



U.S. Department  
of Transportation

Office of the Administrator

800 Independence Ave., S.W.  
Washington, D.C. 20591

**Federal Aviation  
Administration**

December 15, 2016

The Honorable John Thune  
Chairman, Committee on Commerce, Science,  
and Transportation  
United States Senate  
Washington, DC 20510

Dear Chairman Thune:

Thank you for your December 1 letter and the opportunity to update you on the modernization of our Nation's air traffic system. The Next Generation Air Transportation System (NextGen) is at the heart of ensuring that our Nation has the safest, most efficient airspace possible for decades to come, a commitment that is shared by all of us. In this important endeavor, I appreciate the partnership with your Committee.

This letter provides an initial framework for understanding and evaluating our approach to NextGen and outlines the path forward developed with comprehensive stakeholder collaboration.

NextGen has been and will continue to be an extremely worthy public investment. Modernizing the safest and most complex air traffic management system in the world remains one of the Nation's, as well as the Federal Aviation Administration's (FAA), highest priorities. The tremendous benefits of undertaking this mission can be measured in economic activity, jobs, and the safe mobility of our citizens and visitors from around the world.

All of us engaged in this process owe it to the American taxpayers and the flying public to succeed with the modernization of our air transportation system. It is essential infrastructure that supports a vital part of the U.S. economy. We benefit by collaboration with and oversight by your Committee and others who review our approach and our progress. To be sure, there are varying points of view from those who review our work, and we are always willing to share candidly the progress we are making the adjustments we believe are needed and the path forward as we see it. In that spirit, I offer you the following overview and response to your specific requests.

Executive Summary

Your letter provides an opportunity to reflect on where we've been, where we are today, and where we are heading in the future.

Although NextGen pre-dates 2010, that year marked a turning point. By that point, we had long recognized the need to identify clear measures of success, to prioritize NextGen deliverables into

segments that could deliver benefits quickly, and to track costs both on individual segments and overall. Perhaps most importantly, we recognized we could do none of those things alone. Accordingly, we established the NextGen Advisory Committee (NAC) as an industry advisory body to help us set priorities and develop a common language of metrics and milestones.

Six years later, our efforts at collaboration and prioritization have borne fruit. The unprecedented collaboration with the aviation industry has informed the construction of the flexible, resilient and sustainable infrastructure that NextGen relies upon today. The concrete data shows that we are delivering benefits to industry and the public on time, on budget, and in quantifiable segments. Where we have stumbled, we have had the flexibility to work with our stakeholders to learn lessons, reassess, and regroup. And where we have faced risk factors beyond our control, we have done our best to stay on track and to prepare more thoroughly for similar risks in the future.

Looking ahead, we have a clear path for adding more and more capabilities that will transform the way air traffic is managed and more rapidly provide NextGen benefits. As a result, we are on track to meet our original high-level air traffic management objectives for NextGen by 2025.

### Measures of Success

Today, using the measurements upon which we and the aviation community agreed, NextGen is delivering real benefits. NextGen improves the way air traffic flows from gate to gate. It provides advanced procedures, technologies, and tools that allow more commercial aircraft carrying passengers and cargo to depart on schedule, fly more direct paths, and arrive on time at their destinations, burning less fuel and producing fewer emissions. Air traffic controllers communicate with the cockpit digitally, which reduces gate and taxi delays, especially during severe weather events, increasing throughput and efficiency, enhancing safety, and reducing emissions. More aeronautical, traffic and weather information in the flight deck for pilots enhances safety. Airlines, airports and other airspace users access real-time information, contributing to better and more timely decisions on the ground and in the air.

These changes have produced tangible benefits for airlines, pilots and other users in our airspace, as well as for the flying public. For example, airlines are saving an average of 9 minutes and 800 pounds of fuel per flight flying into Denver International Airport on new Performance-Based Navigation procedures. Similarly, there is a 17 percent capacity gain at Memphis International Airport for FedEx due to new wake re-categorization procedures, amounting to more than 100,000 metric tons of carbon dioxide emissions avoided and 10.7 million gallons of jet fuel saved to date. That's the equivalent of taking 21,000 cars off the road.

Overall, through 2016, our multi-faceted airspace improvements already have translated into \$2.72 billion in savings in passenger time and occupant safety, as well as reduced fuel and aircraft operating costs. We project that by 2030, the total benefits of planned NextGen improvements are expected to be \$160.6 billion, at a cost of \$35.8 billion to the FAA and the aviation industry.

### Segmented Approach

I believe that while it is fair to say those most engaged with us now see the initial benefits they have helped achieve, it is also fair to say that the path we have traveled and the path we are on are full of complexities, assessments, and re-assessments that are not easily communicated or broadly understood. Airline business models also frequently adapt to the external environment (such as fuel prices and mergers), thereby impacting the FAA's ability to anticipate airline community priorities. That said, although there may be different points of view on the implementation approach for NextGen, the industry-embraced rollout is deliberate. It considers need, affordability, and the interdependency of automation systems, enabling technologies, and capabilities. It takes into account the dynamic nature of airspace, operations and the rapidly evolving needs of a growing set of airspace users. A segmented approach enables the agency to make decisions based on the most up-to-date information and to leverage rapidly changing technological advances. This approach was adopted both to achieve near-term successes and to reduce risk over the long term. While our long-term plans are well documented, investment decisions are presented to the FAA's internal investment review committee for approval in useful segments.

I am confident that we are on the right path and making solid progress; at the same time, the commitment to collaboration affords us the opportunity to review and evaluate varying points of view from our oversight bodies, our stakeholders and other interested parties. Some of this feedback leads to outcome-improving adjustments to initial approaches.

### Cost Calculations

Frequently, questions have arisen about NextGen's cost and schedule when progress has been measured against our original concept planning dates, rather than the baseline commitment timelines established at each program's final investment decision.

In fact, when our programs are measured properly against a positive cost-benefit analysis and our commitment to invest, we are now on or ahead of schedule with many of our large investment programs. Examples include Data Communications (Data Comm), System Wide Information Management (SWIM), and the ground portion of Automatic Dependent Surveillance-Broadcast (ADS-B). Today, Data Comm delivers tower clearance services at 55 airports, 29 months ahead of schedule and within budget. With SWIM segment 1, we completed all milestones on time and within the cost baseline and completed two milestones ahead of schedule. ADS-B segments 1 and 2 and its baseline services were completed on time and on budget.

Overall, NextGen cost estimates are within the original estimated range. And, for all programs active in 2015, we are only 6.4 percent over cost compared to the initial cost anticipated when they were approved by our investment committee. We are less than 6 percent behind schedule compared to the initial plan when the programs were approved. Additionally, since NextGen cost estimates were baselined, the implications of emerging new entrants to the air traffic control system (unmanned aircraft systems (UAS) and commercial space launches) have become clearer to FAA and all stakeholders. Accommodating these evolving requirements in the budget and schedule continues to be a challenge. The FAA has established the Drone Advisory Committee as a stakeholder feedback and consensus mechanism modeled after the NextGen Advisory

Committee (NAC) to help prioritize and align UAS-related efforts across government and industry.

### Lessons Learned

Without question, NextGen program development and implementation have provided us with many lessons learned. With a transparent and collaborative process, we have shared efforts that fell short and then redesigned our approach. For example, the FAA has had to be agile with the rollout of certain capabilities at a number of locations due to changing stakeholder (e.g., airline and airport) priorities. We learned an important lesson about bringing our subject matter experts in early while we were developing En Route Automation Modernization (ERAM), a foundational system on which NextGen is built. In 2003, when the program began, the project scope did not include a robust plan to obtain input on its design and implementation from our air traffic controllers. This problem set the project back in both time and cost. In 2010, we made course corrections. ERAM was fully deployed in 2015 and is now up and running nationwide. The FAA and the National Air Traffic Controllers Association developed a constructive and collaborative relationship aimed at advancing NextGen.

Performance Based Navigation (PBN) initiatives also provided important lessons. With new and more advanced routes outnumbering traditional procedures, training pilots and air traffic controllers to fully realize the benefits presented a challenge. Thus, we have worked closely with airspace users to highlight the opportunities to maximize these time- and money-saving enhancements.

Another important lesson learned from PBN involved the way we included neighboring communities in implementation of NextGen procedures. Over the last two decades, we have made significant progress in reducing aircraft noise for people living around airports. Advances in aircraft technology, operational procedures, and programs with airports all have worked together to mitigate noise. While NextGen procedures generally have provided noise relief for a majority of communities, they sometimes have resulted in flight pattern changes that can concentrate noise for some residents who live directly under those flight paths. We have seen an increasing level of public debate, political interest, concerns expressed by members of Congress, and even litigation. In response, the FAA has greatly increased its public engagement efforts to work with communities to educate them about how we develop procedures and measure noise, and to listen to residents' concerns. We have been working closely with airports, airlines, and the officials who represent these communities to figure out how we can best balance our pursuit of safer and more efficient flight paths with the needs of the communities over which we operate. This new approach can have cost and schedule implications that we will need to manage. However, it is our hope that increased engagement will lead to fewer problems as we implement. As we strive continually to balance the need for timely project delivery with the need to engage communities meaningfully, we appreciate the guidance and collaboration of this Committee.

### Risk Factors

As with any agency, certain circumstances impacting our initiatives remain outside of our control. NextGen investments benefit from stable funding and long-term authorization. Past interruptions in stability in these areas prompted even closer collaboration with stakeholders to consider together how NextGen improvements should be prioritized to ensure near-term benefits.

Budget and planning uncertainty due to sequestration, continuing resolutions and short-term reauthorizations made long-term planning and budgeting more complex in the past, and some of these factors must be considered risk factors for the future. Given the challenges of the past and the progress we are making, I do believe we have demonstrated an important degree of nimbleness and flexibility that should serve us well going forward.

