Advanced Integrated Passenger and Baggage Screening Technologies

October 31, 2016
Fiscal Year 2016 Report to Congress

Homeland Security

Message from the Secretary

October 31, 2016

I am pleased to present the following report, "Advanced Integrated Passenger and Baggage Screening Technologies," prepared by the Transportation Security Administration (TSA).

This report was compiled pursuant to the *Fiscal Year* (FY) *2016 Department of Homeland Security* (DHS) *Appropriations Act* (P.L. 114-113) and the accompanying Senate Report 114-68. The report details the Department's efforts and resources devoted to developing more advanced integrated passenger screening technologies for the most effective security of passengers and baggage at the lowest possible operating and acquisition costs; how TSA is deploying its existing screener workforce in the most cost-effective manner; the labor savings from the deployment of improved technologies for passenger and baggage screening; and how those savings are being used to offset security costs or are being reinvested to address security vulnerabilities.

The report also includes projected funding levels for the next 5 fiscal years, or until project completion, for each technology discussed, and summarizes the FY 2016 adjustments made to begin a more fundamental transformation of aviation security. This transformation includes revising the staffing model, suitably rightsizing and resourcing operations to address passenger growth, and making necessary equipment investments to close vulnerabilities and improve system effectiveness.

Pursuant to congressional requirements, this report is being provided to the following Members of Congress:

The Honorable John R. Carter
Chairman, House Appropriations Subcommittee on Homeland Security

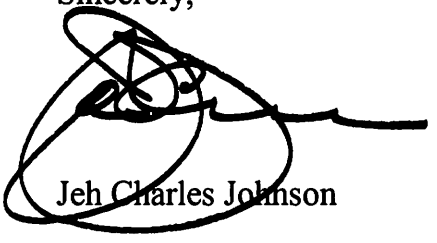
The Honorable Lucille Roybal-Allard
Ranking Member, House Appropriations Subcommittee on Homeland Security

The Honorable John Hoeven
Chairman, Senate Appropriations Subcommittee on Homeland Security

The Honorable Jeanne Shaheen
Ranking Member, Senate Appropriations Subcommittee on Homeland Security

If you have any questions, please do not hesitate to contact me at (202) 282-8203 or the Department's Deputy Under Secretary for Management and Chief Financial Officer, Chip Fulghum, at (202) 447-5751.

Sincerely,



Jeh Charles Johnson

Executive Summary

The *FY 2016 DHS Appropriations Act* (P.L. 114-113) and the accompanying Senate Report 114-68 require TSA to submit a detailed report to address the following:

- DHS's efforts and resources that are being devoted to developing more advanced integrated passenger screening technologies for the most effective security of passengers and baggage at the lowest possible operating and acquisition costs;
- How TSA is deploying its existing passenger and baggage screener workforce in the most cost-effective manner; and
- Labor savings from the deployment of improved technologies for passenger and baggage screening, and how those savings are being used to offset security costs or are being reinvested to address security vulnerabilities.

The report also includes projected funding levels for the next 5 fiscal years, or until project completion, for each technology discussed.

TSA has advanced aviation security through innovative technology investments and continuous evaluation of workforce effectiveness and efficiencies. By developing new technologies and improving its processes, TSA is able to screen passengers and their baggage effectively and efficiently. However, TSA must continue to address issues such as increased passenger volume, and ensure efficient screening of travelers while maintaining its focus on effective security. TSA will work closely with Congress to appropriately rightsize and resource the organization to address passenger growth, improve checkpoint performance, and mitigate vulnerabilities across the aviation system.

TSA's three reprogramming requests in the third and fourth quarter of FY 2016 were designed to match resources to mission demands. These requests enabled TSA to triple the amount of overtime available to officers of high-volume airports; hire an additional 1,368 officers to deploy to high-volume airport security checkpoints; convert 2,784 part-time employees to full-time; accelerate the procurement of 50 new canine teams to Passenger Screening Canines; support the procurement and deployment of 146 Advanced Imaging Technology systems to Category III and IV airports; and accelerate the replacement of 1,186 Explosives Trace Detection systems to checkpoints nationwide. In addition, these reprogramming efforts have allowed TSA to improve security effectiveness and reduce vulnerabilities in checkpoint operations. While these actions have improved TSA's ability to deploy its resources in the most efficient and effective manner possible to screen the record numbers of passengers transiting through the Nation's airports, they also indicate a need for TSA to continue building its mission capability to meet increased passenger demand.

TSA will continue to field mission capabilities that enhance the safety and the security of the aviation system. TSA is enhancing existing checkpoint and checked baggage screening technologies, such as Advanced Imaging Technology, Advanced Technology X-Ray, Enhanced Metal Detectors, Explosives Detection Systems, and Explosives Trace Detection to increase detection capabilities and efficiencies. In addition to enhancing existing technologies, TSA also is investing in new technologies, such as the Credential Authentication Technology, to better protect transportation from current and emerging threats. Once deployed, the Credential Authentication Technology will enhance the passenger screening process at the checkpoint by serving as a technical solution that improves the inspection of identification documentation and confirms passengers' Secure Flight status.

While enhancing existing technologies and acquiring new technologies, TSA also is committed to identifying appropriate efficiencies, especially in regard to personnel and equipment integration. TSA currently uses an Enhanced Staffing Model process to allocate its security workforce at approximately 440 airports across the country. However, TSA is assessing potential adjustments to the existing model to match resources to the demands of the evolving screening environment. Considerations include rightsizing the supervisor-to-subordinate ratio; allowing for realistic, hands-on training at the place of duty versus employing a computer-based delivery model; staffing small airports for which federal screening resources now are committed; ensuring a more comprehensive delivery of TSA Pre✓® screening lanes; and fully funding annual and sick leave liability. TSA is committed to incorporating operational efficiencies with its personnel resources and to utilizing new and existing technologies to more effectively employ risk-based security initiatives.

The threat to U.S. commercial aviation is evolving constantly. By employing smarter security practices in developing and deploying its people, processes, and technologies, TSA can deliver more effective security in a more efficient manner.

Advanced Integrated Passenger and Baggage Screening Technologies

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I. Legislative Language

This report is submitted pursuant to the *Fiscal Year* (FY) *2016 Department of Homeland Security* (DHS) *Appropriations Act* (P.L. 114-113), and the accompanying Senate Report 114-68.

PL 114-113 states:

> Provided further, That not later than 90 days after the date of enactment of this Act, the Secretary of Homeland Security shall submit to the Committees on Appropriations of the Senate and the House of Representatives a detailed report on--
>
> (1) the Department of Homeland Security efforts and resources being devoted to develop more advanced integrated passenger screening technologies for the most effective security of passengers and baggage at the lowest possible operating and acquisition costs, including projected funding levels for each fiscal year for the next 5 years or until project completion, whichever is earlier;
>
> (2) how the Transportation Security Administration is deploying its existing passenger and baggage screener workforce in the most cost-effective manner; and
>
> (3) labor savings from the deployment of improved technologies for passenger and baggage screening, including high-speed baggage screening, and how those savings are being used to offset security costs or reinvested to address security vulnerabilities:

Senate Report 114-68 states:

> ADVANCED INTEGRATED SCREENING TECHNOLOGIES
>
> Pursuant to a statutory requirement in the bill, TSA is to continue providing a report on advanced integrated passenger screening technologies for the most effective security of passengers and baggage no later than 90 days after the date of enactment of this act. The report provides a useful description of existing and emerging equipment capable of detecting threats concealed on passengers and in baggage, as well as projected funding levels for the next 5 fiscal years for each technology discussed in the report.

