

April 2012

CHECKED BAGGAGE SCREENING

TSA Has Deployed
Optimal Systems at
the Majority of TSA-
Regulated Airports,
but Could Strengthen
Cost Estimates



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Why GAO Did This Study

TSA's EBSP, one of DHS's largest acquisition programs, aims to improve security and lower program life cycle costs by optimizing checked baggage screening systems that best meet the needs of the nation's airports. This includes, among other things, the integration of baggage screening equipment into baggage handling systems, referred to as in-line systems. Installing in-line systems typically requires airports to undertake costly facility modification projects, for which TSA will generally reimburse up to the applicable federal cost share. As requested, GAO examined (1) the status of TSA's efforts to install optimal checked baggage screening systems in collaboration with airports, (2) how reducing the federal cost share for eligible airport modification projects from 90 percent to its previous level of 75 percent would affect the amount that TSA pays for modifications, and (3) whether TSA's methods for estimating and validating costs for the EBSP are consistent with best practices. GAO reviewed EBSP planning and status documents, compared TSA's cost estimation approach against GAO best practices, and visited 10 airports selected in part based on the status of the EBSP optimization at these airports. Although the results from these visits are not generalizable, they provided insights into the program.

What GAO Recommends

GAO recommends that TSA ensure that its life cycle cost estimates conform to cost estimating best practices. DHS concurred with GAO's recommendation.

View [GAO-12-266](#). For more information, contact Stephen M. Lord at (202) 512-4379 or lords@gao.gov.

CHECKED BAGGAGE SCREENING

TSA Has Deployed Optimal Systems at the Majority of TSA-Regulated Airports, but Could Strengthen Cost Estimates

What GAO Found

The Transportation Security Administration's (TSA) Electronic Baggage Screening Program (EBSP) reports that 76 percent of the airports (337 of 446) the agency regulates for security have a mix of in-line and stand-alone baggage screening configurations that best meet airport needs (i.e., optimal systems). However, only 36 percent (10 of 28) of the nation's larger airports—based on factors such as the total number of takeoffs and landings annually—have complete optimal systems. This is because the larger airports generally need more complex in-line systems and often require a significant amount of airport infrastructure modification and construction. In August 2011, TSA shifted its focus from installing optimal baggage screening systems to replacing aging machines (recapitalization). However, TSA plans to continue to optimize systems during many of its recapitalization projects.

Using TSA cost estimates, GAO estimates that reducing the portion of costs that TSA pays for facility modifications associated with the installation of optimal baggage screening systems, from 90 percent to 75 percent, would lower the federal government's cost for airport modification projects it supports by roughly \$300 million from fiscal year 2012 through fiscal year 2030. Officials from all 10 airports with whom GAO spoke stated that airports benefit from the installation of integrated, in-line baggage screening systems. The primary benefit—cited by representatives from 9 of the airports GAO visited—is that passenger congestion is reduced by removing stand-alone machines from lobbies or ticketing areas. Other benefits cited by airports included a reduction in lost baggage and increased screening and passenger throughput. However, for a variety of reasons, representatives from 8 of 10 airports GAO visited opposed a reduction in the federal cost share for related airport modifications.

TSA established cost estimates for the EBSP to help identify total program cost, recapitalization cost, and potential savings resulting from installing optimal systems, but its processes for developing these estimates do not fully comply with best practices. These include, among other things, ensuring that the estimates comprise all costs and are well documented. For example, TSA's estimates were properly adjusted for inflation and were developed using relevant data, such as existing contracts for equipment purchases and maintenance costs. However, the estimates did not include all costs, for example, the costs associated with detecting all security threats, and many assumptions and methodologies underlying the cost model were not clearly documented. As highlighted in GAO's past work, a high-quality, reliable cost estimation process provides a sound basis for making accurate and well-informed decisions about resource investments and budgets and thus is critical to the success of a program. Developing accurate cost estimates would help ensure that the program does not experience unanticipated cost growth and program funding needs resulting from future recapitalization and facility modification activities. In addition, TSA is working with the Department of Homeland Security (DHS) to develop an approved acquisition program baseline, which according to DHS guidance is the contract between program and departmental oversight officials for what will be delivered, how it will perform, and what it will cost. TSA expects the baseline to be approved in May 2012.

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Abbreviations

AIP	Airport Improvement Program
ATSA	Aviation and Transportation Security Act
CBRA	Checked Baggage Resolution Area
DHS	Department of Homeland Security
EBSP	Electronic Baggage Screening Program
EDS	explosives detection system
ETD	explosives trace detection
FAA	Federal Aviation Administration
LCCE	Life Cycle Cost Estimate
LOI	letter of intent
OMB	Office of Management and Budget
OSR	On-Screen Resolution
OTA	other transaction agreements
TSA	Transportation Security Administration

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United States Government Accountability Office
Washington, DC 20548

April 27, 2012

The Honorable John D. Rockefeller IV
Chairman
The Honorable Kay Bailey Hutchison
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

The Honorable Susan M. Collins
Ranking Member
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Jim DeMint
United States Senate

The Honorable Henry Johnson
House of Representatives

As demonstrated by the attempted attack of Northwest Airlines Flight 253 from Amsterdam to Detroit on Christmas Day in 2009, commercial aviation continues to be a target of terrorist activity. The 1988 bombing of a U.S. airliner over Lockerbie, Scotland, further demonstrates that explosive devices placed in checked baggage have long been an area of concern. The Aviation and Transportation Security Act (ATSA), enacted on November 19, 2001, created the Transportation Security Administration (TSA), now a component of the Department of Homeland Security (DHS), and mandated, among other things, that it provide for the screening of all checked baggage using explosive detection systems.¹ To satisfy this mandate, TSA has deployed two types of screening equipment to airports in the United States where screening is required: (1) explosives detection systems (EDS), which use X-rays with computer-aided imaging to automatically recognize the characteristic signatures of

¹ See Pub. L. No. 107-71, §§ 101(a), 110(b), 115 Stat. 597, 597-604, 614-16 (2001) (codified as amended at 49 U.S.C. §§ 114(a), 44901(d)). Pursuant to the Homeland Security Act of 2002, enacted on November 25, 2002, TSA transferred from the Department of Transportation to the newly formed DHS. See Pub. L. No. 107-296, §§ 101, 403(2), 425, 116 Stat. 2135, 2142, 78, 85-86 (2002).

threat explosives, and (2) explosives trace detection (ETD) machines, in which a human operator (baggage screener) uses chemical analysis to manually detect traces of explosive materials' vapors and residue.

As amended, ATSA mandated that TSA provide for the screening of all checked baggage using EDS machines no later than December 31, 2003.² To meet the 100 percent checked baggage screening requirement, TSA deployed screening equipment in a variety of temporary screening solutions, including EDS machines placed in stand-alone configurations in airport terminal lobbies, and solutions that relied on ETD machines for primary screening. According to TSA, these initial stand-alone EDS machines have higher operating costs and can screen fewer bags per hour than EDS machines that are integrated into a single, coordinated "in-line" baggage handling system. To improve the efficiency and effectiveness of baggage screening at airports, TSA's Electronic Baggage Screening Program (EBSP) aims to, among other goals, (1) replace, reconfigure, and deploy equipment to increase throughput, system capacity, and effectiveness while reducing staffing requirements and airport lobby installations; (2) increase equipment reliability, reduce equipment downtime, and extend service life; and (3) achieve new capabilities to better detect changing terrorist threats.

Pursuant to ATSA, providing for checked baggage screening is a federal responsibility, but airports must be capable of accommodating the screening systems to secure safe travel for the nation's passengers. TSA collaborates with airports and airlines to determine the most appropriate screening configuration and install the systems that best fit the airports' or airlines' needs. Such optimal baggage screening systems may have a mix of detection systems (EDS or ETD) and configurations (in-line or stand-alone systems), depending on the airport's needs, and may help streamline airport and TSA operations, reduce screening costs, and enhance security. However, in-line solutions may not be appropriate or cost effective in airports or terminals with fewer bags per week to screen. From fiscal years 2008 through 2011, TSA reported that it obligated

² See 49 U.S.C. § 44901(d). ATSA further provides that TSA must take all necessary action to ensure that all explosive detection systems deployed are fully utilized, and that if explosive detection equipment at an airport is unavailable, all checked baggage is screened by an alternative means authorized under the statute, see § 44901(d)-(e) (authorizing a bag match program, a manual search, search by canine explosive detection units in combination with other means, or other means or technology approved by the TSA Administrator, as alternative means to using explosive detection equipment).

approximately \$1.9 billion to support airport facility modification projects required to install more efficient optimal baggage screening systems, and estimates that it will obligate an additional \$1.15 billion for this purpose through fiscal year 2030.³ TSA has determined that manual ETD screening is an optimal configuration for the nation's smaller airports at which TSA performs or oversees screening.

TSA has generally supplemented the costs of airport facility modification projects necessary to install such optimal baggage screening systems by entering into reimbursable agreements with airports.⁴ In general, an airport must be willing and financially capable of undertaking the facility modification project; TSA may not compel an airport to undertake such a project. Although TSA will procure and install the screening equipment, the airport, and not TSA, is ultimately responsible for any facility modification costs. Pursuant to a reimbursable agreement and subject to the availability of appropriations, however, TSA will generally reimburse an airport undertaking such a project at the applicable percentage of allowable project costs. According to TSA, since 2003, it has entered into 12 letter of intent (LOI) agreements at the statutorily established federal cost shares of 75 or 90 percent and at least 150 other transaction agreements (OTA) at cost shares that have ranged from 50 to 100

³ The \$1.9 billion includes over \$700 million made available to TSA in fiscal year 2009 through the American Recovery and Reinvestment Act of 2009, see Pub. L. No. 111-5, 123 Stat. 115, 163 (2009).

⁴ According to TSA's *Planning Guidelines and Design Standards for Checked Baggage Inspections Systems*, version 4.1, September 15, 2011, the project sponsor is assumed to be an airport owner/operator or an airline (if the system is for an airline-owned terminal). Some of the key responsibilities of the project sponsor include initiation and execution of planning and design, application for TSA funding, initiation and execution of construction, as well as testing and commissioning of the checked baggage inspection system and operation and maintenance of the baggage handling system portion of the overall checked baggage inspection system. TSA is responsible for, among other things, developing the planning guidelines and design standards, working with airports and airlines to develop and review designs, providing the EDS and ETD screening equipment, and final approval of the checked baggage system.

percent.⁵ Currently, TSA enters into reimbursable agreements through which it generally funds 90 percent of the costs of modifying airports for the installation of an optimal system, with airports or airlines funding the remaining 10 percent of the projects' cost.

A foundation for making informed budget decisions for acquisition programs at DHS is the acquisition program baseline, which according to DHS's guidance is its contract with a component, such as TSA, on a program's critical costs, schedule, and program performance goals. Establishing such a baseline at the program start is important for defining its scope, assessing whether all life cycle costs are properly calculated, and measuring how well the program is meeting its goals. By tracking and measuring actual program performance against this baseline, management can be alerted to potential problems, such as cost growth or changing requirements, and has the ability to take early corrective action.

You asked us to assess the EBSP's current status, costs, and alternative cost sharing options. Accordingly, this report addresses the following questions:

- What is the status of TSA's efforts to install optimal checked baggage screening systems in collaboration with airports?
- How would reducing the current federal cost share for eligible airport modification projects from 90 percent to its previous level of 75 percent affect the amount that TSA pays for these modifications, and what benefits, if any, do airports report receiving from in-line baggage screening systems?
- To what extent are TSA's cost estimation procedures consistent with best practices and is TSA's acquisition baseline consistent with DHS guidance?