### Collaboration

Our main vehicle for communicating and collaborating with stakeholders is the NAC. The NAC includes representation from all major groups of airspace users from air carriers to pilots of small general aviation aircraft, and now, new entrants like UAS. Through the NAC, the FAA receives critical input on the value of planned improvements as well as metrics for enhancements that have already been implemented. Many NextGen successes to date are due to this very close collaboration with the aviation industry. This engagement is necessary because NextGen relies on the interoperability of air and ground systems, along with synchronized equipage and other joint investments. However, our stakeholders are varied and not all benefit to the same degree in the same locations, or with the same enhancement across all NextGen investments. In this regard, our responsibility is to balance the complex needs of the entire aviation community. In doing so, we are mindful of how the aviation community evolves at an increasingly rapid pace and seek to chart a course to best serve present and future needs. Again, in this effort the NAC has given us a venue to enhance trust among all parties, to consider appropriate flexibility based on an evolving aviation environment, and to weigh options that serve the entire national airspace system to the best of our ability.

Our approach has proven successful. By focusing together with the aviation community on milestones related to the four prioritized capabilities that were part of our joint implementation plan, we achieved a combined 96 percent completion rate in 2015 and 2016. Further, the FAA's operational and tactical decision making resulted in many milestones being delivered earlier than planned.

Since establishing the NAC in 2010, we have proceeded with a more aggressive and transparent process of engagement with aviation leaders, and we have come a long way. As was my hope, the plan for NextGen is now viewed as a broader aviation community plan being guided and managed by the FAA. Today, many consider NextGen much more than an FAA program and view it an industry-wide undertaking that requires synchronized investment from government and industry related to equipage, training, cultural and operational changes, and integration.

Working with the community we have assessed priorities, made corrections and worked to provide benefits as soon as practicable while operating the largest, safest and most efficient airspace system in the world. Today, critical elements of NextGen are fully embraced by the aviation community because of the role they played in shaping the initiatives and the results they are seeing. We focus on "metroplexes" where the highest concentration of air traffic operates. We have a commitment by commercial air carriers to invest in equipment that will allow them to take advantage of advanced surveillance and navigation as well as communication. We enjoy more efficient departure re-routing around weather due to digital flight plan clearance delivery enabled at 55 airports. We also take advantage of sequenced departures that are making for far more efficient fuel saving procedures for moving traffic at peak times at our largest airports.

All of this progress provides the foundation for agreements reached on the path forward. We remain committed to a transparent process where issues are resolved through engagement designed to advance the program and reduce the risk factors posing challenges to success.

### Path Forward

We are in the midst of one of the safest periods in commercial aviation in the United States, achieving an extremely low fatality rate currently equivalent to transporting more than 5 billion passengers without a single life lost. This record is possible only because this and past Administrations have worked with Congress to build, maintain and modernize our air traffic control system. Additionally, it is possible because of the unprecedented degree of collaboration between those who operate in the national airspace and the Agency that regulates and provides air traffic control services for that airspace.

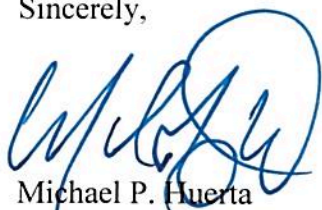
With the help of the Congress and of the aviation community, we have come a long way since 2010. Decisions have been made about future priorities that will provide greater benefits by the end of the decade. In these times of rapid technological change, modernization of systems as complex as our air traffic management system will not come without challenge. The path traveled, however, has taught us that with an ongoing commitment and open collaboration, we can achieve the goals envisioned.

Continuing the work on air traffic modernization while safely and efficiently operating our air transportation system remains my highest priority. Enclosed you will find detailed responses to the specific questions and requests contained in your letter. I hope your letter and this response mark a reinvigorated dialogue around the best ways to achieve our important objectives.

We stand ready to brief you and your staff in greater detail and welcome further opportunities to provide additional information or request direct industry input to the Committee. I look forward to continuing to work with you and the members of the Committee as we move forward.

If I can be of further assistance, please contact me or Kate Howard, Acting Assistant Administrator for Government and Industry Affairs, at (202) 267-3277.

Sincerely,



Michael P. Huerta  
Administrator

Enclosures

cc: The Honorable Bill Nelson, Ranking Member  
The Honorable Calvin L. Scovel III, Inspector General  
U.S. Department of Transportation

**1. For each of the four NAC priority programs discussed above, please provide a summary of implementation progress made both by the FAA and industry partners, including a gap analysis that compares currently available technologies, standards, and procedures to those that were expected to be available by now when the NAC priority program was initially proposed. Please also provide a timeline for expected completion of the implementation of these programs, including the date that the FAA estimates each program will achieve a positive return on investment for the government and users.**

It is important to note that the NextGen Advisory Committee (NAC) NextGen Priorities are not programs themselves. They are the early local operational opportunities that the Federal Aviation Administration (FAA) and the aviation stakeholders agreed to commit getting done for near term benefits enabled by maturing NextGen programs and their ongoing roll outs (e.g. Performance Based Navigation (PBN), Data Communications (Data Comm), Wake Recategorization (Wake Recat), Time Based Flow Management (TBFM), System Wide Information Management (SWIM), etc.). In this context, the NAC NextGen priorities do not have independent return on investments (ROIs), but the underlying enabling NextGen programs do. The FAA and the industry have agreed to measure the benefits derived from the local milestones achieved through the work of the Joint Analysis Team (JAT) under the NAC Subcommittee.

In 2013, the FAA asked the NAC to define their top priorities for NextGen capabilities which led to the top four priorities. FAA has been working closely with industry ever since, to define locations, dates and capabilities with milestones. For each of the four NextGen Priorities focus areas the community has enjoyed substantial success by both the FAA and Industry Partners. Through 2016, the FAA and industry have a combined 96.2 percent (102 of 106) success rate on meeting the expected commitments and delivered the agreed upon outcomes for each commitment. Additionally, 60 of the commitments were completed ahead of time. This success underscores the importance of working together and demonstrates the FAA's ability to deliver.

**The highlights below summarize the implementation progress of each of the four NAC NextGen priorities:**

Multiple Runway Operations (Accomplished 27 of 29) – improve access to airports with multiple runways (to our busiest airports, including those with closely spaced runways) through safety analysis built on NextGen research and better aircraft navigation equipage.

- Wake RECAT Phase 1: Now implemented at 23 airports and 12 Terminal Radar Approach Control Facilities (TRACONS).
- Wake RECAT Phase 2: Recently completed.
- Missed Milestone: FAA Delayed San Francisco (SFO) by 6 months from 2015 to 2016 due to winter weather traffic flow, training requirements from the Super Bowl, and

deconflicting facility implementations. The FAA did not complete the Boston Dependent Staggered operations (7110.308) due to community noise concerns.

- Gap Analysis: There is no longer a gap; the focus area is delivering against those commitments expected and defined in the *NextGen Priorities Joint Implementation Plan*.

Performance Based Navigation (Accomplished 10 of 10) – FAA published the *PBN NAS Navigation Strategy* in 2016 which seeks to take advantage of better aircraft navigation capability by designing smoother transition profiles from upper airspace to runway, shorter more direct flight paths, and increased access to airports near obstacles and terrain.

- Completed final publication milestone at Northern California and Atlanta Metroplex; Charlotte will be completed next year.
- The plan maximized the use of existing aircraft equipage, while providing incentives to equip additional aircraft.
- Explored new work with Required Navigation Procedures (RNP) Established on RNP (EoR) to allow more aircraft to fly more advanced procedures. Completed Established on RNP Track to Fix Safety Analyses. The FAA worked with Denver Airport, United Airlines, and Southwest Airlines to implement a national standard for EoR. This paved the way for additional advanced procedures.
- Completed Enhanced Lateral Spacing Operation (ELSO) National Standard.
- Completed a Single Site Las Vegas Assessment for future implementation.
- Gap Analysis: There is no gap; the focus area is delivering against those commitments expected and defined in the *2014 NextGen Priorities Joint Implementation Plan* through 2016. The updated 2017-2019 plan includes stretch goals for PBN; the systemic benefits of wide-spread use of PBN across the National Airspace System (NAS) and the corresponding benefits are a large focus of the NAC and industry and the FAA will continue to take incremental steps. By implementing PBN automation decision support tools, it will greatly aid in optimizing the use of PBN and corresponding performance benefits.

Surface Operations (Accomplished 15 of 17) - Some of the greatest efficiencies can be gained while an aircraft is still on the ground and at the gate, and when connecting the surface to the En Route airspace. The FAA commits to implementing near-term surface improvements, sharing more data with stakeholders, and completing feasibility assessments of some other capabilities of interest. The goal of these enhancements is to measurably increase predictability and provide actionable and measurable surface efficiency improvements.

- Measurably increasing predictability in the surface area.



- Committed to sharing more data with our stakeholders and to make the operation into and out-of the airport more efficient.
- Received approval for Airports to participate in the collaborative decisionmaking process in the future.
- Successfully sharing the FAA's Time Based Flow Management (TBFM) and Traffic Flow Management System (TFMS) information to stakeholders via SWIM.
- Missed Milestone: Surface Surveillance Event Data at San Francisco (SFO): FAA put the Airport Surface Surveillance Capability (ASSC) roll out on hold until the safety issue related to non-cooperative targets was addressed. That has been resolved and FAA has declared Initial Operating Capability (IOC) at SFO and is proceeding with the ASSC waterfall.
- Missed Milestone: Industry to provide 11 Data Elements: Industry delayed their commitment from June 2016 and is still working to deliver these data elements to the FAA.
- Gap Analysis: To close the two gaps on the above requirements, the FAA is sharing data at current ASSC implemented locations and is working with industry to help them close their requirement to deliver data elements.