II. Introduction

Since its creation following the terrorist attacks of September 11, 2001, TSA has made great strides in advancing aviation security through innovative technology investments and continuous evaluation of workforce efficiencies.

TSA's mission is to protect the Nation's transportation systems by staying ahead of evolving terrorist threats while protecting privacy and civil liberties, and facilitating the flow of legitimate travel and commerce. To achieve its mission, TSA employs risk-based, intelligence-driven operations to reduce the vulnerability of the Nation's transportation system to terrorism. TSA's security measures involve a range of capabilities designed to substantially mitigate risk. Moreover, to remain ahead of those who seek to do us harm, TSA continues to evolve its security approach by constantly evaluating the procedures and technologies that TSA uses, training the workforce, and assessing specific security procedures.

TSA occupies the front lines of the Nation's transportation security responsibilities. These responsibilities include security screening of passengers and baggage at approximately 440 airports in the United States that facilitate air travel for more than 2 million people per day and vetting more than 14 million passengers each week. TSA also conducts security regulation compliance inspections and enforcement activities at airports for domestic and foreign air carriers, for air cargo screening operations throughout the United States, and at last-point-of-departure locations internationally.

TSA also is committed to improving security in the most cost-effective manner possible. Through advancements in technology and workforce efficiency, TSA accommodated an increased workload that has accompanied an increased percentage of carry-on bags per passenger at checkpoints due to the current practice of many airlines charging fees for checked baggage; the restrictions on liquids, aerosols, and gels that were implemented to counter a known terrorist threat; and the screening required for the increase in the number of laptops carried by passengers. By employing smarter security practices in developing and deploying its people, processes, and technologies, TSA continues to advance its vision of a high-performing, highly capable counterterrorism organization that is guided by a risk-based approach to prevent attacks and safeguard legitimate trade and travel.

III. Advancing Integrated Passenger and Baggage Screening Technologies

Threats to aviation security persist and continue to evolve. As a result, passenger and checked baggage security screening must continue to adapt to meet evolving threats and changes within the aviation industry. TSA identifies, tests, procures, deploys, upgrades, and maintains equipment that is capable of detecting threats concealed on passengers and in their baggage. The Passenger Screening Program and the Electronic Baggage Screening Program are responsible for acquiring new and/or upgraded technologies to improve aviation security. These programs work with technology users and other stakeholders to ensure that the technologies that are acquired and fielded meet all necessary workforce and security requirements. Technology users include operators such as transportation security officers, while stakeholders include local, national, and international partners, both within and outside of government. Both the Passenger Screening Program and the Electronic Baggage Screening Program test security equipment at the TSA Systems Integration Facility located at the Ronald Reagan Washington National Airport in Virginia, the DHS Transportation Security Laboratory located at the Atlantic City International Airport in New Jersey, and in other testing activities at airports across the United States.

Risk-based security is a key component of TSA's transformation into a high-performing counterterrorism organization in support of the larger DHS mission to prevent terrorism and enhance security. By applying risk mitigation principles to enhance security effectiveness through initiatives such as TSA Pre✓®, TSA is enhancing security and improving the traveler experience by expediting physical screening for passengers who are deemed lower risk to aviation security.

TSA has significantly expanded its expedited screening operations at all of the approximately 440 federalized airports. Currently, TSA Pre✓® screening is available at more than 180 airports with 16 participating airlines, providing trusted travelers with expedited security screening for a better travel experience.[1] The TSA Pre✓® application program has enrolled more than 2.9 million passengers, and this number is rapidly increasing. The program now has more than 370 enrollment centers nationwide, 43 of which are located within airports; however, this in-airport enrollment center volume continues to expand.

TSA's risk-based security initiatives are driving changes to TSA processes and technology requirements. For example, TSA Pre✓® lanes provide eligible passengers

[1] Participating air carriers include: Aeromexico, Air Canada, Alaska Airlines, Allegiant, American Airlines, Cape Air, Delta Airlines, Etihad Airways, Hawaiian Airlines, JetBlue Airways, Seaborne Airlines, Southwest Airlines, Sun Country Airlines, United Airlines, Virgin America, and WestJet.

with an expedited screening experience, which enables them to keep their shoes on, leave laptops in their bags, leave on light jackets/outerwear, and other measures. TSA will focus on deploying security capability platforms that allow for future enhancements and upgrades to add detection capabilities and improve performance in support of risk-based security initiatives, and as the technology matures and the threat landscape changes.

This section of the report addresses passenger screening technologies, baggage screening technologies, and the programs and initiatives that TSA is undertaking to integrate these technologies within the TSA network and other government agency networks.

A. Checkpoint Technologies

TSA is undertaking efforts to focus its resources and improve the effectiveness of screening while sustaining the passenger experience at security checkpoints by applying new intelligence-driven, risk-based screening procedures and enhanced technology.

To address the security challenges at passenger screening checkpoints, TSA employs a flexible and robust multi-capability approach to detecting an evolving range of threats. TSA is investing in initiatives such as technology automation, including the installation of automated screening lanes, and equipment integration that will allow the use of risk-based algorithms to screen passengers more effectively and efficiently, improve the overall passenger experience, and promote cost savings. The full operational capability numbers will be reassessed periodically to reflect changes associated with risk-based security, automation, and integration initiatives.

TSA strives to automate technologies and detection processes to improve effectiveness while reducing scanning and image processing times and human error, and while rightsizing the number of personnel needed at the checkpoint. Threat detection algorithm software is designed to detect threats or other anomalies concealed on passengers and in their carry-on baggage as they pass through the security checkpoint automatically. The implementation of threat detection algorithms on existing and new transportation security equipment systems is expected to improve TSA's ability to detect and increase throughput at the checkpoint, decrease the probability of false alarms, bring consistency into the screening process, and reduce physical inspections.

To fulfill its security responsibilities for deploying and operating state-of-the-art security technology at approximately 440 airports across the Nation, TSA must be able to deploy technology rapidly to respond to changing threat information, or to have equipment ready to deploy when airport facilities are modified. In addition, TSA must have the flexibility to stand up operations in locations affected by natural disasters and other crises. These factors, and others, require that the agency have a steady inventory of technology available to deploy to continue to strengthen aviation security.

In addition, TSA uses a competitive procurement process for its checkpoint technologies, working with technology vendors to build systems that meet the agency's requirements. TSA makes a best-value decision to acquire technology at the best possible price, which either meets or exceeds agency requirements. Full-rate production delivery orders can be awarded to one or multiple vendors depending on the program acquisition strategies implemented.

The planned checkpoint transportation security equipment procurement tables in this document are based on the Passenger Screening Program's May 2014 Life Cycle Cost Estimate. Therefore, this information is subject to change. TSA will publish updated information upon DHS approval of the new Passenger Screening Program Life Cycle Cost Estimate, which is expected in the fourth quarter of FY 2016. Actual procurement quantities will be based on available funding and changing realities of the security environment.

B. Existing Checkpoint Technologies and Upgrades

TSA identifies, tests, procures, deploys, upgrades, and maintains equipment to screen passengers and their carry-on baggage at airports nationwide. Current deployed technologies include:

- Advanced Imaging Technology;
- Advanced Technology X-Ray;
- Boarding Pass Scanners;
- Bottled Liquids Scanners;
- Enhanced Metal Detectors; and
- Explosives Trace Detectors.