⁵ Pursuant to an LOI, TSA may commit to obligate from future budget authority an amount not to exceed the federal government's share of a project's cost for the purpose of reimbursing an airport or other responsible party that has undertaken an eligible airport facility improvement project. See, e.g., 49 U.S.C. § 44923(d). An LOI is subject to the availability of appropriations and does not constitute a binding commitment of federal funding. According to TSA, OTAs are administrative vehicles used by the agency to fund airport modification projects without undertaking a long-term commitment. OTAs take many forms and are generally not required to comply with federal laws and regulations that apply to contracts, grants, or cooperative agreements, and they enable the federal government and others entering into these agreements to freely negotiate provisions that are mutually agreeable.

To determine the status of TSA's efforts to install optimal checked baggage screening systems, we obtained the most current data available from TSA as of December 2011 and January 2012 for the following: 1) on the current number of airports with at least one in-line system, 2) the number of airports that have optimal checked baggage screening systems, 3) and the number of operational in-line systems and EDS and ETD machines deployed to TSA-regulated airports. We reviewed documentation from TSA's EBSP, including the EBSP strategic plans for fiscal years 2006, 2008, and 2009, and the 2011 *EDS and ETD Recapitalization and Optimization Plan*.

To determine how reducing the current federal cost share for eligible airport facility modification projects may affect the amount that TSA pays for these modifications, we calculated estimates based on TSA's August 2011 projections of how much airport modifications will cost in the future. To estimate what cost shifts could occur in the future, we obtained TSA's projections of its airport modification costs as stated in its final August 2011 Life Cycle Cost Estimate (LCCE) report.⁶ We used TSA's LCCE projections of airport modification costs for each fiscal year, 2012 through 2030, and estimated the amount of expenditures for airport modifications that could be shifted from TSA to airports and airlines if the federal government's cost share were reduced from the current 90 percent to previous federal cost share of 75 percent.

We assessed the reliability of the various data TSA provided about airports, including the number of TSA-regulated airports (by category) and the numbers of airports with the different configurations of baggage screening (in-line or stand-alone) systems, and the investment and budget expenditure dollar values in the LOIs and OTAs by questioning cognizant TSA officials and obtaining documentation about these various

⁶ Life cycle costs are to be comprehensive, which includes all resources and associated cost elements required to develop, produce, deploy, and sustain a particular program from initial concept through operations, support, and disposal. Acquisition costs include costs for all supplies and services for a designated investment.

data.⁷ We found these data to be sufficiently reliable for the purposes of our report.

To assess the extent to which TSA's cost estimation methods are consistent with best practices and how its acquisition program baseline efforts are consistent with DHS guidance, we analyzed the TSA August 2011 LCCE for EBSP. We used best practices in GAO's *Cost Estimating and Assessment Guide* to evaluate TSA's estimating methodologies, assumptions, and results to assess whether the official cost estimates were comprehensive (i.e., include all costs), accurate, well documented, and credible.⁸ We defined a characteristic of the LCCE as not met if the agency provided no evidence that satisfied any portion of the criterion, minimally met if the agency provided evidence that satisfied less than one-half of the criterion, partially met if the agency provided evidence that satisfied about one-half of the criterion, substantially met if the agency provided evidence that satisfied more than one-half of the criterion, and met if the agency provided complete evidence that satisfied the entire criterion. Our analyses examined TSA's practices in developing its LCCE. Regarding the development of an acquisition program baseline, we examined the EBSP Acquisition Review Board decisions and relevant acquisition decision memos during the period 2005 through 2011, as well as other documentation related to DHS and TSA efforts to develop an acquisition program baseline.⁹ We also interviewed TSA and DHS officials, including officials in the TSA Chief Financial Officer's Office and DHS's Program Accountability and Risk Management Office, to identify

⁷ TSA classifies the over 400 commercial airports in the United States into one of five airport security categories (X, I, II, III, and IV) based on various factors, such as the total number of takeoffs and landings annually, the extent to which passengers are screened at the airport, and other special security considerations. In general, category X airports have the largest number of passenger boardings and category IV airports have the smallest.

⁸ GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

⁹ DHS established the Acquisition Review Board as the department's highest review body and charged it with reviewing and approving all programs at key milestone decision points that are above \$300 million in life cycle costs. The Acquisition Review Board reviews provide an opportunity to determine a program's readiness to proceed to the next life cycle phase. DHS's Acquisition Management Directive 102-01 of January 2010 superseded similar interim directives, and requires the Acquisition Review Board chairperson to approve key acquisition documents critical to establishing the program, operational requirements, acquisition baseline, testing, and support.

what procedures they have put in place to approve the acquisition program baseline.

To gain a better understanding of issues across all of our objectives, we conducted site visits to airports in California, New York, Massachusetts, Washington, D.C., and Florida to interview local airport officials, regional TSA officials, and airline representatives. To get a range of airports, we chose these airports based on the size of airport, type of checked baggage screening system installed, and whether the airport's checked baggage screening system had been optimized. Because we selected a nonprobability sample of airports, the information we obtained from these interviews and visits cannot be generalized to all airports. However, we believe that observations obtained from these visits provided us with a greater understanding of airport officials' perspectives on TSA's collaboration with airports that seek to have optimal baggage screening systems installed and allowable costs reimbursed, as well as the perspective of local TSA officials. In addition, we interviewed officials from the largest industry associations, which represent airport executives, airports, and airlines (the American Association of Airport Executives, the Airports Council International North America, and the Air Transport Association). We also interviewed an official from the Association for Airline Passenger Rights. These results cannot be generalized to the entire industry but provided industry perspectives.

We conducted this performance audit from October 2010 through April 2012 in accordance with generally accepted government auditing standards.¹⁰ Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

¹⁰ We issued preliminary results for this work in 2011 and 2012 as part of GAO's effort to identify opportunities that federal agencies or the Congress could consider for reducing the cost of government operations or enhancing revenue collections for the Treasury. See GAO, *Opportunities to Reduce Potential Duplication in Government Programs, Save Tax Dollars, and Enhance Revenue*, [GAO-11-318SP](#) (Washington, D.C.: Mar. 1, 2011), and *2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue*, [GAO-12-342SP](#) (Washington D.C.: Feb. 28, 2012).

Background

With the passage of ATSA in November 2001, TSA assumed from the Federal Aviation Administration (FAA) responsibility for securing the nation's civil aviation system. In accordance with ATSA, TSA is responsible for the procurement, installation, and maintenance of explosive detection systems, including EDS and ETD, used to screen checked baggage for explosives (see figs. 1 and 2) at TSA-regulated airports.¹¹ EDS machines identify suspicious items or anomalies in checked baggage that could indicate the presence of explosives or detonation devices. At airports with EDS, EDS machines are generally employed for primary screening of checked baggage while ETD machines are used for secondary screening to help resolve questions raised by EDS screening. At airports without EDS, ETD machines are used as the primary method for screening checked baggage.

¹¹ "TSA-regulated airports" refers to all airports that implement TSA-approved security programs pursuant to 49 C.F.R. part 1542, which includes airports regularly serving air carrier operations regulated pursuant to 49 C.F.R. §§ 1544.101 and 1546.101 (what may be characterized as U.S and foreign-flagged commercial air carriers), and at which TSA performs or oversees the performance of screening activities.

Figure 1: Transportation Security Officer Removes Checked Baggage from Stand-alone EDS Machine



Source: GAO.

Figure 2: An ETD Machine Being Used to Manually Resolve a Suspect Item

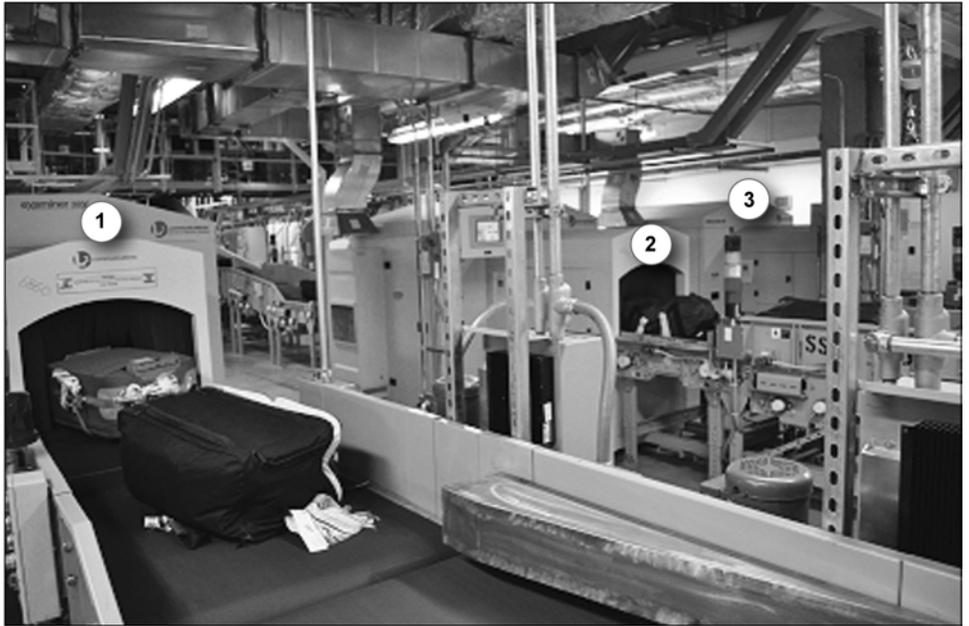


Source: GAO.

TSA deploys EDS machines in stand-alone and in-line configurations. In a stand-alone configuration, checked baggage is manually loaded and unloaded by screeners (see fig. 1).¹² In contrast, an in-line configuration integrates EDS machines with a baggage handling system—a conveyor system that transports and sorts baggage from the ticket counter through the baggage screening system. (See fig. 3, which shows an in-line configuration with three EDS machines.)

¹² The term screeners refers to both transportation security officers, who are TSA employees, and to private sector screeners employed by companies under contract to TSA and who carry out the screening function with TSA oversight at airports participating in TSA's Screening Partnership Program. See 49 U.S.C. §§ 44901(a), 44920.