Data Communications (Accomplished 50 of 50) - Data Comm will provide direct digital communications services between pilots and air traffic controllers and enhance air traffic control information to airline operations centers. The capabilities will enhance safety by reducing communication errors, increasing controller productivity, increasing airspace capacity and efficiency while reducing delays, fuel burn and carbon emissions at towers nationwide.

- Initiated data communications services between pilots and air traffic controllers as well as enhanced air traffic control information to airline operations centers.
- Completed 55 air traffic control towers across the NAS as of December 2016; completed implementation of Data Comm tower services capability is 29 months ahead of the baseline plan.
- Completed the Final Investment Decision (FID) for Initial and Full En Route Data Communications services (the decision was delayed a few times due to affordability).
- The program is coordinating the implementation strategy with all stakeholders to deliver the first Air Route Traffic Control Center (ARTCC) by 2019.
- Gap Analysis: There are no gaps, Data Comm is meeting or exceeding all commitments.

**The following provides a timeline for expected completion of the implementation of these programs:**

As noted above, the *NextGen Priorities Joint Implementation Plan* is updated bi-annually. It is a three year rolling plan. The plan was recently updated and published in 2016 for the years 2017 to 2019. This plan reflects the current priorities of the industry stakeholders that the FAA and industry are jointly committed to meeting and we are already meeting commitments for FY 2017. Per stakeholder requests, the process is dynamic, incremental and accommodates changing industry priorities and desires. It is intended that this process will continue to the end of the NextGen Program to help guide the rollout of capabilities critical to NextGen success. This plan and its updates are governed and managed by the NextGen Advisory Committee's Subcommittee and the NextGen Integration Working Group (NIWG), respectively.

The FAA and industry continue to develop new commitments in the four focus areas by the way of procedures, pilot programs, assessments and successes development. This allows the FAA and industry to learn from assessments, pilot programs, and demonstrations in order to identify changes, improvements and innovations. For example, for Wake RECAT, the FAA and industry worked together to swap implementations where a facility was not ready for implementation and where industry wanted a higher priority sites (Honolulu (HNL) and Indianapolis (IND)). Moreover, additional industry commitments are included in the three-year plan as these priorities are defined by industry stakeholders.

**While there is no separate return on investment calculated, the four NextGen Priorities focus areas are providing benefits today with little industry investments.**

Benefits of Performance Based Navigation (PBN) 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, reduced emissions and a reduction in aviation's adverse environmental impact.
- Charlotte Metroplex projects annual benefits to include \$9.4 million in fuel savings, 3.3 million gallons of fuel, and 28.0 thousand metric tons of carbon emission savings.
- Atlanta Metroplex projects annual benefits to include \$6.3 million in fuel savings, 2.2 million gallons of fuel, and 18.8 thousand metric tons of carbon emission savings.
- Las Vegas Metroplex projects annual benefits include \$7.5 million in fuel savings, 2.6 million gallons of fuel, and 24.8 thousand metric tons of carbon emission savings. These annual benefits are expected to accrue upon completion of the NextGen near-term procedural improvements implemented by the FAA's Metroplex program.

- The benefits are based on the FAA's preliminary assessment of proposed airspace improvements compared to operations in a year before any improvements were made. The value of the projected fuel savings is based on a \$2.85 per gallon rate; the data estimates are current as of March 2016.

Benefits of Multiple Runway Operations (MRO) include:

- No investments from industry on aircraft equipage.
- Decreased arrival and departure spacing during peak periods and result in increased throughput and time savings.
- Wake RECAT was implemented at Atlanta and produced cost savings as reported by Delta Air Lines. The average daily operations increased by 6.8 percent and the overall peak arrival throughput was increased by 5 percent. The taxi-out times decreased by 1.1 to 1.6 minutes and the average flight time within the TRACON decreased by 29 seconds.
- In Atlanta, Delta approximated their annual OpEx savings at \$13.9 to \$18.7 million.
- RECAT procedures were also implemented at Louisville where United Parcel Service, Inc. (UPS) reported positive impacts to arrival / taxi-out times, and fuel savings. UPS estimated annual savings at Louisville to be 1.5 million gallons with positive emissions impact of 14,300 CO<sub>2</sub>.
- RECAT procedures were implemented at Memphis with FedEx reporting 4.1 million gallons and 39,992 CO<sub>2</sub> saved per year.

Benefits of Data Communications (Data Comm) include:

- Provides a digital link between ground automation and flight deck avionics for air traffic control, instructions, traffic flow management, and flight crew requests.
- Reduce delays and provide more efficient routes for aircraft; improve controller and pilot efficiency leading to increased system throughput.
- Enhance safety by reducing operational errors associated with voice communications.
- Reduce the impact of ground delays due to congestion and adverse weather.
- April 2016, John F. Kennedy Airport (JFK) Data Comm saved 299 minutes in gate and taxi delay over a 24 hour period during an adverse weather event.
- Saved time, which equates to monetary/fuel savings, at Newark (June 2016) 217 minutes of delay time, Baltimore (August 2016) 323 minutes, at Denver (August 2016) 175 minutes.

- Estimated to save operators more than \$10 billion over the lifecycle of the program and save the FAA approximately \$1 billion in operating costs.

Benefits of Surface include:

- Reduced fuel burn through departure queue management; improved pushback planning.
- Increased opportunity for flight prioritization; improved data sharing between ATC and flight ops.
- Improved off-time compliance related to controlled departure times.
- Efficiency, cost avoidance and safety lifecycle benefit FY 2016-FY 2048, Risk Adjusted (RA) FY 2015 totals \$2,154 million.
- Non-monetized emission savings is 3.0 M metric tons of CO<sub>2</sub> (\$191 million)<sup>1</sup>; controller time saving is more than 1,000,000 hours and 390 reduced operational incidents.

**2. In an April 2013 report, the Government Accountability Office (GAO) made five recommendations to improve the FAA's ability to implement NextGen programs. For each recommendation, please provide a summary of new policies that you have implemented since 2013 to address GAO's concerns.**

FAA provides the following summary of new policies implemented to address the GAO's concerns for each recommendation.

Recommendation 1: Work with airlines and other users to develop and implement a system to systematically track the use of existing PBN procedures;

FAA Response:

- The Performance Based Navigation (PBN) Dashboard, developed by MITRE Center for Advanced Aviation System Development (CAASD), provides advanced reporting capabilities for the analysis and operational assessment of PBN. This analytical suite is being used to support the development of new PBN and integrated airspace design. The Dashboard also provides critical metrics on the actual use of PBN operations. This information includes use of PBN operations by aircraft categories, types, and carriers as well as tracking aircraft equipage levels. This information is accessible to internal and external users via a web site and provides an extensive range of tools, graphs, charts, and diagrams for analysis. The PBN Dashboard data helps define the baseline metrics of conventional procedures such as utilization rates prior to

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<sup>1</sup> Valuation of emissions using US interagency guidance but not currently approved for FAA Business Case.

implementing new PBN procedures. Post implementation data monitoring provides the performance metrics and usage information.<sup>2</sup>

- A limited public version of the PBN Dashboard is available on NextGen Website as of May 24, 2013.  
(<http://www.faa.gov/nextgen/pbn/dashboard/>)
- A Federal Aviation Administration (FAA)-internal management version of the dashboard, designated Dashboard-FAA Observer, is available via the AJV-14 Website on mMFAA as of August 1, 2013. It requires username and password, which can be obtained on the logon. It provides more information than the current public version to include individual procedure, route, and transition usage per segment of flight as well as more detailed operator equipage and airport utilization statistics.  
(<https://pbn.mitre.org/pbnservices/pbn/FaaObserver.html>)

The Observer functionality fully meets the target to develop and implement a system to systematically track the use of existing PBN procedures.

Recommendation 2: Develop processes to proactively identify new PBN procedures for the NAS, based on NextGen goals and targets, and evaluate external requests so that FAA can select appropriate solutions;

FAA Response:

As part of the NextGen program, a PBN portfolio was established to facilitate more effective integration of PBN-related activities across the agency. The Portfolio Management Team (PfMT) includes members from multiple organizations from different lines of business (LOB) within the FAA that contribute to the overall transition of the National Airspace System (NAS) to PBN. NextGen PBN Operational Improvements are planned and tracked by the PfMT to ensure activities are effectively coordinated. In addition, a PBN Capture Team has been established to provide a more focused forum to define all activities, work assignments, dependencies, and assumptions needed to complete the following objectives: (1) assess the means available for users to request new PBN procedures, (2) assess the processes used to select and prioritize procedures for implementation to ensure the right procedures are delivered where needed, (3) define measures for verifying benefits for PBN procedures, and (4) describe the NextGen operational service environment so that operational requirements and an implementation strategy can be developed.

Recommendation 3: Require consideration of other key operational improvements in planning for NextGen improvements, including PBN projects at Metroplexes such as the Optimization of

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<sup>2</sup> Report of the Federal Aviation Administration Under Section 213 of the FAA Modernization and Reform Act of 2012 - H.R. 658

Airspace and Procedures in the Metroplex program (formerly known as OAPM), as well as the identification of unused flight routes for decommissioning;

FAA Response:

- For Core airports, additional procedures will largely fall into the Metroplex program's scope or that program's successor. Some of the Metroplex projects have already developed a number of procedures. These procedures have been included in the plan and publication has begun for some of the sites. Other Metroplex projects are either in the process of procedure development or projects have not yet commenced. Collaborative Metroplex teams determine the types and number of procedures which will then be captured in the PBN implementation plan. Any other PBN procedures at non-Metroplex Core airports will also be determined collaboratively with industry.
- The PBN Dashboard is designed with the capability to determine usage levels for routes throughout the NAS. This scalable usage data will be used for the initial selection of decommissioning-eligible routes. The routes will then be assessed with non-quantitative measures, to include providing improved access and overall NAS benefits, to thoughtfully arrive at final disposition decisions.
- A limited public version of the PBN Dashboard is available on NextGen Website as of May 24, 2013.  
(<http://www.faa.gov/nextgen/pbn/dashboard/>)
- A FAA-internal management version of the dashboard, designated Dashboard-FAA Observer, is available on the AJV-14 Website on MyFAA as of August 1, 2013. It requires username and password, which can be obtained via the logon. It provides more information than the current public version to include individual procedure, route, and transition usage per segment of flight as well as more detailed operator equipage and airport utilization statistics.  
(<https://pbn.mitre.org/pbnservices/pbn/FaaObserver.html>)
- The Observer functionality fully meets this target to provide data for consideration for PBN planning. The Dashboard-Full will enhance this data.

