

November 2011

ARIZONA BORDER SURVEILLANCE TECHNOLOGY

More Information on Plans and Costs Is Needed before Proceeding

U.S. Government Accountability Office

GAO 90

YEARS

1921-2011

ACCOUNTABILITY ★ INTEGRITY ★ RELIABILITY

Why GAO Did This Study

In recent years, nearly half of all annual apprehensions of illegal aliens along the entire Southwest border with Mexico have occurred along the Arizona border. Keeping illegal flows of people and drugs under control remains a top priority for the Department of Homeland Security's (DHS) U.S. Customs and Border Protection (CBP). In 2005, the Secure Border Initiative Network (SBI*net*) was conceived as a surveillance technology to create a "virtual fence" along the border. After spending nearly \$1 billion, DHS deployed SBI*net* systems along 53 miles of Arizona's border that represent the highest risk for illegal entry. In January 2011, in response to concerns regarding SBI*net*'s performance, cost, and schedule, DHS cancelled future procurements. CBP developed the Arizona Border Surveillance Technology Plan (Plan) for the remainder of the Arizona border. Funding for this Plan for fiscal year 2012 is \$242 million. GAO was requested to assess the extent to which CBP (1) has the information needed to support and implement the Plan and (2) estimated life-cycle costs for future investments in accordance with best practices. GAO analyzed Plan documents and cost estimates, compared those estimates with best practices, and interviewed CBP officials.

What GAO Recommends

GAO recommends that CBP document the analysis justifying the technologies proposed in the Plan, determine its mission benefits, conduct a post-implementation review of SBI*net* and determine a more robust life-cycle cost estimate for the Plan. DHS concurred with the recommendations.

View [GAO-12-22](#) For more information, contact Richard Stana at (202) 512-8777 or StanaR@gao.gov.

ARIZONA BORDER SURVEILLANCE TECHNOLOGY

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What GAO Found

CBP does not have the information needed to fully support and implement its Arizona Border Surveillance Technology Plan in accordance with DHS and Office of Management and Budget (OMB) guidance. In developing the Plan, CBP conducted an analysis of alternatives and outreach to potential vendors. However, CBP has not documented the analysis justifying the specific types, quantities, and deployment locations of border surveillance technologies proposed in the Plan. Best practices for developing and managing costs indicate that a business case analysis should be rigorous enough that independent parties can review it and clearly understand why a particular alternative was chosen to support mission requirements. Without documentation of the analysis, there is no way to verify the process CBP followed, identify how the underlying analyses were used, assess the validity of the decisions made, or justify the funding requested for the Plan. CBP officials also have not yet defined the mission benefits expected from implementing the new Plan. GAO has previously reported that a solid business case providing an understanding of the potential return of large investments can be helpful to decision makers for determining whether continued investment is warranted after deployment. Defining the expected benefit could help improve CBP's ability to assess the effectiveness of the Plan as it is implemented. CBP does not intend to assess and address operational issues regarding the effectiveness and suitability of SBI*net*, steps that could provide CBP with information to help make decisions regarding alternatives for implementing the Plan. OMB guidance suggests that a post-implementation review occur when a system has been in operation for 6 months or immediately following investment termination. Such a review could help CBP make the most effective use of existing SBI*net* systems that, in connection with the Plan, could build a comprehensive and integrated approach for surveillance technology along the entire Arizona border.

CBP's 10-year life-cycle cost estimate for the Plan of \$1.5 billion is based on a rough order of magnitude analysis, and agency officials were unable to determine a level of confidence in their estimate as best practices suggest. Specifically, GAO's review of the estimate concluded that the estimate reflected substantial features of best practices, being both comprehensive and accurate, but it did not sufficiently meet other characteristics of a high-quality cost estimate, such as credibility, because it did not identify a level of confidence or quantify the impact of risks. GAO and OMB guidance emphasize that reliable cost estimates are important for program approval and continued receipt of annual funding. In addition, because CBP was unable to determine a level of confidence in its estimate, it will be difficult for CBP to determine what levels of contingency funding may be needed to cover risks associated with implementing new technologies along the remaining Arizona border. Thus, it will be difficult for CBP to provide reasonable assurance that its cost estimate is reliable and that its budget request for fiscal year 2012 and beyond is realistic and sufficient. A robust cost estimate—one that includes a level of confidence and quantifies the impact of risk—would help ensure that CBP's future technology deployments have sufficient funding levels related to the relative risks.

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Abbreviations

AAR	after-action review
AoA	Analysis of Alternatives
APSS	Agent Portable Surveillance System
ATEC	Army Test and Evaluation Command
CBP	U.S. Customs and Border Protection
COP	Common Operating Picture
DHS	Department of Homeland Security
HSI	Homeland Security Studies and Analysis Institute
IFT	integrated fixed tower
LCCE	life-cycle cost estimate
MSS	Mobile Surveillance System
MVSS	Mobile Video Surveillance System
OMB	Office of Management and Budget
OTIA	Office of Technology Innovation and Acquisition
Plan	Arizona Border Surveillance Technology Plan
ROM	rough order of magnitude
RVSS	Remote Video Surveillance System
SBI	Secure Border Initiative
SBI <i>net</i>	Secure Border Initiative Network

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G A O

Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

November 4, 2011

The Honorable Peter T. King
Chairman
The Honorable Bennie G. Thompson
Ranking Member
Committee on Homeland Security
House of Representatives

The Honorable Candice S. Miller
Chairman
The Honorable Henry Cuellar
Ranking Member
Subcommittee on Border and Maritime Security
Committee on Homeland Security
House of Representatives

Securing the Arizona portion of the approximately 2,000 miles of southwest border that the United States shares with Mexico—while keeping illegal flows of people and drugs under control—is a top priority for the Department of Homeland Security’s (DHS) U.S. Customs and Border Protection (CBP). In recent years, nearly half of all annual apprehensions of illegal aliens along the entire southwest border with Mexico have occurred along the Arizona border, but that number has been steadily decreasing. DHS’s Office of Immigration Statistics reported in June 2011, that the number of apprehensions of people entering the country illegally in 2010 reflects the fifth consecutive year-to-year decrease and is now at its lowest level since the early 1970s. As reflected in table 1, that trend is true for both the southwest border and Arizona in particular. On the other hand, Arizona remains the highest risk area for illegal trafficking in marijuana not only because of the upward trend in the number of pounds of marijuana seized by the Border Patrol but also because nearly half of all marijuana seizures along the southwest border are made in Arizona alone, as reflected in table 2, which follows.

Table 1: U.S. Border Patrol Apprehensions for the Southwest Border and Arizona

Border Location	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
Southwest	1,171,396	1,071,972	858,638	705,005	540,865	447,731
Arizona	577,517	510,623	416,231	326,059	248,624	219,318

Source: CBP.

Note: In the first half of fiscal year 2011 (Oct 1, 2010, to April 1, 2011), Arizona's apprehensions were 69,722, and if that rate continued through the end of FY2011, total apprehensions for fiscal year 2011 would be lower than in fiscal year 2010.

Table 2: U.S. Border Patrol Marijuana Seizures for the Southwest Border and Arizona (in pounds)

Border Location	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
Southwest	1,194,427	1,362,376	1,852,525	1,632,169	2,550,187	2,417,170
Arizona	525,145	662,650	946,718	846,260	1,256,397	1,070,647

Source: CBP.

Note: In the first half of fiscal year 2011 (Oct 1, 2010 to April 1, 2011), Arizona marijuana seizures (lbs.) were 566,699 and if that rate continued through the end of fiscal year 2011, total seizures for fiscal year 2011 would be higher than in fiscal year 2010.

CBP began development of the Secure Border Initiative Network (SBI*net*) in 2005 as a combination of surveillance technologies that relied primarily on radar and camera towers to create a "virtual fence" along the southwest border in order to enhance CBP's capability to detect, identify, classify, track, and respond to illegal breaches at and between land ports of entry. After 5 years and a cost of nearly \$1 billion, SBI*net* systems are now deployed along the 53 miles of Arizona's 387-mile border with Mexico that represent the highest risk area for illegal entry attempts.

In January 2011, in response to internal and external assessments that identified concerns regarding the performance, cost, and schedule for implementing the systems, the Secretary of Homeland Security

announced the cancellation of further procurements of *SBI*net systems.¹ However, CBP plans to continue to operate the existing *SBI*net systems and received \$26.4 million in fiscal year 2011 money for operations and maintenance of the systems. CBP estimates that continued operation and support of the *SBI*net systems will cost \$10 million in fiscal year 2012 and that these costs will continue for the foreseeable future.

CBP has taken steps to develop and implement a new Arizona Border Surveillance Technology Plan (the Plan) for the remainder of the Arizona border. This Plan is the first step in a multiyear, multibillion dollar effort to secure the southwest border. The Plan is intended to identify, acquire, and deploy additional surveillance technology types and quantities, and suit them to the varying terrain along the Arizona border to enhance situational awareness of illegal intrusions. In addition to the \$185 million CBP already allocated in fiscal year 2011, CBP has requested \$242 million to fund the new Plan for fiscal year 2012 and estimates that the total costs of acquiring and maintaining all of the proposed new systems for the Arizona border over their expected 10-year life-cycle will be about \$1.5 billion.

Because of the high cost and challenges faced by CBP's development of *SBI*net and the importance of the revised plan, you asked us to review CBP's plans for developing and implementing a new approach for using surveillance technology along the remainder of the southwest border in Arizona. As agreed, our objectives were to determine (1) the extent to which CBP has in accordance with DHS and Office of Management and Budget (OMB) guidance supported and implemented its Arizona Border Surveillance Technology Plan, and (2) the extent to which CBP's estimated life-cycle costs for the Arizona Border Surveillance Technology Plan reflect best practices.

¹ GAO reported concerns about *SBI*net in a number of products. For example, in May 2010, we reported our concerns regarding DHS's management of the program, see GAO, *Secure Border Initiative: DHS Needs to Reconsider Its Proposed Investment in Key Technology Program*, [GAO-10-340](#) (Washington, D.C.: May, 5, 2010); and in September 2008, we reported that *SBI*net was at risk because of a number of acquisition management weaknesses, and we made recommendations to address them that DHS largely agreed with and committed to addressing, see GAO, *Secure Border Initiative: DHS Needs to Address Significant Risks in Delivering Key Technology Investment*, [GAO-08-1086](#) (Washington, D.C.: Sept. 22, 2008).

To address our first objective, we reviewed key program-planning documents CBP relied on to support its new approach to identifying, acquiring, and deploying surveillance technology applicable to specific types of terrain along the Arizona border and compared them with requirements in DHS acquisition regulations, including Acquisition Regulation 102-01, and OMB guidance A-11. We also interviewed CBP officials responsible for assessing the need for and documenting the cost and operational effectiveness and suitability of proposed systems to support its Arizona Border Surveillance Technology Plan (Plan) and for identifying appropriate metrics to assess progress in border security. We also assessed documents and evaluations of the SBI*net* developed and deployed in Arizona's Tucson sector from 2005 through 2010 and CBP's plans for SBI*net*'s operation and maintenance over its life-cycle. In doing so, we reviewed key program documentation that describes the operational benefits of SBI*net* and the Army Test and Evaluation Command's (ATEC) reports and briefing to CBP on operational test findings. We interviewed Army leadership involved in the design and implementation of the operational test and evaluation of test results in order to determine the reliability of the information we used to support our finding. We determined that the test results were sufficiently reliable for the purposes of this report. We also interviewed officials from CBP's Office of Technology Innovation and Acquisition (OTIA) on how they intended to use the operational test findings and recommendations to inform the continuing operation of existing SBI*net* technology.²

To address our second objective, we reviewed cost and budget documents CBP relied on to support cost estimates for technology alternatives contained in the "analysis of alternatives" (AOA) for Arizona and in the President's budget request for fiscal year 2012.³ We also interviewed OTIA program officials and contractors responsible for estimating the cost of future investments in surveillance technology, specifically the life-cycle approach, requirements development and management, test management, and risk management. We then

² CBP's Office of Technology Innovation and Acquisitions (OTIA) was created to ensure all of CBP's technology efforts are properly focused on the mission and are well integrated, and to strengthen CBP's expertise and effectiveness in program management and acquisition.