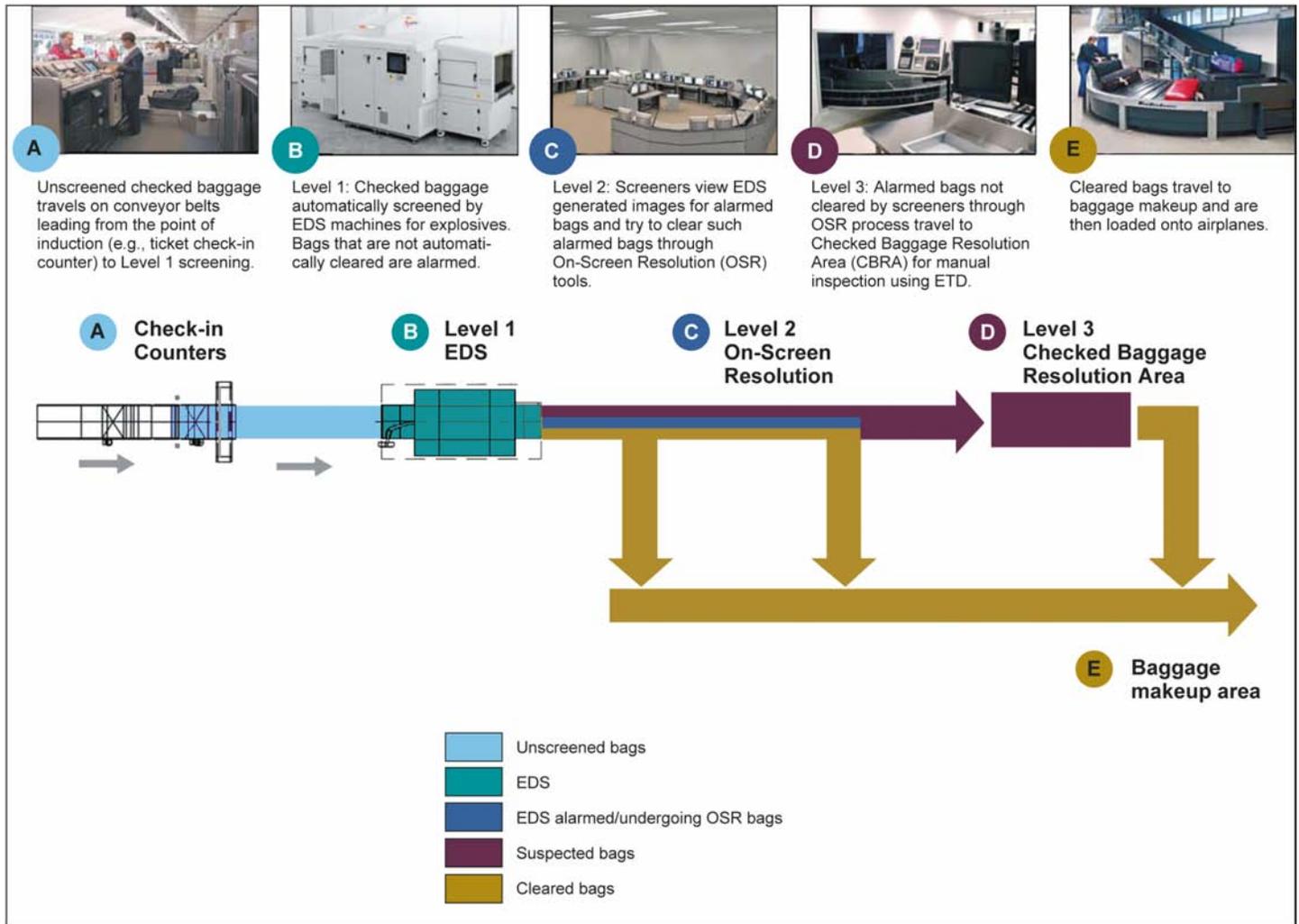
Figure 3: A Checked Baggage Inspection System That Includes a Baggage Handling System with Three In-line EDS Machines



Source: GAO.

Generally, an in-line checked baggage inspection system employs three levels of screening (see fig. 4). EDS machines perform automated (Level 1) screening. If the EDS machine is unable to clear a bag, it sends an alarm to a screener who performs a secondary (Level 2) inspection known as On-Screen Resolution by reviewing an image of the contents of the bag via computer monitor. If the screener cannot resolve the alarm using on-screen resolution tools, the bag goes to the Checked Baggage Resolution Area (Level 3) where another screener will perform manual inspection of the bag assisted by an ETD machine.

Figure 4: A Diagram of a Checked Baggage Inspection System and Three Levels of Screening



Source: TSA.

TSA officials stated that deployment of an integrated, centralized in-line system of EDS machines can enhance security, increase screening efficiencies, and lower screening costs by, among other things, reducing the number of screeners needed to conduct baggage screening and reducing work-related injuries caused by lifting heavy bags. Installing an in-line system can require modification of an airport terminal, including removal of the existing system, installation of a new baggage handling system and EDS machines, and the use of an interim solution to screen

checked baggage while the in-line system is built. TSA estimates that depending on the size and complexity of an in-line project, installing an in-line system can take one to four years at larger (category X and I) airports.

In 2005, we reported that although TSA made substantial progress in installing EDS machines, the agency had not conducted a systematic, prospective analysis to determine which airports could achieve long-term savings and improve efficiencies and security by installing in-line systems or, where in-line systems may not be economically justifiable, by making greater use of stand-alone EDS rather than relying on the labor-intensive and less efficient ETD screening processes.¹³ We recommended that TSA systematically evaluate baggage screening needs at airports, including identifying and prioritizing the airports where the benefits—such as cost savings of screening operations and improved security—of replacing stand-alone baggage screening machines with in-line systems are likely to exceed the costs of the systems. TSA concurred and in response released its Strategic Planning Framework in February 2006, which identified and prioritized airports based on an analysis of several factors, including security risk and the amount of estimated cost savings.

In March 2011, we reported that by continuing to replace or modify older baggage screening systems with more efficient solutions, including in-line screening systems, TSA could continue to eliminate baggage screener positions.¹⁴ TSA agreed that the deployment of more efficient systems offers potential personnel cost savings to the federal government.

In July 2011, we reported on TSA's efforts to enhance explosives detection requirements for checked baggage screening technologies and efforts to ensure that newly acquired and currently deployed explosives detection technologies meet the enhanced requirements.¹⁵ We recommended that TSA, among other things, develop a plan to ensure that new machines, as well as those machines currently deployed in

¹³ GAO, *Aviation Security: Systematic Planning Needed to Optimize the Deployment of Checked Baggage Screening Systems*, [GAO-05-365](#) (Washington, D.C.: Mar. 15, 2005).

¹⁴ [GAO-11-318SP](#).

¹⁵ GAO, *Aviation Security: TSA Has Enhanced Its Explosives Detection Requirements for Checked Baggage, but Additional Screening Actions Are Needed*, [GAO-11-740](#) (Washington, D.C.: July 11, 2011).

airports, will be operated at the levels in established requirements and we recommended that TSA develop a reliable schedule for the EBSP. DHS concurred with these recommendations and has initiated actions to implement them.

In February 2012, we reported that we continue to believe that TSA might achieve savings in screening personnel costs by continuing to replace or modify older checked baggage screening systems with more efficient solutions, including in-line screening systems, to the extent possible.¹⁶ TSA reported that since the issuance of GAO's 2011 report, it had replaced 60 stand-alone checked baggage screening machines with more efficient in-line screening systems.

Since fiscal year 2006, about \$6.8 billion has been made available to TSA for activities related to checked baggage screening (see table 1), making the EBSP one of DHS's largest acquisition programs.

Table 1: Funding Available for the EBSP for Fiscal Years 2006 to 2012

Dollars in millions								
Year	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Total
EBSP funding ^a	\$670	\$1,036	\$771	\$1,542	\$1,294	\$781	\$732	\$6,826

Source: TSA.

^aAmounts available as reported by TSA for activities related to EBSP planning, procurement, installation (including facility modification), and maintenance and utilities. These amounts do not include other related costs, such as the cost of screening personnel. Each fiscal year includes \$250 million from the Aviation Security Capital Fund (see 49 U.S.C. § 44923) as well as supplemental appropriations, including over \$700 million made available to TSA in fiscal year 2009 through the American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. at 163. Although TSA reports \$732 million in funding available for the EBSP in fiscal year 2012, the Department of Homeland Security Appropriations Act, 2012, appropriated approximately \$543 million for explosive detection systems that with the \$250 million from the Aviation Security Capital Fund, amounts to approximately \$793 million made available in fiscal year 2012. See Pub. L. No. 112-74, Div. D, 125 Stat. 786, 950-51 (2011).

Cost Share Option for Funding Airport Modifications

Following the terrorist attacks of September 11, 2001, and the enactment of ATSA, airports relied upon various sources of funding to support security-related capital improvement projects. For example, as enacted, ATSA authorized the use of Airport Improvement Program (AIP) funds for

¹⁶ GAO, *Follow-up on 2011 Report: Status of Actions Taken to Reduce Duplication, Overlap, and Fragmentation, Save Tax Dollars, and Enhance Revenue*, [GAO-12-453SP](#) (Washington, D.C.: Feb. 28, 2012).

projects to support the installation of explosive detection systems.¹⁷ Subsequently enacted statutes, such as the Vision 100—Century of Aviation Reauthorization Act (Vision 100), however, either limited or precluded the use of AIP to fund projects related to the installation of in-line systems.¹⁸ TSA, which is solely responsible for procuring and deploying equipment to screen checked baggage for explosives, also provides funding in support of related facility modifications. The Consolidated Appropriations Resolution, 2003, first authorized the use of LOIs by TSA for airport facility modification projects related to the installation of in-line baggage screening systems.¹⁹ Although not a binding commitment of federal funding, LOIs are agreements providing that TSA will reimburse airports or airlines for a specified percentage of an eligible project's cost, subject to the availability of appropriations. This in turn enables an airport to proceed with a project because the airport and any investors are aware that the agreed-upon percentage of allowable costs will likely be reimbursed. The airport or airline is responsible for its share of the total funding needed to complete the project and generally must be capable of funding the project in its entirety.

From fiscal years 2003 through 2007, TSA entered into 8 LOI agreements covering 9 airports.²⁰ Pursuant to the law then in effect, these LOI agreements provided for a 75 percent federal cost share of allowable

¹⁷ See Pub. L. No. 107-71, § 119(a)(1), 115 Stat. at 628 (amending 49 U.S.C. § 47102(3)) to authorize use of AIP funding for any required security-related activities after September 11, 2001). During fiscal years 2002 and 2003, six airports used AIP grants to fund facility modification projects related to installing in-line EDS screening processes.

¹⁸ See Pub. L. No. 108-176, §§ 142, 159(b), 117 Stat. 2490, 2503, 2510-11 (2003) (amending 49 U.S.C. § 47102(3) to limit the availability of AIP funds for security-related projects). Subsequent prohibitions on the use of AIP funds for projects related to the installation of in-line EDS machines may be found in FAA's annual appropriations statutes beginning in fiscal year 2004. See, e.g., Pub. L. No. 108-199, 118 Stat. 3, 283; Pub. L. No. 108-447, 118 Stat. 2809, 3203 (2004); and Pub. L. No. 112-55, 125 Stat. 552, 648 (2011).

¹⁹ See Pub. L. No. 108-7, § 367, 117 Stat. 11, 423-24 (2003) (authorizing TSA to enter into LOIs to replace baggage conveyor systems or to reconfigure terminal baggage areas to install explosive detection systems if the project would increase security or improve airport efficiencies without lessening security).

²⁰ TSA entered into one LOI agreement that covered Los Angeles International Airport and Ontario International Airport, both of which are operated by Los Angeles World Airports.

project costs.²¹ Beginning in fiscal year 2008 and in accordance with Vision 100, any LOI entered into by TSA was to reflect a 90 percent federal cost share.²² Since 2008, TSA has entered into 4 more LOIs at a 90 percent federal cost share. As of December 13, 2011, TSA reported that its net cumulative obligations for all 12 LOIs were \$1.46 billion. TSA also uses OTAs to support airport facility modification projects related to the installation of checked baggage screening equipment. TSA describes OTAs, which have become the primary administrative vehicles through which TSA financially supports such projects, generally as single-year reimbursable agreements (in contrast to the multiyear LOI agreements). According to TSA, OTAs take many forms and are generally not required to comply with federal laws and regulations that apply to contracts or cooperative agreements, such as the Federal Acquisitions Regulations, thus enabling the parties to negotiate provisions that are mutually agreeable. According to TSA, the federal cost share applied to OTAs may be negotiated, but since fiscal year 2008 TSA has generally followed the federal cost share applicable to LOIs. As of the end of fiscal year 2011, TSA had used at least 150 OTAs to support airport facility modifications related to the installation of in-line systems. According to TSA, these OTAs have reflected federal cost shares ranging from 50 to 100 percent. As of December 13, 2011, TSA reported that its net cumulative obligations for all OTAs were \$1.74 billion.

²¹ The 75 percent federal cost share only applied to projects at medium and large hub airports; a 90 percent federal cost share applied to projects at any other airport. See Pub. L. No. 108-7, § 367(e), 117 Stat. at 424. A “medium hub airport” is a commercial service airport with at least 0.25 percent but less than 1.0 percent of passenger boardings based on the prior calendar year, while a “large hub airport” is a commercial service airport with at least 1.0 percent of passenger boardings. 49 U.S.C. § 47102(10), (12). Small and non-hub airports are commercial service airports with at least .05 percent but less than 0.25 percent, and less than 0.05 percent of passenger boardings, respectively. § 47102 (13), (23). A “commercial service airport” is a public airport in a state that the Secretary of Transportation determines has at least 2,500 passenger boardings each year and is receiving scheduled passenger aircraft service. See § 47102(7).

