,000,000	2013	[5]167,556,000
		2013 Sequester (P.L.112-240)	[6]-8,429,072
		2013 Rescission (P.L. 113-6)	[7] $335,112
2014	166,000,000	2014	158,792,000
		2014 Rescission	[8]-26,183,998
2015	156,750,000	2015	156,750,000
2016	166,000,000	2016	166,000,000
2017	167,500,000		

[1] Reflects a 1.0 percent across-the-board rescission of 1.0 percent per P.L. 109-148.
[2] Includes $122,867,000 from the Airport and Airway Trust Fund and $17,133,000 from the General Fund.
[3] Includes $156,003,000 from the Airport and Airway Trust Fund and $15,025,000 from the General Funs.
[4] Reflects a $340,000 rescission per P.L. 112-55.
[5] Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013.
[6] FY 2013 funds sequestered pursuant to the Budget Control Act of 2011 as Amended by The American Taxpayer Relief Act of 2012 (P.L. 112-240).
[7] Reflects a 0.20 percent across-the-board rescission per P.L. 113-6.
[8] Reflects a $26,183,998 rescission, per P.L. 113-76.

FEDERAL AVIATION ADMINISTRATION

GRANTS-IN-AID FOR AIRPORTS
(LIQUIDATION OF CONTRACT AUTHORIZATION)
(AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES		APPROPRIATIONS	
2006	3,300,000,000	2006	3,399,000,000
2007	4,000,000,000	2007	4,399,000,000
2008	4,300,000,000	2008	4,399,000,000
2009	3,600,000,000	2009	3,600,000,000
		2009 Supplemental (P.L. 111-5)	[1] 1,100,000,000
2010	3,000,000,000	2010	3,000,000,000
2011	3,550,000,000	2011	3,550,000,000
2012	3,600,000,000	2012	3,435,000,000
2013	3,400,000,000	2013	3,435,000,000
2014	3,200,000,000	2014	3,200,000,000
2015	3,200,000,000	2015	3,200,000,000
2016	3,500,000,000	2016	3,600,000,000
2017	3,500,000,000		

[1] American Recovery and Reinvestment Act Supplemental, per P.L. 111-5, from the General Fund.

FEDERAL AVIATION ADMINISTRATION

GRANTS-IN-AID FOR AIRPORTS
LIMITATION ON OBLIGATIONS
(AIRPORT AND AIRWAY TRUST FUND)

ESTIMATES		APPROPRIATIONS	
2006	(3,000,000,000)	2006	(3,514,500,000)
2007	(2,750,000,000)	2007	(3,514,500,000)
2008	(2,750,000,000)	2008	(3,514,500,000)
2009	(2,750,000,000)	2009	(3,514,500,000)
2010	(3,515,000,000)	2010	(3,515,000,000)
2011	(3,515,000,000)	2011	(3,515,000,000)
2012	(2,424,000,000)	2012	(3,350,000,000)
2013	(2,424,000,000)	2013	[1](3,343,300,000)
2014	(2,900,000,000)	2014	(3,350,000,000)
2015	(2,900,000,000)	2015	(3,350,000,000)
2016	(2,900,000,000)	2016	(3,350,000,000)
2017	(2,900,000,000)		

[1] Reflects funding at the FY 2012 funding level pursuant to P.L. 113-6, Consolidated and Further Continuing Appropriations Act, 2013, minus the 0.20% across-the-board rescission.

INSERT TAB HERE:

SECTION 4. RESEARCH, DEVELOPMENT, & TECHNOLOGY

EXHIBIT IV-1
RESEARCH, DEVELOPMENT & TECHNOLOGY

DEPARTMENT OF TRANSPORTATION
BUDGET AUTHORITY
($ in Thousands)

	FEDERAL AVIATION ADMINISTRATION	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	Applied	Development
A.	**Research, Engineering and Development**	**156,750**	**166,000**	**167,500**	**167,500**	
A11	**Improve Aviation Safety**	**91,019**	**95,969**	**97,870**	**97,870**	
a.	Fire Research and Safety	6,000	6,000	7,925	7,925	
b.	Propulsion and Fuel Systems	2,000	2,034	2,574	2,574	
c.	Advanced Materials/Structural Safety	2,909	7,409	4,113	4,113	
d.	Aircraft Icing/Digital System Safety/Aircraft Cyber	5,500	5,500	5,102	5,102	
e.	Continued Airworthiness	9,619	8,987	10,269	10,269	
f.	Aircraft Catastrophic Failure Prevention Research	1,500	1,433	1,528	1,528	
g.	Flightdeck/Maintenance/System Integration Human Factors	6,000	5,000	8,513	8,513	
h.	System Safety Management/Terminal Area Safety	7,970	6,063	7,000	7,000	
I.	Air Traffic Control/Technical Operations Human Factors	5,400	5,410	6,165	6,165	
j.	Aeromedical Research	8,300	8,467	9,538	9,538	
k.	Weather Program	14,847	15,031	17,976	17,976	
l.	Unmanned Aircraft Systems Research	14,974	17,635	8,422	8,422	
m.	NextGen - Alternative Fuels for General Aviation	6,000	7,000	5,792	5,792	
m.	Commercial Space Transportation Safety	0	0	2,953	2,953	
A12	**Improve Efficiency**	**22,286**	**22,589**	**22,243**	**22,243**	
a.	NextGen - Wake Turbulence	8,541	8,541	8,609	8,609	
b.	NextGen - Air Ground Integration Human Factors	9,697	8,000	8,575	8,575	
c.	NextGen - Weather Technology in the Cockpit	4,048	4,048	4,059	4,059	
d.	NextGen - Information Security	0	0	1,000	1,000	
e.	Commercial Space Transportation Safety	0	2,000	0	0	
A13	**Reduce Environmental Impact**	**37,935**	**41,897**	**41,187**	**41,187**	
a.	Environment and Energy	14,921	16,074	15,013	15,013	
b.	NextGen - Environmental Research - Aircraft Technologies, Fuels, and Metrics	23,014	25,823	26,174	26,174	
A14	**Mission Support**	**5,510**	**5,545**	**6,200**	**6,200**	
a.	System Planning and Resource Management	2,100	2,100	2,788	2,788	
b.	William J. Hughes Technical Center Laboratory Facility	3,410	3,445	3,412	3,412	
B.	**Facilities & Equipment**	**114,229**	**203,050**	**189,460**		**189,460**
a.	Advanced Technology Development and Prototype	18,500	21,300	24,800		24,800
b.	Plant	25,249	32,250	32,200		32,200
c.	Center for Advanced Aviation System Development (CAASD)	60,000	60,000	60,000		60,000
d.	NextGen Research & Development	10,480	89,500	72,460		72,460
C.	**Grants-In-Aid for Airports, Airport Technology (T)**	**44,750**	**46,000**	**46,375**	**46,375**	
a.	Airport Technology Research	29,750	31,000	31,375	31,375	
b.	Airport Cooperative Research	15,000	15,000	15,000	15,000	
D.	**Operations**	**9,518**	**10,143**	**10,181**		**10,181**
E.	**Commercial Space Transportation Safety**	**0**	**0**	**0**	**0**	**0**
	Subtotal, Research and Development Total	**255,248**	**346,943**	**334,941**		
	Subtotal, Technology Investment (T) Total	**44,750**	**46,000**	**46,375**		
	Subtotal , Facilities (F) Total	**25,249**	**32,250**	**32,200**		
	TOTAL FAA	**325,247**	**425,193**	**413,516**	**213,875**	**199,641**

This Exhibit IV-1, "Research, Development and Technology", and any related summary, fulfills the requirements of 23 USC 508 (b) – Annual Report, in effect on December 3, 2015. The Department of Transportation recognizes the changes to this requirement effected by the passage of the Fixing America's Surface Transportation (FAST) Act (P.L. 114-94; Dec. 4, 2015; 129 Stat. 1312), creating Chapter 65 – Research Planning in Subtitle III of title 49, United States Code. The Department will implement the new requirements with the FY 2018 Budget Estimates.

Page intentionally left blank

INSERT TAB HERE:

SECTION 5: NEXTGEN

Next Generation Air Transportation System (NextGen)

For FY 2017, the FAA is requesting a total of $1,000 million for the Next Generation Air Transportation System.

Introduction

NextGen is not a single program, rather a transformative change in the management and operation of how we fly. NextGen encompasses many programs, systems, and procedures, at different levels of maturity, and supports investments to develop and deploy capabilities in addition to new infrastructure. Some are being deployed now; some are in development and nearing deployment with additional capabilities being defined as the technology necessary for them becomes available.

The FAA has made significant progress and is now moving several significant programs out of development and into baseline and operational programs such as Automatic Dependent Surveillance-Broadcast (ADS-B), Performance Based Navigation (PBN) and System Wide Information Management (SWIM). Our stakeholders are beginning to experience the benefits of NextGen investments, and we have already provided the several significant capabilities to the aviation community.

The benefits are highlighted in NextGen's accomplishments below.

- Data Communications. The NextGen Data Communications (Data Comm) program is making pilot and controller exchanges more efficient and reliable. As part of the NextGen Priorities, FAA extended its Departure Clearance Operational Trials at Memphis and Newark for an additional 15 months, running through January 2016. At Newark, a number of airlines have participated in the Data Comm tower trials, including UPS, FedEx, United Airlines and British Airways. FedEx and UPS have also been involved in the Memphis trials. Operators of equipped aircraft sharing the Newark departure queue with non-equipped aircraft can see the difference and the benefits of the technology such as improved efficiency, increased flexibility, and reduced delays.