The following sections outline TSA's current and planned initiatives for these existing technologies. TSA is currently reevaluating equipment requirements based on latest operational needs and threats. Therefore, the following initiatives are subject to change.

1. Advanced Imaging Technology

Advanced Imaging Technology is designed to increase security by safely screening passengers for metallic and nonmetallic threats, including weapons, explosives, and other objects concealed under layers of clothing. This technology will be used in TSA Pre✓® lanes as part of the risk-based security initiative.

To date, TSA has procured more than 800 Advanced Imaging Technology systems, and is planning to procure an additional 146 units with FY 2016 reprogramming funds. The Advanced Imaging Technology fleet includes both the Advanced Imaging Technology-1

and second generation Advanced Imaging Technology-2 systems. The Advanced Imaging Technology-2 units have a smaller physical footprint at the checkpoint, and these Advanced Imaging Technology-2 systems also were standardized with Tier II capability. However, in FY 2014, TSA successfully tested the Tier II upgrade for the Advanced Imaging Technology-1 systems.

TSA began deploying the Tier II capability to Advanced Imaging Technology-1 systems in airports in November 2014. The Tier II deployment to all fielded units was completed by the end of March 2015, which brought the Advanced Imaging Technology-1 equipment to functional equivalency with the Advanced Imaging Technology-2 equipment.

Advanced Imaging Technology is an example of a checkpoint technology that is undergoing automation development efforts through the use of threat detection algorithm software. TSA currently is working with industry to develop enhanced detection capabilities. For example, in FY 2016, TSA began test and evaluation efforts with industry for a Tier III detection capability algorithm, which is expected to improve image quality, increase TSA's ability to achieve increased threat detection capabilities, and reduce false-alarm rates. Additionally, TSA is developing a targeted threat algorithm that is expected to increase detection performance in Advanced Imaging Technology systems against the most current threat. The FY 2017 President's Budget supports the upgrade of Advanced Imaging Technology systems with the enhanced Tier III algorithm. TSA also may explore new algorithm techniques and additional technological advances to improve image processing and to address a variety of threats.

Table 1: Advanced Imaging Technology Planned Purchases

($ in thousands)

Advanced Imaging Technology	Planned Purchases with:							Total
	All Available Carryover Funds	FY 2016 Funds	FY 2017 Funds[1]	FY 2018 Funds	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	
Units	7	146	0	0	43	202	300	698
Acquisition Costs	$920	$15,184	0	0	$6,863	$30,824	$46,377	$100,168
System Integration	$385	$4,380	0	0	$2,366	$11,114	$16,508	$34,753
Acceptance Testing	0	$219	$63	$65	$148	$457	$648	$1,600
Maintenance	0	$13,912	$16,964	$17,025	$17,539	$3,427	$4,467	$73,334
Total	**$1,305**	**$33,695**	**$17,027**	**$17,090**	**$26,916**	**$45,822**	**$68,000**	**$209,855**

1. The data in this table is based on the Passenger Screening Program Life Cycle Cost Estimate approved in May 2014. This information will change as a result of an updated Life Cycle Cost Estimate pending approval.

Despite the previous procurement of more than 800 Advanced Imaging Technology systems, many small airports lack advanced imaging capability, while some large airports

have screening lanes without advanced imaging technologies deployed in them. There are currently CAT III and CAT IV airports configured to accommodate advanced imaging technologies that do not have the necessary systems in place. Although not identified as part of TSA's 2014 investment strategy, the increased threat and specific direction from foreign terrorist organizations to use small airports as entry points to the aviation system highlight the need to make immediate investments in this important security capability.

To address these vulnerabilities, TSA notified Congress of its intent to reprogram funds. These funds will provide for procurement, delivery, and installation of additional second generation Advanced Imaging Technology machines to the remainder of the Nation's federalized airports able to accommodate advanced imaging technologies. This procurement will increase security at these airports by safely screening passengers for metallic and nonmetallic threats, including weapons, explosives, and other objects concealed under layers of clothing.

2. Advanced Technology X-Ray

TSA utilizes Advanced Technology X-Ray systems at the checkpoints to screen roughly 3 million carry-on bags for explosives each day. This technology detects threats in carry-on baggage by providing a clear, high-definition x-ray image. Advanced Technology X-Ray technology refers to both first-generation (AT-1) and next-generation (AT-2) units.

The Advanced Technology X-Ray systems have multiple projection x-ray sources that provide multiple views of the contents in a carry-on bag, and are designed to support the application of detection algorithms to find both liquid and bulk explosive threats. TSA began replacing the Threat Image Projection X-Ray legacy carry-on baggage screening systems with Advanced Technology X-Ray units in 2008. The legacy systems could not offer the enhanced functionality offered by Advanced Technology X-Ray systems, such as automated detection and improved imaging capabilities. At present, approximately 20 Threat Image Projection X-Ray machines remain across fewer than 12 airports. Each unit is expected to be replaced by the end of the fourth quarter of FY 2016.

TSA purchased the first AT-1 systems in 2008. An upgrade was performed on the AT-1s between 2011 and 2012, which included updating software, adding an infrared operator sensor, adding a queueing conveyor (Rapiscan only), and adding Alternate Viewing Stations (secondary workstations)[2], all of which brought the AT-1 equipment to

[2] An Alternate Viewing Station is where a Transportation Security Officer can recall the image of an alarmed bag from the AT-2 while performing a target bag search. It is an extension of the AT-2 that is mobile or fixed, and near or as a part of the search table where the targeted search is being conducted. It aids the Transportation Security Officer by providing a visual and location of the item of interest, resulting in enhanced security effectiveness and efficiency.

functional equivalency with the AT-2 equipment. The purchase and deployment of AT-2 systems began in 2012. Presently, 2,194 Advanced Technology X-Ray systems are deployed at more than 400 airports nationwide. TSA completed the factory acceptance process of 55 additional AT-2 systems, which were deployed in the second and third quarters of FY 2016.

As threats emerge and the technical capabilities improve, enhancements to the Advanced Technology X-Ray systems at airports may include both software upgrades as well as procedural changes. TSA continues to work with vendors to develop and deploy enhanced detection capabilities. For example, in FY 2016, TSA is testing an enhanced Tier II algorithm for checkpoint x-ray image analysis. This algorithm will provide a screener assist function with frames or other markers around selected items, which will alert Transportation Security Officers to potential threats in carry-on bags. The algorithm also will provide enhanced threat image libraries based on recent and emerging threats. These algorithms are designed to increase the Transportation Security Officer's ability and efficiency to find prohibited items, and to ensure greater consistency of applying resolution protocols. TSA plans to begin operational testing of the Tier II algorithm on Smiths Advanced Technology X-Ray units in FY 2016, with operational testing beginning for the Rapiscan systems in FY 2017.

Table 2: Advanced Technology X-Ray Planned Purchases

($ in thousands)

Advanced Technology X-Ray	Planned Purchases with:							Total
	All Available Carryover Funds	FY 2016 Funds	FY 2017 Funds	FY 2018 Funds[1]	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	
Units	14	0	0	233	169	196	196	808
Acquisition Costs	$1,796	0	0	$33,058	$25,287	$29,357	$29,915	$119,413
System Integration	$492	0	0	$8,181	$5,934	$6,882	$2,850	$24,339
Acceptance Testing	0	0	0	$436	$323	$381	$388	$1,528
Maintenance	0	$36,359	$40,797	$41,616	$40,716	$38,407	$44,417	$242,312
Total	**$2,288**	**$36,359**	**$40,797**	**$83,291**	**$72,260**	**$75,027**	**$77,570**	**$387,592**

1. The data in this table is based on the Passenger Screening Program Life Cycle Cost Estimate approved in May 2014. This information will change as a result of an updated Life Cycle Cost Estimate pending approval.