Recommendation 4: Develop and implement guidelines for ensuring timely inclusion of appropriate stakeholders, including airport representatives, in the planning and implementation of NextGen improvement efforts.

FAA Response:

The FAA has identified capability readiness across the airborne, airspace, air traffic and airport domains to provide an additional perspective to support harmonized implementation of NextGen capabilities across each of the domains which are incorporated into the NextGen planning

process support tools to include the *NextGen Implementation Plan (NGIP)* and *NAS Segment Implementation Plan (NSIP)*.

The agency has in place a variety of processes to facilitate stakeholder involvement into the NextGen planning and implementation process. As an example, a robust process guide within the required Procedure Tracking Tool incorporates multiple instances where PBN project design and implementation efforts are mandated to incorporate outside stakeholders into the process.

FAA has also included internal and external stakeholders in the development of new NAS procedural designs conducted at major metropolitan airports such as Seattle (SEA), Houston (IAH) and Denver (DEN). This engagement at the conceptual level of new procedure design incorporates vital input from airport representatives and airlines prior to the implementation of these new procedures in the NAS. This initiative started in 2015 and is ongoing.

Recommendation 5: Assure that NextGen planning documents provide stakeholders information on how and when operational improvements are expected to achieve NextGen goals and targets.

FAA Response:

Flexibility, responsiveness, and accessibility influence the driving philosophy of NextGen to plan for and deliver NAS improvements. The long term mixed equipage state of aircraft in the NAS challenges the ability of NextGen to develop an environment that meets all needs. The inherent limitations associated with today's system highlights the need to continue advancements of NextGen capabilities.

The FAA annually publishes the NGIP. Developed by a cross-agency working group, the NGIP provides an overview of the FAA's ongoing transition to NextGen and synthesizes the FAA's planning documents in a format that is accessible to our varied stakeholders.

The FAA's NAS Enterprise Architecture (NAS EA) is the blueprint for transforming the current NAS to the NextGen system. It contains the integrated technical decisions, synchronized investments and the interdependencies across policies, operations, systems and technologies.

The FAA's NSIP is the FAA's NextGen planning document. It describes how the FAA plans to implement NextGen capabilities through 2025 and is organized into portfolios of related operational improvements (OIs).

In 2014, the FAA integrated the NSIP and the NAS EA, which provides an additional level of detail and connectivity and maps interdependencies between OIs. This integrated planning resource illustrates operational and performance impacts and facilitates traceability between OI and NextGen goals. The FAA established an initial set of NextGen goals and associated quantitative targets, aligned with the International Civil Aviation Organization (ICAO) Key Performance Areas and will continue to expand this set and begin to align the OI with the goals.

The FAA completed the updated OI descriptions in the NSIP and revalidated the implementation portfolios. The updated NSIP fully integrates into the NAS EA Portal as of February 2014.

The *PBN NAS Navigation Strategy* was signed by the FAA Administrator on September 28, 2016. This report is the product of collaboration between the FAA and aviation stakeholders, along with input from the NextGen Advisory Committee and the Performance Based Operations Aviation Rulemaking Committee. The Strategy is divided into near-, mid, and far-term objectives over the next 15 years, providing stakeholders with valuable information on operational improvements and achievement goals and targets.

**3. The FAA lists the En Route Automation Modernization (ERAM) computer system, which was completed in March 2015, as a NextGen program. ERAM, however, has received funding since 2003, well before NextGen first appeared in the FAA budget in 2007. For each line item included in the Administration's NextGen budget request for FY 2017, please indicate whether the program had received funding prior to 2007. In addition, please state how each program relates to the goals and expected outcomes of NextGen, including how it will contribute to a measurably safer and more efficient ATC system.**

The attached spreadsheet in Appendix A lists all the 2017 budget items that are directly identified as NextGen investments. For the column labeled "Did it exist prior to 2007," we determined whether there was an existing acquisition baseline system/program that received funding for those years. The column "Did it exist in 2007" highlights the addition of programs in the first year of identified NextGen funding. The final column highlights how each budget line is represented in the *Capital Investment Plan (CIP)* with relationship to the Agency's major performance objectives.

**4. In its November 2016 report, the OIG highlighted the fact that "FAA considers the \$2.7 billion ERAM program to be the backbone for NextGen that allows controllers to better manage flights from gate to gate." Despite your announcement of completion of the program, however, the OIG identified serious integration issues with more than half of the NextGen transformational programs and ERAM. The OIG concluded that modifications to ERAM are necessary before the expanded capabilities of the transformational programs can be realized in the National Airspace System (NAS). In fact, the OIG explained that the FAA already has plans to spend millions of dollars to further modify ERAM in order to address some of these integration issues. Please outline the expanded capabilities that ERAM currently allows for in the NAS beyond the legacy system. In addition, provide an estimate for the total cost of ERAM, including the estimated costs of the modifications necessary to fully integrate ERAM with the NextGen transformational programs and deliver the benefits associated with full NextGen capabilities.**



The FAA believes that there is a misunderstanding/misconception concerning planned enhancements to En Route Automation Modernization (ERAM). The characterization provided by the Office of the Inspector General (OIG) stating “that the Federal Aviation Administration (FAA) already has plans to spend millions of dollars to further modify ERAM in order to address some of these integration issues,” supposes that ERAM is broken and needs to be fixed to work with planned NextGen capabilities. The facts are that ERAM is operating 24/7 in the National Airspace System (NAS) today doing what it was designed to do, replace the HOST system which was becoming increasingly obsolete, and serve as the backbone, the chassis for automation capabilities in the En Route environment.

The FAA’s plans to incorporate NextGen capabilities onto ERAM always required planned enhancements to ERAM, not to fix integration issues with ERAM, but to provide the additional needed capabilities (not able to be fielded on the legacy HOST system). To date the ERAM program has developed software to enable the following capabilities (enhancements) in the NAS (beyond the basic ERAM required capabilities):

- Pre-Departure Re-Route and Airborne Re-Route capabilities (PDRR/ABRR)
- Ground Interval Management – Spacing capability (GIM-S)
- Data Communications (Data Comm): tower datalink services, En Route datalink capabilities under development

There are numerous planned NextGen capabilities in the future that will require additional enhancements to ERAM. These do not indicate that there are integration issues with ERAM, but rather that there are additional planned needs that require additional ERAM software to enable the capability. In fact the agency is about to baseline a new ERAM enhancement segment (Final Investment Decision (FID) December 2016) which will provide capabilities including – automated handoffs with NavCanada, improvements to conflict probe processing to include the R-side capability, enhanced usage of International Civil Aviation Organization (ICAO) flight plan elements, improvements to trajectory modeling algorithms, capability to begin to integrate Unmanned Aerial Vehicles (UAVs) into the NAS, among others.

The base ERAM program has been successfully completed as of March 2015 as the FAA previously indicated. Continuing software development on ERAM should be viewed as indicative of executing the concept of seamlessly integrating new capabilities into the NAS onto the ERAM infrastructure as previously planned NextGen capabilities mature.

The table below includes baselines, technical refreshes, and improvements as required by regular operational system maintenance. The cost for implementing NextGen transformational programs are ascribed to the individual programs as outlined in their benefits case and not to the ERAM program.

<b>En Route Automation Modernization (ERAM)</b>			
	<b>Baseline Date</b>	<b>Description</b>	<b>Current Estimate at Completion or Actual (Millions)</b>
En Route Automation Modernization (ERAM)	Jun-03	Deployed a replacement of the En Route air traffic control system used by air traffic controllers in the 20 En Route centers.	\$2,579.5
ERAM System Enhancements and Tech Refresh (SETR)	Sep-13	Tech refresh of ERAM hardware and software	\$152.9
ERAM Tech Refresh 2 - Pending FID approval	Jan-17	Tech refresh of ERAM hardware and software	\$279.2
ERAM System Enhancements 2 (Sector, Segment 1) - Pending FID approval	Jan-17	Improve the efficiency and effectiveness of En Route sector operations.	\$253.6
<b>Total ERAM</b>			<b>\$3,265.2</b>

**5. In its January 2016 report, the OIG made three recommendations that would improve the FAA's ability to manage acquisition for NextGen programs and to implement reforms fully. For each recommendation, provide a summary of the actions the FAA has taken or intends to take to fulfill the recommendation.**

**FAA provides the following summary of actions taken and/or intends to take to fulfill the OIG recommendations.**

Recommendation 1: Identify and implement Agency-wide cost-saving initiatives and develop appropriate timelines and metrics to measure whether the initiatives are successful.

FAA Response:

The Federal Aviation Administration (FAA) already includes Agency-wide cost savings in its Organizational Success Measures and will continue to identify and implement Agency-wide cost-saving initiatives. These initiatives are tracked and reported to the FAA's Chief Financial Officer on a monthly basis.

This recommendation is resolved but remains open and is pending closure. The Office of the Inspector General (OIG) is reviewing the Fiscal Year (FY) 2016 Performance and Accountability Report (PAR) before closing.