- Time Based Flow Management. TBFM uses Time Based Metering (TBM) to optimize use of NAS capacity. TBM determines specific time of arrival for points in an aircraft's route resulting in a systemic and efficient flow of aircraft to the terminal airspace, beginning hundreds of miles away. TBFM is currently installed in the 20 Air Route Traffic Control Centers (ARTCC) with supporting equipment in most major TRACONS and the airports served by those centers. TBFM improves upon the Traffic Management Advisor (TMA) system by adding more sophisticated software to enhance air traffic operations, by reducing delays and increasing efficiency of airline operations. National deployment of Adjacent Center Metering and other TBFM capabilities have resulted in substantial time and fuel savings for flights bound for busy airports.

- Satellite-Based Surveillance and Navigation via the Automatic Dependent Surveillance-Broadcast (ADS-B). The FAA completed the baseline deployment of the ground stations in 2014. ADS-B has now been integrated into the automation platforms at 22 of 24 En route air traffic control facilities (19 of 20 En Route Automation Modernization systems and three of four Microprocessor En Route Automated Radar Tracking systems), which control high-altitude traffic. ADS-B traffic and weather broadcasts are now available nationwide. Similar system upgrades in our terminal radar approach control facilities are also on track and will be completed by 2016. Airlines, which are required to equip with ADS-B out capabilities by 2020, are already investing in ADS-B to realize these benefits. As of October 2014, more than 6,000 general aviation aircraft and 225 commercial aircraft have been equipped with ADS-B avionics. General aviation pilots in properly equipped aircraft have subscription-free access to traffic and weather. The FAA is working with industry to resolve barriers delaying operators from equipping with ADS-B Out avionics.

- Performance Based Navigation (PBN). The introduction of area navigation operations and the more advanced GPS-based PBN procedures are reducing flight distances, flight times, noise pollution, fuel consumption, and harmful engine emissions. As part of our Metroplex initiative, new satellite-based air traffic procedures have been implemented in several major metropolitan areas, including Houston, North Texas, Northern California, and Washington D.C.

- Improve Surface Operations and Data Sharing. SWIM provides increased ground situational awareness with data shared from SWIM Terminal Data Distribution System (STDDS) via NAS Enterprise Messaging Service (NEMS) to TRACONS and airports. The FAA has already installed the SWIM Visualization Tool (SVT) at the New York, Chicago, Houston, Boston and Louisville TRACONs in 2015, enabling controllers to see aircraft moving on the surface at airports they serve. SVT is installed at nine TRACON Traffic Management Unit (TMU) stations providing situational awareness during peak traffic and during airport construction and runway closures.

- Data Standards and Information Management. The FAA has developed standards to enable information sharing among various users and stakeholders, both NAS and international, allowing for better coordination, situational awareness, and collaborative decision making. These standards address flight, weather, and aeronautical information and are updated annually in collaboration with industry and the international community including ICAO and International Air Transport Association (IATA). Through SWIM, this data is collected, managed, and disseminated to support NAS operations.

The FY 2017 requested funding will allow the FAA to continue the on-going development and implementation of operational improvements to safely and efficiently operate the NAS, which encompass the deployment of new systems, technologies, and procedures that will help reduce delays, expand air traffic system capacity, and mitigate aviation's impact on the environment while ensuring the highest levels of safety. The entire NextGen portfolio totals $1.000 billion distributed among F&E programs ($877.4 million), Research, Engineering & Development programs ($62.6 million) and Operations activities ($60.1 million). This request is an increase of $19.9 million, or approximately 2 percent, above the FY 2016 enacted level.

The funding will be used to achieve the NextGen goals that have the largest benefits and the biggest need by focusing the deployment on enhancements at "optimal" sites and delivering ready capabilities now. The FAA's investments are consistent with the *NextGen Priorities Joint Implementation Plan* report delivered to Congress in October of 2014. The NextGen budget has also been updated to include unmanned aircraft system integration into the NAS, which is funded in the F&E, Operations and RE&D accounts. The NextGen portion of the Operations account also now reflects the costs associated with implementing PBN, and NextGen staffing costs now include travel by FAA's NextGen organization (ANG).

Table 1 below shows the budget BLIs and detailed funding and program requirements can be found in the budget narrative, Section 3. Table 2, located on the last page of this section, gives the section and page number of the specific locations. Line item detail for each account is shown in the table below.

Table 1: NextGen Program Summary

	FY 2015 Actual	FY 2016 Enacted	FY 2017 PB Request
Facilities and Equipment	**$791,500,000**	**$854,545,000**	**$877,419,037**
NextGen - Separation Management Portfolio	13,000,000	31,500,000	25,800,000
NextGen - Improved Surface	38,808,000	17,000,000	2,000,000
NextGen - On Demand NAS Portfolio	6,000,000	11,000,000	8,500,000
NextGen - Environment Portfolio	5,500,000	1,000,000	0
NextGen - Improved Multiple Runway Operations Portfolio	5,500,000	8,000,000	6,500,000
NextGen - NAS Infrastructure Portfolio	14,480,000	11,000,000	17,660,000
NextGen – Support (NIEC, Test Bed) Portfolio	13,000,000	10,000,000	12,000,000
NextGen - System Safety Management Portfolio	18,700,000	17,000,000	17,000,000
Performance Based Navigation and Metroplex Portfolio	26,500,000	13,000,000	17,500,000
NextGen - Communications in Support of NextGen	150,340,000	234,900,000	232,000,000
En Route Automation Modernization (ERAM) - System Enhancements	45,200,000	79,400,000	78,000,000
System - Wide Information Management (SWIM)	60,261,000	37,400,000	28,800,000
ADS - B NAS Wide Implementation	254,700,000	184,600,000	31,100,000
Collaborative Air Traffic Management (CATMT) Portfolio	13,491,000	14,770,000	13,820,000
NextGen - Improved Surface/TFDM			42,200,000
Tactical Time Based Flow Management (TBFM)	21,000,000	42,600,000	50,600,000
Next Generation Weather Processor (NWP)	23,320,000	7,000,000	27,800,000
NAS Voice System (NVS)	20,550,000	53,550,000	48,400,000
Flight Interfacility Data Interface (FIDI) Modernization		9,000,000	15,000,000
Aeronautical Information Management Program (AIM)	12,650,000	5,000,000	10,400,000
Cross Agency NextGen Management	2,000,000	3,000,000	2,000,000
Activity 5 F&E PCBT - NextGen Staffing*	46,500,000	63,825,000	66,639,037
Activity 6 ADS-B Subscription Cost			123,700,000
Research Engineering and Development (RE&D)	**$51,300,000**	**$71,047,000**	**$62,631,000**
NextGen - Alternative Fuels for General Aviation	6,000,000	7,000,000	5,792,000
NextGen- Information Security			1,000,000
NextGen - Wake Turbulence	8,541,000	8,541,000	8,609,000
NextGen - Air Ground Integration	9,697,000	8,000,000	8,575,000
NextGen - Weather in the Cockpit	4,048,000	4,048,000	4,059,000
NextGen - Environmental Research, Aircraft Technologies, Fuels and Metrics	23,014,000	25,823,000	26,174,000
Unmanned Aircraft Systems Research		17,635,000	8,422,000
Operations	**$14,100,000**	**$54,641,000**	**60,126,723**
NextGen Staffing*	14,100,000	29,460,000	32,963,723
NextGen Unmanned Aircraft System		11,656,000	13,503,000
Performance Based Navigation (PBN) Activities		13,525,000	13,660,000
Total NextGen Programs	**$856,900,000**	**$980,233,000**	**$1,000,176,760**

*Note: NextGen PC&B has been increased by a rebaselining of staffing and the inclusion of 14 UAS personnel.

NextGen's Planned Accomplishments – Building on Investments

By 2020, the air transportation system will be fundamentally different from today. The FAA estimates that NextGen will reduce total flight delays by approximately 11 percent by 2020, compared with the level that delays would reach without NextGen, while providing $18 billion in cumulative benefits to the traveling public, aircraft operators, and FAA. Aircraft owners will save about 800 million gallons of fuel during this period, reducing carbon dioxide emissions by seven million tons. The FAA is achieving these benefits by the improvements delivered through foundational program deployments and implementation portfolios.

In FY 2017, NextGen plans to build upon the past achievements particularly in the areas of data communication, networkable voice communication and air traffic management. The FY 2017 funding will support implementation of the following NextGen capabilities:

- Data Communications. The FAA is increasing its focus on the way information is transferred between the cockpit and air traffic control facilities. Today, controllers and pilots communicate verbally using analog radios. The use of voice communication is labor intensive, time consuming, and limits the ability of the NAS to effectively meet future traffic demand. Data Communications (Data Comm) will change this by allowing controllers and pilots to communicate with digitally delivered written messages. As with other improvements, this will be phased in to minimize disruption and ensure that messages are delivered without the errors in hearing and transcribing the information that cause repeats or worse – operational errors. Applied initially to messages between airport towers and aircraft on the surface, data communications will improve safety and reduce the time it takes from gate to air, and will eventually become the principal method of routine communications through all phases of flight.