²² See 49 U.S.C. § 44923(e) (providing that the federal share for projects at medium or large hub airports would be 90 percent and 95 percent for projects at any other airports). Notwithstanding Vision 100, which was enacted in December 2003, the fiscal years 2005 through 2007 DHS appropriations acts maintained the 75 percent federal cost share for projects under any LOI. See, e.g., Pub. L. No. 109-295, 120 Stat. 1355, 1362-63 (2006).

TSA Has Made Progress in Deploying Optimal Checked Baggage Screening

TSA Has Collaborated with Airports to Install Optimal Baggage Screening Systems at 76 Percent of TSA-Regulated Airports

TSA reports that 337 of 446 airports (76 percent) the agency regulates for security have optimal baggage screening systems. The remaining 109 of 446 airports (24 percent) do not yet have optimal baggage screening systems in all screening areas.²³ To be considered an airport with an optimal baggage screening system, as TSA considers it and as we define it for purposes of this report, an airport must have completed installation and activation of the in-line or stand-alone systems that best fits the airport's screening needs without relying on temporary stand-alone systems.²⁴ Thus, an airport with an optimal baggage screening system may have a mix of explosive detection systems (EDS or ETD) and configurations (in-line or stand-alone systems), depending on the airport's needs. TSA officials told us that they plan to deploy equipment for an additional 201 in-line systems in the future, which will include the

²³ Airports that do not have optimal solutions in place include those with in-line systems under construction and that are not yet screening checked baggage, and those that, for example, continue to rely on temporary stand-alone technology in the lobby. According to TSA, all TSA-regulated airports, regardless of whether they have an optimal solution, remain capable of screening 100 percent of checked baggage for explosives using EDS or ETD machines.

²⁴ According to TSA officials, although an airport will not be considered as having an optimal baggage screening system if it relies on temporary stand-alone systems for screening checked baggage, some exceptions exist. For example, temporary stand-alone systems could be installed at airports for testing, special events, or other needs, without affecting the airport's status related to having an optimal baggage screening system.

purchase of an estimated 685 new EDS machines for installation at airports that are not screening with optimal configurations.²⁵

TSA aims to complete its efforts to deploy optimal screening systems by using EDS machines as the primary means for screening checked baggage at all category X, I, II, and III airports while continuing to use ETD machines as the primary means at category IV airports.²⁶

Additionally, TSA plans to deploy EDS machines in in-line configurations at all category X and I airports and in-line or stand-alone configurations at category II and III airports. At each of the 10 airports we visited, we observed distinct checked baggage screening needs, based on an airport's terminal configuration and the number of passenger boardings. We discussed an airport's willingness and financial ability to pay for facility modifications required to install in-line systems. For each of these airports, officials and engineers provided documentation (for example, drawings and blueprints) on distinct facility modification projects to accommodate baggage screening system upgrades. According to airport officials, TSA and airport officials work together to determine the most appropriate baggage screening configuration based on an airport's needs. Of the 337 airports where baggage screening systems are optimal and no longer using temporary solutions, 55 airports use EDS in-line systems exclusively for their primary checked baggage screening needs, while 92 airports use EDS stand-alone machines only, and 167 use ETD systems exclusively. The remaining 23 airports have a mix of systems.²⁷

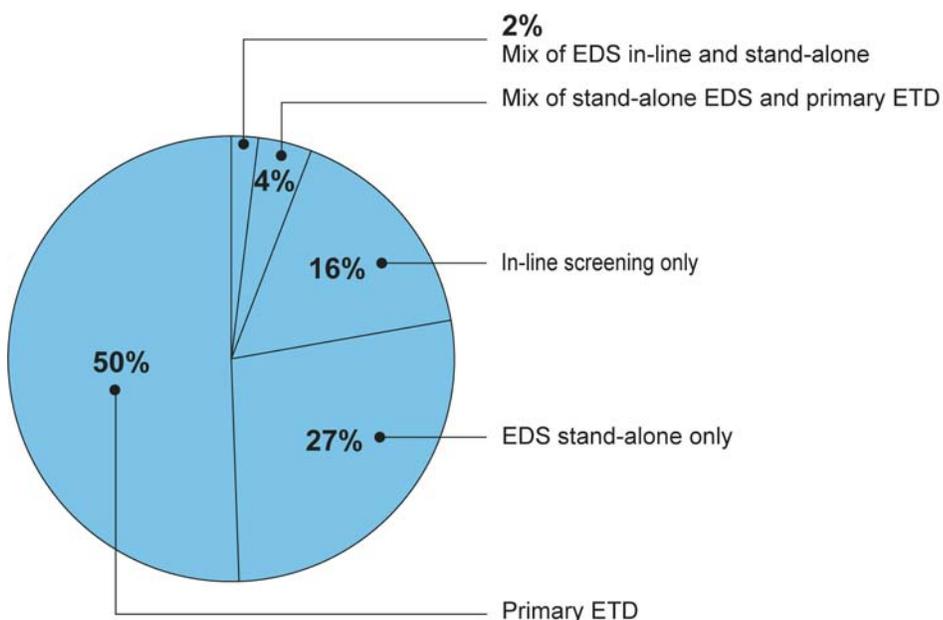
²⁵ Data are based on the most current numbers available as of December 2011. TSA officials told us that the accuracy of this estimate at any given time depends on an airport's willingness and financial readiness. Additionally, TSA officials stated that this estimate is based on several assumptions and constraints that may affect the number of new in-line systems deployed in the future, including (1) number of new terminals, terminal renovations, or other capital projects at airports; (2) changing cost assumptions; and (3) if an airport is added to, removed from, or changed on the list of TSA-regulated airports. As of December 2011, TSA had installed 1,933 stand-alone EDS machines, 4,819 ETD machines, and 261 in-line systems among the 446 TSA-regulated airports (see app. II for further details).

²⁶ TSA has a goal of deploying EDS machines for primary screening at all category X, I, II, and III airports with a minimum peak throughput of 1,500 bags per week. Where this throughput requirement is not met, primary ETD screening is more cost effective and will be allowed. Currently, as shown in app. II, table 4, 30 category III airports have ETD machines for their primary baggage screening, while 20 category IV airports have some form of EDS screening.

²⁷ Data are based on the most current numbers available as of December 2011. Airports that use EDS machines also use ETD machines to assist in resolving alarmed bags.

See figure 5 for additional details on airport screening configurations. Also, see appendix II for more details on the status of efforts to optimize checked baggage screening systems.

Figure 5: Baggage Screening Configurations at the 337 Airports with Optimal Systems



Source: GAO analysis of TSA data.

Note: Percentages do not add to 100 percent because of rounding.

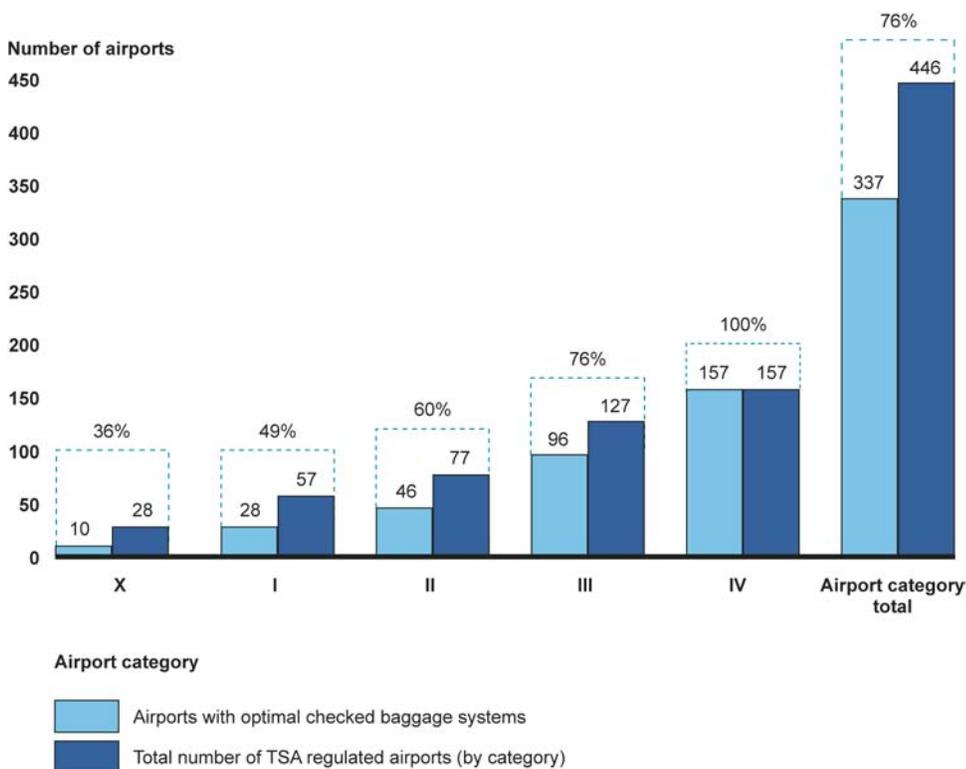
Of the 337 airports with optimal baggage screening systems, larger airports were less likely to have completed optimal solutions than smaller airports.²⁸ Specifically, 36 percent (10 of 28) of the category X airports and 49 percent (28 of 57) of the category I airports were considered to have optimal solutions, whereas 60 percent (46 of 77) of the category II airports, 76 percent (96 of 127) of the category III airports, and all of the 157 of the category IV airports were considered to be optimally configured, as shown in figure 6.²⁹ According to TSA and airport officials,

²⁸ Data are based on the most current numbers available as of December 2011. TSA also tracks airports that have begun installing optimal systems but whose systems are not yet complete.

²⁹ In addition to the 10 category X airports with optimal systems in all screening areas, TSA reports that 15 others have optimal systems in some screening areas.

this is because the larger airports generally need to install more complex in-line systems, which are more time and resource intensive to install and often require a significant amount of airport infrastructure modification and construction, while the smaller airports, particularly the category IV airports that rely on the smaller ETD machines, require far less time and resources to install these systems. Moreover, TSA officials stated that the in-line systems that best meet the screening needs of larger airports take longer to plan and build because of the added complexity and scale of the upgrades and the coordination required among multiple stakeholders.

Figure 6: Number of Airports with Optimal Baggage Screening Systems Compared to All TSA-Regulated Airports



Source: GAO analysis of TSA data.