³ The "analysis of alternatives" (AOA) analyzed the cost effectiveness of technology alternatives to SBI*net* for Arizona and was intended to inform Border Patrol's development of the Arizona Border Surveillance Technology Plan.

compared this information to relevant federal cost-estimating guidance, derived from leading government and industry practices.⁴ To assess the reliability of the cost data for the rough order of magnitude estimate for implementation of the Plan, which assumed a 10-year life-cycle for the acquisition, we relied on data for fiscal year 2010 and beyond to support the findings in the report. To assess the reliability of the data that we used to support the findings in this report, we reviewed relevant program documentation to substantiate evidence obtained through interviews with knowledgeable agency officials, where available, regarding the integrity of the data. We determined that these data are sufficiently reliable for the purposes of this report.

We conducted this performance audit from March 2011 through October 2011 in accordance with generally accepted government auditing standards. 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. Further details of our objectives, scope, and methodology are in appendix I.

Background

In November 2005, DHS announced the launch of the Secure Border Initiative (SBI), a multiyear, multibillion-dollar program aimed at securing U.S. borders and reducing illegal immigration. CBP is the lead agency within DHS responsible for the development and deployment of SBI technology (e.g., cameras, sensors, radars, and tactical communications) and tactical infrastructure (e.g., pedestrian and vehicle fences, roads, and lighting). In July 2010, CBP announced the formation of OTIA, which was created to ensure all of CBP's technology efforts are properly focused on the mission and are well integrated, and to strengthen CBP's expertise and effectiveness in program management and acquisition. OTIA

⁴ Office of Management and Budget, *Circular No. A-11, Preparation, Submission, and Execution of the Budget* (Washington, D.C.: August 2011) (hereinafter referred to as OMB Circular A-11); *Circular No. A-130 Revised, Management of Federal Information Resources* (Washington, D.C.: Nov. 28, 2000); and Office of Management and Budget, *Capital Programming Guide: Supplement to Circular A-11, Part 7, Preparation, Submission, and Execution of the Budget* (Washington, D.C.: June 2006); and GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#), (Washington, D.C.: March 2009).

assumed the responsibilities of the former SBI program office that previously managed *SBI_{net}*.

SBI_{net} was intended to cover the entire southwest border with an integrated set of fixed sensor towers. These towers were to transmit radar and camera information into a centralized location that integrated information to create a Common Operating Picture (COP) at work stations manned at all times by Border Patrol Agents. *SBI_{net}*'s initial deployment, known as Block 1, was deployed to 53 miles of the Arizona border where it continues to be used by the Border Patrol. Since its inception, *SBI_{net}* had continued and repeated technical problems, cost overruns, and schedule delays, which raised serious questions about *SBI_{net}*'s ability to meet Border Patrol's needs for surveillance technology along the border. We have issued 26 reports and testimonies identifying operational and program management weaknesses that contributed to *SBI_{net}*'s performance shortfalls, including cost overruns and schedule slippages. For example, in September 2008 and May 2010, we reported on deficiencies in CBP's timely preparation and completion of key acquisition documents essential to setting operational requirements, identifying and mitigating risks, and establishing the cost, schedule, and performance of the project and the technology to be delivered.⁵ We also reported that key acquisition documents, such as a risk management plan, were not prepared and approved for *SBI_{net}* prior to the start of the acquisition process, a lack that precluded a fully informed design for the system that would meet CBP's needs within the expected time frame. In May 2010, we made a number of recommendations to enhance CBP's acquisition of *SBI_{net}* systems. DHS agreed with 10 of our recommendations and partially agreed with two of them and detailed actions planned to address each. This included a recommendation to respond to a departmentwide reassessment of the program.

In January 2010, the Secretary of Homeland Security ordered a departmentwide reassessment of the *SBI_{net}* program to consider options

⁵ GAO, *Department of Homeland Security: Billions Invested in Major Programs Lack Appropriate Oversight*, [GAO-09-29](#) (Washington, D.C.: Nov. 18, 2008); GAO, *Department of Homeland Security: Assessments of Selected Complex Acquisitions*, [GAO-10-588SP](#) (Washington, D.C.: Jun. 30, 2010); and GAO, *Secure Border Initiative DHS Needs to Reconsider Its Proposed Investment in Key Technology Program* [GAO-10-340](#) (May 5, 2010, Washington, D.C.).

that may more efficiently, effectively, and economically meet the nation's border security needs. The assessment focused on two key questions:

- whether the *SBI_{net}* program was viable and could be made to work effectively and fulfill the intent of the program and
- whether *SBI_{net}* was cost-effective.

After receiving the results of the assessment, in January 2011, the Secretary of Homeland Security announced that the department had concluded that *SBI_{net}* systems were not appropriate for the entire southwest border and did not meet current standards for viability and cost-effectiveness. While the department would continue to use those elements of *SBI_{net}* that were useful, the Secretary announced that the department was canceling further deployments of *SBI_{net}* systems using the current contract.

In its place, DHS is implementing a new approach for acquiring and deploying border security technology called Alternative (Southwest) Border Technology. As the approach's first step, CBP's Plan is to deploy a mix of technologies to complete coverage of the Arizona border including integrated fixed-tower (IFT) systems, Remote Video Surveillance Systems (RVSS),⁶ Mobile Surveillance Systems (MSS),⁷ hand-held equipment, and unattended ground sensors. CBP plans to deploy five IFT systems each comprising about 10 radar-and-camera-equipped towers and integrate their signals into a system command center. According to CBP officials, though similar, the IFT systems' equipment will be simpler when compared with the equipment for the tower systems deployed under *SBI_{net}*.⁸ Thus, CBP's plans include the currently deployed *SBI_{net}* system for 53 miles in Arizona along with the new Plan to acquire and deploy additional towers, mobile surveillance equipment, unattended ground sensors, and hand-held devices to secure the rest of the Arizona border. CBP estimates that the total life-cycle cost

⁶ An RVSS is a system of towers with cameras that transmit information to video monitors at a Border Patrol facility.

⁷ A MSS consists of camera and radar systems mounted on a truck, with images being transmitted to and monitored on a computer screen in the truck's passenger compartment. For a picture of a MSS, see appendix II.

⁸ CBP officials said that the five IFT systems collectively would consist of 52 fixed towers, about 39 fewer towers than would have been the case under the original *SBI_{net}* deployment that was canceled.

of the new Plan will be about \$1.5 billion for Arizona. In fiscal year 2011, CBP allocated \$185 million to procure border surveillance technologies contained in the Plan except for the new IFT systems. The agency has requested \$242 million in fiscal year 2012 appropriations to procure the first three IFT systems also included in the Plan.

CBP Does Not Have the Information Needed to Fully Support and Implement Its Plan

CBP does not have the information needed to fully support and implement its Plan in accordance with DHS and OMB guidance. To develop this Plan, CBP conducted an analysis of alternatives (AOA) and outreach to potential vendors, and took other steps to test the viability of the current system. However, CBP has not

- documented the analysis justifying the specific types, quantities, and deployment locations of border surveillance technologies proposed in the Plan;
- defined the mission benefits or developed performance metrics to assess its implementation of the Plan; or
- developed a plan to assess and address operational issues with the continuing use of *SBI^{net}* systems along the highest risk section of the border that could affect the new Plan's implementation across the remainder of Arizona.

For these reasons, CBP's newly proposed approach is at an increased risk of not accomplishing its goal in support of Arizona border security.

CBP, in Developing a Business Case for Its New Approach, Conducted an Analysis of Alternatives

At the Secretary of Homeland Security's direction, CBP has adopted a new approach for developing a technology plan for surveillance at the border that includes development of a business case to justify the way forward. CBP officials told us their business case consists of the Arizona Border Surveillance Technology Plan and a phased independent analysis of alternatives (AOA).⁹

According to CBP officials, the development of the Arizona Border Surveillance Technology Plan consisted of a two-step process. First, the

⁹ Although different organizations use different names for these decision packages—such as business cases or project requests—the packages generally include documents and analyses to support a proposed investment.

Homeland Security Studies and Analysis Institute (HSI) was enlisted to conduct a multipart AOA beginning with Arizona.¹⁰ Second, using the AOA, the Border Patrol conducted an operational assessment of border surveillance technologies to identify the appropriate mix of technologies required to gain situational awareness and manage the Arizona border area. HSI's AOA considered four technology alternatives: (1) agent-centric hand-held devices, (2) integrated fixed-tower systems, (3) mobile surveillance equipment, and (4) unmanned aerial vehicles. These technology alternatives were analyzed in four representative geographic areas of Arizona. The AOA for Arizona found that integrated fixed-tower systems, like the other technology alternatives, represent the most effective choice only in certain circumstances and that there is no one technology alternative that is appropriate for the entire Arizona border. A summary of the conclusions reached for each of the four alternatives examined is presented in table 3.

Table 3: Results for AOA of Four Technology Alternatives for Arizona

Technology alternative	Conclusions
Integrated fixed towers (IFTs)	IFTs had significant information technology infrastructure costs and their cost-effectiveness depended on the area to be covered, which could be significant over moderately-sized areas of largely open or rolling terrain.
Mobile surveillance equipment	Somewhat lower in cost and providing slightly less coverage than integrated fixed towers. The AOA also noted that mobile surveillance equipment had significant personnel costs but that the costs were generally well defined.
Hand-held devices	The AOA concluded the hand-held devices that are agent-centric were the lowest cost, but provided the smallest increase in coverage.
Unmanned aerial vehicles	This alternative had significant infrastructure costs with the highest cost risk, but could provide significantly more coverage in areas with rugged terrain.

Source: GAO analysis based on the SBI^{net} analysis of alternatives.

Unattended ground sensors were not included in the analysis because they were considered part of the existing baseline of technology and would co-exist with all of the alternatives in the AOA. In the AOA, HSI

¹⁰ The Homeland Security Studies and Analysis Institute is a federally funded research and development center to provide independent analysis of homeland security issues.

noted that its analysis did not, among other things, identify the optimal combination of specific equipment and systems, measure the contribution of situational awareness to achieving control of the border, or quantify the number of apprehensions that may result from the deployment of any technology solution.

Upon completion of the AOA, in July 2010, the Secretary of Homeland Security directed the AOA study team to seek independent validation of its work. In response, HSI assembled an independent review team composed of senior subject matter experts with expertise in border security, operational testing, acquisition, performance measurement, and the management and execution of AOAs to evaluate the AOA for Arizona. In the results of the final report in March 2011, the review team concluded that the AOA for Arizona appeared to have successfully answered the questions asked and drew appropriate conclusions and insights that should be useful to DHS and CBP.¹¹ CBP officials said they planned to conduct additional analysis of alternatives to incorporate additional technologies and Border Patrol Sectors.¹²

Following the completion of the AOA, the Border Patrol conducted its operational assessment, which included a comparison of alternative border surveillance technologies and an analysis of operational judgments to consider both effectiveness and cost. According to CBP officials, they started with the results of the AOA for Arizona, noting that the AOA considered the technologies in terms of the trade offs between capability and cost—but did not document the quantities of each technology needed, the appropriate mix of the technologies, or how a proposed mix of technologies would be applied to specific border areas. CBP officials stated that a team of Border Patrol agents familiar with the Arizona terrain determined the appropriate quantity and mix of technologies by considering the terrain in each area under consideration and which mix of technologies appeared to work for that area and terrain. These officials also stated that they used an iterative process involving dialogue between trained engineers and Border Patrol agents based on

¹¹ *SBI*net AOA Report of the Independent Review Team Final Report (March 28, 2011). The independent review team was composed of staff members from two consulting groups and the Air Force Materiel Command, Office of Aerospace Studies.