- Time Based Flow Management. NextGen capabilities will provide a number of improvements to terminal area operations that save fuel, increase predictability and minimize holding patterns, delaying vectors and other such maneuvers. The time-based flow management tool analyzes flights approaching an airport from hundreds of miles away, across air traffic control facility boundaries, and calculates scheduled arrival times to reduce low altitude delays and holding. To increase the benefit and usage of performance based procedures in the busiest terminals, the tool will provide arrival sequence and spacing guidance to allow the aircraft to fly the fuel efficient procedure, while maintaining runway throughput. These NextGen advances will support controllers in overcoming obstacles to implementing PBN and improve the flow of arrival traffic by efficiently maximizing the use of existing capacity, saving fuel and reducing emissions.

- NAS Voice System. Future air traffic operations as envisioned by NextGen will require a new flexible, networkable voice communications system with flexible networking capabilities. NVS is the key voice communication component for the NextGen System. One of the key transformations is that air-to-ground voice communication is no longer limited by geographical facility boundaries. This allows greater flexibility for developing and using airspace/traffic assignments in all airspace. NextGen voice communication paths will be controlled by an intelligent network. Current voice switches are not network enabled and cannot be modified for installation in new facilities resulting from NextGen.

- Collaborative Air Traffic Management (CATM). CATM capabilities will coordinate flight and flow decision-making by flight planners and FAA traffic managers to improve overall efficiency, provide greater flexibility to flight planners, and make the best use of available airspace and airport capacity. The FAA is evaluating capabilities to improve the Traffic Flow Management System (TFMS) system-wide, as well as at the tactical or location-based level, related to improved demand predictions, integrated TMI modeling, airport acceptance rate decision support, arrival route status and impact, and integrated departure route planning. This effort requires coordination with the collaborative decision making (CDM) and international community to ensure information sharing, common views of the NAS, and an understanding of impacts on the system and its users.

- Separation Management. Aircraft separation assurance is the cornerstone of Air Traffic Control (ATC) operations. Improvements to tools and procedures will assist controllers with separating aircraft in a mixed environment of varying navigation equipment and wake tolerance capabilities. The Wake Turbulence Re-Categorization (Wake Re-Cat) project will develop the system adaptation, procedures, training and documentation for implementing the airport specific wake mitigation. The FAA is also developing En route NextGen enhancements associated with trajectory modeling to reduce the occurrence of false and missed alerts; identifying and resolving conflicts and displaying this information on the radar console; and automation support for contingency operations for UAS and increasing use of Special Activity Airspace (SAA) in En route airspace. These improvements in the terminal and En route environment will improve efficiency and provide better service for NAS users.

Unmanned Aircraft Systems (UAS)

Safe, efficient, and timely integration of UAS into the NAS poses challenges to FAA and the aviation industry. UAS often use new or novel technologies to achieve unique operational capabilities that challenge the expectations of current NAS users. Integrating UAS in the NAS will potentially affect the entire system, as a result of the various sizes of the aircraft, which can range from less than a foot to the size of a commercial jet. UAS operations have increased dramatically in both the public and civil sectors. This proliferation introduces greater operational risk and exposure to the users of the NAS. The FY 2017 work to support integration of UAS into the NAS spans the RE&D, F&E, and Operations appropriations and totals approximately $42 million for contract and personnel compensation costs.

The F&E request, included under the Separation Management Portfolio (1A05) and Activity 5, conducts the overall analysis and planning for the development, integration, and subsequent implementation of emerging UAS enabling technologies. These activities are essential to the FAA's objective of integrating UAS operations into the NAS. The proliferation of UAS introduces greater operational risk and exposure to the users of the NAS. As such, air traffic products, policies, and procedures must be reviewed and refined, or newly developed through supporting concept maturation work to permit safe UAS operations, alongside manned aircraft operations. This program will continue to identify and mature concepts and capabilities to facilitate the safe and timely integration of UAS into the NAS.

The RE&D request will further FAA efforts by studying safety implications of new aircraft operational concepts and technology and supporting the development of new and modified regulatory standards. UAS specific technical issues, such as detect and avoid, datalink aircraft control and communication with air traffic control, and emergency response requirements, will require research efforts to promote the ultimate integration of these systems into the NAS. The UAS program under RE&D will identify and assess alternative business models and acquisition strategies to determine the best approach to implementing a governing framework for command and control business elements and spectrum management. Incorporation of new technologies is needed and may include communications, surveillance, and automation changes to support continued evolution of UAS in the NAS. Challenges associated with integrating UAS in the NAS include the inability of UAS to comply with traditional see and avoid requirements, unique communications needs, lost link procedures, and other issues which dictate that concept engineering activities address all aspects associated with UAS integration.

The funding requested for UAS under the Operations appropriation will enable Aviation Safety (AVS) to expand certification and integration services for newly designed and manufactured UAS products. The FAA will continue with the development of standards, issuance of policy, and guidance to further enable UAS operations and will adapt services and regulatory approaches in order to integrate UAS operations into the NAS in a timely fashion and with the same level of safety and efficiency as other legacy operations.

Successful integration of UAS into the NAS provides benefits to both public and civil users. Studies indicate benefits when UAS are used in missions related to agriculture, search and rescue, border protection and pipeline monitoring among other applications. These public and civil users, as well as the general public and commercial and general aviation (GA), benefit from the work being conducted under this program since it leads to safe UAS integration.

FAA Stakeholder Collaboration on Achieving Benefits of NextGen

The FAA's collaboration with aviation industry representatives allows the agency to focus its resources on priority efforts. The FAA met its commitments to RTCA Task Force 5 and as a follow on convened the NextGen Advisory Committee (NAC). The collaboration meetings have enabled the FAA and industry to reach agreement on all of the high priority, high readiness capabilities, with the FAA committing to specific site implementation plans and industry ensuring operator preparedness in order to take full advantage of NextGen benefits. This has been a contributing factor in the FAA's successful optimization of NextGen investments.

In October of 2014, the FAA delivered the *NextGen Priorities Joint Implementation Plan* to Congress, which outlined a plan to implement a number of high-priority NextGen capabilities in four focus areas: Multiple Runway Operations, Performance Based Navigation, Surface Operations and Data Sharing, and Data Communications.

- Multiple Runway Operations (MRO): The efficiency of parallel runways, particularly those that are closely spaced, has been limited by the interplay of wake vortices with nearby aircraft. MRO capabilities improve access to these runways and can increase basic runway capacity and throughput by reducing separation between aircraft based on improved wake categorization standards. Improved access will enable more arrivals and/or departures during less than visual meteorological conditions, which will increase efficiency and reduce flight delays.

- Performance Based Navigation: With PBN, FAA delivers new routes and procedures that primarily use satellite-based navigation and on-board aircraft equipment to navigate with greater precision and accuracy. PBN provides a basis for designing and implementing automated flight paths, airspace redesign and obstacle clearance. Benefits include shorter and more direct flight paths, improved airport arrival rates, enhanced controller productivity, increased safety due to repeatable and predictable flight paths, fuel savings and a reduction in aviation's adverse environmental impact.

- Surface Operations and Data Sharing: Some of the greatest efficiencies can be gained while an aircraft is still on the ground. The FAA commits to implementing near-term surface improvements, sharing more data with stakeholders, and completing feasibility assessments of other capabilities of interest. The goal of these enhancements is to measurably increase predictability and provide actionable and measurable surface efficiency improvements. Work in this area will leverage existing industry groups like the Surface Collaborative Decision Making (CDM) Team.

- Data Communications: The Data Com program will provide data communications services between pilots and air traffic controllers as well as enhanced air traffic control information to airline operations centers. The first phase is to focus on messages between airport towers and aircraft on the surface, which will improve safety and reduce the time it takes from gate to air.

These are capabilities that will provide significant near-term benefits to National Airspace System (NAS) users. The commitments for CY 2015-2017 are listed in the table below.

Focus Area	CY 2015	CY 2016	CY 2017
Multiple Runway Operations	Wake Recategorization, Phase 1: Charlotte Douglas International Airport (CLT), John F. Kennedy International Airport (JFK), Newark Liberty International Airport (EWR), and LaGuardia Airport (LGA) Q1 CY2015; Chicago O'Hare International Airport (ORD) and Chicago Midway Airport (MDW) Q2 CY2015; San Francisco International Airport (SFO) Q3 CY2015 Wake Recategorization, Phase 2: Denver International Airport (DEN) Q4 CY2015 Apply Order 7110.308 to Additional Airport: Boston Logan International Airport (BOS) for Runways 4 Left and 4 Right Q3 CY2015 Wake Turbulence Mitigation for Departures (WTMD): final investment decision Q3 CY2015 Wake Turbulence Mitigation for Arrivals-Procedures: ATL Q1 CY2015	Wake Recategorization, Phase 1: Los Angeles International Airport (LAX) Q1 CY2016 and Honolulu International Airport (HNL) Q3 CY2016 Wake Recategorization, Phase 2: Ted Stevens Anchorage International (ANC) Q2 CY2016 Dependent Parallel Operations Between 2,500 Feet and 3,600 Feet: Q2 CY2016 at JFK, Minneapolis/St. Paul International Airport (MSP), Seattle-Tacoma International Airport (SEA), Portland International Airport (PDX), Raleigh/Durham International Airport (RDU), Dallas Love Field (DAL), and Memphis International Airport (MEM) Dual Independent Parallel Operations with Offset: Q4 CY2016 at JFK	Wake Recategorization, Phase 1: Miami International Airport (MIA) Q1 CY2017; Indianapolis International Airport (IND) Q2 CY2017; and Washington Dulles International Airport (IAD) Q3 CY2017 Wake Recategorization, Phase 2: SFO Q2 CY2017 Dependent Parallel Operations Between 2,500 Feet and 3,600 Feet: Q2 CY2017 at SFO and BOS Triple Independent Parallel Operations: Q3 CY2017 at ATL and IAD Dual Independent Parallel Operations with Offset: Q3 CY2017 at PDX, MSP, and Detroit Metropolitan Wayne County Airport (DTW) Dependent Parallel Operations for Runways Greater than 4,300 Feet: Q1 CY2017 at Louisville International Airport (SDF), Phoenix Sky Harbor Airport (PHX), CVG, and MEM
Performance Based Navigation	Northern California Metroplex: Implementation Q3 CY2015 Established on RNP (EoR) Authorization Required – Widely Spaced Operations: DEN Q3 CY2015 Equivalent Lateral Spacing Operations (ELSO) National Standard: Q2 CY2015		Atlanta Metroplex: Implementation Q2 CY2017 Charlotte Metroplex: Implementation Q2 CY201 Established on RNP (EoR) Widely Spaced National Standard: Q2 CY2017