Recommendation 2: When reporting on major acquisitions, identify the current estimated costs for each acquisition system, including all segments. Separately identify cumulative amounts for acquisition costs, technical refresh, and other enhancements in order to identify the total baselined/rebaselined costs for each system and account for the way funds are being used when reporting to managers, Congress, and other stakeholders.

FAA Response:

The FAA already provides much of the information recommended by the OIG in the Annual FAA System Acquisition Baseline Performance Report. However, per the recommendation, the Agency enhanced the report to include the recommended acquisition information as of the 2015 FAA System Acquisition Baseline Performance Report. The OIG closed the recommendation based upon the FAA's actions to address the recommendation.

Recommendation 3: Review and identify Federal and industry best practices and guidance from OMB and the Federal CIO that may be incorporated into AMS for acquiring major capital investments and IT systems, including the use of successive contracts that are separately priced and the use of modular concepts when planning and purchasing IT, and determine which are appropriate for incorporation into AMS.

FAA Response:

The FAA is reviewing Federal and industry best practices for acquiring major capital investments and Information Technology systems. This review includes the use of successive contracting and the use of modular concepts. Based on the review findings, the FAA will determine what changes, if any, to incorporate into the Acquisition Management System.

The recommendation is resolved but open remains open. FAA's corrective action is sufficient but it has not been fully implemented. The FAA intends to update the Acquisition Management System in 2017 based on the review of government and industry best practices.

**6. The OIG has identified insufficient outreach to stakeholders as a NextGen implementation obstacle. Have you implemented any policy changes aimed at improving stakeholder outreach so that NextGen's costs, benefits, and expected return on investment are more easily quantifiable and stakeholders can make more informed business decisions? If so, please describe these policy changes. In your response, please also provide specific dates by which system users can expect a return on their investments for each program listed in the FAA's budget as a NextGen program and the date by which taxpayer investments in these NextGen programs are expected to result in actual savings for taxpayers.**

The Office of the Inspector General (OIG) observation is inaccurate. NextGen implementation progress is at an all-time high. The infrastructure is nearly complete and the effectiveness of the

NAC NextGen Priorities success rate have provided some operators with highest system predictability rates ever posted. *“Industry is operating at unprecedented levels of reliability.” - Richard Anderson, Delta Airlines*

On the heels of the publication of the original concept for the NextGen program in 2007, the FAA reached out to its key operational stakeholders with the establishment of Task Force 5. Industry worked to refine NextGen to a more evolutionary, integrated endeavor, identifying all the components that must be addressed for the Federal Aviation Administration (FAA) and the operators to realize the intended Return on investment (ROI).

Upon receiving Task Force 5 recommendations, the FAA established the NextGen Advisory Committee (NAC) to continue critical collaboration with industry on this highly-integrated initiative. The FAA launched the NAC in 2010 to help steer the implementation of NextGen considering Task Force 5 recommendations. The FAA and industry have been working in close collaboration since 2010. The NAC has developed comprehensive recommendations supported by all segments of the aviation community to address NextGen issues, strategies, plans, implementations and tools to measure the effectiveness of implementations.

In 2013-14, the FAA reached out to the stakeholders and the NAC provided the FAA with their list of the top priorities. The FAA has continued to work with industry through the NAC to focus on implementing their top four priority capabilities.

FAA has met nearly all the milestones agreed to with the NAC NextGen Priorities (see response to question 1). Industry is seeing some benefits at some locations, but not at others. FAA had some early snags coordinating with Industry on schedule changes when the FAA had to reschedule San Francisco (SFO) Wake RECAT because of facility training necessary to plan for the Super Bowl. FAA learned from that, adjusted, and increased their coordination at the working group to discuss changes before they are implemented. Industry has pushed the FAA to set some higher-risk, stretch goals. Industry does not expect all of those to show as green throughout the life-cycle. *“If all milestones are green, FAA and Industry teams aimed too low.”* The implementation of the Data Communications (Data Comm) program has been managed in full collaboration with industry through the Data Communications Implementation Team (DCIT). Terminal Flight Data Manager (TFDM), under the Surface area, will implement a similar construct throughout the deployment of TFDM for meaningful engagement with Industry.

The FAA, through numerous communication venues with the stakeholders, communicates on the progress and implements changes to the NAC NextGen Priorities. In 2014 along with the *NextGen Priorities Joint Implementation Plan*, the FAA published a robust *NextGen Priorities Joint Implementation Plan Oversight Process*. The *NextGen Priorities Joint Implementation Plan Oversight Process* outlines the process for managing the FAA/industry commitments. Inside this plan, the FAA outlines the outreach and communication that is to take place as part of

the implementation and management of the NAC NextGen Priorities. Since the implementation of the plan, the FAA has made the NAC NextGen Priorities a regular agenda item at the NAC and NextGen Advisory Committee Subcommittee (NACSC); both committees are widely attended by industry stakeholders in which the FAA discusses and reports on the NAC NextGen Priorities. Additionally, the individual four focus groups meet regularly with industry stakeholders to communicate specific program information and to update/add stakeholder priorities to the goals.

For example, the Data Comm program has worked with both internal and external stakeholders throughout the lifecycle of the program, vetting plans for both the Tower and En Route phases with stakeholders in multiple forums. This has resulted in an approach which has been validated and supported every step of the way by industry. Additionally, the program remained flexible, incorporating stakeholder requests at key decision points throughout the deployment. The FAA works with industry to measure the cost versus benefits of delivering services to specific tower locations to ensure that the entire stakeholder community realizes the benefits of the tool within the NAS. Industry has already realized significant cost savings as a result of the deployment of Data Comm technologies into the National Airspace System (NAS) and these benefits will continue to grow as the program transitions into En Route airspace.

In addition to the four focus groups, the NACSC created a Joint FAA/Industry Assessment Team (JAT) to evaluate key NextGen implementations with the goal of producing a common statement of facts regarding benefits to system users. The JAT includes operational and analytical experts from the FAA and industry operators. To date the JAT has evaluated and reached consensus on the benefits of three NextGen capabilities: Wake Recategorization at Charlotte and Chicago, Required Navigation Procedures (RNP) at Denver, and the North Texas Metroplex. In 2017 the JAT will analyze additional RECAT sites, Performance Based Navigation (PBN), and Data Comm. The JAT work has already influenced future priorities for RECAT and Established on RNP (EoR). For example, as a result of the JAT analysis on EoR, the team reported to the NAC that EoR is an important enabler to further future growth of utilization of efficient PBN approaches. At Denver, EoR increased utilization of fuel-saving PBN approaches by 12 percent and increased time savings for these approaches by 33 percent. The JAT has helped improve the understanding and transparency of FAA benefit projections for NextGen programs. The JAT team and the four focus groups meet regularly to provide continuous feedback for future prioritizations.

NextGen is delivering improvements in every phase of flight to system users and the flying public. The FAA is not able to provide ROI data for every NextGen budget line item (BLI), as several of these lines fund early development activities and new airspace/procedures development not associated with specific acquisition programs. The budget lines that correspond with acquisition programs, and have entered full-scale development, will have acquisition program baselines. These “baselined” programs have approved business cases which include breakeven dates. The table below lists all FY 2017 NextGen budget items, and includes for

baselined programs the dates when the programs are expected to achieve a positive return on investment, as reported in their individual business cases.

The FAA has also created an overall NextGen business case which captures all costs and benefits for the program, including those accruing to the government, airspace operators, and the flying public (<https://www.faa.gov/nextgen/media/BusinessCaseForNextGen-2016.pdf>). Non-acquisition activities (Budget Activity 1) are included in this overall business case. The business case benefits are developed using program-level inputs in a system wide model of the NAS. The model simulates future traffic levels and delay changes based on airport and airspace capacity improvements, fuel burn, and cancellation reductions.

The FY 2016 NextGen Business Case projects a breakeven point in FY 2021 and a net present value (NPV) of \$54.5B. This NPV is calculated using NextGen cost and benefit streams from 2007 to 2030. Total benefits through 2030 are \$160.6B and costs are \$35.8B (both FY 2015). Through 2016 NextGen has already delivered \$2.7B in benefits, including \$0.9B in direct benefits to airspace users (additional benefits come from time savings to the flying public).

Acquisition program business cases do not typically include projections for when airspace operators will break even on their equipage investments. However, using data from the NextGen Business Case, benefits for system users from reduced flight time, fuel burn, and cancellations amounts to \$39.8B through 2030. This compares with equipage costs for operators of \$15.2B. The NPV for system users is estimated to be \$10.3B with a breakeven point in 2022.

Finally, in 2015 the FAA worked with McKinsey & Co. to develop business cases for seven airlines (United, Delta, American, Southwest, JetBlue, Alaska, and Republic) and two cargo carriers (Federal Express (FedEx) and United Parcel Service, Inc. (UPS)). These operator-specific business cases were derived from the latest overall NextGen Business Case, but included only the costs for each carrier to equip with Automatic Dependent Surveillance – Broadcast (ADS-B) Out and Data Comm, and the benefits to the operators associated with these two capabilities. The pay-back period for these equipage investments ranged from 2 to 6 years for the passenger carriers, and 5 to 12 years for the cargo carriers.

The following table represents planned investments and their ROIs.