¹² The department's new technology deployment plan for the entire southwest border is called the Alternative (Southwest) Border Technology plan. This plan, which the Arizona Border Surveillance Technology Plan is a part of, is still being developed.

the team's understanding of topography and technology, considering the lowest dollar cost mix of technologies as a starting point to see if situational awareness provided by the mix sufficiently met the threat. As a result, according to CBP officials, if the least expensive technology, such as hand-held portable equipment, met the threat, then that technology would be chosen. If the threat was not addressed by the hand-held technologies, then officials said the team considered the next higher cost technology. The officials added that the IFT systems were the most expensive.

CBP Did Not Document How It Derived the Specific Types and Quantities of Technologies Contained in Its Arizona Border Surveillance Technology Plan

CBP has taken a number of steps to develop the Plan; however, program officials developed and proposed the new Plan without documenting the analysis justifying the specific types, quantities, and deployment locations of border surveillance technologies CBP proposed. While the AOA process itself was well documented, the Border Patrol's operational assessment, a key analytical component leading to the Plan, was not transparent because of the lack of documentation.

The Plan includes quantities of various technologies, prioritized and planned for implementation on a yearly basis. Specifically, based on the Plan, CBP allocated \$185 million to purchase border surveillance technologies including mobile and hand-held equipment as well as RVSS for fiscal year 2011, and has requested \$242 million for fiscal year 2012 to acquire and deploy three IFT systems in Arizona, with two others to be deployed by 2015, depending on funding availability.

Without documentation of the analysis justifying the specific types, quantities, and deployment locations of border surveillance technologies proposed in the Plan, an independent party cannot verify the process followed, identify how the AOA was used, determine whether CBP's use of the AOA considered the limitations identified by HSI, assess the validity of the decisions made, or justify the funding requested. Given that the number of apprehensions of illegal border crossers is at the lowest level in 40 years, if threats in the southwest border environment continue to change and the Plan otherwise requires updating or revision, it will be difficult for CBP officials to reassess the rationale for and determine what, if any, changes are needed in the types, quantities, and deployment locations of border surveillance technologies called for in the Plan.

Internal and management control standards for the federal government call for agencies to promptly record and clearly document transactions and significant events to maintain their relevance and value to

management in controlling operations and making decisions and to ensure that agency objectives are met. The standards also call for documentation to be readily available for examination.¹³ These standards apply to CBP's development of the quantities and types of technology and their suitability to terrain to support the Plan; the expenditure of fiscal year 2011 funds on mobile, RVSS, and hand-held equipment; as well as the planned acquisition of IFT systems requested in the President's fiscal year 2012 budget request.¹⁴

A senior CBP official responsible for the program's acquisitions told us that he believed the AOA and the process used to develop and support the plan justified acquisition decisions called for in the Arizona Border Surveillance Technology Plan. According to CBP officials, the agency is in the process of drafting the acquisition-planning documents required for the DHS Acquisition Review Board to review and make a decision on acquiring the IFT systems.¹⁵ These acquisition-planning documents are required by DHS guidance for planning acquisitions, setting operational requirements, and establishing acquisition baselines to help ensure delivery of the required performance at acceptable levels of cost, schedule, and risk.¹⁶ CBP officials said that they expect the Acquisition Review Board to meet in November 2011 to consider the IFT acquisition. The Acquisition Review Board is to consider these documents prior to approving the program for acquisition and the issuance of a request for proposal for the new IFT systems.

¹³ GAO, *Internal Control: Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21-3.1 (Washington, D.C.: November 1999) and Office of Management and Budget, *Circular A-123, Management's Responsibility for Internal Control* (Washington, D.C.: Dec. 21, 2004).

¹⁴ OMB Circular A-11 requires budget submissions to have undergone the scrutiny of cost and performance risk analyses.

¹⁵ The Acquisition Review Board (ARB) is a cross-component organization within the department that determines whether a proposed acquisition has met the requirements of key phases in the acquisition life-cycle framework and is able to proceed to the next phase and eventual full production and deployment.

¹⁶ Acquisition planning documents include (1) a Mission Need Statement to provide a description of the strategic need for an investment; (2) an Operational Requirements Document to provide a bridge between the functional requirements of the mission needs statement and the detailed technical requirements that form the basis of the performance specifications; and (3) an Acquisition Program Baseline to identify operational requirements for addressing the program's critical cost, schedule, and performance parameters.

Nonetheless, in the absence of documentation that describes how CBP integrated the operational assessments and technology deployment analyses and used the results of the AOA to develop the types and quantities of technology and their suitability to the terrain from the various alternatives, it is unclear whether and how the analyses conducted to develop the Plan demonstrated the cost and operational effectiveness of the selected mix of technology versus other less costly solutions, or whether the analyses determined the most appropriate technology for the terrain. As a result, CBP cannot demonstrate the validity of the Arizona Border Surveillance Technology Plan and the acquisition approach and lacks reasonable assurance that the acquisition-planning documents will fully support future deployments of border surveillance technology in Arizona.

CBP Officials Have Not Yet Defined Expected Mission Benefits nor Quantified Metrics to Assess Progress in Implementing the Plan

Agency officials have not yet defined the mission benefits expected or quantified metrics to assess the contribution of the selected approaches in achieving their goal of situational awareness and detection of border activity using surveillance technology. Without defining the expected benefit or quantifying metrics, it will be difficult for CBP to assess the effectiveness of the Plan as it is implemented. Assessing the effectiveness of the program in Arizona will be essential as CBP works to develop a more comprehensive plan for the entire southwest border.

Our findings are particularly relevant considering similar deficiencies in *SBI*net systems. In May 2010, we reported that in the case of the deployment of *SBI*net systems along the first 53 miles of the Arizona border, CBP did not define or measure the expected mission benefits of the system.¹⁷ For example, while program officials reported that system benefits are documented in the *SBI*net Mission Need Statement dated October 2006, this document did not include either quantifiable or qualitative benefits. Rather, it provided general statements such as “the lack of a program such as *SBI*net increases the risks of terrorist threats and other illegal activities.” Moreover, we concluded that DHS had not demonstrated that its proposed *SBI*net solution was a cost-effective course of action, and thus whether the considerable time and money invested to acquire and deploy it was a prudent use of limited resources.

¹⁷ GAO, *Secure Border Initiative: DHS Needs to Reconsider Its Proposed Investment in Key Technology Program*, [GAO-10-340](#) (Washington, D.C.: May 5, 2010).

As a result, we recommended that DHS should reconsider its proposed SBInet solution. In doing so, it should explore ways to both limit its near-term investment in an initial set of operational capabilities and develop and share with congressional decision makers reliable projections of the relative costs and benefits of longer-term alternatives. These longer-term alternatives would help meet the mission goals and outcomes that SBInet was intended to advance. DHS should also share with congressional decision makers the reasons why cost-benefit information was not available and the uncertainty and risks associated with not having it. DHS concurred with reconsidering its proposed SBInet solution and the Secretary cancelled the program in January 2011.

The Secretary of Homeland Security reported in January 2011 that the new Plan is expected to provide situational awareness for the entire Arizona border by 2014, but CBP officials have not yet defined the expected benefits or developed measurable and quantifiable performance metrics that would show progress toward achieving that goal.¹⁸ The Clinger-Cohen Act of 1996 and OMB guidance emphasize the need to ensure that information technology investments, such as IFT systems, actually produce tangible, observable improvements in mission performance.¹⁹ We have previously reported that a solid business case providing an understanding of the potential return of large investments can be helpful to decision makers for determining whether continued investment is warranted.²⁰ Additionally, according to the Government Performance and Results Act, as amended, activities need to be established to monitor performance measures and indicators.²¹

¹⁸ According to OMB *Circular A-11*, Part 6, Section 200, performance measurement should include program accomplishments in terms of outputs (quantity of products or services provided) and outcomes (results of providing outputs in terms of effectively meeting intended agency mission objectives), as well as, indicators, statistics or metrics used to gauge program performance.

¹⁹ Clinger-Cohen Act of 1996, 40 U.S.C. §§ 11101-11703, and Office of Management and Budget, *Circular No. A-130 Revised, Management of Federal Information Resources* (Washington, D.C.: Nov. 28, 2000).

²⁰ A sound business case includes well defined requirements, preliminary design, realistic cost estimates, and mature technology according to GAO, *NASA's Space Vision, Business Case for Prometheus 1 Needed to Ensure Requirements Match Available Resources*, [GAO-05-242](#). (Washington D.C.: Feb. 28, 2005).

²¹ Pub. L. No. 103-62, 107 Stat. 285 (1993), *amended by* Government Performance and Results Act (GPRA) Modernization Act of 2010, Pub. L. No. 111-352, 124 Stat. 3866.

The supporting documents CBP officials used to justify its allocation of fiscal year 2011 funds and its budget requests for fiscal year 2012 did not include any performance goals related to the expected outcome of the investment.²² CBP officials reported that the decision documents that informed their fiscal year 2012 budget request for \$242 million (the AOA, the Plan, and the Department's fiscal year 2012-2016 Resource Allocation Decision) did not contain any measurable and quantifiable performance metrics by which progress toward achieving performance goals could be determined. They said that the AOA contained four measures of effectiveness associated with the alternatives they assessed; however, these measures do not quantify the mission benefits associated with implementation of the Plan. Without measurable and quantifiable performance goals relating to expected outcomes, particularly for alternatives selected for CBP's Plan, it will be difficult for decision makers to assess the costs and benefits provided by acquisition and deployment of these systems and, more broadly, to measure program performance and progress in achieving national homeland security goals for securing the southwest border.

We have previously reported on key attributes of successful performance measures that should be included in program performance metrics.²³ In circumstances where complete information is not available to measure performance outcomes, agencies may need to use intermediate goals and measures to show progress or contribution to intended results. For example, Border Patrol may currently lack the capability to detect all illegal entries of people, drugs, and weapons along the southwest border. However, they may choose to establish performance measures that can track progress in terms of using technology to increase the probability of detection. Once CBP achieves an optimal level in terms of the probability

²² For the fiscal year 2012 budget submission, CBP did not provide an A-11 Exhibit 300 in support of the emerging (at that time) Arizona Technology Plan. The OMB's *Circular, A-11*, Exhibit 300 cycle had already commenced and was nearing completion at the time the final Arizona Plan—including specifically the Integrated Fixed Tower plan and associated cost estimates—was submitted for approval. In lieu of the Exhibit 300 documentation, information was provided to, and discussed with, OMB during the final fiscal year 2012 Border Security, Fencing, Infrastructure and Technology budget submission. As part of this year's fiscal year 2013 budget Exhibit 300 cycle, CBP is preparing and submitting Exhibit 300s for the appropriate Arizona Technology capital projects. These will not be available for release until OMB concludes the cycle later this fall.

²³ GAO, *Employment and Training Programs: Opportunities Exist for Improving Efficiency*, [GAO-11-506T](#) (Washington: D.C.: Apr. 7, 2011).

of detection, or situational awareness, it may then transition to measures for reducing the flow of illegal activity and interdiction. In September 2011, CBP officials reported that they are developing new measures to determine whether and how technology investments impact border security. They acknowledged that since large investments have been made in border security, it is critical to assess the impacts these investments have had on improving border security as well as projecting the additional impact future investments will have on their ability to manage the borders. However, CBP officials have not yet determined the key attributes of these new measures. Measures and key attributes are generally defined as part of the business case in order to explain how they contribute to the mission's benefits.²⁴ Without a meaningful understanding and disclosure of the mission benefits of the Plan and related metrics to assess progress, it will be difficult for CBP to justify and make informed decisions about its investment as well as measure the extent to which implementation of the Plan will actually deliver mission value commensurate with costs, similar to the challenges faced by *SBI_{net}*.