Focus Area	CY 2015	CY 2016	CY 2017
	EoR Track-to-Fix Safety Analysis: Q4 CY2015		
Surface Operations And Data Sharing	Advanced Electronic Flight Strips (AEFS): CLE ATCT in Q2 CY2015 SWIM Surface Visualization Tool: five additional TRACONs (Boston, New York, Houston, Chicago, and Louisville) by Q2 CY2015 Surface Surveillance Event Data Distribution to Users via SWIM (ASDE-X)/ ASSC) : CLE Q3 CY2015 Feasibility assessment of the TFDM departure management: Q1 CY2015 Feasibility Assessment for Electronic Flight Data: New York AEFS Q4 CY2014	AEFS: SFO ATCT and LAS ATCT in Q3 CY2016 Surface Surveillance Event Data Distribution to Users via SWIM (ASDE-X)/ ASSC) : CVG, Pittsburgh International Airport (PIT), Kansas City International Airport (MCI) in Q3 CY2016; PDX and MSY Q4 CY2016 FAA to Ingest 11 Data Elements via TFMS Update: NAS-wide Q2 CY2016	Surface Surveillance Event Data Distribution to Users via SWIM (ASDE-X)/ ASSC) : ANC and Joint Base Andrews (ADW) Q1 CY2017
Data Communications (Data Comm)	Departure clearances: Deliver at 56 airports under the Data Comm Segment 1Phase 1 by the end of 2019	Departure clearances: Deliver at 56 airports under the Data Comm Segment 1Phase 1 by the end of 2019 Extend the Departure Clearance (DCL) Operational Trials: MEM and EWR for 15 months to run through Q1 CY2016 Final investment decision on Data Comm Segment 1 Phase 2 En Route Services: Q4 CY2014	Departure clearances: Deliver at 56 airports under the Data Comm Segment 1Phase 1 by the end of 2019

NextGen Staffing

The NextGen initiatives crosscut FAA's organizational structures and lines of business. Based on the crosscutting structure, FAA tracks and reports NextGen dedicated staffing levels. The NextGen dedicated staffing is defined as employees who spend 50 percent or more of their time on NextGen-related activities.

The table below shows our updated NextGen "dedicated" staffing levels.

Appropriation/Organization	FY 2016 Enacted			FY 2017 PB Request			Change		
	FTP Positions	EOY	FTE	FTP Positions	EOY	FTE	FTP Positions	EOY	FTE
Facilities and Equipment (F&E)									
ANG:									
F&E Activity 5, Personnel & Related Expenses - NextGen Staffing (Various Programs/Projects)	298	298	298	298	298	298	0	0	0
ATO:									
F&E Activity 5, Personnel & Related Expenses - NextGen Staffing (Various Programs/Projects)	54	54	54	54	54	54	0	0	0
AFN:									
F&E Activity 5, Personnel & Related Expenses - NextGen Staffing (Various Programs/Projects)	45	45	45	45	45	45	0	0	0
AVS:									
F&E Activity 5, Personnel & Related Expenses - NextGen Staffing (Performance Based Navigation)	30	30	30	30	30	30	0	0	0
Subtotal, NextGen F&E	**427**	**427**	**427**	**427**	**427**	**427**	**0**	**0**	**0**
Research, Engineering & Development (R,E&D)									
ANG:									
NextGen – Wake Turbulence; Air Ground Integration; Self Separation; Weather in the Cockpit	12	12	12	12	12	12	0	0	0
APL:									
NextGen – Environmental Research, Aircraft Technologies, Fuels and Metrics	4	4	4	4	4	4	0	0	0
Subtotal, NextGen R,E&D	**16**	**16**	**16**	**16**	**16**	**16**	**0**	**0**	**0**
Operations									
ANG: NextGen Staffing	52	52	52	52	52	52	0	0	0
ATO: NextGen Staffing	64	64	64	64	64	64	0	0	0
AVS: NextGen Staffing	61	61	61	75	75	70	14	14	9
AFN: NextGen Staffing	13	13	13	13	13	13	0	0	0
AOC: NextGen Staffing	1	1	1	1	1	1	0	0	0
APL: Integrate Environmental Performance into NextGen; Environmental/Noise Studies	8	8	8	8	8	8	0	0	0
Subtotal, NextGen Operations	**199**	**199**	**199**	**213**	**213**	**208**	**14**	**14**	**9**
Total NextGen Staffing	**642**	**642**	**642**	**656**	**656**	**651**	**14**	**14**	**9**
ANG	362	362	362	362	362	362	0	0	0
ATO	118	118	118	118	118	118	0	0	0
AVS	91	91	91	105	105	100	14	14	9
APL	12	12	12	12	12	12	0	0	0
AFN	58	58	58	58	58	58	0	0	0
AOC	1	1	1	1	1	1	0	0	0

The change between FY 2016 and FY 2017 represents a program increase within the Operations appropriation for 14 positions and 9 FTEs to support Unmanned Aircraft System Certification and Integration activities with the AVS organization.

NextGen Challenges

Under the best of circumstances, management and coordination of NextGen is a complex undertaking. NextGen's multiple capabilities are interdependent, and the FAA will incorporate them into the airspace over varying time frames. This calls for a deliberate and incremental approach, not only in technology and infrastructure development but also the policies, standards, and operational practices that maintain safety.

The logical progression of deployments, each laying a solid foundation for the next, belies its overall complexity. It must be managed and implemented as a portfolio, not as a series of independent programs. Variable maturity times for interdependent projects and infrastructure limitations create a communications challenge, arising from perceptions about complexity and uncertainty. The FAA must continually ensure that our intent, commitment and timing remain clear to all stakeholders as FAA moves forward together with NextGen.

As the FAA makes investment decisions, we must consider the full context of capabilities and benefits, rather than focusing only on specific systems or deployments in isolation. Private-sector stakeholders must use their own internal processes to commit to investing in NextGen capabilities. A thorough understanding of expected benefits and costs will help solidify the business cases both FAA and individual stakeholders need to justify investment decisions.

With proper recognition and management of uncertainty must be a central feature of the overall approach to NextGen development and deployment. Failure to do so would place NextGen capabilities, benefits and costs in jeopardy. As a result, the FAA has addressed these and other challenges.

- NextGen is a wide ranging transformation of the entire national air transportation system. Aligning research and prototyping activities, developed the components of a mid-term architecture, integrated implementation plans, moved forward with execution, and enhanced industry engagement, NextGen will meet future demands while improving safety and protecting the environment.

- Engaging stakeholders is a way to manage priorities and risks collaboratively by reaching a common understanding of what to implement and where. These and other local, technical or political factors may require implementation teams tasked with working out a specific local implementation plan guided by an overarching national framework. A properly managed and effective mix of FAA and stakeholder participants is needed to ensure bilateral implementation of respective NextGen capabilities.

- Conducting operational demonstrations and prototypes also present solutions to uncertainties that arise due to local factors, such as unique airport or airspace considerations. Solutions to integration issues can be accelerated, and specific programmatic requirements and operational and certification standards can crystallize outcomes that can help solidify the case for follow-on investments.

- Ensuring international harmonization of aircraft equipage standards, so that aircraft equipped for NextGen will be able to operate using equivalent capabilities in other regions of the world, is another complex endeavor. Both of these requirements make partnership an integral component of FAA's strategy for NextGen.

Taking a leadership role in information management and data sharing by establishing standards for publishing and distributing information via SWIM to National Airspace System users in the air and on the ground—particularly airline operations centers—will enable multiple decision makers to work from the same information. Data-sharing and information management is a necessary foundation element of NextGen to support Collaborative Air Traffic Management and On Demand NAS information.

Next Generation Air Transportation System (NextGen)
Budget Narrative Reference Guide
NextGen Index of Programs

Specific funding and program requirements can be found as indicated below in Table 2.