3. Boarding Pass Scanners

Boarding Pass Scanners are systems that read two-dimensional barcodes located on boarding passes issued by airlines that participate in TSA Pre✓®and the Mobile Boarding Pass Program. They read and decrypt electronic (mobile and print-at-home) and paper (kiosk and ticket counter) boarding passes. Boarding Pass Scanner systems reduce the need for manual verification of boarding passes, and are the main tool for validating TSA

Pre✓® passengers. These procurements allowed TSA to replace airline-owned systems, and enabled TSA to control the configuration of all deployed Boarding Pass Scanner systems at airport security checkpoints nationwide. TSA has procured approximately 2,100 systems to date.

Table 3: Boarding Pass Scanner Planned Purchases
($ in thousands)

Boarding Pass Scanners	Planned Purchases with:							Total
	All Available Carryover Funds	FY 2016 Funds	FY 2017 Funds	FY 2018 Funds	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	
Units	12	175	0	0	0	0	0	187
Acquisition Costs	$20	$298	0	0	0	0	0	$318
System Integration	0	0	0	0	0	0	0	$0
Acceptance Testing	0	0	0	0	0	0	0	$0
Maintenance	0	0	0	0	0	0	0	$0
Total	**$20**	**$298**	**0**	**0**	**0**	**0**	**0**	**$318**

4. Bottled Liquids Scanners

The Bottled Liquids Scanner technology can discriminate explosives or flammable liquids from common, benign liquids carried by passengers. The technology is the primary screening tool for medically exempt liquids traversing the checkpoint. Deployed Bottled Liquids Scanner units currently operate at the Tier I specification, which provide a primary resolution of liquids contained in clear or translucent bottles. TSA is working with industry to develop capabilities that detect a broader range of threats, enable the screening of opaque containers, and detect smaller quantities of liquid explosives.

Table 4: Bottled Liquids Scanner Planned Purchases
($ in thousands)

Bottled Liquids Scanners	Planned Purchases with:							Total
	All Available Carryover Funds	FY 2016 Funds	FY 2017 Funds	FY 2018 Funds	FY 2019 Funds[1]	FY 2020 Funds	FY 2021 Funds	
Units	0	0	0	0	61	367	367	795
Acquisition Costs	0	0	0	0	$1,994	$12,194	$12,425	$26,613
System Integration	0	0	0	0	0	0	0	0
Acceptance Testing	0	0	0	0	$70	$427	$435	$932
Maintenance	0	$2,559	$2,409	$2,460	$2,528	$1,823	$718	$12,497
Total	**0**	**$2,559**	**$2,409**	**$2,460**	**$4,592**	**$14,444**	**$13,578**	**$40,042**

1. The data in this table is based on the Passenger Screening Program Life Cycle Cost Estimate approved May 2014. This information will change as a result of an updated Life Cycle Cost Estimate pending approval.

5. Enhanced Metal Detectors

TSA currently uses Enhanced Metal Detectors to locate potential metallic threats on a person, beneath clothing, or otherwise obscured. Although Advanced Imaging Technology systems are the primary passenger screening device in standard lanes at airport checkpoints, a need still exists for metal detectors. Enhanced Metal Detectors are primary screening devices in TSA Pre✓® lanes, and are used where Advanced Imaging Technology does not exist and for Advanced Imaging Technology overflow.

As passenger volumes steadily increase and the number and types of metallic threats continue to evolve, TSA seeks an Enhanced Metal Detector system with improved threat detection and discrimination capabilities, increased throughput, and the ability to support TSA's unpredictable screening process. The implementation of next-generation Enhanced Metal Detector-2 technology will help to mitigate this gap.

The mission of Enhanced Metal Detector-2 devices is to screen passengers effectively at screening checkpoints for prohibited metallic threat objects. The deployment of these devices is intended to:

- Increase detection capability;
- Maximize passenger throughput;
- Mitigate passenger privacy and dignity concerns;
- Minimize the impact on operations in the screening checkpoint and on passengers; and,
- Increase or maintain operational efficiency when compared to legacy walk-through metal detector devices.

TSA hosted an industry day in January 2016 to review new Enhanced Metal Detector detection standards. TSA may schedule an additional industry day and will continue to solicit input from vendors. TSA is re-evaluating the requirement and is currently in the process of updating the detection standards for the Enhanced Metal Detectors. As part of the process, TSA also is testing a new control head for fielded units. The new control head should provide an increased threat detection capability and possible extended service life on the existing Enhanced Metal Detector fleet. Testing is expected to be completed this summer. If testing is successful, TSA will upgrade the systems rather than replace them. If the test results are negative/not as expected, TSA will seek to replace the Enhanced Metal Detector fleet beginning in FY 2017, as indicated in the FY 2017 President's Budget.

Table 5: Enhanced Metal Detector Planned Purchases

($ in thousands)

Enhanced Metal Detectors	Planned Purchases with:							Total
	All Available Carryover Funds[1]	FY 2016 Funds	FY 2017 Funds[1]	FY 2018 Funds	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	
Units	0	0	0	72	28	6	0	106
Acquisition Costs	0	0	0	$844	$328	$73	0	$1,245
System Integration	0	0	0	$25	$10	$2	0	$37
Acceptance Testing	0	0	0	$53	$20	$5	0	$78
Maintenance	0	$1,092	$1,011	$1,005	$1,045	$1,069	$1,079	$6,301
Total	**0**	**$1,092**	**$1,011**	**$1,927**	**$1,403**	**$1,149**	**$1,079**	**$7,661**

1. The data in this table is based on the Passenger Screening Program Life Cycle Cost Estimate, approved in May 2014. This information will change as a result of an updated Life Cycle Cost Estimate pending approval.

6. Explosives Trace Detectors

Explosives Trace Detectors are employed in checkpoint and checked baggage screening for traces of explosives. Transportation security officers swab a piece of carry-on or checked baggage, or a passenger's hands, and then place the swab inside the unit to analyze it for the presence of potential explosive residue.

TSA awarded a contract to Implant Sciences for the purchase and deployment of 1,085 checkpoint Explosives Trace Detectors systems in November 2014. A protest was issued and since resolved, which led to a delay in delivery and installation of these systems. Deployment of the Implant Sciences Explosives Trace Detectors systems began in December 2015 and will continue through September 2016. TSA currently has deployed approximately 5,385 of these detectors to airports for both checkpoint and checked baggage screening. Additionally, Morpho Detection has been unable to upgrade the DX Explosives Trace Detector systems to a newer detection standard. Therefore, TSA is developing a field strategy that would replace the Morpho DX Explosives Trace

Detectors, as well as any other remaining technically obsolete Explosives Trace Detector systems that cannot be upgraded to the latest threat detection standard. Details on the checked baggage Explosives Trace Detectors are discussed later in this report in Section III.E.2.

TSA is developing next-generation Explosives Trace Detector requirements and associated documentation to include the concept of operations, operational requirements document, and functional requirements document. Furthermore, TSA plans to implement the new detection standard 6.2 on currently fielded systems in FY 2016 to increase security detection capabilities. In addition, TSA is working in collaboration with the DHS Science and Technology Directorate (S&T) and industry to develop new Explosives Trace Detector capabilities to improve technical and operational performance. These new capabilities will also include better training support, the ability to detect new threats, and have fast throughput rates.