CBP Does Not Have a Plan to Assess and Address Operational Issues for Continuing Use of *SBI_{net}* Technology for Surveillance

The new Arizona Border Surveillance Technology Plan does not include the 53 miles covered by previously deployed *SBI_{net}* systems that have historically been at the highest risk for illegal crossing. CBP made its decision to continue using *SBI_{net}* Block 1 systems in the Tucson sector before the results of operational testing were available, and CBP does not have a plan to assess and address operational issues with *SBI_{net}* technology in use in this area. Effective use of existing *SBI_{net}* systems is essential for a comprehensive and integrated approach for surveillance technology along the entire Arizona border.

The Secretary of Homeland Security's January 2011 announcement stated that in DHS's assessment, the issue of viability was evaluated within the context of the *SBI_{net}* Block 1 deployments in the Tucson and Ajo Border Patrol Stations' areas of responsibility—referred to as Tuscon-1 and Ajo-1. It stated that testing and evaluation of the system was under way at those sites and that it was too early to quantify the effectiveness of the technology. However, based on qualitative assessments from the

²⁴ Office of Management and Budget, *OMB Circular No. A-11, Part 7, Section 300, Planning, Budgeting, Acquisition, and Management of Capital Assets* (Washington, D.C.: Executive Office of the President, July 2010).

Test Results Revealed System Operational Challenges, Although Test Participants Who Provided Feedback Had Favorable Opinions of the System

Border Patrol, which had begun using the systems,²⁵ *SBI_{net}* systems enhanced the Border Patrol's ability to detect, identify, track, deter, and respond to threats along some parts of the border. The announcement further stated that *SBI_{net}* contributed in part to increasing the likelihood of the apprehension of illegal entrants.

Since the Secretary's announcement, CBP has received the U.S. Army's Test and Evaluation Command (ATEC) operational test results for the *SBI_{net}* system at Tucson-1 that revealed challenges regarding the effectiveness and suitability of the technology for border surveillance.²⁶ In its March 2011 report on operational testing conducted from October 2010 to November 2010, ATEC said that *SBI_{net}* was "effective with limitations" because (1) the ability of the system to correctly detect, identify, and classify items of interest was below initial system acceptance benchmarks and was (2) further degraded by terrain and weather conditions, and (3) the radar system generated a high number of extraneous radar returns or "hits" that overwhelmed operators. ATEC found that the system was "not operationally suitable" because the reliability of the system was low.²⁷

Specifically, ATEC officials found that the rugged, restrictive terrain and weather conditions prevalent where *SBI_{net}* is deployed affected the performance of the system's radar, which impacted success in detecting, identifying, and classifying the items of interest. ATEC officials referred to this situation as a "terrain/technology mismatch." ATEC also reported that the radar's difficulties with terrain and weather resulted in a high number of extraneous radar hits' being generated by the system, hits that presented a difficult-to-manage workload for operators for which *SBI_{net}*'s

²⁵ The Border Patrol began using *SBI_{net}* at Tucson-1 in February 2010 and at Ajo-1 in August 2010.

²⁶ ATEC is the operational test agency for the *SBI_{net}* Block 1 deployment at Tucson-1. In this capacity, ATEC provides an independent evaluation of the system's operational effectiveness and suitability. ATEC issued its final evaluation report in March 2011: U.S. Army Test and Evaluation Command, *Operational Test Agency Evaluation Report for the Secure Border Initiative Network (SBI_{net}) Block 1.0* (Aberdeen Proving Ground, Md.: Mar. 29, 2011).

²⁷ Detection is a visual determination by the COP operator that items of interest are present in the field of view of *SBI_{net}* cameras. Identification is a visual determination by the COP operator that the detected item of interest is a person, vehicle, or animal. Classification is a determination by the COP operator that the identified item of interest can be assigned a designation of migrants, traffickers, or other.

technical filtering techniques could not compensate fully. Moreover, ATEC also noted that the system required operators to cull through thousands of extraneous radar hits (among a total average of 26,000 hits per day). This generated an unreasonable expectation given the lack of standardized procedures in how to manage the extraneous radar hits and lack of training in how to use the system tools to filter them out.

In response to ATEC's findings, CBP said that problems with using *SBI*net to detect, identify, and classify items of interest are less significant now than when they began using the system since the operators, through their continued experience with the system, better understand what causes extraneous radar hits and are better able to deal with them. Similarly, CBP stated that ATEC's reliability findings have been mitigated by the fact that many of the system failures were because of routine system reboots that are being addressed by enhancements to *SBI*net currently in process.

Notwithstanding the findings of the ATEC testers, Border Patrol *SBI*net operators and field agents who participated in this testing and completed questionnaires during and at the end of testing responded favorably about a number of aspects of the system, including responding that the system significantly enhanced both agent safety and overall situational awareness during day-to-day operations for tracking and apprehending illegal border crossers.²⁸ Further, in our March 2011 work reviewing the status of *SBI*net, all the Border Patrol officials we spoke with told us the system provided them with capability they did not have previously and was considerably better than the technology that was available to them prior to *SBI*net's deployment.²⁹ Nonetheless, based on the factors mentioned above, ATEC concluded that because of the limitations of the *SBI*net radar, the system does not significantly reduce the need for traditional field agents' role in the operating environment. ATEC also

²⁸ Border Patrol *SBI*net operators completed 61 questionnaires and field agents completed 103 questionnaires about their opinions of the system at the end of shifts over the course of the test period. Some operators and field agents may have completed multiple questionnaires, if they had worked on more than one shift during testing. Seventeen of the operators and 10 of the field agents who participated in operational testing completed questionnaires about their opinions of the system at the end of the test period. CBP and Border Patrol officials and operators with whom we spoke also had favorable opinions of the system.

²⁹ [GAO-11-448T](#).

A Post-Implementation Review of SBInet Could Help CBP Determine How Best to Proceed in Its Operation and Inform Future Deployment Decisions

concluded that, despite receiving high questionnaire ratings from test participants who completed questionnaires, actual performance of SBInet in terms of interdiction was only slightly different than if the system had not been present in the areas where it is deployed.

According to DHS guidance, project managers are required to conduct a Post Implementation Review to evaluate the impact of an investment's deployment on customers, the mission and program, and technical and/or mission capabilities.³⁰ Similarly, OMB's Capital Programming Guide, a supplement to OMB Circular A-11, identifies a Post-Implementation Review as a tool to evaluate an investment's efficiency and effectiveness to determine how well an investment achieved the planned functionality and anticipated benefits.³¹ Moreover, as the next step in the evaluation phase for any major information technology investment, like SBInet, DHS policy requires that an operational analysis be undertaken to measure the performance and cost of the asset against the established baseline.³² According to the guidance, operational analyses measure how close the investment is to achieving the project's expected cost, schedule, and performance goals. When performance is found deficient, the project manager must identify and schedule suitable corrective actions.

DHS guidance further states that the Post-Implementation Review should occur when a system has been in operation at least 6 months or immediately following investment termination, and the Operational Analysis should be performed annually for information technology investments in the steady-state or operations and maintenance phase like SBInet. Such reviews would be prudent and provide a baseline for CBP to decide whether to continue the system without adjustment, to modify the system to improve performance—to the extent that addressing the operational issues identified by the Army's operational testing are cost beneficial—or, if necessary, to consider alternatives to the implemented

³⁰ Chief Information Officer, Department of Homeland Security, *Capital Planning and Investment Control (CPIC) Guide*, Version 4.0 (Washington, D.C.: May 2007).

³¹ Office of Management And Budget, *Capital Programming Guide V 2.0 Supplement to Office of Management and Budget, Circular A-11, Part 7: Planning, Budgeting, and Acquisition of Capital Assets* (Washington, D.C.: Executive Office of the President, June 2006).

³² Chief Information Officer, Department of Homeland Security, *Capital Planning and Investment Control (CPIC) Guide*, Version 4.0 (Washington, D.C.: May 2007).

system. The reviews could also provide CBP with an opportunity to more quantitatively determine and document the *SBlnet* system's ability to satisfy the agency's operational requirements, given that CBP plans to continue to operate the *SBlnet* system along the highest risk 53 miles of the Arizona border and will be faced with funding operation and maintenance costs over the remaining 10-year life of the system. (For example, CBP has requested \$10 million for fiscal year 2012 to support the continuing operation of *SBlnet* systems.)

A Post-Implementation Review and Operational Analysis could also help inform CBP's decisions about whether future technology deployments of similar ground-based radar technologies that are to make up the IFT systems being used for the next step in its plan to deploy border surveillance technology in Arizona are necessary where *SBlnet* systems are currently being used.

CBP program officials initially told us they did not intend to develop an action plan that addressed ATEC deficiencies and recommendations. They said that the Secretary of Homeland Security's decision to cancel further procurements of *SBlnet* systems was a basis for their decision not to commit resources to resolve technical, logistical, and operational issues identified during the Army's operational testing of the system. However, in response to our inquiries related to the applicability of this guidance, CBP told us in August 2011 that the Border Patrol was considering, but had not yet developed, a plan for reviewing and addressing the results of the ATEC tests for *SBlnet*.

CBP officials said they had not developed a plan to address *SBlnet* operational test outcomes or conducted a post-implementation review because of the Secretary's cancellation of the program. They said they were confident that the technology was now available to acquire and deploy a non-developmental system as part of the new Arizona Border Surveillance Technology Plan.³³ However, CBP plans to continue using *SBlnet* for surveillance along the highest risk corridor in Arizona. The impact of the use of *SBlnet* systems could affect the deployment and use of other surveillance technologies along the Arizona border. For example, if *SBlnet* systems are particularly effective, illegal border-crossing traffic

³³ The Arizona Border Surveillance Technology Plan limits acquisition to proven, fully-integrated, non-developmental systems suitable for operations in remote, isolated areas along the border.

may decrease in the area where the systems are in use. Conversely, if *SBI*net is less effective, illegal border crossings may increase in the area surveilled. Thus, conducting an assessment of *SBI*net operational test results and the potential cost-effective resolution of the issues identified could better position CBP in determining analyses of alternative technologies for future systems' deployments in the areas of the Arizona Border covered by *SBI*net.

CBP's Cost Estimate Reflects Some but Not All Key Cost-Estimating Best Practices

CBP officials have taken steps to develop a cost estimate for the Arizona Border Surveillance Technology Plan consistent with some best practices. However, the officials did not determine a level of confidence around their rough order of magnitude (ROM) estimate, inconsistent with best practices.

CBP's Cost Estimate Is Substantially Comprehensive and Accurate but Partially Documented and Minimally Credible

Our analysis of CBP's 10-year life-cycle cost estimate (LCCE) for the Arizona Border Surveillance Technology Plan (the Plan) found that CBP did not fully follow best practices for developing a reliable LCCE, which is at the core of successfully managing a project within cost and affordability guidelines. CBP's estimate for the Plan is \$1.5 billion.³⁴ The estimate includes approximately \$750 million in acquisition costs and approximately \$800 million for operations and maintenance costs to procure and deploy a range of border surveillance technology across Arizona.

Our guide and OMB guidance emphasize that reliable cost estimates are important for program approval and continued receipt of annual funding.³⁵ DHS policy similarly provides that life-cycle cost estimates are essential to an effective budget process and form the basis for annual budget decisions. Reliable LCCEs reflect four characteristics. They are (1) well-documented, (2) comprehensive, (3) accurate, and (4) credible. These

³⁴ \$1.54 billion then-year dollars. Then-year dollars reflect the cost at the time of the procurement.