### NextGen FY17 Budget Line Items

BLI	Program	Estimated ROI Breakeven Date	Final Investment Decision Date
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**Activity 1 - Engineering, Development, Test and Evaluation**

1A05	Separation Management Portfolio	NA
1A06	Improved Surface/TFDM Portfolio	NA
1A07	On Demand NAS Portfolio	NA
1A08	Improved Multiple Runway Operations Portfolio	NA
1A09	NAS Infrastructure Portfolio	NA
1A10	NextGen Support Portfolio	NA
1A11	Performance Based Navigation & Metroplex Portfolio	NA

### Activity 2 - Air Traffic Control Facilities and Equipment

#### a. En Route Programs

2A01	En Route Automation Modernization (ERAM) - System Enhancements and Tech Refresh	NA*	September 2013
2A11	System-Wide Information Management		
	System-Wide Information Management (SWIM) - Segment 1A	FY 2010	June 2007
	System-Wide Information Management (SWIM) - Segment 1B	FY 2021	July 2009
	System-Wide Information Management (SWIM) - Segment 2A	FY 2016	July 2012
	System-Wide Information Management (SWIM) - Common Support Services Weather (CSS - Wx)	FY 2020	March 2015
	System-Wide Information Management (SWIM) - Segment 2B	FY 2025	October 2015
2A12	ADS-B NAS Wide Implementation		
	ADS-B NAS Wide Implementation - Segment 1 and 2	FY 2032**	May 2012
2A14	Collaborative Air Traffic Management Technologies		
	Collaborative Air Traffic Management Technologies - WP2	FY 2015	September 2008
	Collaborative Air Traffic Management Technologies - WP3	FY 2022	January 2010
2A15	Time Based Flow Management Portfolio		
	Time Based Flow Management (TBFM) WP2	FY 2013	April 2010
	Time Based Flow Management (TBFM) WP3	FY 2026	April 2015
2A17	NextGen Weather Processors		
	NextGen Weather Processors (NWP) - Work Package 1	FY2022	September 2014
2A18	Airborne Collision Avoidance System X (ACASX)	NA***	
2A19	Data Communications in Support of NG Air Transportation System		
	Data Communications - Segment 1 Phase 1	FY 2028	May 2012
	Data Communications - Segment 1 Phase 2	FY 2025	October 2014
	Data Communications - Segment 1 Phase 2 Full En Route Services	FY 2026	August 2016

#### b. Terminal Programs

2B13	National Airspace System Voice System (NVS)	NA*	September 2014
2B18	Improved Surface/TFDM Portfolio		
	Terminal Flight Data Manager (TFDM)	FY 2047**	June 2016
2B22	Flight and Interfacility Data Interface (FIDI) Modernization	NA	2017

Activity 3 - Non-Air Traffic Control Facilities and Equipment			
a. Support Equipment			
3A09	System Safety Management Portfolio	NA	
b. Training, Equipment and Facilities			
Activity 4 - Facilities and Equipment Mission Support			
a. System Support and Services			
4A09	Aeronautical Information Management Program	NA	
	Aeronautical Information Management (AIM) Segment 2	FY 2026	August 2014
4A10	Cross Agency NextGen Management	NA	

\* These programs are replacements or technology refreshments. No quantitative business cases were produced.

\*\* These programs provide infrastructure that enable future capabilities and benefits. The incremental costs and benefits are captured in the overall NextGen Business Case.

\*\*\* This program is a non-material solution not requiring a quantitative business case.

**7. GAO has identified cybersecurity as another area of challenge for NextGen implementation. This is a serious matter given the high degree of interconnectivity inherent in NextGen technologies. In an April 2015 report, GAO stated that the FAA currently has no plans to produce a cybersecurity threat model and that without such a model, the agency may be improperly allocating resources to defend NextGen aircraft and facilities against the most serious cybersecurity threats. The FAA Extension, Safety, and Security Act of 2016 requires the FAA to research and assess the creation of an agency-wide cybersecurity threat assessment model. What are the FAA's current plans for complying with the Act's directive? Will the FAA consider whether a threat model should include threats specific to NextGen programs? What is the estimated date of completion for the FAA's threat model research?**

The Federal Aviation Administration (FAA) concurred with the Government Accountability Office's (GAO) recommendations regarding cybersecurity of NextGen programs. The three GAO recommendations have been implemented including the recommendation which called for creation of a plan to create a National Airspace System (NAS) level threat model. The FAA has been executing on this plan and intends to have the initial NAS level threat and risk modeling completed in June 2017. It is FAA opinion that the cyber threat and risk models should not be limited to the NextGen Programs alone. The NextGen programs do not exist in isolation within the NAS. Several programs change legacy infrastructure directly or the NAS integrated with NextGen capabilities exhibits new behavior. Considering this, a holistic approach to NAS



cybersecurity is necessary to understand the risk to the FAA mission. Therefore, the Agency's threat and risk modeling efforts are aimed at the entirety of the NAS.

**8. How do multilateral and bilateral commitments and agreements, including with the International Civil Aviation Organization, impact implementation timelines for NextGen programs?**

Concurrent timing in development and implementation of NextGen and international Air Traffic Modernization (ATM) programs is optimal for harmonization of operations and benefits. However, timing of international standards development and promulgation, business, operational and budget drivers make that difficult and may impact domestic timelines.

Understanding the impacts of our commitments and agreements with multilateral and bilateral partners, the FAA has placed a higher emphasis on global leadership as one of the Administrator's Strategic Initiatives. As part of this initiative, the FAA is moving and developing resources to ensure the harmonization and interoperability of international ATM modernization efforts with NextGen. This is being promulgated through strategic planning of resources and budgets as well as prioritized work at the International Civil Aviation Organization (ICAO) and with our bilateral partners. The main FAA thrust is to ensure global harmonization through NextGen alignment to the *Global Air Navigation Plan* and the *Aviation System Block Upgrade Roadmap*. To further ensure global harmonization for future development, the FAA has formal agreements with the European Commission, Japan, and Singapore to collaborate on air traffic management development and direction. Accomplishments and progress under the United States – European Commission agreement are documented in a biannual State of Harmonisation Report. The next report will be released the week of December 12, 2016, and will cover the harmonization efforts between the NextGen and Single European Sky ATM Research (SESAR) programs since mid 2014.

While the prioritization on international harmonization through the Global Leadership Initiative is positive and is providing results, there is ongoing work the FAA must do to ensure NextGen initiatives are globally harmonized where required. This necessitates additional coordination with critical global partners. Decisions at the ICAO and with bilateral partners can impact NextGen implementation, and have the potential to force rework of NextGen programs. Alternatively, the United States can deviate from global timelines and decisions in favor of our NAS requirements, but the FAA must take additional care to communicate this to Congress, industry and the public to prevent a false sense that NextGen is behind or not fulfilling stated objectives and commitments.

**9. Has the FAA conducted an analysis to identify potential risks to NextGen interoperability with other Air Navigation Service Providers? If so, does the agency anticipate NextGen implementation delays due to interoperability concerns?**

The FAA has not conducted a detailed gap analysis for interoperability with the multiple international Air Traffic Modernization (ATM) programs; however a risk assessment was added to the FAA systems engineering process to support ongoing harmonization efforts. Also, similar assessments have and continue to take place as part of bilateral agreements and work at the International Civil Aviation Organization (ICAO). Continuous assessment is a significant aspect of the cooperation with Europe under the Single European Sky ATM Research (SESAR) annex. These assessments look at timing and need for specific standards and procedures and are flexible to evolving information standards and operational changes such as advanced Performance Based Navigation (PBN) procedures and most recently, Unmanned Aircraft Systems (UAS).

Additionally, as part of the ICAO Standards Roundtable and updates to the *Global Air Navigation Plan*, the FAA has identified those minimum standards that need to be addressed globally to assure movement to a global system that is harmonized and interoperable with NextGen.

FAA also encourages that Radio Technical Commission for Aeronautics (RTCA) to develop performance standards that serve as a basis for regulations jointly with our European counterpart, the European Organisation for Civil Aviation Equipment (EUROCAE). Most of the standards critical to future phases of NextGen are being developed jointly with EUROCAE. Industry encourages FAA to support efforts to have the resulting standards adopted by ICAO and referenced in ICAO Standards and Recommended Practices (SARPS) where appropriate.

It is important for the FAA to harmonize to the greatest extent practicable. It is also important to recognize that the US NAS is unique in the extent of existing infrastructure, the capabilities of our workforce, the pace of operations, and the frequency of visual weather conditions. Our programs are structured for the NAS, while considering interoperability as a factor (for aircraft equipment and for flight crew operations).

The FAA does not believe that a detailed analysis for every global initiative is warranted given the ongoing work bilaterally and through ICAO. This work is dynamic and evolves around frequent changes in the international system due to business, budget, standards and technology updates and changes. While a gap analysis may provide an accurate snapshot of program interoperability today, those circumstances may quickly change in the near future.

**10. In 2014, the National Academies issued a report highlighting challenges the FAA may face in developing and retaining a workforce with the appropriate skills needed to manage a large, complex initiative such as NextGen. What actions have FAA officials taken to implement this report's recommendations?**

In 2015, the FAA met jointly with the National Academies of Sciences and the National Air Traffic Controllers Association (NATCA) to collaborate on controller staffing model review and

validation. These meetings also provided an opportunity to review the July 2014 National Airspace System (NAS) report findings and recommendations, and to develop a path forward. The FAA is continuing to consult with the National Academy and NATCA regarding controller staffing models, scheduling practices, and the execution of hiring plans.

Overall, the FAA believes that the current aptitudes it seeks for controller candidates -- such as deductive and visuospatial reasoning, concentration, and stress tolerance -- will continue to be applicable for the foreseeable future. This has proven true for the controllers who have adapted to the use of the Advanced Technologies and Oceanic Procedures (ATOP) system to manage the oceanic airspace, in what is the first continual use of time-based management.

The National Academies report highlighted the need to involve controllers in the development, testing, and implementation of NextGen products and procedures. More recently, the NextGen Advisory Committee emphasized that in order to move to time-based management throughout the NAS, Air Traffic Control (ATC) will need well-developed training and operational acceptance and adoption by both pilots and controllers.