In order to meet operational needs to address the evolving threat, Passenger Screening Program requires additional Explosives Trace Detector deployments beyond approved full operating capability numbers. To address the vulnerability in aviation security, TSA received reprogramming approval of FY 2016 funds to execute these requirements, including the Passenger Screening Program's request to adjust the Explosives Trace Detector full operational capability quantities.

These funds will provide for procurement, delivery, and installation of additional Explosive Trace Detectors. The Passenger Screening Program will conduct a one-for-one swap of currently deployed systems with these new systems capable of achieving the current detection standards.

With the congressionally authorized reprogramming of FY 2016 appropriations, the investment in additional Explosive Trace Detectors serves as a vulnerability mitigation by closing detection gaps and ensuring that fielded Explosive Trace Detectors systems are able to detect an expanded set of threat materials with higher detection probabilities, faster throughput rates, and lower lifecycle costs to support a comprehensive and dynamic risk management approach to aviation security.

Table 6: Explosives Trace Detector Planned Purchases

($ in thousands)

Explosives Trace Detectors	Planned Purchases with:							Total
	All Available Carryover Funds	FY 2016 Funds	FY 2017 Funds	FY 2018 Funds[1]	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	
Units	21	1,186	0	297	298	298	298	2,398
Acquisition Costs	$657	$19,211	0	$10,241	$10,436	$10,634	$10,836	$62,015
System Integration	0	$10,434	0	$594	$596	$596	$913	$13,133
Acceptance Testing	0	$355	0	$105	$107	$109	$111	$787
Maintenance	0	$17,920	$3,774	$6,985	$7,195	$9,630	$12,205	$57,709
Total	**$657**	**$47,920**	**$3,774**	**$17,925**	**$18,334**	**$20,969**	**$24,065**	**$133,644**

1. The data in this table is based on the Passenger Screening Program Life Cycle Cost Estimate approved in May 2014. This information will change as a result of an updated Life Cycle Cost Estimate pending approval.

C. Emerging Checkpoint Technologies

TSA continues to assess and evaluate new checkpoint technologies and capabilities to maximize threat detection and efficiency. An example of emerging checkpoint technologies is the Credential Authentication Technology, which will be used to verify the authenticity of passenger identification and updates the current passenger's status through a network connection to Secure Flight. Credential Authentication Technology is expected to identify passengers with false or forged documents, and to obtain the most up-to-date passenger status through a near real-time connection to Secure Flight.

TSA conducted developmental testing at the TSA Systems Integration Facility in late 2014 through early 2015. Operational testing was expected to begin in early fall 2015 at Hartsfield-Jackson Atlanta International Airport (ATL), Washington Dulles International Airport (IAD), Los Angeles International Airport (LAX), Austin-Bergstrom International Airport (AUS), and Chicago O'Hare International Airport (ORD). However, following the Office of Personnel Management (OPM) data breach, DHS mandated the addition of new cybersecurity requirements, which has delayed the CAT test and evaluation process.

TSA currently is implementing solutions to address the nine cybersecurity requirements. Once the cybersecurity requirements have been incorporated and pending successful test results, TSA plans to request authority to procure full-rate production systems and begin deployment in the fourth quarter of FY 2017.

Once deployed, Credential Authentication Technology will enhance the passenger screening process at the checkpoint by serving as a technical solution that improves the inspection of identification documentation and confirms passengers' Secure Flight status.

Table 7: Credential Authentication Technology Planned Purchases
($ in thousands)

Credential Authentication Technology	Planned Purchases with:							Total
	All Available Carryover Funds	FY 2016 Funds	FY 2017 Funds[1]	FY 2018 Funds	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	
Units	0	1,100	0	0	0	0	0	1,100
Acquisition Costs[2]	0	$21,234	$3,183	$5,993	$4,155	$12,540	$6,792	$53,897
System Integration	0	$771	0	0	0	0	0	$771
Acceptance Testing	0	$573	0	0	0	0	0	$573
Maintenance	0	$1,337	$2,562	$2,610	$2,660	$2,711	$2,762	$14,642
Total	**0**	**$23,915**	**$5,745**	**$8,603**	**$6,815**	**$15,251**	**$9,554**	**$69,883**

1. The data in this table is based on the Passenger Screening Program Life Cycle Cost Estimate approved in May 2014. This information will change as a result of an updated Life Cycle Cost Estimate pending approval.

2. Acquisition costs for Credential Authorization Technology include auxiliary equipment such as ID and passport scanners, ID library subscriptions, desktop computer and associated components, privacy filters, and uninterruptable power supply.

D. Baggage Screening Technologies

In accordance with the *Aviation and Transportation Security Act of 2001* (P.L. 107-71), TSA screens 100 percent of checked baggage with Explosives Detection Systems or a suitable alternative, such as an Explosives Trace Detector. In FY 2015, TSA screened approximately 475 million checked bags. TSA accomplishes this mission by testing, acquiring, deploying, integrating, upgrading, and maintaining technology that screens checked baggage to deter, detect, mitigate, and prevent transportation of explosives or other prohibited items on commercial aircraft, while ensuring freedom of movement for people and commerce.

E. Existing Electronic Baggage Screening Technologies

TSA has deployed an advanced fleet of checked baggage screening equipment to meet the security needs of the Nation's aviation network. TSA continues to work with industry to apply spiral and incremental approaches to technology development. This allows TSA to procure technologies and upgrade existing machines as new capabilities arise, instead of requiring complete system replacements.

1. Explosives Detection Systems

Explosives Detection Systems are the primary component of checked baggage screening. These systems provide imaging, screening, and detection capabilities through computed

tomography x-ray technology to identify possible threats and create images of the bag contents. Objectives sought during procurement and deployment of Explosives Detection Systems machines includes minimum maintenance, high detection, high durability, high throughput, and a low false-alarm rate.

Explosives Detection Systems technologies are categorized into three distinct groups:

- High-speed: Throughput $\geq$ 900 bags per hour;
- Medium-speed: 400 $\leq$ Throughput < 900 bags per hour; and
- Reduced-size: 100 < Throughput < 400 bags per hour.

At this time, contracts have been awarded for reduced-size and medium-speed Explosives Detection Systems. However, high-speed systems are still in the developmental testing phase. No high-speed systems have successfully passed qualification testing or have been placed on the Explosives Detection Systems qualified products list.

TSA has implemented a robust plan for the recapitalization of Explosives Detection Systems technologies reaching the end of useful life and for the upgrade of selected airport screening zones to realize efficiencies. The prioritization of recapitalization projects is based on various factors, including lifecycle support maintenance records and threat detection capabilities.

Since 2010, TSA has been engaged in an Explosives Detection Systems competitive procurement to test and procure next-generation systems. This strategy has allowed TSA to deploy enhanced capabilities successfully to the field in support of its recapitalization efforts. To sustain recapitalization priorities and fulfill purchase requirements for FYs 2015–2018, TSA will continue to procure Explosives Detection Systems models listed on the current Explosives Detection Systems Competitive Procurement Qualified Products List. However, TSA closed the current list to new entrants on February 13, 2015, and will release new requirements for next-generation Explosives Detection Systems in FY 2017, supporting a shift of focus to the enhanced capabilities mission.