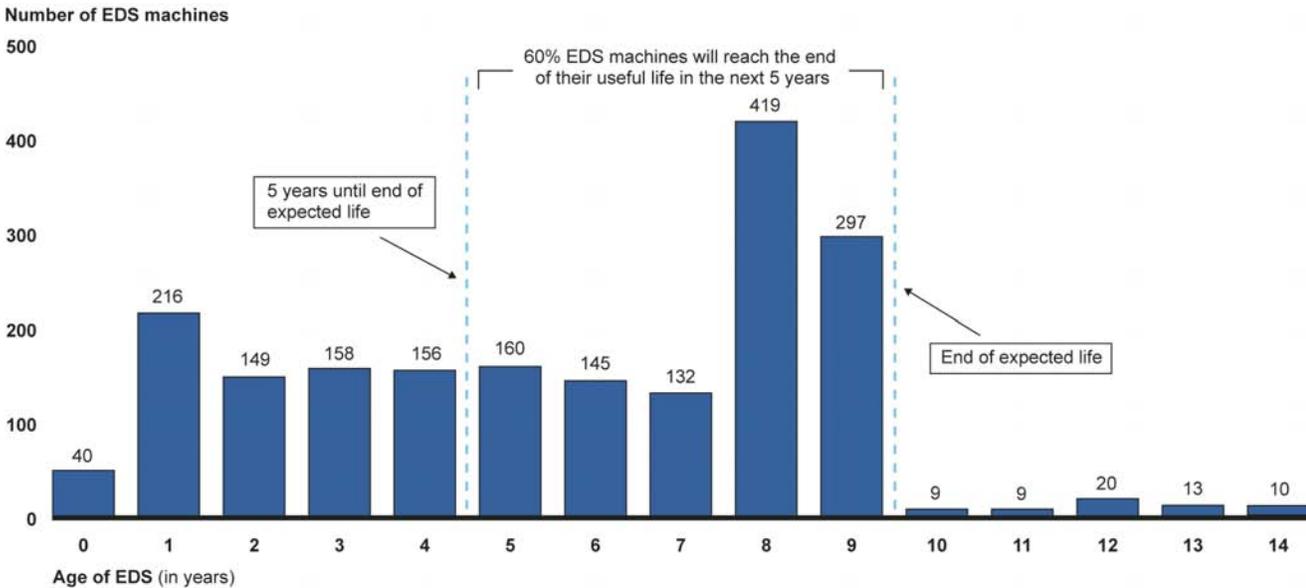
TSA Has Shifted Its Focus to Replacing Aging Machines

TSA anticipates that in the next 5 years about 60 percent (1,153 of 1,933) of the EDS machines will reach the end of their useful life of about 10 years and will need to be replaced, as shown in figure 7.³⁰ As a result, to ensure that 100 percent of checked bags continue to be screened as required by ATSA, TSA revised its focus from replacing stand-alone EDS in airport lobbies with in-line systems to replacing its aging fleet of EDS and ETD machines, a process it calls recapitalization. However, TSA reported that it will continue to collaborate with airports or airlines to install optimal in-line systems if it coincides with efforts to recapitalize aging EDS machines or if the existing in-line systems do not meet current TSA standards. In August 2011, TSA issued its *EDS and ETD Recapitalization and Optimization Plan*, which establishes the method and criteria for prioritizing when and how EBSP recapitalization and optimization will occur. The plan notes that many in-line recapitalization projects will include an optimization component. For example, a number of early in-line screening systems are likely to require optimization, among other things, to improve performance, increase efficiency, and reduce operating costs. At one airport we visited with an early in-line system, we observed a baggage handling system that needed to be replaced because it had sharp curves and steep grades that led to an excessive number of errors and jams.³¹ The airport was involved in TSA's recapitalization pilot program, and airport officials anticipated TSA supporting the optimization of this system as part of recapitalization.

³⁰ Data are based on the most current numbers available as of December 2011. In addition to age, TSA considers a variety of factors to decide which machines to replace first, such as repair rate and downtime.

³¹ TSA is also replacing and modernizing aging ETD machines at all TSA-regulated airports. TSA's *EDS and ETD Recapitalization and Optimization Plan* notes that because of the significant number of ETDs deployed during the initial TSA rollout in 2002 and 2003, many of those units have reached or will exceed the 8 years of service in fiscal years 2010 and 2011 and are now due to be recapitalized. According to the recapitalization plan, because of the high volume, it was not possible to recapitalize all the ETDs at the 8-year mark in 2010 and 2011. As necessary, TSA will focus on replacing poorly performing units first.

Figure 7: Age and Number of Deployed EDS Machines as of December 2011



Source: TSA.

Reducing the Federal Cost Share for Eligible Airport Facility Modification Projects Could Reduce TSA's Costs

Reducing the Federal Cost Share

Consistent with current law, TSA enters into reimbursable agreements through which it generally funds 90 percent of the cost of an eligible airport facility modification project to support the installation of an optimal system, with an airport or airline funding the remaining 10 percent of the

project's cost.³² If the federal cost share for airport facility modification projects is reduced, TSA may be able to use available funding to install a greater number of optimal solutions than currently anticipated. From fiscal year 2003 through fiscal year 2007, in accordance with law then in effect, TSA entered into LOIs at a 75 percent federal cost share.³³ Looking forward, we used TSA's projections of airport modification costs for each fiscal year, 2012 through 2030, as presented in its latest LCCE, and estimated the amount of expenditures for airport modifications that could be shifted from TSA to airports if the federal government's cost share were reduced from the current 90 percent to 75 percent. As discussed later in this report, we found that TSA's LCCE data are of questionable reliability for a precise estimate. However, the data can serve to provide a rough indication of how much TSA could save if the cost share were adjusted. Thus, we estimate that if the federal cost share for such projects returned to the 75 percent TSA applied to many of the reimbursable agreements it entered into prior to fiscal year 2008, rather than the current federal share of 90 percent, TSA's anticipated expenditures for these modifications would be roughly \$300 million less through fiscal year 2030.³⁴

TSA had previously determined that assigning costs among industry stakeholders and the nation as a whole is difficult because operational

³² TSA uses LOIs and OTAs to support facility modification projects related to checked baggage screening. In general, LOIs are multiyear but nonbinding agreements through which TSA agrees, subject to the availability of appropriations, to reimburse an airport or other responsible party for a percentage of allowable airport facility modification costs. See 49 U.S.C. § 44923(d). OTAs, as described by TSA, are generally single-year reimbursable agreements used by TSA to fund airport facility modification projects without the long-term commitment associated with LOIs.

³³ TSA has used OTAs more regularly than LOIs to fund such projects. TSA is able to negotiate OTA cost shares, and has used cost shares as low as 50 percent and as high as 100 percent. TSA began implementing a business practice in fiscal year 2008 that applies the same cost share rates to OTAs as are statutorily required for LOIs.

³⁴ Based on the level of modification costs currently projected in TSA's LCCE estimate, we calculated that TSA could save \$339 million through fiscal year 2030. To estimate the decrease in TSA's payments for airport modification costs (and the corresponding increase in those costs paid by airports and, in a few cases, airlines), we totaled the airport modification costs for the life of the program, fiscal years 2012 through 2030, as identified in TSA's LCCE. We then estimated what TSA's expenditures would be if it pays 75 percent of these costs. All estimates are in 2011 dollars, based on the discount rate (3.9 percent) that TSA applied in its September 2011 analysis of alternatives submission to the Office of Management and Budget (OMB).

improvements to the baggage handling systems and national security benefits are difficult to quantify. This, in turn, makes it difficult to develop a cost share formula that would allow TSA to allocate costs in proportion to benefits. Consistent with the Intelligence Reform and Terrorism Prevention Act of 2004, TSA commissioned the 2006 Baggage Screening Investment Study Working Group to prepare a report for the Aviation Security Advisory Committee, which examined what an appropriate federal government/airport cost share should be for the installation of checked baggage screening equipment.³⁵ The working group, which consisted of over 60 members representing, among others, TSA, FAA, airports, airlines, designers of baggage handling systems, and financial institutions, were unable to develop a consensus on an appropriate cost share formula, in large part because of the difficulties of measuring benefits, differing views on the federal responsibility for funding capital investments related to baggage screening, and the competing demands on the federal budget. As a result, potential cost share options were not submitted to the Congress as part of DHS's fiscal year 2006 budget submission.

Airport Officials Acknowledge Benefits from In-line Systems but Oppose Increasing Their Cost Share

Representatives of all 10 airports we visited told us that they benefit from the installation of integrated, in-line baggage screening systems. Specifically,

- officials from 9 of the 10 airports cited the reduction of passenger congestion in airport terminals because stand-alone EDS machines were removed from the lobby or ticketing areas,
- officials from half of the airports noted that in-line systems reduce the number of lost or stolen bags by creating a streamlined process for moving checked baggage directly from where baggage is checked by the passenger and airline to the aircraft, and
- officials from 3 of 10 airports noted that in-line systems facilitate airport growth.

³⁵ See Pub. L. No. 108-458, § 4019(d), 118 Stat. 3638, 3722 (2004). The Aviation Security Advisory Committee is composed of private sector organizations representing key constituencies affected by aviation security requirements, including, among others, law enforcement, aviation consumer groups, airport operators, airline management, airline labor, and airline security equipment manufacturers. Its mission is to examine areas of civil aviation security as tasked by TSA with the aim of developing recommendations for improving civil aviation security methods, equipment, and procedures.

However, for various reasons, officials representing 8 of the 10 airports opposed a reduction in the federal cost share that would increase airports' share of modifications costs.³⁶ Specifically, officials from half of the airports stated the following four concerns:

- Assuming a larger share of airport modification costs would pose hardships because of current fiscal or funding constraints.
- Airports incur additional (that is, nonallowable) costs that are necessary to building an in-line system, but which TSA will not reimburse. Examples of the nonallowable costs the airports cited include the costs of designing an in-line system and constructing rooms in which screeners manually screen bags that have not previously been cleared.³⁷ As a result, officials from 5 of the 10 airports we spoke with told us that after necessary, but nonallowable, costs were included, the airports were already paying for more than 10 percent of the modification costs associated with in-line systems.³⁸
- Airports have a backlog of capital projects or would rather fund projects that will produce additional revenue, such as parking garages or larger areas for concessions, than projects that are related to TSA's security responsibilities.
- TSA will be the primary beneficiary of in-line baggage screening systems because the integration and consolidation of these systems will enable TSA to reduce the number of baggage screeners and provide TSA with other operational efficiencies.

³⁶ Two airports had no comments.

³⁷ TSA's guidance to project sponsors has been evolving. As explained in TSA's *Planning Guidelines and Design Standards for Checked Baggage Inspection Systems*, v. 4.1, app. F, TSA will provide reimbursement for up to the agreed-upon percentage of allowable costs; the document also lists the reimbursable and nonreimbursable costs. For example, TSA does not reimburse costs associated with the building shell or exterior enclosure. TSA does not reimburse the cost of construction of terminal expansions, whether necessary to support TSA operations or for other purposes. TSA also does not support costs related to the construction of new or replacement terminal buildings and infrastructure unless such construction is proven to be cost-beneficial to TSA.

³⁸ TSA officials told us that provided a design OTA is in place between TSA and the airport when design commences, TSA does pay for allowable costs. However, TSA agreed that an airport's cost share for the overall project may be higher if the design includes unallowable costs or if the airport began design activities prior to having an OTA in place with TSA.

TSA's Cost Estimation Processes Do Not Fully Comply with Best Practices, and TSA and DHS Are Working Together to Establish an Acquisition Program Baseline

TSA Estimates That the EBSP Will Cost Close to \$50 Billion through 2030

TSA's August 25, 2011, life cycle cost estimate identified a total program cost for EBSP of \$49.2 billion through fiscal year 2030.³⁹ The \$49.2 billion includes \$2.65 billion for EBSP program operation and management; \$11.03 billion for capital costs, including, among other things, recapitalization and facility modifications for optimization; \$14.89 billion for operations and maintenance of equipment; \$18.42 billion for screener salaries; and \$2.22 billion for research and development and other miscellaneous related costs.⁴⁰ Additionally, TSA officials reported that the program is expected to provide life cycle cost savings of \$537 million.⁴¹ However, we found that the cost estimates are of questionable reliability for a precise estimate. TSA continues to revise its life cycle cost estimates. For example, its August 2011 EBSP life cycle cost estimate report stated that new requirements, including recapitalization and

³⁹ Costs are in then-year dollars and include costs to the federal government, airports, and airlines.

⁴⁰ An LCCE encompasses all past (or sunk), present, and future costs for every aspect of the program, regardless of funding source. TSA officials noted that some of these costs, such as screener salaries, are EBSP related but are not paid for by the EBSP.