The FAA knows that controllers' acceptance of automation and decision support tools significantly increases our ability to make air traffic management more efficient, and thus are focusing on building that trust during testing, training, and early implementation. In 2015-2016, we've had more than 250 controllers involved with development of more than 30 programs.

For example, the En Route Automation Modernization (ERAM) program has increased its reliance on controller expertise and involvement as it works on future releases. The FAA and NATCA have used cadres of controller subject matter experts (SMEs) in the early development of air traffic control functionality behavior on the glass, in order to maximize the likelihood that the products will meet the operational needs identified. This is in addition to the testing SMEs used in the development and operational evaluation testing at FAA's William J. Hughes Technical Center labs and at key sites.

The FAA also worked to improve how we introduce new programs, capabilities, and procedures into specific facilities. For example, the ERAM and Terminal Automation Modernization and Replacement (TAMR) programs deliver advanced test and training capabilities at each facility, which allow us to build scenarios that represent the local operations and train to those with new NextGen technologies integrated into the automation. This high-fidelity training, on operational equivalent systems, improves the speed of adoption.

Likewise, our Metroplex projects use checklists tailored to each location that detail the actions required to successfully implement the Performance Based Navigation (PBN) procedures. The FAA develops site-specific controller training to ensure familiarity with the pending new procedures, and when they go operational, controller "Go-Teams" are placed on-site as a ready resource to troubleshoot the implementation and to promote cultural acceptance.

Our Program Management Office was established to, among other things, oversee a coordinated approach to planning and deploying systems into the NAS. The FAA accounts for SME requirements as part of its investment planning and analysis. These impacts are incorporated in various business cases and to date have not resulted in major impacts to our current or projected controller staffing levels.

By developing programs with workforce input throughout the process, and by designing training and implementation activities in a manner that actively reduces barriers to acceptance, we are increasing our chances of success, which is evidenced by its use in programs such as Data Communications (Data Comm), which has implemented its tower services component two years ahead of schedule.

Looking ahead, the FAA is engaging with outside experts as it explores future training enhancements. The Agency's new Center of Excellence (CoE) for Technical Training and Human Performance established 5-year (with a 10-year option) cooperative agreements with sixteen universities on September 28, 2016. These agreements focus on researching and developing improvements to the technical training of air traffic controllers, aviation safety inspectors, engineers, technicians and pilots. The CoE's goal is to enhance and advance the teaching of these specialists through part-task training, immersive simulation and adaptive learning technologies that are standard in other technical workforces. The CoE will analyze human performance factors, including academic best practices and changes in learner expectations, as well as innovative training methods for a new generation of learners and NextGen technologies.

Additionally, the FAA has tasked the Aviation Rulemaking Advisory Committee (ARAC) to provide recommendations on how the agency can use external training providers for its new-hire air traffic controller training program. The Air Traffic Controller Basic Qualification Training Working Group (ATCWG) will provide the ARAC with analysis and recommendations on options for external training provider solutions that restructure the FAA Air Traffic Controller candidate pipeline in FY 2017 and FY 2018.

**11. In an August 2016 report, the OIG highlighted that the FAA has not yet established a structure to coordinate research and development (R&D) transfer with all NextGen partner agencies, potentially resulting in missed opportunities to build upon past R&D efforts at other agencies or the potential for duplication of efforts across agencies. What steps is the FAA currently taking to increase interagency coordination to better leverage the R&D being conducted at NextGen partner agencies?**

The FAA has significant coordination with its interagency partners and collaboration is strong. The FAA is fulfilling much of what has been described in the question through other means while formalizing additional processes and products for long-term research and development

(R&D). Our work with the *National Aviation Research Plan (NARP)*, *The Future of the NAS*, *NAS Enterprise Architecture (NAS EA)*, et al., will continue to inform and provide a solid foundation for the future. Additionally, the FAA has made great strides in expanding NextGen interagency collaboration and facilitation efforts, through facilitating interactions and collaboration in such key areas as aviation cybersecurity and NextGen weather.

The FAA is meeting the intent of the question by conducting several regular and recurring activities/engagements that occur between the FAA and the NextGen partner agencies to support the evaluation of interagency planned and ongoing research efforts. The FAA believes that the level of interaction and current engagement with the NextGen partner agencies meets the evolving needs and implementation plan for NextGen.

The National Aeronautics and Space Administration (NASA) is vested with the mission for conducting long-term Air Traffic Management (ATM) research, and thus interactions with the FAA are key to ensuring effective NextGen R&D coordination. The FAA is fully engaged in NASA's annual review of its aeronautics research as well as its review of individual research projects, such as Airspace Technology Demonstrations (ATD)-1, 2, and 3. These recurring reviews ultimately lead to full engagement through the Research Transition Team (RTT) process. RTTs help ensure that R&D needed for NextGen implementation is identified, conducted, and effectively transitioned to the implementing agency, and they provide a structured forum for researchers and implementers to work together on a continual basis. RTTs help ensure that planned research results can be fully utilized and will be sufficient to enable implementation of NextGen Operational Improvements.

The RTT process was established in 2008, and has been referenced as a best practice in multiple Government Accountability Office (GAO) and Inspector General (IG) reports. Several highly-visible technologies have been transitioned using this process. For example, the Efficient Flow into Congested Airspace (EFICA) RTT involved joint collaboration with industry partners for near-term efficient and reduced environmental impact of arrival operations under constrained airspace conditions. As part of this RTT, NASA transitioned the Efficient Descent Advisor/3D-Path Arrival Management (EDA/3D-PAM) technology to the FAA in November 2011. It has the potential to reduce local noise and emissions, reduce flight time and save \$300 million per year in jet fuel. In addition, the EFICA RTT transitioned the Terminal Sequencing and Spacing tool to FAA in July 2014. This tool is currently scheduled to be deployed in the NAS as part of Time Based Flow Management program Work Package 3 and will expand time based metering into the terminal environment. Other transitions include the Precision Departure Release capability (transitioned in August 2013) and the Multi-Sector Planning capability (transitioned in July 2011). There are six active RTTs, and additional RTTs are being considered for the future. As identified in the August 2016 OIG Report, the FAA is updating the RTT Charter to update the guidance and improve its usefulness for other agencies. Additionally, the RTT process has been expanded to include other partner agencies beyond the FAA and NASA as appropriate, with regular reporting to the Interagency Planning Office for NextGen's (IPO) Executive Board.

To ensure the overall coordination between the FAA and NASA, NASA's Aeronautics Research Mission Directorate (ARMD) and the FAA's NextGen Organization conduct quarterly meetings to discuss R&D efforts, RTTs, ATD-1/2/3 progress, discussion on NASA and FAA key strategic documents, as well as other related topics. These quarterly engagements serve as an executive-level review of the strong collaboration between both agencies.

FAA's NextGen Office has expanded the National Airspace System Enterprise Architecture (NAS EA) to identify key partner agency R&D and activities. In addition, the FAA added a New Entrants Roadmap to the NAS EA, which includes Unmanned Aircraft Systems (UAS) and Commercial Space. The intent of the New Entrants roadmap is to provide a single, consolidated timeline of all activities and investments, both active and planned, required to integrate UAS and Commercial Space into the NAS. At the NextGen portfolio level, FAA program managers regularly engage with partner agency counterparts to collaborate on R&D, program needs, and/or equities as appropriate.

Elements of the *NextGen Segment Implementation Plan (NSIP)* annually undergo an assessment of implementation readiness based on feasibility, affordability, dependencies, potential benefits and technical maturity. Ongoing research directly influences these factors. Operational increments may be rescheduled in time or deleted based on these factors and all changes are documented. With respect to technological opportunities that lead changes in standards and guidance, the research is individually documented as part of the individual research projects.

The Interagency Core Cyber Team (ICCT) is tri-chaired by the FAA, Department of Defense (DoD), and Department of Homeland Security (DHS). The ICCT coordinates with the FAA Cyber Steering Committee, and promotes and enables consistent multiagency coordination on aviation cybersecurity topics. The ICCT has identified ongoing or completed R&D projects by DoD and DHS that have the potential to address Aviation Cybersecurity needs and gaps. In 2016, the ICCT began working with the principal investigators of these R&D projects for future cooperation; dialogue began with a DoD research facility (Air Force Research Laboratory) for additional opportunities for R&D collaboration. Some examples include: Mission Assurance Technologies for Net-Enabled Architectures (MATNA)-Sensors Directorate; New Intrusion-Resistant Virtualized Adaptive Network Architecture (NIRVANA); and Security Optimization and Fault-Tolerance in Cloud Architecture (SOFTCloud). Additionally, the ICCT is coordinating with NASA on an initiated effort to conduct research on a secure net-centric aviation communications (SNAC) infrastructure.

Beginning in 2015, the FAA participated in CYBER GUARD, a massive exercise led by United States Cyber Command (CYBERCOM) focused on "whole of nation" solutions to protect, prevent, mitigate and recover from cyber-attacks against U.S. critical infrastructure. Additionally, the FAA leads the Cybersecurity Incident Response Processes (IRP) Exercise with involvement of DoD, DHS, and others to examine the FAA's Security Operation Center (SOC) incident response processes, the internal escalation procedures and triggers for escalation.

The FAA's Aviation Weather Division assures the development and integration of productive weather information into Air Traffic management (ATM) decisions by pilots, controllers, flight operations, and airport operators. To this end, the FAA coordinates and works with FAA operations, safety and standards organizations, the National Weather Service (NWS)—a component of the National Oceanic and Atmospheric Administration (NOAA)—and the commercial sector to improve and integrate weather information into operational aviation decision making. The FAA, as the responsible agency for aviation research, engages with NWS and its other stakeholders through its Aviation Weather Research Program (AWRP) process to review its planned and proposed research, especially those efforts which will transition to NWS, and provides concept development and engineering for Weather ATM integration. The IPO will continue to support the NextGen Executive Board, to better document ongoing engagements that may influence long-term R&D decisions of NASA/FAA and FAA/NWS.