³⁵ Office of Management And Budget, *Capital Programming Guide V 2.0 Supplement to Office of Management and Budget, Circular A-11, Part 7: Preparation, Submission, and Execution of the Budget* (Washington, D.C.: Executive Office of the President, June 2006) and [GAO-09-3SP](#).

four characteristics encompass 12 best practices for reliable program life-cycle cost estimates.³⁶ (See app. III that describes the 12 steps of high-quality cost estimates.) The results of our analysis of CBP’s cost estimate against these four best practice characteristics are summarized in table 4.

Table 4: Extent to which CBP’s Arizona Border Surveillance Technology Plan Cost Estimate Meets Best Practices

Best Practice	Best practice description	Results of GAO analysis
Well-documented	The cost estimates should be supported by detailed documentation that describes the purpose of the estimate, the program background and system description, the scope of the estimate, the ground rules and assumptions, all data sources, estimating methodology and rationale, and the results of the risk analysis. Moreover, this information should be captured in such a way that the data used to derive the estimate can be traced back to, and verified against, their sources.	Partially Met
Comprehensive	The cost estimates should include costs of the program over its full life-cycle, provide a level of detail appropriate to ensure that cost elements are neither omitted nor double-counted, and document all cost-influencing ground rules and assumptions.	Substantially Met
Accurate	The cost estimate should be based on an assessment of most likely costs (adjusted for inflation), documented assumptions, and historical cost estimates and actual experiences on other comparable programs. Estimates should be cross-checked against an independent cost estimate for accuracy, double counting, and omissions. In addition, the estimate should be updated to reflect any changes.	Substantially Met
Credible	The cost estimates should discuss any limitations of the analysis because of uncertainty, or biases surrounding data or assumptions. Risk and uncertainty analysis should be performed to determine the level of risk associated with the estimate. Further, the estimate’s results should be cross-checked against an independent estimate. ^a	Minimally Met

Source: GAO analysis based on information provided by CBP.

Note: “Not met” means CBP provided no evidence that satisfies any of the criterion.

“Minimally met” means CBP provided evidence that satisfies a small portion of the criterion.

“Partially met” means CBP provided evidence that satisfies about half of the criterion.

“Substantially” means CBP provided evidence that satisfies a large portion of the criterion.

“Fully met” means CBP provided evidence that completely satisfies the criterion.

^aAn independent cost estimate is another estimate based on the same technical information that is used to validate and cross-check the baseline estimate, but is prepared by a person or organization that has no stake in the approval of the project

CBP’s life-cycle cost estimate for the Plan substantially met best practices in terms of being both comprehensive and accurate. For example, in terms of comprehensiveness, the estimate included technical data that was documented at a sufficient level of detail. This included specific technology requirements anticipated to provide situational awareness for

³⁶ [GAO-09-3SP](#).

each of the focus areas along the Arizona border such as the number of integrated fixed-tower systems, mobile surveillance systems, or other technologies. However, detailed technical data related to shared IT infrastructure was missing, and risk information on the technologies, assumptions, and estimating were not provided. As a result, our analysis concluded that CBP's cost estimate substantially, but not fully, reflected best practices for comprehensiveness. In terms of accuracy, the cost estimate was continually updated and refined as more information became known; this helps to provide decision makers with accurate and current information. Specifically, there were 10 changes documented that clearly showed what updates were made to the cost estimate. These changes included new technology quantities, learning-curve adjustments, and incurred cost adjustments. However, the estimate also relied on historical data from earlier *SBI_{net}* deployment, and the accuracy and the reliability of that data were questionable because some data were still pending. As a result, CBP's estimate substantially, but not fully, met criteria for accuracy.

Moreover, the Plan's estimate partially met best practices in terms of being well-documented and minimally met best practices for being credible. Cost estimates are well-documented when they can be easily repeated and can be traced to original sources. The documentation should explicitly identify the primary methods, calculations, assumptions, and sources of the data used to generate each cost element. However, according to our review of data provided to us by CBP, while many data sources were discussed, the actual data used to determine the estimate were not always shown. Therefore, it is not possible for an unfamiliar analyst to recreate the estimate with the provided documentation. As a result of insufficient documentation, the validity and reliability of the CBP's life-cycle cost estimate for the Arizona Border Surveillance Technology Plan cannot be verified. For that reason, we assessed CBP's cost estimate as partially meeting criteria for being well-documented.

In terms of credibility, we found that CBP officials did not conduct a sensitivity analysis, and a cost-risk and uncertainty analysis, to determine a level of confidence in the \$1.5- billion life-cycle cost estimate for Arizona. Therefore, CBP's estimate provides an incomplete basis for management decisions because without a level of confidence, it will be difficult for decision makers to identify a range of possible costs, higher and lower, corresponding to the associated risks involved with the acquisition and deployment of technology across Arizona. A sensitivity analysis of all cost estimates examines the effects of changing one assumption or cost driver at a time while holding all other variables

constant. Since uncertainty cannot be avoided, it is necessary to identify the cost elements that represent the most risk and, if possible, cost estimators should quantify the risk.³⁷

In addition to sensitivity analysis, which looks at the effects of changing one parameter or cost driver at a time, a cost risk and uncertainty analysis should be performed to capture the cumulative effect of multiple variables changing, such as schedules slipping, or proposed solutions' not meeting user needs, allowing for a known range of potential costs.³⁸ Because CBP officials did not perform a cost-risk, and uncertainty analysis, the estimate for the Plan is likely to be unrealistic because it does not assess the variability in the cost estimate from such effects as schedules slipping, missions changing, and proposed solutions' not meeting users' needs. Without this type of analysis for example, it will be difficult for CBP decision makers to determine a defensible level of contingency reserves necessary to cover increased costs resulting from uncertainties associated with the Arizona plan.

Another way to reinforce the credibility of the cost estimate would be for CBP to commission an independent cost estimate and then reconcile any differences between the two.³⁹ This process is considered one of the best and most reliable estimate validation methods.⁴⁰ However, because CBP

³⁷ A sensitivity analysis also requires estimating the high and low uncertainty ranges for significant cost driver input factors. To determine what the key cost drivers are, a cost estimator needs to determine the percentage of total cost that each cost element represents. The major contributing variables within the highest percentage cost elements are the key cost drivers that should be varied in a sensitivity analysis.

³⁸ High-quality cost estimates usually fall within a range of possible costs, with a point estimate being located between extremes. Having a range of costs around a point estimate is more useful to decision makers, because it conveys the level of confidence in achieving the most likely cost and also informs them on cost, schedule, and technical risks. Lacking a cost risk and uncertainty analysis, management cannot determine a defensible level of contingency reserves and the estimate is unrealistic because it does not assess the variability in the cost estimate.

³⁹ An independent estimate provides an independent view of expected program costs that tests the program office's estimate for reasonableness. It is usually developed from the same technical baseline description the program office used, but it is typically performed by an organization higher in the decision-making process than the office performing the baseline estimate. Without an independent cost estimate, decisions makers will lack insight into a program's potential costs because independent cost estimates frequently use different methods and are less burdened with organizational bias.

⁴⁰ [GAO-09-3SP](#).

officials did not compare their estimate with an independent estimate, agency decision makers may lack insight regarding the plan's range of potential costs because independent cost estimates frequently use different methods and are less burdened with organizational biases. Despite these deficiencies, we assessed CBP's cost estimate as minimally meeting best practices for credibility rather than not meeting them because CBP did identify some cost drivers that could be used as a basis for conducting a sensitivity analysis.

Responding to the results of our cost analysis, CBP officials reported that their approach was to develop and report a rough order of magnitude (ROM) cost estimate for the portfolio of technology projects contained in the Arizona Border Surveillance Technology Plan. Because CBP officials considered the \$1.5-billion estimate an initial ROM estimate, they reported that it lacked some elements of the technology costs and complete supporting documentation, and was not subjected to an independent or corroborating cost-estimating effort.

Based on a Rough Order of Magnitude Analysis, CBP's Budget Request for IFT Systems May Not Be Realistic and Is Not Sufficient

CBP officials reported that while they believed the \$1.5 billion cost estimate to complete the Arizona border was reasonable, they cautioned that they considered it to be a ROM estimate rather than a LCCE. According to cost-estimating best practices, a ROM cost estimate is developed when a quick estimate is needed and few details are available. It is usually based on historical ratio information and typically developed to support what-if analyses and can be developed for a particular phase or portion of an estimate to the entire cost estimate, depending on available data. It is helpful for examining differences in high-level alternatives to see which are the most feasible. However, according to cost-estimating best practices, because a ROM is developed from limited data and in a short time, a ROM analysis should never be considered a budget-quality cost estimate. However, CBP used the ROM estimate to support its \$242-million budget request for fiscal year 2012 because it lacked the time needed to develop a more robust estimate.

CBP officials said the request reflected relevant operational information from authoritative CBP sources as well as comprehensive program technical descriptions for both the acquisition and sustainment life-cycle phases. Officials plan to use the fiscal year 2012 appropriations to purchase IFT systems technology for future deployments in Arizona. The three initial deployments are planned for the Nogales, Douglas, and Casa Grande station areas of operation followed by two additional deployments planned in Sonoita and Wellton station areas. According to OTIA and

Border Patrol officials, depending on the availability of funding, the deployments of the IFT system component of the Plan are expected to begin around March 2013 and be completed by the end of 2015 (or possibly early 2016), with other sector deployments sequentially following the Arizona sector. CBP estimated that the entire IFT system acquisition for Arizona would cost about \$570 million, including funding for design and development, equipment procurement, production and deployment, systems engineering and program management, and a national operations center.

Nonetheless, there is significant uncertainty regarding the cost of IFT systems stemming from assumptions made as part of the cost-estimating process. For example, when developing the ROM estimate, CBP officials expected that IFT systems would be able to access existing commercial communication networks in target deployment areas. CBP officials said that this assumption is no longer valid in all cases and additional communication relay equipment will likely be necessary. While CBP officials believe they have adequate risk contingency funds to address this issue, because they did not undertake a risk and uncertainty analysis to quantify the impact on the cost estimate of these kinds of risks, it will be difficult for them to determine whether the contingency funds will be sufficient to cover this or other risks.

The findings of our analysis are particularly relevant considering that similar deficiencies were identified with the life-cycle cost estimate for the *SBlnet* Block 1 deployment. In May 2010, we reported that the life-cycle cost estimate for the Block 1 deployment was not credible because risk and uncertainty were not adequately assessed.⁴¹ For example, the risks associated with software development were not examined, even though such risks were known to exist. In fact, the only risks considered were those associated with uncertainty in labor rates and hardware costs, and instead of being based on historical quantitative analyses, these risks were expressed by assigning them arbitrary positive or negative percentages. In addition, the estimate did not specify contingency reserve amounts to mitigate known risks, and an independent cost estimate was not used to verify the estimate. Our program assessments have too often revealed that not integrating cost estimation, system development

⁴¹ GAO, *Secure Border Initiative: DHS Needs to Reconsider Its Proposed Investment in Key Technology Program*, [GAO-10-340](#) (Washington, D.C.: May 5, 2010).

oversight, and risk management—three key disciplines, interrelated and essential to effective acquisition management—has resulted in programs' costing more than planned and delivering less than promised.⁴²

In discussing this issue, CBP officials said they attempted to establish as much fidelity as possible with the Arizona technology cost estimate and associated budget requests. However, the officials reported that they knew that several of their planning and estimating assumptions were broad and that they lacked some desired details. For those reasons, the officials continue to call their Arizona technology cost estimates ROM estimates. CBP officials stated that they used the best information available to establish budget quality estimates and plan to provide updated, comprehensive, and thoroughly documented cost estimates in fall 2011 related to the Plan.