		Amount	Page
	Facilities and Equipment (F&E)		**Section 3B**
1A05	NextGen – Separation Management Portfolio	$25,800,000	26
1A06	NextGen – Improved Surface	$2,000,000	35
1A07	NextGen – On Demand NAS Portfolio	$8,500,000	37
1A08	NextGen – Improved Multiple Runway Operations Portfolio	$6,500,000	43
1A09	NextGen – NAS Infrastructure Portfolio	$17,660,000	47
1A10	NextGen – Support Portfolio	$12,000,000	56
1A11	Performance Based Navigation and Metroplex Portfolio	$17,500,000	58
2A01	En Route Automation Modernization System Enhancements and Tech Refresh	$78,000,000	66
2A11	System-Wide Information Management (SWIM)	$28,800,000	92
2A12	ADS-B NAS Wide Implementation (ADS-B)	$31,100,000	96
2A14	Collaborative Air Traffic Management (CATMT) Portfolio	$13,820,000	102
2A15	Time Based Flow Management (TBFM) Portfolio	$50,600,000	107
2A17	Next Generation Weather Processor (NWP)	$27,800,000	112
2A19	Data Communications in Support of NextGen	$232,000,000	117
2B13	National Airspace System Voice System (NVS)	$48,400,000	155
2B18	Improved Surface/TFDM Portfolio	$42,200,000	168
2B22	Flight and Interfacility ATC Data Interface Modernization	$15,000,000	177
3A09	NextGen – System Safety Management Portfolio	$17,000,000	272
4A09	Aeronautical Information Management Program (AIM) Segment 2	$10,400,000	309
4A10	Cross Agency NextGen Management	$2,000,000	312
5A01	Personnel and Related Expenses - NextGen Staffing	$66,639,037	314
6A01	ADS-B Subscription Costs	$123,700,000	317
	Total, Facilities and Equipment	**$877,419,037**	
	Research, Engineering, and Development		**Section 3C**
A11l	Unmanned Aircraft Systems Research	$8,422,000	54
A11m	NextGen – Alternative Fuels for General Aviation	$5,792,000	58
A12a	NextGen – Wake Turbulence	$8,609,000	65
A12b	NextGen – Air/Ground Integration Human Factors	$8,575,000	68
A12c	NextGen – Weather Technology in the Cockpit	$4,059,000	71
A12d	NextGen- -Information Security	$1,000,000	75
A13b	NextGen – Environmental Research, Aircraft Technologies, Fuels and Metrics	$26,174,000	81
	Total, Research, Engineering, and Development	**$62,631,000**	
	Operations		**Section 3A**
	NextGen Staffing	$32,963,723	ANG/ATO
	Unmanned Aircraft Systems	$13,503,000	ANG/ATO
	Performance Based Navigation (PBN) Metroplex Activities	$13,660,000	ANG/ATO
	Total, Operations	**$60,126,723**	
	Total, NextGen Programs	**$1,000,176,760**	

INSERT TAB HERE:

SECTION 6:
CAPITAL
INVESTMENT PLAN

Federal Aviation Administration
National Airspace System Capital Investment Plan
for Fiscal Years 2017 – 2021

Overview

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, 2016 (P.L. 114-113) requires "that no later than March 31, the Secretary of Transportation to transmit to the Congress an investment plan for the Federal Aviation Administration which includes funding for each budget line item for fiscal years 2017 through 2021, with total funding for each year constrained to the funding targets for those years as estimated and approved by the Office of Management and Budget…"

This abbreviated version of the CIP contains the following information:

- Funding amounts for capital investments by budget line item (BLI) for Fiscal Years (FY) 2017-2021. The BLIs are consistent with the FAA's Facilities and Equipment (F&E) FY 2017 President's Budget request.

- Information for Major Capital Programs with a total F&E investment cost of more than $100 million or those that involve significant impact, complexity, risk, sensitivity, safety or security issues.

Strategic Priorities and the CIP

The FAA Administrator has established a strategic framework to define where the agency will focus its efforts. This framework consists of four, high-level strategic priorities as follows:

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

- **Deliver benefits through technology and infrastructure** – Next Generation Air Transportation System (NextGen) gives FAA the opportunity to redefine the National Airspace System for the future and prove that benefits can be delivered to the users of the system. FAA also needs to safely integrate new types of user technologies into the airspace, as well as rebalance existing services and modernize our infrastructure, which will enable reductions to costs and increased efficiency in the long run.

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

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

Important Factors Affecting Planning for the Future

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 more than five percent of the U.S. Gross Domestic Product. Spending on aviation-related activities supported an estimated 11.8 million jobs. Air carriers transported over 61.2 billion revenue ton-miles of air cargo in support of commercial activity.

A reliable worldwide aviation network is essential for sustaining today's economy. Domestic and international commerce rely heavily on access to aviation capacity for transporting both freight and passengers to cities around the world. The introduction of NextGen technologies and advanced decision support tools are further modernizing the Air Traffic Control (ATC) system and will make air travel more efficient, safer, and environmentally friendly than ever before, and support continued economic growth.

Economic growth in aviation can be supported by increasing available airport capacity through runway infrastructure improvements. These programs require capital investment, especially at the 30 large hub airports where flights are concentrated and account for about 72 percent of all airline enplanements. When medium hub airports are included, the combined estimate for these 63 airports rises to 88 percent of all enplanements. Reducing delays at the large and medium hub airports will benefit a significant number of passengers.

Key Considerations in Capital Planning

The air traffic control system requires very high reliability and availability to maintain safe operations. Controllers must maintain the safe separation of aircraft both while inflight and on the ground. Safe separation depends upon reliable communication, navigation and surveillance systems. Each system in the NAS requires a high level of redundancy to support system reliability. These systems must be monitored and periodically inspected to ensure that they continue to operate within their technical specifications and serviced or replaced as necessary to reduce the potential for system outages. NAS computer systems, and other technology used for air traffic control, also face technical obsolescence over time. When manufacturers cease production of replacement parts for legacy systems, the ability of the agency to maintain and repair these systems becomes increasingly difficult. Capital planning must be done well in advance to prevent or minimize any impact to NAS operations due to systems obsolescence.

The annual publication of the CIP provides the latest update on the progress, plans, and objectives of FAA's capital programs to modernize the air traffic control and supporting systems over the next five years. The CIP must balance projected funding and the resources required for the sustainment and improvement of legacy NAS equipment and facilities with the continuing development and delivery of the capabilities and investments needed to achieve NextGen. During the transition to Nextgen, and beyond, capital investment in legacy equipment, facilities and information technology systems must be made to ensure that the reliable and safe operation of the NAS continues without interruption.

There are 21 Air Route Traffic Control Centers (ARTCC) that house the automation equipment used by air traffic controllers to control en route traffic. There are over 500 Air Traffic Control Towers (ATCTs) and 168 Terminal Radar Control (TRACON) facilities that control air traffic approaching, landing, and departing from airports. Successful flow management of air traffic in the NAS depends upon 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. To meet FAA's availability and reliability goals, equipment at these facilities must be regularly upgraded or replaced.

Examples of capital investment programs supporting NAS sustainment and modernization include:

- **En Route Automation** – The En Route Automation Modernization (ERAM) platform became fully operational at all sites in 2015. Ongoing technology refresh and system upgrades will support implementation of many NextGen operational enhancements.

- **Terminal Automation Modernization and Replacement (TAMR) –** The TAMR program is replacing legacy automation platforms at 108 terminal air traffic control facilities with the Standard Terminal Automation Replacement System, or STARS. Establishing a single, common automation platform will reduce maintenance costs. STARS will accept Automatic Dependent Surveillance-Broadcast (ADS-B) position reports to enable NextGen operational improvements.

- **Next Generation Very High Frequency Air/Ground Communications System (NEXCOM) –** The NEXCOM program replaces obsolete NAS air-to-ground (A/G) analog radios with modern multi-mode digital radios for voice communication with pilots. The new radios support Voice over Internet Protocol (VoIP) and meet the requirements for the NextGen NAS Voice System (NVS) program.

- **Navigation/Landing** – The Wide Area Augmentation System (WAAS) program will augment the Global Positioning System (GPS) to support Performance Based Navigation (PBN) allowing aircraft to fly direct routes during en route operations and take advantage of more efficient PBN approach procedures into an airport.

- **Air Traffic Control Facilities** – ARTCCs, ATCTs and TRACON facilities require upgrading and modernization of heating, ventilating, and air conditioning, piping, plumbing, control systems and other elements of the facility to enable the installation of new automation systems and prevent deterioration.

- **Power Systems** – Emergency backup systems and aging power system components must be replaced to maintain and ensure the reliability of backup power systems during a commercial outage.

Planning for the Future through NextGen Investments

NextGen is the ongoing, wide-ranging transformation of the NAS to ensure that future safety, capacity and environmental needs are met. NextGen is fundamentally changing the way air traffic is managed by combining new technologies for surveillance, navigation, and communications with automation system enhancements. NextGen enables precise monitoring of aircraft both on the ground and while inflight. It enables direct routes for travel between cities, improves decision support to strategically manage traffic flow on busy routes, and uses precise navigation aids to better utilize existing airspace and runway capacity. Having achieved many of the foundational milestones needed for this transformation, we are already realizing benefits from NextGen.

Some of the capital investments supporting NextGen implementation include:

- **Data Communications (Data Comm) –** Data Comm enables controllers and pilots to communicate with digitally-delivered messages, rather than rely solely on radio voice communications. Controllers will be able to electronically send routine instructions, such as departure clearances and weather-avoiding reroutes, directly to the flight deck. Data Comm will provide a direct link between ground automation and flight deck avionics for safety-of-flight ATC clearances, instructions, traffic flow management, flight crew requests, and reports.