The FAA facilitates the NextGen Executive Weather Panel (NEWP), which is comprised of weather executives from the FAA, DoD, Department of Commerce (DOC), and NASA. The NEWP collaborates on NextGen weather-related R&D, policy, and implementation activities. The NEWP also serves as a forum to discuss and monitor the Ceiling and Visibility research-to-operations/operations-to-research (R2O/O2R) process, which uses a similar structure to RTTs in order to effectively guide research transfer. The NEWP will be instrumental in evaluating potential future NextGen weather-related R2O/O2R candidates.

The FAA will continue to leverage partner agencies R&D efforts to assist in successful execution of NextGen.

**12. The OIG has observed that, according to the FAA's data, only 651 out of 7,000 commercial aircraft have been equipped with rule-compliant avionics as of August 2016. Furthermore, industry has raised concerns regarding both the availability of ADS-B avionics and repair station time slots to install the avionics in time to meet the 2020 mandate. Please provide an update on the steps the FAA is taking to ensure that the 2020 ADS-B equipage mandate is met.**

The FAA has actively collaborated with industry, operators, airlines, pilots, and government through the NextGen Advisory Committee (NAC), Equip 2020 Working Group, and other forums to identify and address barriers delaying operators from equipping with Automatic Dependent Surveillance Broadcast (ADS-B) Out avionics by the 2020 deadline.

The projected fleet in 2020 for Part 121 operators is currently 6000-7000 aircraft, of which 787 are currently equipped. Through the NAC efforts the Equip 2020 collaborative initiative has received equipage plans from airlines that account for 88 percent of the projected fleet meeting the 2020 mandate. FAA continues to work with airlines to address the remaining aircraft, which

include new deliveries, additional retrofits, and aircraft that may be shifted outside the US market.

The FAA and aviation industry, through the Equip 2020 Working Group, have worked together since the October 2014 ADS-B Call to Action to ensure ADS-B equipage solutions are available for all aircraft types, both commercial and general aviation. The FAA's ADS-B equipage solution database contains 5,549 approved solutions mapping to 2,031 unique make model combinations and is available to search on the FAA's Equip ADS-B website:

[https://www.faa.gov/nextgen/equipadsb/adsb\\_ready/](https://www.faa.gov/nextgen/equipadsb/adsb_ready/). For the remaining aircraft, the FAA has also allowed the installation data of an ADS-B Out system in the database to be re-used without requiring any specific approval.

Other key accomplishments of the Equip 2020 Working Group to date include:

- Recommendations for operational accommodation for air carrier operators who were early adopters for initial generations of Global Navigation Satellite System (GNSS) receivers. Airlines for America petitioned for an exemption based on those recommendations, and the FAA has approved that exemption for all similarly-situated operators. These operators must have ADS-B Out systems installed prior to the mandate, and will be accommodated during brief GPS satellite outages if their performance falls below the required level. This accommodation ends on January 1, 2025.
- Updated and streamlined installation and operational use guidance.
- Single ADS-B information source FAA Website ([www.faa.gov/nextgen/equipadsb](http://www.faa.gov/nextgen/equipadsb)).

Through Equip 2020, the FAA is beginning to monitor the wait time for repair stations. Commercial operators often have dedicated maintenance facilities and contracts to assure company objectives, but there is a risk that the general aviation community will wait too long to equip and be unable to schedule the alteration before the deadline. The FAA has launched the General Aviation ADS-B Incentive program, to encourage this community to equip early, to gain insight on the repair station capacity, and to educate the community about the rule and the risks of waiting too long to equip.

FAA will continue to work with industry to address any barriers to complying with the 2020 rule through the NAC, Equip 2020, and other arenas, to ensure the aviation community meets the 2020 mandate.



**Appendix A**

Facilities and Equipment		FY 2017				Benefit Categories	Did this exist Prior to 2007?	Did this exist in 2007?	FY 2017 House Mark	FY 2017 Senate Mark	FY 2017 Cong Submit	Source NAS CIP FY 2017-2021
FY 2017 BLI	BLI Name											
<b>Activity 1 - Engineering, Development, Test and Evaluation</b>												
1A05	Separation Management Portfolio	25,800,000	25,800,000	27,800,000	No	1. Capacity 2. Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures. 2. Safely and efficiently integrate new types of operations, such as commercial space and unmanned aircraft, into the NAS and enable the benefits these operations will provide	
1A06	Improved Surface/TFDM Portfolio	0.000	0.000	0.000								
1A07	On Demand NAS Portfolio	8,500,000	8,500,000	11,500,000	No	1. Capacity 2. Safety	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures. 2. Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period	
1A08	Improved Multiple Runway Operations Portfolio	6,500,000	6,500,000	6,500,000	No	1. Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.	
1A09	NAS Infrastructure Portfolio	17,660,000	17,660,000	17,660,000	No	1. Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures.	
1A10	NextGen Support Portfolio	12,000,000	12,000,000	12,000,000	No	1. Cost Saving/Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures. 1. Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016.	
1A11	Performance Based Navigation & Metrolplex Portfolio	17,500,000	17,500,000	17,500,000	No	1. Capacity 2. Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures. 2. Optimize airspace and Performance Based Navigation (PBN) procedures to improve efficiency an average of 10 percent across Core airports by 2018.	
<b>TOTAL ACTIVITY 1</b>		87,960,000	87,960,000	92,960,000								
<b>Activity 2 - Air Traffic Control Facilities and Equipment</b>												
<b>a. En Route Programs</b>												
2A01	En Route Automation Modernization (ERAM) - System Enhancements and Tech Refresh	78,000,000	78,000,000	78,000,000	Yes	1. Capacity	Yes				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures	
2A11	System-Wide Information Management	28,800,000	28,800,000	28,800,000	Yes	1. Capacity 2. Cost Saving/Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures. 2. Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016	
2A12	ADS - B NAS Wide Implementation	154,800,000	181,400,000	154,800,000	Yes	1. Capacity 2. Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures 2. Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.	
2A14	Collaborative Air Traffic Management Technologies	13,820,000	13,820,000	13,820,000	Yes	1. Capacity	Yes				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures	
2A15	Time Based Flow Management Portfolio	50,600,000	50,600,000	50,600,000	Yes	1. Capacity	Yes				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures	
2A17	NextGen Weather Processors	27,800,000	27,800,000	27,800,000	No	1. Capacity	No				1. Achieve a NAS on-time arrival rate of 88 percent at Core airports and maintain through FY 2018.	
2A18	Airborne Collision Avoidance System X (ACASX)	8,900,000	8,900,000	8,900,000	No	1. Safety	No				1. Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.	
2A19	Data Communications in Support of NG Air Transportation System	232,000,000	232,000,000	232,000,000	No	1. Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures	
Subtotal En Route Programs		594,720,000	621,320,000	594,720,000								
<b>b. Terminal Programs</b>												
2B13	National Airspace System Voice System (NWS)	48,400,000	48,400,000	48,400,000	Yes	1. Capacity	No				1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures	

Appendix A

Facilities and Equipment		FY 2017 Cong Submit	FY 2017 Senate Mark	FY 2017 House Mark	Did this exist in 2007?	Did this exist Prior to 2007?	Benefit Categories	
FY 2017 BLI	BLI Name							
2B18	Improved Surface/TFDM Portfolio	44,200,000	44,200,000	44,200,000	No	No	1. Capacity 2. Cost Saving/Capacity	Source NAS CIP FY2017-2021 1. Maintain an average daily capacity for Core airports of 57,975, or higher, arrivals and departures. 2. Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016
2B22	Flight and Interfacility Data Interface (FIDI) Modernization	15,000,000	15,000,000	15,000,000	No	No	1. Capacity	1. Sustain adjusted operational availability at 99.7 percent for the reportable facilities that support the Core airports.
	Subtotal Terminal Programs	107,600,000	107,600,000	107,600,000				
	<b>c. Flight Service Programs</b>							
	<b>d. Landing and Navigational Aids Program</b>							
	<b>e. Other ATC Facilities Programs</b>							
	<b>TOTAL ACTIVITY 2</b>	702,320,000	728,920,000	702,320,000				
3A09	System Safety Management Portfolio	17,000,000	17,000,000	17,000,000	No	No	1. Safety	1. Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.
	Subtotal Support Equipment	17,000,000	17,000,000	17,000,000				
	<b>b. Training, Equipment and Facilities</b>							
	Subtotal Training, Equipment and Facilities	0,000	0,000	0,000				
	<b>TOTAL ACTIVITY 3</b>	17,000,000	17,000,000	17,000,000				
	<b>Activity 4 - Facilities and Equipment Mission Support</b>							
	<b>a. System Support and Services</b>							
4A09	Aeronautical Information Management Program	10,400,000	10,400,000	10,400,000	No	No	1. Safety	1. Reduce the commercial air carrier fatalities per 100 million persons on board by 24 percent over 9 year period (2010-2018). No more than 6.2 in 2018.
4A10	Cross Agency NextGen Management	2,000,000	2,000,000	2,000,000	No	No	1. Cost Saving/Capacity	1. Achieve documented cost savings and cost avoidance of \$50.27 million in FY 2016.
	<b>TOTAL ACTIVITY 4</b>	12,400,000	12,400,000	12,400,000				
	<b>Activity 5 - Personnel and Related Expenses</b>							
	<b>Activity 6 - Sustain ADS-B services and Wide Area Augmentation Services (WAAS) GEOs</b>							
6A01	ADS-B services and WAAS GEOs	0,000	0,000	0,000				
	<b>SUB-TOTAL ALL ACTIVITIES</b>	819,680,000	846,280,000	824,680,000				
	NG Pre-Imp	91,780,000	91,780,000	96,780,000				