CBP officials said they consider the Arizona Border Surveillance Technology Plan to be a grouping of multiple projects that will proceed as independent acquisitions rather than a unified capital asset acquisition. As such, CBP officials reported that they are preparing LCCE for the individual acquisition projects in the Plan, initially for the IFT systems and the Remote Video Surveillance Systems (RVSS) with other projects to follow. CBP officials reported that OTIA will request baseline approval for the projects in the Plan later this year from the appropriate department or CBP acquisition oversight board. They said that this process will further examine respective cost and schedule estimates, technical performance and program risks, as well as contracting and related management concerns. Prior to the major acquisition reviews, CBP officials said that OTIA is developing detailed program management plans and supporting documentation for each of the Arizona technology projects within the portfolio. CBP officials do not expect to release a cost estimate for technology acquisition and deployment beyond Arizona until February 2012. However, without a complete LCCE that contains all cost estimating best practices for the Arizona Plan, CBP could experience the same kind of problems as the ones it encountered in the acquisition of *SBlnet*.

⁴² GAO, *Homeland Security: DHS Could Strengthen Acquisitions and Development of New Technologies*, [GAO-11-829T](#) (Washington, D.C.: July 15, 2011).

Conclusions

CBP has not yet demonstrated the effectiveness and suitability of its new approach for deploying surveillance technology in Arizona. By taking steps to document how, where, and why it plans to deploy specific combinations of technology prior to its acquisition and deployment, CBP could be better positioned to minimize performance risks associated with the new approach. Given that apprehensions along the southwest border are at their lowest levels since the 1970s and, in light of the difficulties CBP has faced in its efforts to procure and deploy surveillance technology, documenting the underlying analysis used to justify the technology types, quantities, and suitability to terrain contained in the Arizona Border Surveillance Technology Plan could help CBP make its decisions more transparent. Further, better defining the mission benefits to be gained from planned procurements and quantifying performance metrics to assess the effectiveness of technologies selected for Arizona would help justify program funding and assist CBP in measuring its progress toward securing the southwest border. Given that CBP plans to spend \$1.5 billion for technologies to enhance surveillance across the remainder of the Arizona border, conducting a post-implementation review and operational assessment of the *SBl_{net}* systems that includes a review of operational test results, and then weighing costs and benefits of taking action on the results could give CBP the opportunity to maximize the effectiveness of the system it has already deployed in the highest risk area in Arizona. It could also help CBP in making decisions for future technology deployments along the southwest border and provide a sound basis for assessing and deploying alternative technologies.

Fully documenting the data used in the cost model could help ensure that the validity and reliability of the CBP's life-cycle cost estimate for the Arizona Border Surveillance Technology Plan can be verified. Because CBP officials did not conduct a sensitivity analysis and a cost-risk and uncertainty analysis to determine a level of confidence in the \$1.5-billion life-cycle cost estimate for the Plan, it will be difficult for decision makers to determine what levels of contingency funding may be needed to cover risks associated with implementing new technologies along the remaining Arizona border. Until CBP officials accurately quantify the impacts of the risks, the budget requests for fiscal year 2012 and beyond may not be realistic and sufficient to achieve program aims. Because CBP officials do not expect to release a cost estimate for technology acquisition and deployment beyond Arizona until February 2012, until that time, the cost visibility of the total investment required to deploy technology across the southwest border is unclear. Verification of the new life-cycle cost estimate with an independent cost estimate and reconciliation of any differences could further help ensure the credibility of the cost estimate.

Recommendations

To increase the likelihood of successful implementation of the Arizona Border Surveillance Technology Plan and maximize the effectiveness of technology already deployed, we recommend that the Commissioner of CBP take the following three steps in planning the agency's new technology approach:

- ensure that the underlying analyses of the Plan are documented in accordance with DHS guidance and internal controls standards;
- determine the mission benefits to be derived from implementation of the plan and develop and apply key attributes for metrics to assess program implementation; and
- conduct a post-implementation review and operational assessment of *SBI_{net}*, including consideration of the ATEC test results, and assess the costs and benefits of addressing the issues identified to help ensure the security of the 53 miles already covered by *SBI_{net}* and enhance security on the Arizona border.

To increase the reliability of CBP's Cost Estimate for the Arizona Border Surveillance Technology Plan, we recommend that the Commissioner of CBP update its cost estimate for the Plan using best practices, so that the estimate is comprehensive, accurate, well-documented, and credible. Specifically, the OTIA program office should (1) fully document data used in the cost model; (2) conduct a sensitivity analysis and risk and uncertainty analysis to determine a level of confidence in the estimate so that contingency funding can be established relative to quantified risk; and (3) independently verify the new life-cycle cost estimate with an independent cost estimate and reconcile any differences.

Agency Comments and Our Evaluation

We requested comments on a draft of this report from DHS and DOD. DHS provided written comments which are reprinted in appendix IV. In commenting on the draft report, DHS concurred with our recommendations and identified steps officials planned to take to implement them, along with estimated dates for their completion. DHS also stated that there were several issues raised in the report that could not be addressed at present. In an email received on October 14, 2011, the DOD liaison indicated that DOD had no comments on the report.

Regarding the first recommendation that CBP ensure that the underlying analyses of the Plan are documented in accordance with DHS guidance and internal controls standards, DHS concurred. DHS stated that CBP plans to work with the DHS Internal Control Program Management Office

to ensure Plan documentation is in accordance with DHS guidance and internal controls and anticipates completing this action by May 31, 2012. Such actions should address the intent of the recommendation.

Regarding the second recommendation that CBP determine the mission benefits to be derived from implementation of the Plan and develop and apply key attributes for metrics to assess the program's implementation, DHS concurred and stated that CBP plans to develop a set of measures by April 30, 2012, that will assess the effectiveness and mission benefits of future technology investments. Such action should address the intent of the recommendation.

With regard to the third recommendation that CBP conduct a post-implementation review and operational assessment of *SBlnet*, DHS concurred and stated that CBP's Office of Border Patrol (OBP) is working with Johns Hopkins University Applied Physics Laboratory on a Block I after-action review (AAR), which will address the operational test and evaluation results and offer recommendations on tactics, techniques, and procedures. DHS also said that OTIA and the Border Patrol will conduct a post-implementation review and operational assessment required in light of the OBP AAR, consistent with departmental policy and procedures for recurring reporting of fielded systems. DHS states that CBP plans to complete these actions by June 30, 2012. Such actions should address the intent of the recommendation.

Regarding the three recommendations related to CBP's life-cycle cost estimate—that CBP fully document data used in the cost model; conduct a sensitivity analysis and risk and uncertainty analysis to determine a level of confidence in the estimate so that contingency funding can be established relative to quantified risk; and independently verify the new life-cycle cost estimate with an independent cost estimate and reconcile any differences—DHS concurred. DHS stated that OTIA is preparing individual RVSS and IFT project cost estimates consistent with the GAO's guidelines and is fully documenting all assumptions, data structures and sources, methods and calculations, as well as risks and sensitivities for the two largest elements of the Plan that will enable CBP to refine contingency funding as needed. Officials plan to submit the appropriate project documentation, including the projects' Cost Estimating Baseline Document and the updated life-cycle cost estimate, to the department for independent review and verification of the respective projects' methodology and data sources. The department commented that it plans to determine the need for an independent cost estimate at a later time but will complete these actions by April 30, 2012. While these actions are

positive steps, they do not fully address the recommendation that DHS implement best practices for cost estimates for the entire Plan. Instead, DHS's response indicates that it plans to implement these best practices for the two largest projects within the Plan. To fully understand the impacts of integrating these separate projects, DHS should update the life-cycle cost estimate for the entire Plan.

DHS also noted that there were three issues in the draft that it did not feel, at present, it could address. First, regarding the need to document analytical steps taken to develop the Plan, the department stated that DHS relies on Border Patrol field agents' expert judgment to select the types and quantities of technologies best suited for their respective geographic areas of responsibilities. According to DHS, in all cases, technology selections were verified for consistency with the major findings of the AoA. In some cases, however, the Border Patrol determined that operational priorities justified a technology mix that was not necessarily the lowest cost—for example, the Border Patrol said a higher cost integrated fixed tower (IFT) solution would be operationally superior to deploying lower cost mobile systems. According to DHS, CBP is not planning further analyses or additional documentation given that they consider their analyses to be sufficiently documented in the final Plan.

We recognize the value of Border Patrol agents' expert judgment in selecting the types and quantities of technologies best suited for their respective geographic areas of responsibility. Nonetheless, internal control standards call for documentation to support decision making to be available for examination. In the Plan, CBP officials documented the results of their analyses in terms of their planned deployments of technologies but did not include documentation of the supporting operational assessment done by the Border Patrol justifying the specific types, quantities, and deployment locations of border surveillance technologies, a key analytical component leading to the Plan. Documentation of the underlying analyses, not just the results, would enable the analyses supporting the Plan to be independently assessed. As noted in the report, it is unclear whether and how the analyses conducted to develop the Plan demonstrated the cost and operational effectiveness of the selected mix of technology, including whether the most appropriate technology for the terrain was selected. CBP cannot demonstrate the validity of the Arizona Border Surveillance Technology Plan and its acquisition approach in the absence of documentation that describes how CBP developed the operational assessments and technology deployment analyses and used the results of the AoA to develop the types and quantities of technologies and their suitability to the

terrain from the various alternatives. Further, in the light of the significant difficulties faced by CBP in its prior efforts to develop and implement the nearly \$1 billion *SBI*net system to provide unquantified improvements in border surveillance along 53 miles of the Arizona border after 5 years of program efforts, we remain concerned that CBP lacks reasonable assurance that its Plan will fully support its future deployments of border surveillance technology in Arizona.

The second issue DHS raised regarded the report's observations about limitations of *SBI*net systems currently fielded in Arizona and the need for CBP to address operational test results. DHS did concur with the recommendation that CBP conduct a post-implementation review and operational assessment of *SBI*net. However, DHS said that, because of the Border Patrol's ongoing mitigation efforts and a planned system enhancement to address these limitations, they are unable to address this issue at this time. DHS added that they plan to continue to use the system to maintain enhanced situational awareness while gaining additional experience with the system until the planned system enhancement can be implemented in 2012 to address operational concerns.

The third issue regarded the report's observations about limitations of the Plan's cost estimates and the potential sufficiency of contingency funds to accommodate unforeseen cost growth. DHS said that CBP program officials "are mindful" of this concern, were conservative in their budget requests, and believe this issue has been largely addressed by their prior efforts to accommodate reasonable cost contingencies. However, DHS added that, in response to the related recommendation, it is preparing updated life-cycle cost estimates, consistent with the GAO's best practice guidelines, for two projects in the Plan that account for 90 percent of the estimate. But to fully address this recommendation, DHS will need to implement best practices for the entire Plan, not just for the two largest projects, so that the impacts of integrating the separate projects can be fully understood. DHS and DOD provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the Secretary of Homeland Security, the Commissioner of the U.S. Customs and Border Protection, and interested congressional committees. In addition, the report will be available at no charge on GAO's Web site at <http://www.gao.gov>.

If you or your staff have questions regarding this report, please contact me at (202) 512-8777 or at StanaR@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix V.

Richard M. Stana

Richard Stana
Director, Homeland Security and Justice Issues

Appendix I: Objectives, Scope, and Methodology

Our objectives were to determine the extent to which (1) U.S. Customs and Border Protection (CBP) has the information needed to fully support and implement its Arizona Border Surveillance Technology Plan in accordance with Department of Homeland Security (DHS) and Office of Management and Budget (OMB) guidance, and (2) CBP's life-cycle cost estimate for the Arizona Border Surveillance Technology Plan reflects best practices.