- **National Airspace System Voice System (NVS)** – NVS replaces current voice switches operated independently at individual facilities, and will use router-based communications linked through the FAA Telecommunications Infrastructure (FTI) network. NVS supports future NextGen concept of operations for capabilities such as networked facilities, dynamic resectorization, and off-loading selected sector control to other facilities during non-peak operations.

- **System Wide Information Management (SWIM)** – SWIM is the digital data-sharing backbone of NextGen. SWIM infrastructure enables air traffic management related information sharing among diverse, qualified systems and provides information governance. SWIM has been distributing weather and flight planning information to NAS users, mainly airline operations centers, since 2010 and will continue to develop and add services.

- **Collaborative Air Traffic Management Technologies (CATMT)** – CATMT provides enhancements to the Traffic Flow Management System (TFMS). The TFMS is the primary automation system used by the Air Traffic Control System Command Center (ATCSCC) and the nationwide Traffic Management Units at ATC facilities, to assist the command center in managing air traffic flow and planning for future air traffic demand. TFMS hosts the software decision support tools that assist in managing and metering air traffic to reduce delays, maximize the use of available system capacity, and dynamically balance flight demands.

- **NextGen Performance Based Navigation (PBN) – Metroplex Area Navigation (RNAV)/Required Navigation Performance (RNP)** – The program will develop procedures at Metroplexes to improve airspace efficiency. It will examine transition access/egress points to and from terminal airspace not tied to ground-based navigation aids; implement optimized arrival and departure procedures; decouple conflicting operations to and from satellite airports serviced by the same complex terminal airspace; and develop high altitude routes through congested airspace for more efficient routes between major metropolitan areas.

- **Time Based Flow Management (TBFM)** – TBFM uses time-based metering to better utilize NAS capacity by improving traffic flow management of aircraft approaching and departing congested airspace and airports. Enhancements to TBFM will implement NextGen concepts, such as optimized descent during time-based metering, and Terminal Sequencing and Spacing to provide efficient sequencing and runway assignment.

- **Automatic Dependent Surveillance–Broadcast (ADS-B) –** ADS-B is a more precise, satellite-based successor to radar. ADS-B Out uses the Global Positioning System (GPS) and/or inertial navigation or other navigation aides to determine an aircraft's location, airspeed and other data, and then broadcasts that information to a network of ground stations to relay the data to air traffic control automation systems and to nearby aircraft equipped with ADS-B In. ADS-B can also deliver weather and traffic information directly to the cockpit of properly equipped aircraft.

FAA has completed development work that supports progress in implementing NextGen Operational Improvements, some of which are already providing benefits to the aviation community. At the request of Congress, FAA has collaborated with industry through the NextGen Advisory Committee to develop a plan to expedite the implementation of high-priority NextGen capabilities projected to produce significant benefits including:

- Increased use of wake categorization and other improvements for dual and independent parallel runway operations at 28 locations nationwide.

- Improving air traffic flow in major metropolitan areas by deploying Performance Based Navigation procedures that allow shorter and more direct flight routes.

- Improving information sharing and taxi procedures for surface operations at airports. Automation improvements and collaboration with air carriers will reduce aircraft delays in reaching active runways and may increase the hourly rate of takeoffs and landings by reducing inefficiencies in moving from the gate to the active runway.

- Replacing voice communications with data communications to reduce the time, and therefore the delay, to operations needed to relay non-critical air traffic information such as severe weather reroutes and reduce the potential for errors in sending and receiving read back of flight plan clearances.

Conclusion

The Capital Investment Plan requires a significant level of planning, funding, and oversight to realize the expected benefits from NAS modernization and the transition to NextGen. FAA has developed the requisite processes and management discipline necessary to complete and deliver the planned capabilities from these programs. The CIP describes the program objectives, the resources required to accomplish the work, and the time horizon for implementation and operational use of new infrastructure and capabilities in the NAS. These programs provide significant benefits, not only to commercial carriers and the flying public in the United States, but also to the international aviation community.

Estimated Funding by budget line item (dollars in Millions)

BLI Number	Capital Budget Line Item (BLI) Program	FY 2017 Budget	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.	FY 2021 Est.
	Activity 1: Engineering, Development, Test and Evaluation	**$147.0**	**$172.5**	**$186.0**	**$208.1**	**$229.2**
1A01	Advanced Technology Development and Prototyping (ATDP)	$24.8	$30.2	$30.2	$31.2	$28.2
1A02	William J. Hughes Technical Center Laboratory Improvement	$1.0	$1.0	$1.0	$1.0	$1.0
1A03	William J. Hughes Technical Center Laboratory Sustainment	$19.0	$19.0	$19.0	$19.0	$19.0
1A04	William J. Hughes Technical Center Infrastructure Sustainment	$12.2	$10.0	$10.0	$11.6	$11.7
1A05	NextGen – Separation Management Portfolio	$25.8	$34.5	$41.5	$50.0	$62.0
1A06	NextGen – Improved Surface Portfolio	$2.0	$4.0	$8.0	$11.0	$9.0
1A07	NextGen – On Demand NAS Portfolio	$8.5	$17.0	$21.5	$34.5	$43.5
1A08	NextGen – Improved Multiple Runway Operations Portfolio	$6.5	$2.0	$1.0	$0.0	$0.0
1A09	NextGen – NAS Infrastructure Portfolio	$17.7	$24.0	$23.0	$24.0	$29.0
1A10	NextGen – Support Portfolio at WJHTC	$12.0	$12.8	$12.8	$12.8	$12.8
1A11	NextGen – Performance Based Navigation & Metroplex Portfolio	$17.5	$18.0	$18.0	$13.0	$13.0
	Activity 2: Procurement and Modernization of Air Traffic Control Facilities and Equipment	**$1,631.4**	**$1,663.1**	**$1,715.8**	**$1,736.6**	**$1,762.4**
	A. En Route Programs	**$683.7**	**$699.9**	**$677.3**	**$644.8**	**$666.0**
2A01	NextGen – En Route Automation Modernization (ERAM) – System Enhancements and Technology Refresh	$78.0	$93.6	$106.1	$126.4	$150.0
2A02	En Route Communications Gateway (ECG)	$2.7	$2.7	$4.8	$2.7	$2.7
2A03	Next Generation Weather Radar (NEXRAD)	$6.3	$5.5	$5.5	$4.0	$6.1
2A04	Air Route Traffic Control Center (ARTCC) & Center Radar Approach Control (CERAP) Building Improvements	$74.9	$81.3	$75.3	$75.3	$75.3
2A05	Air Traffic Management (ATM) – Traffic Flow Management (TFM)	$20.0	$9.3	$7.0	$7.0	$7.0
2A06	Air/Ground Communications Infrastructure	$8.8	$9.8	$8.8	$6.7	$6.4
2A07	Air Traffic Control En Route Radar Facilities Improvements	$5.8	$5.9	$5.9	$5.9	$5.9
2A08	Voice Switching Control System (VSCS)	$11.3	$12.8	$11.4	$11.7	$12.1
2A09	Oceanic Automation System (OAS)	$24.0	$31.1	$27.5	$18.0	$18.0
2A10	Next Generation Very High Frequency Air/Ground Communications System (NEXCOM)	$50.5	$60.0	$62.0	$64.0	$64.0
2A11	NextGen – System-Wide Information Management (SWIM)	$28.8	$48.1	$42.9	$28.4	$9.4
2A12	NextGen – Automatic Dependent Surveillance - Broadcast (ADS-B) NAS Wide Implementation	$31.1	$27.9	$34.7	$43.5	$70.0
2A13	Windshear Detection Service (WDS)	$4.5	$1.0	$2.8	$1.0	$1.0
2A14	NextGen – Collaborative Air Traffic Management Portfolio	$13.8	$21.0	$22.0	$14.0	$20.0
2A15	NextGen – Time Based Flow Management (TBFM) Portfolio	$50.6	$49.6	$47.4	$42.8	$46.8
2A16	ATC Beacon Interrogator (ATCBI) - Technology Refresh	$1.0	$0.0	$0.0	$0.0	$0.0
2A17	NextGen – Next Generation Weather Processor (NWP)	$27.8	$35.1	$24.3	$16.0	$6.2