⁴¹ This total is based on life cycle cost savings as submitted in OMB Exhibit 300 for EBSP. TSA's EBSP net cost savings estimate is in present value dollars and based on the DHS alternative analysis presented in Exhibit 300, which was completed in August 2011 and submitted to OMB. The preferred alternative—a combination of upgrading and recapitalizing checked baggage screening equipment—was estimated to cost \$537 million less than the baseline option—an approach where no additional investment is made in optimized systems and equipment is recapitalized as needed.

upgrading the efficiency of early in-line systems, will likely lead to a gap between anticipated program needs and anticipated funding during fiscal years 2012 to 2017, totaling up to \$436 million. However, in December 2011 TSA officials told us the DHS Acquisition Review Board had requested that TSA revise the EBSP funding plans and projections to more accurately reflect current budget constraints and reduced funding available for the program.⁴² According to TSA officials, they plan to complete the revised EBSP planning estimates and funding projections to help eliminate the potential funding gap before the next Acquisition Review Board meeting in May 2012. EBSP senior program officials explained that TSA will address the potential funding gap by (1) controlling the costs associated with engineering initiatives and improvements in technology performance, (2) delaying funding of some new in-line systems and recapitalization projects, and (3) extending the useful life of equipment beyond 10 years in cases where replacement could be delayed.

TSA's Life Cycle Cost Estimates Are Not Fully Consistent with Best Practices for Reliable and Credible Estimates

Although TSA's methods for developing its LCCE reflect features of best practices, its methods do not fully adhere to these practices. As highlighted in our past work, a high-quality, reliable cost estimation process provides a sound basis for making accurate and well-informed decisions about resource investments, budgets, assessments of progress, and accountability for results and thus is critical to the success of a program.⁴³ According to the Office of Management and Budget (OMB), federal agencies must maintain current and well-documented estimates of program costs, and these estimates must encompass the program's full life cycle.⁴⁴ Without such an estimate, agencies are at increased risk of making poorly informed investment decisions, securing

⁴² The Acquisition Review Board reviews provide an opportunity to determine a program's readiness to proceed to the next life cycle phase. The directive also requires the Acquisition Review Board chairperson to approve key acquisition documents critical to establishing the program, operational requirements, acquisition baseline, and document testing and support plans.

⁴³ See [GAO-09-3SP](#).

⁴⁴ OMB Circular No. A-11, *Preparation, Submission, and Execution of the Budget*; (August 2011); OMB Circular No. A-130 Revised, *Management of Federal Information Resources* (August 2000); and OMB, *Capital Programming Guide: Supplement to Office of Management and Budget Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets* (Washington, D.C.: August 2011).

insufficient resources to effectively execute defined program plans and schedules, and experiencing program cost and schedule overruns and performance shortfalls. As highlighted in our *Cost Estimating and Assessment Guide*, a reliable cost estimate has four characteristics—it is comprehensive, well documented, accurate, and credible. We reviewed TSA’s cost estimation procedures for the EBSP and assessed the extent to which the agency met the four characteristics, as shown in table 2.

Table 2: GAO’s Assessment of TSA’s Method for Developing EBSP Life Cycle Cost Estimates

Characteristic	Description	Overall assessment ^a
Comprehensive	A comprehensive cost estimate should include all government and contractor costs over the program’s full life cycle, provide sufficient detail to ensure that the cost elements are neither omitted nor double counted, and document all cost-influencing ground rules and assumptions.	Partially met
Well documented	A well-documented cost estimate should capture in writing such things as the source and significance of the data used, the calculations performed and their results, and the rationale for choosing a particular estimating method or reference. A well-documented estimate can be easily reconstructed by an outside source and should be reviewed and accepted by management.	Partially met
Accurate	An accurate cost estimate should be, among other things, based on historical data reflecting most likely costs, adjusted properly for inflation, and validated against an independent cost estimate. An accurate estimate should be updated regularly to reflect material changes in the program and actual cost experience on the program, and steps should be taken to minimize mathematical mistakes.	Partially met
Credible	A credible cost estimate should discuss any limitations in the analysis caused by uncertainty or biases surrounding the data and assumptions. Major assumptions should be varied and other outcomes computed to determine how sensitive the estimate is to changes in the assumptions. Risk and uncertainty inherent in the estimate should be assessed and disclosed.	Minimally met

Source: GAO analysis based on the *GAO Cost Estimating and Assessment Guide*.

^aWe defined a characteristic as not met if the agency provided no evidence that satisfied any portion of the criterion, minimally met if the agency provided evidence that satisfied less than one-half of the criterion, partially met if the agency provided evidence that satisfied about one-half of the criterion, substantially met if the agency provided evidence that satisfied more than one-half of the criterion, and met if the agency provided complete evidence that satisfied the entire criterion.

Our assessment showed that TSA’s EBSP estimates partially met three characteristics and minimally met one characteristic of a reliable cost estimate. Specifically, TSA’s cost estimate was as follows:

- **Partially comprehensive** because the estimate defines the program, reflects the current schedule, is technically reasonable, includes assumptions identified by a team of personnel and engineers, and provides risks related to detection standards. However, the cost estimate is not considered fully comprehensive because it does not incorporate costs associated with all security threats, lacks a detailed

product-oriented work breakdown structure that covers the entire scope of work, and lacks a single technical baseline. Without fully accounting for life cycle costs, management may have difficulty successfully planning program resource requirements and making wise decisions. Further, the program lacks a defined end date. A reasonable criterion is that the estimate capture at least 10 years of costs beyond the planned full operational capability date—the date at which optimal systems are fully deployed and operating at all locations. However, we cannot determine whether the time frame is sufficient because we have not received documentation to support the program’s official, planned full operational capability date. According to TSA, the EBSP does not have a defined end date for procurement because maintaining compliance with the 100 percent screening mandate established by ATSA requires TSA to continuously procure and replace equipment as it reaches the end of its useful life. TSA also believes that it is following DHS acquisition guidance outlined under the acquisition decision memorandum dated January 13, 2005, for estimating threshold dates. Nevertheless, the EBSP still lacks a defined, official full operational capability date, without which we can neither determine whether the time frame used in the LCCE is sufficient nor verify that the life cycle cost estimate is fully comprehensive.

- **Partially documented** because TSA used relevant data to help develop the estimate. For example, TSA’s estimated price for the equipment is based on existing contracts for EBSP equipment purchases, maintenance costs, LOI agreements, and OTAs. TSA also provided narratives, briefings, and documents to describe the program requirements, purpose, technical characteristics, and acquisition strategy, and explained how calculations were performed. However, TSA did not adequately document many assumptions or methodologies underlying its cost model to the extent that would allow someone unfamiliar with the cost estimate, using only the available documentation, to easily re-create the estimate. For example, equipment purchase and hardware upgrade costs were based in part on estimates from engineers and contract specialists rather than historical or analogous data. Unless ground rules and assumptions are clearly documented, the cost estimate will not have a basis for areas of potential risk to be resolved. In addition, TSA also provided little or no evidence that the assumptions and methodologies

underlying the cost estimate were approved by management.⁴⁵ TSA officials agreed that additional documentation could improve the outside reviewers' ability to evaluate the estimate. According to TSA, the EBSP plans to follow DHS guidance to implement software dedicated to the estimation, documentation, and reporting of costs during all phases of the EBSP program life cycle to help address documentation concerns.

- **Partially accurate** because while the estimate is properly adjusted for inflation, differences between planned and actual costs are not fully documented, explained, or reviewed. In addition, we cannot determine whether the cost estimate is unbiased—that is, neither overly conservative nor overly optimistic—because the program did not perform an uncertainty analysis that meets best practices. While TSA agreed that costs should be documented, it could not explain why the differences between planned and actual costs were not being fully documented, explained, or reviewed.
- **Minimally credible** because while TSA identified changes in cost for each scenario against the baseline and developed a limited risk analysis, TSA did not complete other relevant activities to ensure that the estimate accounts for bias and uncertainty. For example, the agency did not (1) document in detail the assumptions and parameters associated with its sensitivity analysis, such as detailed calculations on how each parameter was varied between its minimum and maximum values; (2) conduct a fully objective uncertainty analysis that derives the point estimate percentile rather than assumes it; (3) cross-check major cost elements to see whether results are similar; and (4) use an independent cost estimate to validate the cost estimate. Given the important role that an independent cost estimate provides in developing an objective and unbiased assessment of whether the program estimate can be achieved, developing and using an independent cost estimate would provide decision makers with insight into a program's potential costs and reduce the risk of underfunding a program. TSA officials told us they did not perform a complete uncertainty analysis because it was too costly and time consuming. TSA officials concurred that an independent cost estimate was not done for the EBSP and agreed that completing an independent estimate would be helpful.

⁴⁵ Among other things, TSA presented no evidence that a formal overview of the program's technical foundation, time-phased life cycle cost estimate, ground rules and assumptions, estimating methodology, sensitivity analysis, or risk and uncertainty analysis were presented to and reviewed by management.

Regarding the credibility of TSA's estimates, our past work has shown that program cost estimates that are independently validated help improve the confidence that the estimate is credible, are needed for making timely and informed budget decisions, and help reduce the likelihood of unanticipated program cost growth.⁴⁶ Our prior reviews of several DHS programs, including the EBSP, have also shown that if cost estimates are not validated in accordance with DHS acquisition management directive requirements at the start of an acquisition program, it is difficult to assess whether a program is being deployed within planned budgets.⁴⁷ Further, DHS's Acquisition Management Directive requires major program cost estimates to be validated early in the decision-making process, before programs can receive authorization for acquisition contracts at the DHS Acquisition Review Board meeting.⁴⁸ However, we found that since 2008 the DHS Acquisition Review Board allowed the EBSP to proceed with acquisition contracts before the LCCE was independently validated by DHS, which is inconsistent with DHS policy.⁴⁹

In May 2010, the DHS Cost Analysis Division reviewed the EBSP life cycle cost estimate and found that it needed more comprehensive data and that its accuracy could not be determined. As of December 2011, the

⁴⁶ An independent cost estimate is a comparison with the program estimate to determine whether it is accurate and realistic. According to our best practices, independent cost estimates that are validated are generally conducted by an organization outside the acquisition chain, using the same detailed technical information as the program estimate. See [GAO-09-3SP](#).

⁴⁷ In addition, we previously reported that the EBSP faced recurring programwide costs in excess of the budget, and that program costs could grow significantly as cost estimates are revised to include new requirements. [GAO-10-588SP](#).

⁴⁸ DHS Acquisition Management Directive 102-01, and *DHS Acquisition Instruction/Guidebook*, 102-01-001 (2008). Specifically, according to DHS guidance, cycle cost estimates are required to be validated before programs are approved for acquisition.

⁴⁹ According to DHS, the Director, Cost Analysis Division, located in the Office of the Chief Procurement Officer, serves as the focal point within DHS for cost analysis and estimating policy, process, and procedure. In November 2011, DHS officials stated that the Cost Analysis Division was reorganized and split into the Program Support and Risk Analysis Division. According to DHS officials, the process for the future oversight of cost estimates is unclear and is likely to be performed by the newly established Risk Analysis Division, which will include some key Cost Analysis Division staff. While DHS officials supported the former Cost Analysis Division's positive assessment of the EBSP life cycle cost estimates, they also stated that DHS never completed a comprehensive independent cost estimate for the EBSP.

estimate had not been independently validated by DHS.⁵⁰ According to TSA, DHS guidance that required validation of cost estimates was not in place until November 2008. The interim DHS directive for LCCEs and validation was established in November 2008, and the Cost Analysis Division was designated the authority responsible for independent cost estimates on January 24, 2010. However, the DHS Acquisition Review Board did not request a validated LCCE until February 25, 2011. TSA officials also stated that since the program's budget circumstances changed over time, the cost estimate needed to be revised to reflect a constrained budget for fiscal year 2013 and other program changes. For example, TSA officials stated that new requirements for the EBSP, particularly the shift in focus to recapitalization of the aging EDS and ETD fleet and upgrades to in-line baggage screening systems and threat detection levels, contributed to continued program cost growth and delayed efforts to validate the latest LCCEs. As a result, the federal government's portion of the cost estimates for the EBSP has increased from approximately \$20.5 billion in fiscal year 2010 to \$25.4 billion in fiscal year 2011—a 24 percent increase.⁵¹ TSA is currently working with DHS on the validation of the cost estimate for the next Acquisition Review Board meeting scheduled for May 2012.