To answer our first objective, we reviewed key program-planning documents CBP relied on to support its new approach to identifying, acquiring, and deploying surveillance technology applicable to specific types of terrain along the Arizona border. We also interviewed CBP officials responsible for assessing the need for and documenting the cost- and operational effectiveness and suitability of proposed systems to support its Arizona Border Surveillance Technology Plan and for identifying appropriate metrics to assess progress in border security. Specifically, we reviewed the announcement of the Secretary of Homeland Security and her vision of CBP's new approach to identifying, acquiring, and deploying surveillance technology to the Arizona border in support of Border Patrol's mission, principle goal, and objective. We also reviewed CBP's analysis of alternatives (AOA) for Arizona, the Arizona Border Surveillance Technology Plan informed by the AOA, the final report of the independent peer review team on the AOA, CBP's request for information on integrated fixed-tower technology, its Industry Day announcement and answers to industry questions, and CBP's comparison of the similarities and differences between integrated fixed towers and *SBlnet* technology.

In relation to operational test results, we reviewed what the independent evaluation of *SBlnet* and discussed with officials the extent CBP is using these findings to inform future investments as well as the continuing operation of *SBlnet*. We largely focused on the elements of *SBlnet* known as Block 1, developed and deployed in Arizona's Tucson sector between 2005 and 2010 and CBP's plans for its operation and maintenance over its life-cycle. In doing so, we reviewed program documentation, including the Army Test and Evaluation Command's reports and briefing to CBP, and interviewed the key officials involved in the design and implementation of the operational test and evaluation of test results in order to determine the reliability of the information we used to support our

finding.¹ We compared CBP's program management plans and activities with requirements in DHS acquisition regulations including Acquisition Regulation 102-01 and OMB guidance A-11. We also interviewed CBP officials from its Office of Technology Innovation and Acquisition (OTIA) on how they intended to use the operational test findings and recommendations to inform the continuing operation of existing *SBlnet* technology. Specifically, we reviewed the Army's operational test plans, the initial and final test and evaluation reports, and their "Quick Look" briefing to OTIA officials. We also interviewed CBP and Army officials about the results of those tests and discussed the soundness of the test design process, its sampling methodology, and its implementation in order to determine whether we could rely on test results data. We found the test results to be sufficiently reliable for the purposes of this report. We also observed the *SBlnet* systems in operation in the Tucson sector, and discussed the systems' performance with Border Patrol Agents in the Tucson and Ajo station *SBlnet* command centers. We reviewed our body of work on *SBlnet* since 2005 as a basis for assessing CBP's proposed approach for developing and implementing its new Arizona Border Surveillance Technology Plan.

To answer our second objective, we reviewed cost and budget documents CBP relied on to support cost estimates for technology alternatives contained in the AOA for Arizona and in the President's budget request for fiscal year 2012. We also interviewed program officials and contractors responsible for estimating the cost of future investments in surveillance technology, specifically the life-cycle approach, requirements development and management, test management, and risk management. We then compared this information to relevant federal guidance derived from leading industry practices.² To assess the reliability of the cost data for the rough order-of-magnitude estimate for implementation of the Plan, which assumed a 10-year life-cycle for the acquisition, we relied on data for fiscal year 2010 and beyond to support the findings in the report. We also reviewed relevant program documentation to substantiate evidence obtained through interviews with

¹ The operational test results were based on testing activities conducted by the Army on *SBlnet* Block 1 during October and November 2010.

² GAO, *Secure Border Initiative: DHS Needs to Reconsider Its Proposed Investment in Key Technology Program*, [GAO-10-340](#) (Washington, D.C.: May, 5, 2010); and *Secure Border Initiative: DHS Needs to Address Significant Risks in Delivering Key Technology Investment*, [GAO-08-1086](#) (Washington, D.C.: Sept. 22, 2008).

knowledgeable agency officials, where available, regarding the integrity of the data. We determined that the data used in this report are sufficiently reliable for the purposes of this report.³ We compared CBP cost estimating practices and budget documents to our Cost Estimating and Assessment Guide, which contains best practices compiled from cost-estimating organizations throughout the federal government and industry.⁴

We conducted this performance audit from March 2011 through October 2011 in accordance with generally accepted government auditing standards. 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 The CBP cost data we relied on was developed by CBP during July and August 2010.

⁴ GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

Appendix II: Photographs of Technologies Contained in the Arizona Border Surveillance Technology Plan

Figure 1: Mobile Surveillance System (MSS)



Source: GAO.

An MSS consists of camera and radar systems mounted on a truck, with images being transmitted to and monitored on a computer screen in the truck's passenger compartment.

Figure 2: Mobile Video Surveillance System (MVSS)



Source: GAO.

An MVSS is a truck-mounted, long-range infrared imaging device.

Figure 3: Integrated Fixed Tower Concept (SBI_{net} Tower)



Source: GAO.

An Integrated Fixed Tower “system” consists of various components and program support activities. The components include fixed towers, sensors (cameras and radar), a data communications network, facilities upgrades, information displays, and an information management system. Program support activities include those performed to design, acquire, deploy, and test the system; and manage government and contractor efforts.

Figure 4: Air Support (Unmanned Aerial System)



Source: GAO.

The mission of the UAS is to provide sensor information to law enforcement, emergency management, and intelligence planners to prevent terrorism, secure the borders from the illicit flow of people and contraband, and respond to disasters.

Figure 5: Long Range Handheld Thermal Imaging System (RECON III)



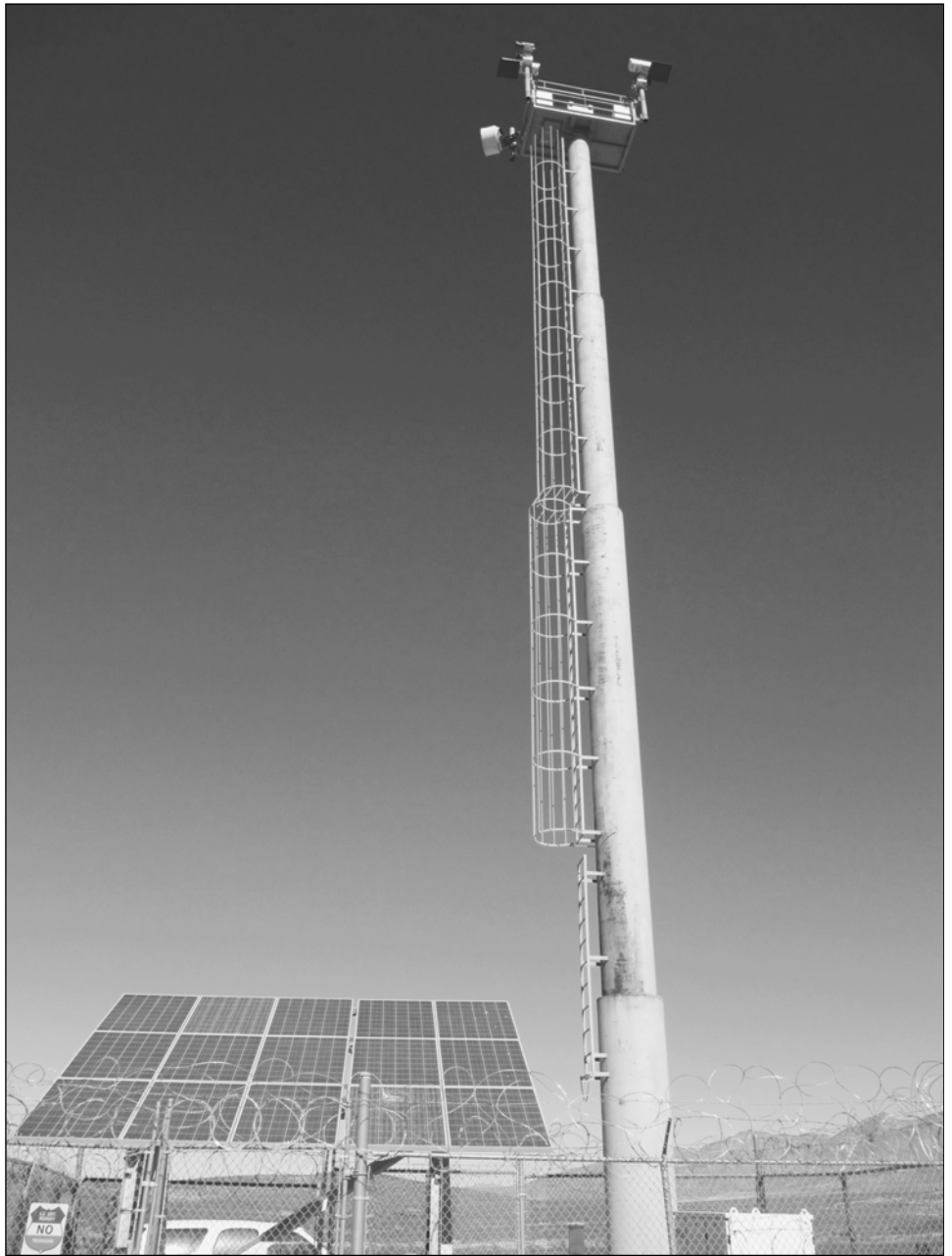
Source: CBP.

Figure 6: Agent Portable Surveillance System (APSS)



Source: CBP.

Figure 7: Remote Video Surveillance System (RVSS)



Source: CBP.

Appendix III: Aspects of High-Quality Cost Estimates

Table 5: The 12 Steps of High-Quality Cost Estimating Mapped to the Characteristics of a High-Quality Cost Estimate

Characteristic	Explanation	Step
Well-documented	The documentation should address the purpose of the estimate, the program background and system description, its schedule, the scope of the estimate (in terms of time and what is and is not included), the ground rules and assumptions, all data sources, estimating methodology and rationale, the results of the risk analysis, and a conclusion about whether the cost estimate is reasonable. Therefore, a good cost estimate—while taking the form of a single number—is supported by detailed documentation that describes how it was derived and how the expected funding will be spent in order to achieve a given objective. For example, the documentation should capture in writing such things as the source data used and their significance, the calculations performed and their results, and the rationale for choosing a particular estimating method or reference. Moreover, this information should be captured in such a way that the data used to derive the estimate can be traced back to and verified against their sources, allowing for the estimate to be easily replicated and updated. Finally, the cost estimate should be reviewed and accepted by management to ensure that there is a high level of confidence in the estimating process and the estimate itself.	<p>Step 1: Define the estimate's purpose, scope, and schedule</p> <p>Step 3: Define the program characteristics</p> <p>Step 5: Identify ground rules and assumptions</p> <p>Step 6: Obtain the data</p> <p>Step 10: Document the estimate</p> <p>Step 11: Present the estimate to management for approval</p>
Comprehensive	The cost estimates should include both government and contractor costs of the program over its full life-cycle, from inception of the program through design, development, deployment, and operation and maintenance to retirement of the program. They should also completely define the program, reflect the current schedule, and be technically reasonable. Comprehensive cost estimates should provide a level of detail appropriate to ensure that cost elements are neither omitted nor double counted, and they should document all cost-influencing ground rules and assumptions. Establishing a product-oriented work breakdown structure is a best practice because it allows a program to track cost and schedule by defined deliverables, such as a hardware or software component.	<p>Step 2: Develop the estimating plan</p> <p>Step 4: Determine the estimating structure</p> <p>Step 5: Identify ground rules and assumptions^a</p>
Accurate	The cost estimates should provide for results that are unbiased, and they should not be overly conservative or optimistic. Estimates are accurate when they are based on an assessment of most likely costs, adjusted properly for inflation, and contain few, if any, minor mistakes. In addition, the estimates should be updated regularly to reflect material changes in the program, such as when schedules or other assumptions change, and actual costs so that the estimate is always reflecting current status. Among other things, the estimate should be grounded in documented assumptions and a historical record of cost estimating and actual experiences on other comparable programs.	<p>Step 7: Develop the point estimate^b</p> <p>Step 12: Update the estimate to reflect actual costs and changes</p>

Appendix III: Aspects of High-Quality Cost Estimates

Characteristic	Explanation	Step
Credible	The cost estimates should discuss any limitations of the analysis because of uncertainty or biases surrounding data or assumptions. Major assumptions should be varied, and other outcomes recomputed to determine how sensitive they are to changes in the assumptions. Risk and uncertainty analysis should be performed to determine the level of risk associated with the estimate. Further, the estimate's results should be crosschecked, and an independent cost estimate conducted by a group outside the acquiring organization should be developed to determine whether other estimating methods produce similar results. For management to make good decisions, the program estimate must reflect the degree of uncertainty, so that a level of confidence can be given about the estimate. Having a range of costs around a point estimate is more useful to decision makers because it conveys the level of confidence in achieving the most likely cost and also informs them on cost, schedule, and technical risks.	Step 7: Compare the point estimate to an independent cost estimate ^c Step 8: Conduct sensitivity analysis Step 9: Conduct risk and uncertainty analysis

Source: [GAO-09-3SP](#).