BLI Number	Capital Budget Line Item (BLI) Program	FY 2017 Budget	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.	FY 2021 Est.
2A18	Airborne Collision Avoidance System X (ACAS X)	$8.9	$7.7	$7.7	$6.9	$5.1
2A19	NextGen – Data Communication in support of NextGen	$232.0	$194.7	$178.3	$170.6	$160.1
2A20	Offshore Automation	$3.0	$3.0	$3.0	$0.0	$0.0
	B. Terminal Programs	**$561.7**	**$580.2**	**$623.4**	**$684.3**	**$671.6**
2B01	Airport Surface Detection Equipment - Model X (ASDE-X)	$8.4	$0.0	$0.0	$0.0	$0.0
2B02	Terminal Doppler Weather Radar (TDWR) – Provide	$5.0	$3.8	$4.5	$2.2	$0.0
2B03	Standard Terminal Automation Replacement System (STARS) (TAMR Phase 1)	$64.2	$62.8	$66.9	$40.0	$50.0
2B04	Terminal Automation Modernization/ Replacement Program (TAMR Phase 3)	$108.9	$85.0	$8.0	$0.0	$0.0
2B05	Terminal Automation Program	$7.7	$7.8	$12.8	$12.9	$17.9
2B06	Terminal Air Traffic Control Facilities - Replace	$58.8	$87.0	$148.8	$119.5	$110.0
2B07	ATCT/Terminal Radar Approach Control (TRACON) Facilities - Improve	$47.7	$47.8	$72.8	$95.8	$91.8
2B08	Terminal Voice Switch Replacement (TVSR)	$6.0	$6.0	$6.0	$6.0	$5.0
2B09	NAS Facilities OSHA and Environmental Standards Compliance	$42.7	$42.0	$42.0	$42.0	$42.0
2B10	Airport Surveillance Radar (ASR-9)	$4.5	$2.2	$0.0	$0.0	$0.0
2B11	Terminal Digital Radar (ASR-11) Technology Refresh and Mobile Airport Surveillance Radar (MASR)	$6.1	$3.2	$4.4	$4.4	$4.4
2B12	Runway Status Lights (RWSL)	$4.8	$1.2	$0.0	$3.5	$3.5
2B13	NextGen – National Airspace System Voice System (NVS)	$48.4	$68.4	$32.2	$116.6	$105.5
2B14	Integrated Display System (IDS)	$7.7	$5.0	$18.0	$24.0	$28.0
2B15	Remote Monitoring and Logging System (RMLS)	$9.9	$10.4	$23.1	$16.4	$19.6
2B16	Mode S Service Life Extension Program (SLEP)	$37.9	$42.5	$37.5	$45.5	$35.5
2B17	Surveillance Interface Modernization (SIM)	$26.8	$32.1	$34.0	$22.2	$20.2
2B18	NextGen – Terminal Flight Data Manager (TFDM)	$42.2	$50.0	$79.0	$92.8	$95.2
2B19	Voice Recorder Replacement Program (VRRP)	$2.0	$5.0	$11.3	$14.5	$12.0
2B20	Integrated Terminal Weather System (ITWS) Technology Refresh	$1.0	$1.0	$2.1	$0.0	$0.0
2B21	Next Generation Surveillance, Weather and Back-up Surveillance Capability	$6.0	$0.0	$0.0	$0.0	$0.0
2B22	Flight and Interfacility Data Interface (FIDI)	$15.0	$17.0	$20.0	$26.0	$31.0
	C. Flight Service Programs	**$17.9**	**$21.7**	**$25.7**	**$16.7**	**$12.7**
2C01	Aviation Surface Weather Observation System	$10.0	$10.0	$10.0	$2.0	$0.0
2C02	Future Flight Services Program (FFSP)	$3.0	$6.8	$12.0	$12.0	$10.0
2C03	Alaska Flight Service Facility Modernization (AFSFM)	$2.7	$2.7	$2.7	$2.7	$2.7
2C04	Weather Camera Program	$2.2	$2.2	$1.1	$0.0	$0.0
	D. Landing and Navigation Aids Programs	**$146.9**	**$140.8**	**$139.1**	**$141.6**	**$158.5**
2D01	VHF Omnidirectional Radio Range (VOR) with Distance Measuring Equipment (DME)	$7.0	$11.0	$17.0	$20.0	$12.0

BLI Number	Capital Budget Line Item (BLI) Program	FY 2017 Budget	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.	FY 2021 Est.
2D02	Instrument Landing Systems (ILS) – Establish	$7.0	$7.0	$10.0	$11.0	$11.0
2D03	Wide Area Augmentation System (WAAS) for GPS	$85.0	$78.7	$71.4	$67.0	$86.5
2D04	Runway Visual Range (RVR) & Enhanced Low Visibility Operations (ELVO) Program	$6.5	$4.0	$6.0	$6.0	$6.0
2D05	Approach Lighting System Improvement Program (ALSIP)	$3.0	$3.0	$5.0	$5.0	$5.0
2D06	Distance Measuring Equipment (DME)	$3.0	$3.0	$5.0	$5.0	$5.0
2D07	Visual Navaids - Establish/Expand	$2.0	$2.0	$2.0	$2.0	$2.0
2D08	Instrument Flight Procedures Automation (IFPA)	$9.4	$8.5	$2.2	$3.1	$1.5
2D09	Navigation and Landing Aids – Service Life Extension Program (SLEP)	$3.0	$3.5	$7.5	$12.5	$14.5
2D10	VASI Replacement – Replace with Precision Approach Path Indicator	$5.0	$5.0	$10.0	$10.0	$15.0
2D11	Runway Safety Areas – Navigation Mitigation	$14.0	$12.1	$0.0	$0.0	$0.0
2D12	NAVAIDS Monitoring Equipment	$2.0	$3.0	$3.0	$0.0	$0.0
	E. Other ATC Facilities Programs	**$221.3**	**$220.5**	**$250.3**	**$249.3**	**$253.6**
2E01	Fuel Storage Tank Replacement and Management	$22.7	$22.0	$22.0	$22.0	$22.0
2E02	Unstaffed Infrastructure Sustainment	$40.5	$41.3	$42.3	$42.4	$46.7
2E03	Aircraft Related Equipment Program	$13.0	$12.5	$13.0	$13.0	$13.0
2E04	Airport Cable Loop Systems – Sustained Support	$8.0	$8.0	$10.0	$10.0	$10.0
2E05	Alaskan Satellite Telecommunication Infrastructure (ASTI)	$6.0	$12.0	$10.3	$0.0	$0.0
2E06	Facilities Decommissioning	$6.2	$8.0	$10.0	$10.0	$10.0
2E07	Electrical Power Systems – Sustain/Support	$105.0	$102.7	$130.7	$135.7	$135.7
2E08	Energy Management and Compliance (EMC)	$2.0	$2.0	$2.0	$6.2	$6.2
2E09	Child Care Center Sustainment	$1.0	$1.0	$0.0	$0.0	$0.0
2E10	FAA Telecommunications Infrastructure 2	$10.4	$1.0	$0.0	$0.0	$0.0
2E11	System Capacity, Planning and Improvements	$6.5	$6.5	$6.5	$6.5	$6.5
2E12X	Independent Operational Test and Evaluation	$0.0	$3.5	$3.5	$3.5	$3.5
	Activity 3: Non-Air Traffic Control Facilities and Equipment	**$182.9**	**$187.9**	**$181.9**	**$166.3**	**$163.2**
	A. Support Programs	**$167.4**	**$172.9**	**$166.9**	**$151.3**	**$148.2**
3A01	Hazardous Materials Management	$31.0	$30.0	$30.0	$31.0	$31.0
3A02	Aviation Safety Analysis System (ASAS)	$11.3	$12.0	$14.0	$18.2	$15.3
3A03	National Airspace System (NAS) Recovery Communications (RCOM)	$12.0	$12.0	$12.0	$12.0	$12.0
3A04	Facility Security Risk Management	$21.0	$18.1	$15.9	$15.0	$14.9
3A05	Information Security	$25.0	$25.0	$12.0	$12.0	$12.0
3A06	System Approach for Safety Oversight (SASO)	$17.2	$25.8	$23.5	$21.0	$14.1
3A07	Aviation Safety Knowledge Management Environment (ASKME)	$4.2	$0.0	$0.0	$0.0	$0.0
3A08	Aerospace Medical Equipment Needs (AMEN)	$3.0	$7.0	$19.6	$12.8	$14.0

BLI Number	Capital Budget Line Item (BLI) Program	FY 2017 Budget	FY 2018 Est.	FY 2019 Est.	FY 2020 Est.	FY 2021 Est.
3A09	NextGen – System Safety Management Portfolio	$17.0	$17.0	$17.0	$17.0	$17.0
3A10	National Test Equipment Program	$5.0	$4.0	$5.0	$3.0	$3.0
3A11	Mobile Assets Management Program	$5.8	$3.0	$1.8	$0.0	$0.0
3A12	Aerospace Medicine Safety Information System (AMSIS)	$12.0	$14.0	$16.1	$9.3	$9.2
3A13	Tower Simulation System (TSS) Technology Refresh	$3.0	$5.0	$0.0	$0.0	$0.0
3A14X	Logistics Support System and Facilities (LSSF)	$0.0	$0.0	$0.0	$0.0	$5.7
	B. Training, Equipment and Facilities	**$15.5**	**$15.0**	**$15.0**	**$15.0**	**$15.0**
3B01	Aeronautical Center Infrastructure Modernization	$14.0	$14.0	$14.0	$14.0	$14.0
3B02	Distance Learning	$1.5	$1.0	$1.0	$1.0	$1.0
	Activity 4: Facilities and Equipment Mission Support	**$237.4**	**$230.9**	**$232.2**	**$254.6**	**$260.1**
4A01	System Engineering (SE2020) and Development Support	$35.0	$35.0	$38.0	$38.0	$38.0
4A02	Program Support Leases	$46.6	$47.0	$47.0	$50.0	$55.0
4A03	Logistics Support Services (LSS)	$11.0	$11.0	$11.0	$11.0	$11.0
4A04	Mike Monroney Aeronautical Center Leases	$19.3	$19.7	$20.2	$20.6	$21.1
4A05	Transition Engineering Support	$24.1	$19.3	$17.0	$15.0	$15.0
4A06	Technical Support Services Contract (TSSC)	$23.0	$23.0	$23.0	$30.0	$30.0
4A07	Resource Tracking Program (RTP)	$6.0	$6.0	$6.0	$8.0	$8.0
4A08	Center for Advanced Aviation System Development (CAASD)	$60.0	$60.0	$60.0	$65.0	$65.0
4A09	NextGen – Aeronautical Information Management Program	$10.4	$7.9	$8.0	$15.0	$15.0
4A10	NextGen – Cross Agency NextGen Management	$2.0	$2.0	$2.0	$2.0	$2.0
	Activity 5: Personnel Compensation, Benefits and Travel	**$489.0**	**$496.1**	**$503.5**	**$510.8**	**$519.5**
5A01	Personnel and Related Expenses	$489.0	$496.1	$503.5	$510.8	$519.5
	Activity 6: Sustain ADS-B services and WAAS GEOs	**$150.3**	**$144.5**	**$133.5**	**$135.6**	**$136.6**
6A01	ADS-B Services and WAAS GEOs	$150.3	$144.5	$133.5	$135.6	$136.6
	Note: BLI numbers with X represent outyear programs not requested in the FY 2017 President's Budget. Note: FY 2018-2021 outyear funding amounts are estimates.					
	Total Year Funding	**$2,838.0**	**$2,895.0**	**$2,953.0**	**$3,012.0**	**$3,071.0**
	Targets	**$2,838.0**	**$2,895.0**	**$2,953.0**	**$3,012.0**	**$3,071.0**

Information for Major Capital 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 Air Traffic Organization's performance in acquiring ATC systems.