In some cases, an Explosives Detection System is not the optimal screening solution for an airport. Therefore, TSA utilizes a methodology to determine the optimal screening solution for airports. Typically, only airports with checked baggage screening zone volumes exceeding 1,000 bags per week or 100 bags per hour (during the peak hour) qualify for an Explosives Detection System. In such cases, the nonqualifying airports receive Explosives Trace Detector equipment instead of Explosives Detection Systems for screening check baggage. Checked baggage Explosives Trace Detector technology is discussed in Section III.E.2.

Table 8: Explosives Detection Systems Planned Purchases

($ in thousands)

Explosives Detection Systems	Planned Purchases with: All Available Carryover Funds[1]	FY 2016 Funds	FY 2017 Funds	FY 2018 Funds[2]	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	Total
Units	12	72	87	65	35	39	38	348
Acquisition Costs	$12,500	$72,405	$80,962	$43,214	$24,582	$32,479	$30,240	$296,382
System Integration	$950	$18,034	$22,141	$13,622	$9,446	$12,330	$7,028	$83,551
Acceptance Testing	$23	$74	$88	$180	$150	$164	$155	$834
Maintenance	$0	$63,650	$148,397	$145,193	$149,117	$154,290	$157,773	$818,420
Total	**$13,473**	**$154,163**	**$251,588**	**$202,209**	**$183,295**	**$199,263**	**$195,196**	**$1,199,187**

1. Includes expiring and no-year carryover funds that are available for obligation in FY 2016.
2. The data in this table is based on the Electronic Baggage Screening Program Life Cycle Cost Estimate, approved in July 2015.

2. Explosives Trace Detectors

TSA has deployed approximately 2,650 checked baggage next-generation Explosives Trace Detector units throughout our Nation's airports. In March 2015, TSA awarded a contract to Implant Sciences for the purchase and deployment of 85 next-generation Explosives Trace Detectors for checked baggage screening to replace legacy units that have reached the end of their projected lifecycles. These improved units have enhanced explosives detection sensitivity and the ability to detect a wider range of explosives threats.

TSA is developing a field replacement strategy that would replace the Morpho DX Explosives Trace Detectors. Once a plan is developed, TSA can provide updates to Table 9.

Table 9: Explosives Trace Detector Planned Purchases
($ in thousands)

Explosives Trace Detectors	Planned Purchases with:							Total
	All Available Carryover Funds[1]	FY 2016 Funds	FY 2017 Funds	FY 2018 Funds[1]	FY 2019 Funds	FY 2020 Funds	FY 2021 Funds	
Units	1,898	0	0	31	36	12	1,417	3,394
Acquisition Costs	$40,000	$0	$0	$1,395	$1,620	$540	$63,765	$107,320
System Integration	$0	$0	$0	$86	$12	$0	$765	$863
Acceptance Testing	$0	$0	$0	$0	$0	$2	$1	$3
Maintenance	$0	$19,034	$19,249	$20,010	$20,653	$21,266	$10,846	$111,058
Total	**$40,000**	**$19,034**	**$19,249**	**$21,491**	**$22,285**	**$21,808**	**$75,377**	**$219,244**

1. The data in this table is based on the Electronic Baggage Screening Program Life Cycle Cost Estimate, approved in July 2015.

F. New Electronic Baggage Screening Technologies

TSA is working continually to improve and expand on the aviation security screening capabilities that are deployed at the Nation's airports. Working in collaboration with the DHS Science and Technology Directorate (S&T) and industry, TSA is pursuing new capabilities in the detection of explosive threats within checked baggage. These new capabilities include the ability to detect an expanded set of threat materials with higher detection probabilities, lower false-alarm rates, and faster throughput rates, all at lower lifecycle costs, resulting in less impact to airport operations and the traveling public.

TSA is pursuing new means of data acquisition, data processing and management, detection algorithm development, and systems integration. Examples of potential new data acquisition techniques include stationary gantry x-ray systems, which could provide improved x-ray imaging capabilities and significantly reduce maintenance costs; and three-dimensional x-ray systems, which could provide improved threat detection and reduced lifecycle costs. Efforts also are ongoing in the areas of computed tomography image reconstruction and segmentation using powerful data processing solutions.

TSA is developing new algorithms with enhanced detection capabilities in checked baggage. The scientific and vendor communities are working on challenges to deploy improved algorithms on both in-service Explosives Detection Systems as well as new systems currently in development.

Systems integration is also drawing much attention from TSA and the research and development community. Improvements in data communications, systems compatibility,

open standards-based designs, human factors, and system reliability, maintainability, and availability all lead to improved checked baggage screening effectiveness and efficiency. TSA is developing a systems architecture for airport security screening that will tie together the enabling technologies, processes, and concepts discussed in Section III.G of this report to help meet future aviation security challenges.

G. TSA Technology Integration—Passenger and Baggage Screening

TSA is working actively with industry and other stakeholders on a number of initiatives to further standardize and integrate equipment at the checkpoint and at baggage screening. These initiatives are aimed at reducing costs, furthering automation, and gaining efficiencies. Integration efforts will reduce the number of screening procedures required for each passenger, and the footprint of technologies at the passenger checkpoint, while also introducing automated capabilities to reduce manpower requirements.

1. Common Graphical User Interface

TSA is working to develop a common graphical user interface that will increase operational efficiency in the security checkpoint and checked baggage areas by decreasing the amount of specialized training and personnel resources required to operate individual technologies in the field. TSA has designed and tested a common graphical user interface for Explosives Detection Systems primary viewing stations. The common interface provides all necessary operator functionality and tools in an easy-to-use display, which can support security screening operations with multiple systems designs and permit a faster assimilation to the equipment.

Currently, TSA is collaborating with original equipment manufacturers to develop prototype software, which will enable Explosives Detection Systems to save images in the Digital Imaging and Communications in Security format. Successful use of the Digital Imaging and Communications image format is a fundamental element to the common interface concept. Therefore, upon successful testing of the prototype, TSA will progress toward the implementation of this capability for additional screening technologies, including Advanced Technology X-Ray systems at the checkpoints.

2. Digital Imaging and Communications in Security

Digital Imaging and Communications in Security is an industry standard for structuring and communicating data among security screening equipment. It is an ongoing project that aims to improve security capabilities while achieving increased efficiencies. Digital Imaging and Communications in Security will deliver the ability to pair the most capable security data acquisition systems with the most sophisticated data analysis algorithms, and display results to front-line operators on the most user-friendly, cost-effective

workstations. It also will facilitate further multi-modal integration of equipment and systems in security screening. The ability to integrate system components in a standards-based environment will enable specialized vendors with true expertise in specific capabilities to enter and thrive in the security screening equipment market. A Digital Imaging and Communications in Security-enabled environment will encourage both technical and economic competitiveness.

TSA has supported the development of Digital Imaging and Communications in Security by the National Electrical Manufacturers Association under contract to S&T. Digital Imaging and Communications in Security specifies standardized data structures for Advanced Imaging Technology, Explosives Detection Systems, and Advanced Technology X-Ray systems. Once Digital Imaging and Communications in Security compliance is mandated for security screening equipment, TSA expects to realize improved technology performance and increased visibility into, and control over, deployed technologies. Digital Imaging and Communications in Security compliance also could lead to modular system architectures that translate into streamlined systems and procedures that provide for a less intrusive passenger experience and an improved Transportation Security Officer work environment. TSA currently is working with original equipment manufacturers to assess potential challenges to Digital Imaging and Communications in Security implementation.