According to our 2009 *Cost Estimating and Assessment Guide*, endorsed by the OMB and DHS, cost estimates are integral to determining and communicating a realistic view of likely cost outcomes that can be used to plan the work necessary to develop, produce, and support a program.⁵² Taking steps to ensure that its cost estimates for the EBSP conform to cost estimating best practices will help provide TSA with a sound basis for understanding how the program can be sustained in future years.

⁵⁰ The DHS guidance uses information in our *GAO Cost Estimating and Assessment Guide* as criteria to define a valid estimate as one that is well documented, comprehensive, accurate, and credible. DHS policy explains that cost estimates should be validated to ensure that the single best estimate is provided for all resources required to develop, acquire, field, sustain, and dispose of required capability over the program's life cycle. According to DHS officials, a validated LCCE is one that is approved and reviewed by the former DHS Cost Analysis Division.

⁵¹ This amount is in then-year dollars in billions. These estimates are based on annual submissions to OMB (DHS Exhibit 300). These cost estimates represent only the historical and projected life cycle costs to the federal government for the EBSP, whereas the complete life cycle cost estimate of \$49.2 billion includes significant additional costs for screener salaries, as well as the costs to industry.

⁵² [GAO-09-3SP](#).

TSA and DHS Are Working to Develop an EBSP Acquisition Program Baseline

Another foundation for making informed budget decisions is the acquisition program baseline, which is to document a program's critical cost elements, including acquisition costs and life cycle costs. According to DHS's acquisition guidance, the program baseline is the contract between the program and departmental oversight officials and must be established at program start to document the program's expected cost, deployment schedule, and technical performance. Establishing such a baseline at program start is important for defining the program's scope, assessing whether all life cycle costs are properly calculated, and measuring how well the program is meeting its goals. As we have previously reported, establishing realistic original baseline estimates is important for minimizing the risks of poorly defined requirements and achieving better program outcomes.⁵³ By tracking and measuring actual program performance against this formal baseline, management can be alerted to potential problems, such as cost growth or changing requirements, and has the ability to take early corrective action.⁵⁴

However, since the inception of the program more than eight years ago, the EBSP has not had a DHS approved acquisition program baseline and DHS did not require TSA to complete an acquisition program baseline until November 2008. An approved baseline will provide DHS with additional assurances that TSA's approach is appropriate and that the capabilities being pursued are worth the expected costs. DHS officials told us that several reorganizations of DHS offices responsible for approving the baseline and a lack of functional expertise within the agency contributed to further delays in approving the EBSP acquisition program baseline. According to TSA officials, they have twice submitted an acquisition program baseline to DHS for approval. In November 2009 and February 2011, TSA requested approval of a program baseline, but according to DHS officials TSA did not have a fully developed life cycle cost estimate. In November 2011, DHS told TSA that it needed to revise the life cycle cost estimates as well as its procurement and deployment schedules to reflect budget constraints. DHS officials told us that they could not approve the acquisition program baseline as written because

⁵³ [GAO-10-588SP](#).

⁵⁴ According to DHS Acquisition Management Directive 102-01, the baseline requirements must also include a threshold value that is the minimum acceptable value that in the user's judgment, is necessary to satisfy the need. Failure to achieve a threshold would require creating a new baseline or termination of the program. For more information, see [GAO-10-588SP](#).

TSA's estimates were significantly over budget. TSA officials stated that TSA is currently working with DHS to amend the draft program baseline for approval. TSA officials stated that they plan to resubmit the revised acquisition program baseline before the next Acquisition Review Board meeting in May 2012. Establishing and approving a program baseline, as DHS and TSA currently plan to do for the EBSP, could help DHS assess the program's progress in meeting its goals and achieve better program outcomes.

Conclusions

TSA's EBSP is aimed at increasing airport screening efficiencies and addressing the continuing threat of explosives concealed in checked baggage, at a total estimated cost to the federal government and the private sector of close to \$50 billion through fiscal year 2030.⁵⁵ Given the size of the federal investment, it is vital that TSA ensures effective stewardship over these resources and conveys useful information to the Congress about the scope and cost of the program. However, the limitations we identified in TSA's EBSP cost estimates raise questions about their reliability. Taking steps to ensure that its cost estimates meet the four characteristics for high-quality and reliable cost estimates would provide TSA with increased assurance about the reliability of the estimated total cost of the program and better position it to account for all resources and associated costs required to develop, implement, and sustain the EBSP.

Recommendation for Executive Action

In order to strengthen the credibility, comprehensiveness, and reliability of TSA's cost estimates and related savings estimates for the EBSP, we recommend that the Administrator of TSA ensure that its life cycle cost estimates conform to cost estimating best practices.

Agency Comments and Our Evaluation

On March 30, 2012, we provided a draft of this report to DHS for its review and comment. DHS provided written comments on April 19, 2012, which are reprinted in appendix IV. In its written comments, DHS concurred with our recommendation that TSA ensure that its life cycle

⁵⁵ This includes \$2.65 billion for EBSP operation and management; \$11.03 billion for capital costs, including, among other things, recapitalization and facility modifications for optimization; \$14.89 billion for operations and maintenance of equipment; \$18.42 billion for screener salaries; and \$2.22 billion for miscellaneous related costs.

cost estimates conform to cost estimating best practices and discussed efforts under way to address it. DHS further acknowledged the importance of producing life cycle cost estimates that are comprehensive, well documented, accurate, and credible so that they can be used to support DHS funding and budget decisions. DHS also noted that after conducting an internal review, TSA is implementing a management directive that applies DHS guidance and the best practices from the *GAO Cost Estimating and Assessment Guide*. As part of this effort, TSA is (1) establishing a working group and executive board to review program cost estimates to validate whether the estimates are credible and affordable, (2) requiring all life cycle cost estimates to be approved by DHS to ensure consistency and quality across TSA programs, (3) purchasing and training its employees on specialized cost estimating software, and (4) initiating hiring actions to hire additional cost estimating personnel. TSA believes that this will institutionalize cost estimating best practices within the organization and ultimately allow TSA and the Department to make better-informed investment decisions. These are positive steps; however, additional time will be needed to assess whether they have been fully and consistently implemented in accordance with GAO best practices.

We are sending copies of this report to the Secretary of Homeland Security, the Assistant Secretary of the Transportation Security Administration, and appropriate congressional committees. In addition, this report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-8777 or lords@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page

of this report. GAO staff who made major contributions to this report are listed in appendix V.

A handwritten signature in black ink that reads "Stephen Lord". The signature is written in a cursive style with a large, stylized initial 'S'.

Stephen M. Lord
Director
Homeland Security and Justice Issues

Appendix I: Objectives, Scope, and Methodology

We examined the Department of Homeland Security's (DHS) Transportation Security Administration's (TSA) operation of the Electronic Baggage Screening Program (EBSP) to assess the program's current status, alternative cost sharing options, and cost estimates. Specifically, we addressed the following questions:

- What is the status of TSA's efforts to install optimal checked baggage screening systems in collaboration with airports?
- How would reducing the current federal cost share for eligible airport modification projects from 90 percent to its previous level of 75 percent affect the amount that TSA pays for these modifications, and what benefits, if any, do airports report receiving from in-line baggage screening systems?
- To what extent are TSA's cost estimation procedures consistent with best practices and is TSA's acquisition baseline consistent with DHS guidance?

To determine the status of TSA's efforts to install optimal checked baggage screening systems, we obtained data as of December 2011 and January 2012 from TSA, such as the current number of airports with at least one in-line system, and the number of airports with optimal systems. We also obtained data on the number of airports configured exclusively with in-line screening, the number of airports configured with a mix in-line and stand-alone explosives detection systems (EDS), and the number of airports using only stand-alone EDS for the same time period. We also collected data on the overall number of operational in-line systems and EDS and explosives trace detection (ETD) machines as of December 2011. We reviewed documentation from TSA's EBSP, including the EBSP strategic plans for fiscal years 2006, 2008, and 2009, and the 2011 *EDS and ETD Recapitalization and Optimization Plan*.

We assessed the reliability of the various data TSA provided about airports, including the number of TSA-regulated airports (by category) and the numbers of airports with the different configurations of baggage screening systems (in-line or stand-alone), and the investment and budget expenditure dollar values in the letters of intent and other transaction agreements by questioning cognizant TSA officials and obtaining extensive documentation about these various data. We found these data to be sufficiently reliable for the purposes of our report.

To determine how reducing the federal cost share from the current 90 percent to the previous federal cost share of 75 percent for eligible airport modification projects may affect the amount that TSA pays for these

modifications, we calculated estimates based on TSA's August 2011 projections of how much airport modifications will cost in the future. These projections represent TSA's best estimate for how much it will spend on airport modifications for in-line systems each year from fiscal years 2012 through 2030. We also reviewed the reliability of the cost estimate by evaluating how well TSA followed best practices detailed in the *GAO Cost Estimating and Assessment Guide* (see below). While TSA's process for estimating costs only partially meets the characteristics of a reliable cost estimate, the data can serve to provide a rough indication of how much could be saved by reducing the federal cost share for optimization. To assess how the installation of in-line baggage handling systems may benefit the airports that receive them, we visited a nonrandom sample of 10 airports. We chose these airports based on the size of airport, type of checked baggage screening systems installed, and status of airport facility modification completion. We discussed cost share with officials at each airport representing the airport authority, tenant airlines, and TSA's Federal Security Director. In addition, we interviewed officials from the largest industry associations that represent airport executives, airports and airlines (the American Association of Airport Executives, the Airports Council International North America, and the Air Transport Association). We also interviewed an official from the Association for Airline Passenger Rights. In addition, we discussed potential benefits of optimization with aviation security experts. These results cannot be generalized to the entire industry, but did provide broader perspectives on the issues and costs associated with the EBSP.

To assess the extent to which TSA's methods for estimating costs for EBSP are consistent with best practices and its acquisition program baseline is consistent with DHS guidance, we analyzed TSA's most recent life cycle cost estimate and recapitalization report finalized in August 2011. Specifically, we used best practices in the *GAO Cost Estimating and Assessment Guide* to evaluate TSA's estimating methodologies, assumptions, and results to assess whether the official cost estimates were comprehensive (i.e., includes all costs), accurate, well documented, and credible.¹ Our *Cost Estimating and Assessment Guide* considers an estimate to be

¹ GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

- comprehensive if its level of detail ensures that all pertinent costs are included and no costs are double counted;
- accurate if it is not overly conservative, is based on an assessment of the most likely costs, and is adjusted properly for inflation;
- well documented if the estimate can be easily repeated or updated and can be traced to original sources through auditing; and
- credible if the estimate has been cross-checked with an independent cost estimate and a level of uncertainty associated with the estimate has been identified.

We also interviewed the TSA EBSP office's cost estimating team and its consultants to obtain a detailed understanding of their methodology, the cost model, and data. In doing so, we interviewed cognizant program officials, including the Program Manager and cost analysis team, regarding their respective roles, responsibilities, and actions in developing the cost estimate, reviewing it, or both.

We examined data reliability of the cost estimate by doing the following:

- Obtaining cost estimates and reviewing how each major element was calculated with an emphasis on the basis for the estimate and strength and quality of the supporting documentation.
- Verifying that the parameters used to create each estimate were valid and applicable by comparing to available cost estimating references, posing questions to the cost estimators for clarification, and relying on other technical sources for cross-checking.
- Verifying that calculations were correct for each major element.
- Verifying that escalation was properly applied and elements rolled up accurately to the overall program cost estimate.