^aThis step applies to two of the characteristics—well-documented and comprehensive.

^bA point estimate is a single cost estimate number representing the most likely cost.

^cThis step applies to two of the characteristics—credible and accurate.

Appendix IV: Comments from the Department of Homeland Security

U.S. Department of Homeland Security
Washington, DC 20528



**Homeland
Security**

October 20, 2011

Richard Stana
Director, Homeland Security and Justice
441 G Street, NW
U.S. Government Accountability Office
Washington, DC 20548

Re: Draft Report GAO-12-22, "ARIZONA BORDER SURVEILLANCE TECHNOLOGY:
More Information on Plans and Costs Is Needed Before Proceeding"

Dear Mr. Stana:

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's) work in planning and issuing this report.

In 2010, Secretary Napolitano directed an independent, quantitative assessment of the *SBI_{net}* program, which combined the input of U.S. Border Patrol agents on the front lines with the Department's leading science and technology experts. This assessment made clear that *SBI_{net}* could not meet its original objective of providing a one-size-fits-all border security technology solution. As a result, earlier this year, U.S. Customs and Border Protection (CBP) began the process of redirecting *SBI_{net}* resources to other, proven technologies – tailored to each border region – to better meet the operational needs of the Border Patrol. This new border security technology plan – which is already well underway – is providing faster deployment of technology, better coverage, and a more effective balance between cost and capability.

The Department is pleased to note the report highlights several important aspects of our efforts to develop and implement the Arizona Border Surveillance Technology Plan (Plan) and address the progress being made. The draft acknowledges the robust and deliberative process we have used to hone CBP's surveillance technology investment plan for the Arizona border region. The draft reiterates the threats and challenges our Nation faces at the border and the Department's need for additional surveillance to establish situational awareness for enhancing border security efforts. The draft acknowledges the Department's deliberative efforts to evaluate and assess multiple sensor technology investment options as part of a formal Analysis of Alternatives (AoA). The draft affirms the expertise of our Border Patrol and their detailed "operational assessments" regarding the selection of specific technologies by frontline agents responsible for securing the targeted areas in Arizona. In addition, the draft found our cost estimating to be comprehensive and accurate, reflecting rigor throughout the process as well as support for the final decisions identified in the Plan.

The draft report also detailed several ongoing CBP activities to implement the Plan. As of today, CBP has awarded contracts for commercially available mobile surveillance capabilities, hand-held thermal imaging binoculars, and agent-portable tripod-mounted radar/camera systems—these systems are now deployed and being used by agents on the border or are undergoing government acceptance testing prior to field delivery. Additional contracts for mobile video camera systems and unattended ground sensors are expected this fall. Of particular interest is the final unit price for each of these procurement contracts is approximately 10 percent to 20 percent less than what CBP estimated; this fact validates our cost estimating and budgeting methods.

In addition to its recommendations, the GAO draft encourages DHS to consider additional measures that may enhance the success of the Plan. Although DHS agrees with these recommendations, there were some points in the draft that we do not feel, at present, we can address.

- GAO asserts analytical steps were inadequately documented, thereby denying decision-makers and overseers insights into aspects of the Plan – As CBP has previously briefed the GAO, the Department relies on field agents’ expert judgment to select the types and quantities of technologies best suited for their respective geographic areas of responsibilities. This judgment is based on the years of experience the Border Patrol has with operating many of the candidate technologies, as well as their intimate familiarity with the threats, tactics, and terrain of the target geographical areas. In all cases, the Border Patrol’s selections were verified for consistency with the major findings of the Department’s Analysis of Alternatives, including considerations of geographic location, cost and operational objectives. In some cases, however, the Border Patrol determined that operational priorities justified a technology mix that was not necessarily the lowest cost, e.g., a higher cost Integrated Fixed Tower (IFT) solution would be operationally superior to deploying lower cost mobile systems onto an active Marine Corps bombing range in Arizona that would have to be relocated during frequent range exercises. These decisions are documented as part of the final Plan and were shared with the GAO during the review. Given the thorough nature of this analysis, CBP is not planning further analyses or additional documentation at this time.
- GAO asserts previously fielded SBInet Block 1 systems (TUS-1 and AJO-1) are likely to require costly system modifications to be effective and suitable for current border security efforts — The findings of the TUS-1 system Operational Test & Evaluation event showed that the system is operationally effective, but limited by operational and support concerns. CBP noted these findings in its publicly released Plan in January 2011. Many of the concerns identified in the testing event were anticipated prior to testing, and the Border Patrol operators are effectively using the system in ways that mitigate most of the concerns. Additionally, the program office and prime contractor have been preparing a system enhancement (due summer of 2012) to address several of the identified concerns. Until then, the Border Patrol advocates continued use of the Block 1 system “as-is” to maintain the enhanced situational awareness, command and control capabilities offered by the system, while gaining additional experience and learning prior to implementing significant changes to the Block 1 deployments.

- GAO asserts the Plan's cost estimates, reported to be substantially comprehensive and accurate, still require detailed documentation and analysis, and may understate contingency budgets to accommodate unforeseen needs. — The draft suggests CBP may not have sufficient contingency budget available to accommodate unforeseen cost growth. CBP program officials are mindful of this concern, and accordingly developed conservative estimates and integrated a contingency margin in our overall budget requests. Based on recent contract award prices being less than our estimates, and based on generally accepted budgeting practices, CBP is confident that we are adequately resourced to accommodate reasonable cost contingencies. Additionally, we are preparing updated life cycle cost estimates for the Remote Video Surveillance System (RVSS) and the IFT projects, consistent with the GAO best practice guidelines, to report the quantifiable risk and sensitivity measures for more than 90 percent of the total Plan's cost estimate.

The draft report contained six recommendations directed at DHS, with which DHS concurs. Specifically, GAO recommended that the Commissioner of CBP:

Recommendation 1: Ensure that the underlying analyses of the Plan are documented in accordance with DHS guidance and internal controls standards.

Response: Concur. CBP has documentation for all of the underlying analyses and resulting conclusions of the SBInet Analysis of Alternatives, the Arizona "operational assessments," and the completed final Plan. CBP has provided the GAO significant documentation, interviews, and analytical products covering all facets of the Plan's development, including the specified types, quantities, and deployment locations of technologies derived from the expert judgment of seasoned Border Patrol Agents. The DHS Internal Control Program Management Office will work with CBP to ensure Plan documentation is in accordance with DHS guidance and internal controls. Estimated Completion Date (ECD): May 31, 2012

Recommendation 2: Determine the mission benefits to be derived from implementation of the plan and develop and apply key attributes for metrics to assess program implementation.

Response: Concur. The Department and CBP are developing a set of measures that will assess the effectiveness and mission benefits of future technology investments. ECD: April 30, 2012

Recommendation 3: Conduct a post-implementation review and operational assessment of SBInet, including consideration of the ATEC test results, and assess the costs and benefits of addressing the issues identified to help ensure the security of the 53 miles already covered by SBInet and enhance security on the Arizona border.

Response: Concur. CBP's Office of Border Patrol (OBP) is working with Johns Hopkins Applied Physics Laboratory on a Block 1 After Action Review (AAR), which will address the Operational Test & Evaluation results and offer recommendations on Tactics, Techniques, and Procedures. OTIA and the Border Patrol will conduct a post implementation review required in light of the OBP AAR, consistent with Departmental policy and procedures for recurring reporting of fielded systems. Because of the planned software/hardware upgrades and enhancements being developed, OTIA and OBP will coordinate the post-implementation review and operational analysis next summer following the upgrade installations. These

updates were already identified by OBP to improve the system performance and effectiveness. Additionally, OTIA and the Border Patrol continue to collect system performance information data that highlights performance of the system. ECD: June 30, 2012

Recommendation 4: Fully document data used in the cost model.

Response: Concur. OTIA, as well as the cost estimating team involved in formulating the updated Plan, applied the GAO Cost Estimating Guidelines to the extent practical. All of the cost estimating underlying the Arizona AoA is fully documented as part of the Homeland Security Institute's final report to the government. This documentation, coupled with the documented inputs from the Border Patrol's operational assessments (specific quantities, locations, performance values, and other significant system specifications), provide a comprehensive record of the cost estimating methodology and data sources employed for the Plan. OTIA is preparing individual RVSS and IFT project cost estimates consistent with the GAO guidelines, fully documenting all assumptions, data structures and sources, methods and calculations, as well as risks and sensitivities for the two largest elements of the Plan. ECD: April 30, 2012

Recommendation 5: Conduct a sensitivity analysis and risk and uncertainty analysis to determine a level of confidence in the estimate so that contingency funding can be established relative to quantified risk.

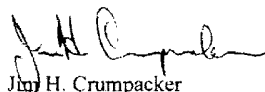
Response: Concur. CBP is updating cost estimates for the RVSS and IFT projects, the two largest elements of the Plan. The updated estimates will include sensitivity and quantified risk analyses and will enable CBP to refine contingency funding as needed. ECD: April 30, 2012

Recommendation 6: Independently verify the new life-cycle cost estimate with an independent cost estimate and reconcile any differences.

Response: Concur. CBP is updating cost estimates for the RVSS and IFT projects, the two largest elements of the Plan. CBP will submit the appropriate project documentation, including the projects' Cost Estimating Baseline Document and the updated Life Cycle Cost Estimate, to the Department for independent review and verification of the respective projects' methodology and data sources. The Department will determine the need for an independent cost estimate at a later time. ECD: April 30, 2012

Again, thank you for the opportunity to review and comment on this draft report. General, technical, and sensitivity comments have been provided under separate cover. 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

Richard Stana, at (202) 512-8777 or RichardS@gao.gov

Staff Acknowledgments

Chris Keisling, Assistant Director, and Ron Salo, Analyst-in-Charge, managed this assignment. David Alexander, Seto Bagdoyan, Charles Bausell, Justin Dunleavy, Mike Harmond, Richard Hung, Karen Richey, and Sean Seales made important contributions to this report. Frances Cook provided legal assistance, and Tina Cheng provided graphics assistance. Katherine Davis contributed to report preparation.

Related GAO Products

Homeland Security: DHS Could Strengthen Acquisitions and Development of New Technologies. [GAO-11-829T](#) (Washington, D.C.: July 15, 2011).

Border Security: DHS Progress and Challenges in Securing the U.S. Southwest and Northern Borders. [GAO-11-508T](#) (Washington, D.C.: March 30, 2011).

Border Security Preliminary Observations on the Status of Key Southwest Border Technology Programs. [GAO-11-448T](#) (Washington, D.C. March 15, 2011).

Secure Border Initiative: DHS Needs to Strengthen Management and Oversight of Its Prime Contractor. [GAO-11-6](#) (Washington, D.C.: October 18, 2010).

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