3. The Integrated Checkpoint Program

The Integrated Checkpoint Program is a collaborative effort between TSA and S&T through the support of the Space and Naval Warfare System Center Pacific. The Integrated Checkpoint Program is a networked system that provides interoperability between multiple checkpoints' transportation security equipment through the standardization of data, protocols, and requirements. The main objectives of the project are to minimize the invasiveness of the screening process, reduce the number of screening procedures required for each passenger, reduce the number of transportation security officers required to operate security equipment, and reduce the footprint of technologies at the passenger checkpoint by developing a system-of-systems approach to the screening process. The ultimate end goal is a unified, interconnected system in which passengers will walk through the screening system in a user-friendly manner.

4. Security Technology Integration Program

The Security Technology Integration Program is an information technology program that connects all transportation security equipment to a single network, enabling two-way exchange of information. With this connectivity, the program can accomplish three capabilities:

- Enable a secure and stable transfer of information between Credential Authentication Technology and Secure Flight. The program also developed the identification matching algorithm hosted in the Credential Authentication Technology machines;
- Automate operational and configuration data collection from connected transportation security equipment. The program can also push out commands, software patches, and configuration changes remotely; and,
- Provide a secure remote access to transportation security equipment to facilitate diagnosis and resolution of maintenance issues.

These capabilities lead to the following operational benefits for TSA:

- Efficiency gained due to automating what is currently a labor-intensive manual process of collecting operational metrics from transportation security equipment in the field;
- Enhanced Risk-Based Security posture by supporting Credential Authentication Technology;
- More effective automated asset management and utilization tracking; and
- Automated configuration management and remote software updates.

With greater emphasis on cybersecurity, the Security Technology Integration Program has taken proactive steps to mitigate risk and develop processes immediately to address cybersecurity concerns and challenges to ensure that the networked transportation security equipment environment represents a strong cybersecurity posture. Specific goals include:

- Apply continuous monitoring processes to the environment for security weaknesses and prioritize remediation efforts;
- Use sound security processes to mitigate known and existing cyber vulnerabilities;
- Acquire, develop, and test technologies that lower cybersecurity risk; and
- Assign and enforce responsibility to comply with policy and standards.

5. Open Threat Assessment Platform

The Open Threat Assessment Platform is a feasibility demonstration of a dynamic threat detection capability to lay the foundation for an open market that supports further innovation. Notionally, the platform will be a common application program interface that enables different logical capabilities of the system to communicate and dynamically screen passengers in real time. The platform will be a dynamic risk-based screening system, using data from multiple sources to inform each successive step in the process, as well as the final risk decision. The Open Threat Assessment Platform supports TSA's goals to:

- Accelerate capability delivery and responsiveness to evolving threats;
- Increase vendor choice, producing capability improvements & lower costs;
- Increase upgrade and maintenance ease; and
- Implement risk-based operations and increase organizational efficiency.

6. Innovation Task Force

In Spring 2016, TSA established the Innovation Task Force to encourage innovation by conducting field demonstrations of emerging capabilities. The goals of the program are to address the evoloving threat landscape, improve the passenger screening experience, and facilitate the delivery of the next-generation curb-to-gate screening experience. Through data and information sharing, partnering with stakeholders across the aviation sector, and fostering a platform for innovation, the Innovation Task Force aims to promote rapid development of new solutions, and refinement of requirements and processes. Ultimately, the Innovation Task Force will enhance TSA's ability to respond to an evolving terrorist threat and dynamic screening environment.

In less than 9 weeks, the Innovation Task Force established Hartsfield-Jackson Atlanta International Airport as an innovation site and demonstrated Automated Screening Lanes in partnership with Delta Air Lines. The Automated Screening Lanes demonstration (which included automated bin returns, multiple divestiture stations, and enhanced bin tracking and data capabilities) has been recognized by partner airlines, vendors, and travelers for its expediency to design and deploy, and for reducing wait times and improving the passenger experience. Success at the Hartsfield-Jackson Atlanta International Airport has enabled expansion of Innovation Task Force efforts to target airports around the country for additional demonstrations and next-generation solutions, and the program has forged a process with the potential to transform the passenger experience and enhance security. Through the Innovation Task Force, TSA will continue to develop and utilize innovation sites at airports nationwide to demonstrate emerging technological, automated, ergonomic, environmental, or aesthetic improvements for checkpoint and checked baggage areas.

IV. Cost-Effective Screener Workforce Deployment

TSA employs staff at approximately 440 airports. Each airport is unique and requires its own technology and employee configuration. TSA determines the most cost-effective means of staffing through various methodologies, modeling, and optimization efforts to provide the greatest opportunity to maximize screening effectiveness while minimizing operational impacts due to passenger volume.

A. Staffing Allocation Process

TSA utilizes a rigorous staff allocation process and Enhanced Staffing Model to allocate its security workforce effectively. The process considers each airport's flight schedule data, airport equipment, layout configuration, and unique operating characteristics to determine appropriate staffing. TSA refines and improves the tools for the staffing process and the Enhanced Staffing Model application on a continuous basis.

The model is centered on a proven, discrete-event simulation model with the following inputs:

- Airport Configurations
  - Each airport's unique configuration is entered with details for operating hours, terminals, checkpoints, bag zones, screening equipment, and exit lanes. The configuration details are vetted with local airport scheduling operations officers.
- Passenger and Baggage Screening Work Demand
  - TSA uses data provided directly from the airlines, the Bureau of Transportation Statistics, Federal Aviation Administration Forecast, and UBM Aviation to project flight activity and subsequent passenger enplanements. This provides a means of accounting for planned growth in passenger loads, a variable that is constantly monitored and adjusted as needs mature. Each airport's unique flight schedules are loaded into TSA's simulation modeling software to reflect flight departure times, aircraft seat capacities, and other flight details.
- Processing Rates and Staffing Constants
  - TSA uses data provided by the airlines and collected through time studies to determine appropriate staffing standards and expected processing rates. These rates and staffing standards are used for all airport staff modeling. In the case of airport deviation from these rates and standards, the reasoning for the deviation is documented.

The staffing requirements generated by the simulation model then are run through integrated schedule optimization software driven by a sophisticated mathematical