We reviewed TSA's EBSP cost estimates to determine whether the characteristic was (1) not met if the agency provided no evidence that satisfied any portion of the criterion, (2) minimally met if the agency provided evidence that satisfied less than one-half of the criterion, (3) partially met if the agency provided evidence that satisfied about one-half of the criterion, (4) substantially met if the agency provided evidence that satisfied more than one-half of the criterion, and (5) met if the agency provided complete evidence that satisfied the entire criterion. One analyst assigned a value ranging from 1 to 5 indicating the extent to which the agencies met each best practice and averaged the values for the practices that were associated with each characteristic. A second analyst independently verified the results. We also interviewed program officials from TSA and DHS responsible for each cost estimate about the estimate's derivation. In doing so, we independently assessed the cost

estimates for the current EBSP, as provided to us in August 2011, against our best practices.

To understand how TSA is working to make better informed budget decisions and complying with DHS guidance to develop an acquisition program baseline, we reviewed DHS guidance on acquisitions and documents related to TSA's efforts to coordinate with DHS on developing an acquisition program baseline for EBSP, which DHS considers the contract between the program and departmental oversight officials to document the program's expected cost, deployment schedule, and technical performance. We also reviewed EBSP Acquisition Review Board decisions and relevant acquisition decision memos during the period 2005 through 2011. Additionally, we interviewed TSA and DHS officials, including officials in the TSA Chief Financial Officer's office and DHS's Program Accountability and Risk Management Office to identify what procedures have been put in place to approve the acquisition program baseline.

To gain a better understanding of issues across all of our objectives, including the development of optimal systems, status of implementation, funding challenges, impact of a change in the cost share formula at the airport level, and cost estimation, we conducted site visits to California, New York, Massachusetts, Washington, D.C., and Florida to interview local airport officials, regional TSA officials, and airline representatives.² To get a range of airports for our site visits, we made our selections based on the size of airport, type of checked baggage screening systems installed, and status of airport facility modification completion. We also considered recommendations from TSA and industry association officials about which airports to visit. Because we selected a nonprobability sample of airports, the information we obtained from these interviews and visits cannot be generalized to all airports. However, we believe that observations obtained from these visits provided us with a greater understanding of the airport officials' perspectives. On these site visits, we interviewed airport, airline, and TSA officials responsible for financing, operating, and installing the checked baggage systems within their respective airports.

² We visited the following airports: Ronald Reagan Washington National, Washington Dulles International, General Edward Lawrence Logan International, John F. Kennedy International, Miami International, Monterrey Peninsula, Mineta San Jose International, San Francisco International, Southwest Florida International, and Westchester County.

We conducted this performance audit from October 2010 through April 2012 in accordance with generally accepted government auditing standards.³ Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

³ We issued preliminary results for this work in 2011 and 2012 as part of GAO's effort to identify opportunities that federal agencies or the Congress could consider for reducing the cost of government operations or enhancing revenue collections for the Treasury. See GAO, *Opportunities to Reduce Potential Duplication in Government Programs, Save Tax Dollars, and Enhance Revenue*, [GAO-11-318SP](#) (Washington, D.C.: Mar. 1, 2011), and *2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue*, [GAO-12-342SP](#) (Washington, D.C.: Feb. 28, 2012).

Appendix II: Status of Implementation Efforts for TSA's EBSP

TSA, through its EBSP, has deployed EDS and ETD machines in a variety of in-line and stand-alone configurations at airports to streamline airports and TSA operations, reduce screening costs, and enhance security. The following three tables provide information on the status of checked baggage screening systems. Table 3 highlights the different system configurations for airports that have optimal checked baggage systems by airport category. Table 4 shows the number of TSA-regulated airports with at least one in-line system. Table 5 provides the numbers of in-line systems and stand-alone EDS and ETD machines at TSA-regulated airports.

Table 3: Checked Baggage Configurations for TSA-Regulated Airports That Have Optimal Systems as of December 2011

Types of checked baggage configurations	Number of airports (by airport category)					Total
	X	I	II	III	IV	
In-line screening only	8	25	12	9	1	55
Mix of EDS in-line and stand-alone	2	3	3	0	0	8
EDS stand-alone only	0	0	31	56	5	92
Mix of stand-alone EDS and primary ETD	0	0	0	1	14	15
Primary ETD	0	0	0	30	137	167
Total	10	28	46	96	157	337

Source: TSA.

Table 4: TSA-Regulated Airports with at Least One In-line System as of December 2011

	Number of airports (by airport category)					Total
	X	I	II	III	IV	
Number of TSA-regulated airports	28	57	77	127	157	446
Number of TSA-regulated airports with at least one in-line system	23	38	18	12	1	92

Source: TSA.

Table 5: Numbers of In-line Systems and Stand-alone EDS and ETD Machines for TSA-Regulated Airports as of December 2011

Types of baggage screening configurations	Number of baggage screening configurations (by airport category)					
	X	I	II	III	IV	Total
In-line systems ^a	133	88	27	12	1	261
In-line EDS	694	284	60	27	2	1,067
Stand-alone EDS	383	172	202	91	18	866
ETD machines	2,195	1,324	592	405	304	4,820

Source: TSA.

^aOne in-line system may include one or more EDS machines.

Appendix III: Our Evaluation of EBSP's Cost Estimate Process

In determining that TSA's processes for developing EBSP cost estimates do not fully comply with best practices, we evaluated TSA's cost estimation methods against our 2009 *Cost Estimating and Assessment Guide*. (See table 6.) We applied the following scale across the four categories of best practices:

- Not met: TSA provided no evidence that satisfies any portion of the criterion.
- Minimally met: TSA provided evidence that satisfies less than one-half of the criterion.
- Partially met: TSA provided evidence that satisfies about one-half of the criterion.
- Substantially met: TSA provided evidence that satisfies more than one-half of the criterion.
- Met: TSA provided complete evidence that satisfies the entire criterion.

Table 6: Summary Assessment of TSA's Electronic Baggage Screening Program Cost Estimate Compared to Best Practices

Characteristic	Overall assessment	Best practice	Individual assessment
Comprehensive	Partially met	The cost estimate includes all life cycle costs.	Partially met
		The cost estimate completely defines the program, reflects the current schedule, and is technically reasonable.	Partially met
		The cost estimate work breakdown structure is product oriented, traceable to the statement of work/objective, and at an appropriate level of detail to ensure that cost elements are neither omitted nor double counted.	Partially met
		The estimate documents all cost-influencing ground rules and assumptions.	Partially met
Well documented	Partially met	The documentation should capture the source data used, the reliability of the data, and how the data were normalized.	Partially met
		The documentation describes in sufficient detail the calculations performed and the estimating methodology used to derive each element's cost.	Partially met
		The documentation describes step-by-step how the estimate was developed so that a cost analyst unfamiliar with the program could understand what was done and replicate it.	Partially met
		The documentation discusses the technical baseline description, and the data in the baseline are consistent with the estimate.	Substantially met
		The documentation provides evidence that the cost estimate was reviewed and accepted by management.	Minimally met
Accurate	Partially met	The cost estimate results are unbiased, not overly conservative or optimistic and based on an assessment of most likely costs.	Partially met
		The estimate has been adjusted properly for inflation.	Met

Appendix III: Our Evaluation of EBSP's Cost Estimate Process

Characteristic	Overall assessment	Best practice	Individual assessment
		The estimate contains few, if any, minor mistakes.	Partially met
		The cost estimate is regularly updated to reflect significant changes in the program so that it is always reflecting current status.	Partially met
		Variances between planned and actual costs are documented, explained, and reviewed.	Not met
		The estimate is based on a historical record of cost estimating and actual experiences from other comparable programs.	Partially met
Credible	Minimally met	The cost estimate includes a sensitivity analysis that identifies a range of possible costs based on varying major assumptions, parameters, and data inputs.	Partially met
		A risk and uncertainty analysis was conducted that quantified the imperfectly understood risks and identified the effects of changing key cost driver assumptions and factors.	Partially met
		Major cost elements were cross-checked to see whether results were similar.	Not met
		An independent cost estimate was conducted by a group outside the acquiring organization to determine whether other estimating methods produce similar results.	Not met

Source: GAO analysis of TSA's data.

Appendix IV: Comments from the Department of Homeland Security

U.S. Department of Homeland Security
Washington, D.C. 20528



**Homeland
Security**

April 19, 2012

Stephen M. Lord
Director, Homeland Security and Justice
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Re: Draft Report GAO-12-266, "CHECKED BAGGAGE SCREENING: TSA Has Deployed Optimal Systems at the Majority of TSA-Regulated Airports, but Could Strengthen Cost Estimates"

Dear Mr. Lord:

Thank you for the opportunity to review and comment on this draft report. The U.S. Department of Homeland Security (DHS) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The Department is pleased to note GAO's positive acknowledgement of the progress the Transportation Security Administration (TSA) has made deploying optimal checked baggage screening systems at airports across the Nation. This includes recognition of TSA's efforts to replace aging machines that have or will soon reach the end of their useful life, and that many of these projects include an optimization component to improve performance, increase efficiency, and reduce operating costs. We also appreciate comments in the report about DHS responsiveness to prior GAO recommendations related to checked baggage screening.

The draft report contained one recommendation with which the Department concurs. Specifically, GAO recommended that the TSA Administrator:

Recommendation: Ensure that its life-cycle cost estimates conform to cost estimating best practices.

Response: Concur. TSA acknowledges the importance of producing life-cycle cost estimates (LCCEs) that are comprehensive, well-documented, accurate, and credible. In addition, TSA understands that LCCEs are used to support DHS portfolio funding decisions, to develop budget requests, to evaluate resource requirements at key acquisition decision events, and to develop performance measurement baselines. TSA is initiating a layered approach to institutionalize

cost estimating with the express purpose of improving the quality, fidelity, and uniformity of LCCEs to further its objective of establishing an internal cost estimating capability.

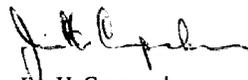
Specifically, after conducting an internal review, TSA is implementing a Management Directive specific to preparing and approving LCCEs that follow the process steps and guidelines documented in DHS Acquisition Directive 102, as well as best practices from the GAO Cost Estimating and Assessment Guide. Moreover, to help satisfy DHS Cost Center of Excellence expectations that TSA LCCEs will comply with the aforementioned guidance, TSA's Acquisition Management Functional Division personnel are:

- establishing a working group and executive board to review program cost estimates with the purpose of validating whether the estimate is credible and affordable,
- requiring all life-cycle cost estimates to be approved by the Component Acquisition Executive to ensure consistency and quality across TSA Programs,
- purchasing and training its employees on specialized cost-estimating software, and
- initiating hiring actions to hire additional cost-estimating personnel

We anticipate that these actions will be completed by December 31, 2012.

Again, thank you for the opportunity to review and comment on this draft report. Technical and sensitivity comments for the report were previously provided under separate cover. Please feel free to contact me if you have any questions. We look forward to working with you on future Homeland Security issues.

Sincerely,



Jim H. Crumpacker
Director
Departmental GAO-OIG Liaison Office

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Stephen M. Lord, (202) 512-4379 or lords@gao.gov

Staff Acknowledgments

In addition to the contact named above, Glenn Davis, Assistant Director, and Daniel Rodriguez, Analyst-in-Charge, managed this assignment. Wendy Dye, Daren Sweeney, and Yee Wong made major contributions to the planning and all other aspects of the work. David Alexander and Richard Hung assisted with design, methodology, and data reliability. Chuck Bausell and Jack Wang assisted with economic analysis. Jason Lee, Stacey Steele, and Karen Richey assisted with life cycle cost estimate analysis. Nathan Tranquilli assisted with acquisition and contracting issues. Linda Miller provided assistance in report preparation. Thomas Lombardi provided legal support.

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