In December 2007 the GAO issued its report GAO-08-42 entitled, "AIR TRAFFIC CONTROL FAA Reports Progress in System Acquisitions, but Changes in Performance Measurement Could Improve Usefulness of Information." This report documented the findings and provided recommendations to the FAA.

One of GAO's recommendations was to identify or establish a vehicle for regularly reporting to Congress and the public on FAA's overall, long-term performance in acquiring ATC systems by providing original budget and schedule baselines for each program and the reasons for any baseline revision. The table provided in this section provides the most current information for FAA's Major Active Programs and is in direct response to the GAO's recommendation.

FAA Capital Programs
Current Information for Major Programs

	Original Baseline			Current Baseline			Current Estimate		
Programs	Original APB Date	Completion Date	Budget $M	Current APB Date	Revised Completion Date	Revised Budget $M	Completion Date	Budget $M	Comments
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	
Common Support Services (CSS) Weather (Wx) ACAT 1	Mar-15	Aug-22	$120.1	Mar-15	Aug-22	$120.1	Aug-22	$120.1	NOTE: New Addition. Final Investment Decision (FID) approved by the Joint Resources Council (JRC) in Mar-15.
Data Communications (Data Comm) Segment 1, Phase 1 (S1P1) ACAT 1	May-12	May-19	$741.4	May-12	May-19	$741.4	May-19	$741.4	
Data Communications (Data Comm) Segment 1, Phase 2 (S1P2), Initial En Route Services ACAT 1	Oct-14	Feb-21	$816.7	Oct-14	Feb-21	$816.7	Feb-21	$816.7	
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	
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	

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	Apr-14	Apr-16	$79.4	Apr-16	$79.4	Current Baseline vs Original Baseline: The schedule delay of 24 months (-50% variance) and cost increase of $12M (-17.8% variance) is associated with the following factors: 1) Business processes developed during the Business Process Reengineering (BPR) phase did not address system interactions between functional areas; 2) delays in developing interfaces with legacy systems; 3) complexity of the tool integration required for interfaces; and 4) changes in contract and program management. In Apr-14, the JRC approved a Baseline Change Decision (BCD) for LCSS.
NAS Voice System (NVS) Demonstration and Qualification Phase ACAT 1	Sep-14	Mar-20	$294.2	Sep-14	Mar-20	$294.2	Mar-20	$294.2	
Next Generational Weather Processor (NWP) ACAT 1	Mar-15	Aug-22	$189.3	Mar-15	Aug-22	$189.3	Aug-22	$189.3	NOTE: New Addition. Final Investment Decision (FID) approved by the Joint Resources Council (JRC) in Mar-15.
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	Current Baseline vs Original Baseline: In Jul-13 the JRC approved a BCD for the RWSL program. The JRC determined to minimize the cost exposure to the baseline, deployment will be limited to the 16 airports that have been fully committed and San Francisco International for a total of 17 airports. 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 increase ($39.3M, -12% variance) and schedule delay (23 months, -26.1% variance) 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.
System Wide Information Management (SWIM) Segment 2A ACAT 2	Jul-12	Dec-17	$120.2	Jul-12	Dec-17	$120.2	Dec-17	$111.5	
System Wide Information Management (SWIM) Segment 2B ACAT 2	Oct-15	Sep-21	$119.6	Oct-15	Sep-21	$119.6	Jun-21	$119.6	NOTE: New Addition. Final Investment Decision (FID) approved by the Joint Resources Council (JRC) in Oct-15.

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 (TAMR), Phase 3, Segment 1 (P3 S1) ACAT 2	Dec-11	Oct-17	$438.0	Aug-15	Oct-17	$528.6	Oct-17	$528.6	Original Baseline vs Current Baseline: The cost increase of $90.6M (-20.7% variance) is associated with the following factors: 1) A number of new software requirements (gaps) have been identified from deploying to the first sites. These first deployments demonstrated the significant complexity of transitioning to STARS at large TRACONs which had not been considered with the original baseline and are critical for operational suitability; 2) In addition, the complexity of operations and over a decade of CARTS tailoring by sites was not understood and under-estimated; and 3) Costs were underestimated and not considered for support costs and site spares. During FY14, the JRC was notified of the current estimate to complete the program and in Aug-15, the JRC approved the BCD.
Terminal Automation Modernization and Replacement (TAMR), Phase 3, Segment 2 (P3 S2) ACAT 2	Sep-12	Aug-19	$462.5	Sep-12	Aug-19	$462.5	Aug-19	$505.7	Current Estimate vs Current Baseline: The cost increase of $43.2M (-9.3% variance) is associated with the impact of higher prime costs and a funding reduction in FY16, which may require additional funding to complete the program. The Program Office is reviewing the overall program and assessing potential mitigation actions to minimize the impact to the baseline. During FY14, the JRC was notified of the current estimate to complete the program and in Aug-15 the program provided the JRC with a status update.
Terminal Automation Modernization and Replacement (TAMR), Phase 1 Technology Refresh ACAT 2	Sep-12	Feb-20	$531.5	Sep-12	Feb-20	$531.5	Feb-20	$531.5	
Time Based Flow Management (TBFM) WP3 ACAT 3NI	Apr-15	Sep-22	$188.3	Apr-15	Sep-22	$188.3	Sep-22	$188.3	NOTE: New Addition. Final Investment Decision (FID) approved by the Joint Resources Council (JRC) in Apr-15.

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	
Wide Area Augmentation System (WAAS) Phase IV, Segment 1 - Dual Frequency Operations (DFO) ACAT 1	May-14	Sep-19	$603.2	May-14	Sep-19	$603.2	Sep-19	$603.2	

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	
Collaborative Air Traffic Management Technologies (CATMT) Work Package 2 (WP2) ACAT 3	Sep-08	Sep-14	$109.5	Sep-08	Sep-14	$109.5	Mar-15	$107.7	Actual Result vs Current Baseline: Traffic Flow Management System (TFMS) Release 11, which included the Airborne Reroute (ABRR) functionality, was deployed nationally on March 29, 2015. This completed the deployment of the last piece of functionality encompassed by the CATMT WP2 program. The CATMT WP2 program completed with a 6 month schedule delay (-8.3% variance). The variance was due to the impact of Sequestration in March-April 2013 and the government shutdown that occurred October 2013, adversely affecting the execution of Operational Test (OT) for TFMS Release 8 resulting in a cascading effect on the development, testing and deployment of subsequent TFMS Releases.
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	Actual Result vs Current Baseline: The ERAM program declared Operational Readiness Date (ORD) at the last site (20th site), Washington ARTCC (ZDC) on March 27, 2015 completing the program. ERAM completed with a total cost increase of $95.1M (-3.8% variance) to the current baseline. $43.9M of the variance results from transfer of O&M funding to the F&E budget line to cover second level engineering costs. $51.2M of this variance is related to the schedule slip of 7 months due to sequestration. The impact of the sequestration in March 2013 which reduced funding in the F&E and Operations accounts severely impacted the availability of resources to support site teams from March 2013 to May 2013. Specific impacts were to Subject Matter Experts (SMEs), program overtime, and travel funding, as well as the inability to proceed with any material re-planning until these teams were allowed to resume their work which occurred in late May 2013. These impacts have resulted in a schedule delay of 7 months (-5.2% variance).

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	
System Approach for Safety Oversight (SASO) Phase IIa ACAT 3	Sep-08	Sep-13	$88.0	Sep-13	Jan-16	$126.9	Dec-15	$126.9	Actual Result vs Current Baseline: The SASO Phase IIa achieved Initial Operational Capability (IOC) at Miami, the 100th and last site, on December 16, 2015 completing deployment of the Safety Assurance System (SAS).
System Wide Information Management (SWIM) Segment 1 ACAT 2	Jul-09	Sep-15	$310.2	Jul-12	Sep-15	$310.2	Sep-15	$305.4	Actual Result vs Current Baseline: The SWIM Flight Data Publication Service (SFDPS) became operational May 2015 followed by approval of the In-Service Decision (ISD) Authority in July 2015. Activities were then conducted to approve multiple External Consumers for the SFDPS data. The connection of these external customers to the SFDPS data in September 2015 represents the completion of the implementation of the last SWIM Segment 1 capability.