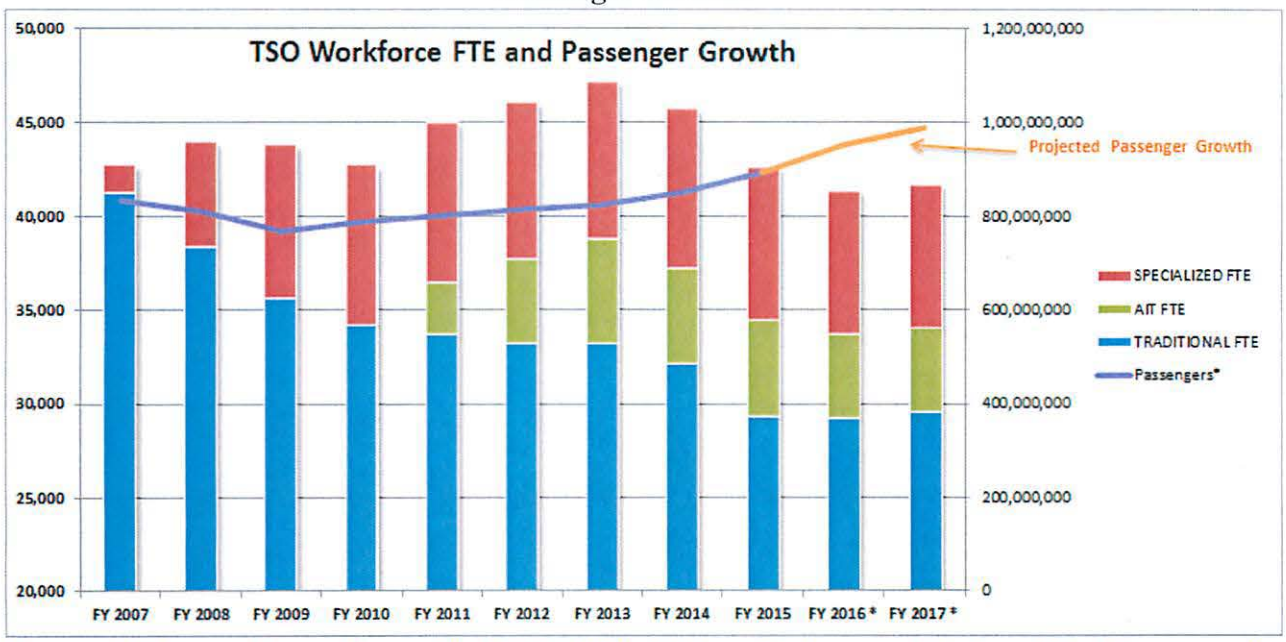
problem-solving engine. In addition to the staffing demand generated by the simulation model, this schedule optimization engine considers several other variables that affect staffing requirements, including the requirement to utilize a mix of part- and full-time employees to cover the work demand, and the requirement to minimize the number of start times for employees, so that shift breaks can be scheduled effectively.

Following this step, TSA uses historical and projected requirements information to add funding for nonmodeled requirements, such as paid time off, overtime, and training. The result of all these processes is an individual staffing goal for each airport, with a breakdown of the goal by screening type (baggage and passenger) and with recommended part- and full-time employee headcounts.

The staffing process has been in place and used to establish airport staffing budgets since FY 2004. TSA has seen a decrease in staffing demand for checked baggage screening as in-line baggage screening systems have been installed. Conversely, there has been an even greater increase in staffing demand at checkpoints because of the increase in the number of carry-on bags; the complications that arise from screening liquids, aerosols, and gels; the increased number of electronics being screened individually; and the introduction of staffing-dependent technologies, such as Advanced Imaging Technology. Staffing resource requirements also have increased over recent years as a result of a substantial increase in passenger volume. Volume growth in 2015 was five percent and is expected to increase an additional six-and-a-half percent in 2016. At the same time, TSA's staffing allocation is down 5,800 from 2013, although TSA was able to halt the additional reduction of 1,660 personnel in FY 2016. TSA requires a new model that is dynamic and can evolve with the changing security and operational landscape (see Figure 1 below). The passenger volume growth combined with TSA personnel reductions has created a mismatch of resources to mission. Historically, the staffing process and the Enhanced Staffing Model provided TSA with the flexibility to determine staffing requirements as the airport security landscape has changed over time. The staffing process is adjusted periodically to account for new technology, new threats, and changes in TSA's operating procedures. Still, TSA needs greater adaptability in its staffing process.

As a result, TSA currently is assessing potential adjustments to the existing model to match resources to the demands of the screening environment. Considerations include adjusting the supervisor to subordinate ratio, allowing for realistic, hands-on threat detection training for processes such as the patdown of persons at the place of duty vice employing a computer-based deliver model, staffing small airports for which federal screening resources are now committed, ensuring a more comprehensive delivery of TSA Pre✓® screening lanes, and fully funding annual, medical, and sick leave accounts (see chart below).

Figure 1: Transportation Security Officer Workforce Full-Time Equivalent (FTE) and Passenger Growth



* Passenger Data is taken from the **Bureau of Transportation Statistics T-100 Market Data** consisting of passengers that enplane and deplane between two specific points with the same flight number, and if the flight number changes a new market begins. **FY16** based on projected growth of 6.5% and **FY17** based on projected growth of 4.0%. Also note that passenger count ties to enplanements, not necessarily screening throughput.

B. Risk-Based Security

In the fall of 2010, TSA began developing a strategy for implementing risk-based security principles—an intelligence-driven, risk-based approach to transportation security. TSA's risk-based security initiatives boost the effectiveness of security resources by focusing them on high-risk and unknown travelers and commerce, while at the same time facilitating the efficient movement of legitimate travelers and trade.

To support a risk-based approach, it is critical to continue to grow the population of fully vetted travelers. TSA is working aggressively to expand the number of enrolled travelers, with the goal over the next 4 to 5 years of enrolling 25 million travelers either directly in the TSA Pre✓® Application Program or via a DHS trusted traveler program. This is a fourfold increase from today. This is an important security component for TSA as it shifts to a model where "low-risk" individuals either are enrolled directly or are part of an eligible low-risk population that is known to TSA. At the same time, TSA will continue to apply appropriate measures to address known threats, unknown threats, and low-risk or trusted populations. TSA wants to ensure that its focus on security effectiveness is well-defined and applied across the entire workforce, and wants to align resources around this renewed focus on security effectiveness.

TSA is continuing to introduce or expand Risk-Based Security initiatives as it strives for the most effective security in the most efficient manner. TSA will continue to reallocate

security capabilities/resources to best manage risk within acceptable tolerance ranges and to reduce government and industry total security costs while enhancing value for the American people.

V. Savings and Reinvestment from Improved Technology Deployment

TSA continues to look for efficiencies by installing labor-saving, improved technology for passenger and baggage screening. TSA uses these efficiencies and reinvests its resources in other essential security capabilities to support staffing needs at the checkpoint.

Table 10: FY 2015 Staffing Savings & Investments

In-Line Savings		
	Full-Time Equivalent	Dollars[1]
Cumulative In-Line Savings through FY 2015	3,425	$ 225,089,800
[1] Estimated dollars are based on the weighted average of Transportation Security Officers, Lead and Supervisory Transportation Security Officers, as well as actual savings reported in the FY 2015 and 2016 Budget Requests.		

At the end of FY 2015, a total of 126 airports possessed operational in-line Explosives Detection Systems, with a cumulative savings of 3,425 full-time equivalents when compared to the staffing required for the stand-alone screening equipment configuration. TSA estimates the FY 2016 full-time equivalent savings from in-line Explosives Detection Systems installations to be 93 full-time equivalents, increasing TSA's cumulative in-line full-time equivalents to 3,518 through FY 2016. These savings are considered when formulating TSA's budget requests.

VI. Conclusion

To address the ever-evolving threats to aviation security, TSA continues to enhance existing technologies, to acquire and integrate new technologies, and to use intelligence-based and risk-based processes to screen passengers and their baggage more effectively and efficiently. TSA is committed to using its workforce effectively, specifically by focusing on labor and cost savings to serve the public better and secure the Nation's transportation system. As TSA moves forward with a renewed focus on security, revised alarm resolution procedures, new investments in technology, and a retrained workforce, there is a new balance between effectiveness and efficiency as the system is tested continuously to identify gaps and measure system readiness and performance.

By working closely with Congress to appropriately rightsize and resource the organization, TSA will continue to address passenger growth, improve checkpoint performance, and mitigate vulnerabilities across the aviation system. The initiatives outlined in this report will allow TSA to address the dynamic threat to aviation security and partner with industry to provide the capabilities needed.