United States General Accounting Office

GAO

Report to Congressional Committees

May 2004

INFORMATION TECHNOLOGY

Early Releases of Customs Trade System Operating, but Pattern of Cost and Schedule Problems Needs to Be Addressed

GAO-04-719

May 2004

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Early Releases of Customs Trade System Operating, but Pattern of Cost and Schedule Problems Needs to Be Addressed

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Highlights

Highlights of GAO-04-719, a report to the Subcommittees on Homeland Security, Senate and House Committees on Appropriations

Why GAO Did This Study

The Department of Homeland Security's (DHS) Bureau of Customs and Border Protection (CBP) is conducting a multiyear, multibillion-dollar acquisition of a new trade processing system planned to support the movement of legitimate imports and exports and strengthen border security. By congressional mandate, expenditure plans for this system, called the Automated Commercial Environment (ACE), must meet certain conditions, including GAO review. This study addresses the extent to which the latest plan, for fiscal year 2004, satisfies these conditions, provides information about DHS's efforts to implement GAO's recommendations for improving ACE management, and makes observations about ACE.

What GAO Recommends

To assist DHS in managing ACE and increasing the chances that future releases will deliver promised capabilities on time and within budget, GAO is making recommendations to the Secretary of Homeland Security aimed at addressing recurring cost and schedule problems. DHS concurred with GAO's recommendations and described specific actions that it is taking to respond to each.

www.gao.gov/cgi-bin/getrpt?GAO-04-719

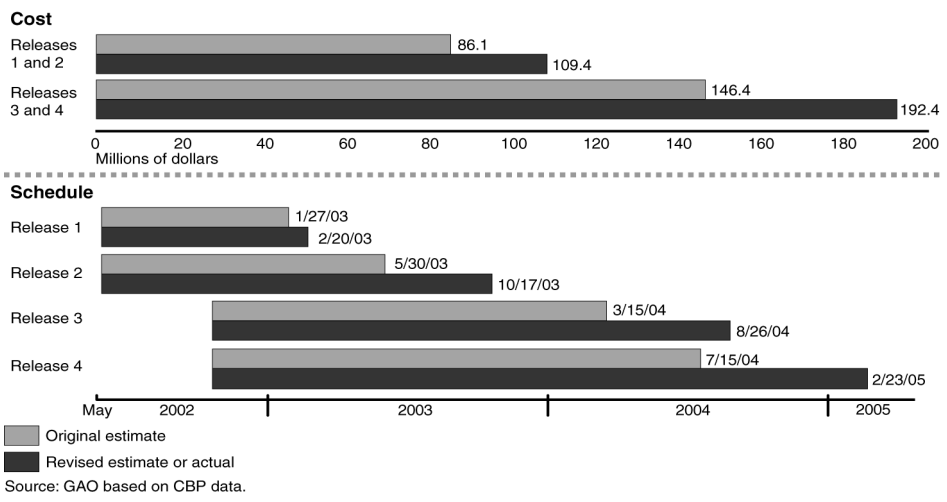
To view the full product, including the scope and methodology, click on the link above. For more information, contact Randolph C. Hite at (202) 512-3439 or hiter@gao.gov.

What GAO Found

The DHS fiscal year 2004 ACE expenditure plan provides for certain activities, including system implementation infrastructure and support, operations and maintenance, and the definition and design of two future releases. This plan, including related program documentation and program officials' statements, largely satisfies the legislative conditions imposed by the Congress. Some of the recommendations that GAO has previously made to strengthen ACE management have been addressed, and DHS has committed to addressing those that remain. However, much remains to be done before these recommendations are fully implemented. Specifically, progress on overcoming human capital challenges has been slow.

GAO made several observations about ACE. Specifically, the first two ACE releases, which have been deployed, are operating largely as intended. However, achieving this initial operating capability has been difficult. DHS has established a pattern of borrowing resources from future releases to address problems of near-term releases, which has adversely affected the cost, schedule, and capability commitments of ongoing releases. In particular, the delay in completing the second ACE release has introduced a pattern of increased reliance on concurrent activities to meet the dictated schedule, continued release schedule delays, and cost overruns for the ongoing releases, as the figure below indicates. This domino effect is continuing into Release 3 and beyond. This pattern is not likely to change unless the degree of concurrence among activities within and between releases is better controlled, which will require that the reasons for release quality problems that led to the concurrent activity be addressed. Until the reasons for this pattern are pinpointed and corrected, in part through implementation of GAO's unaddressed recommendations, DHS will not be positioned to deliver promised capabilities on time and within budget, or produce mission value commensurate with investment cost.

Cost Overruns and Schedule Delays, Releases 1–4



Source: GAO based on CBP data.

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Abbreviations

ACE	Automated Commercial Environment
CBP	Customs and Border Protection
CBPMO	Customs and Border Protection Modernization Office
DHS	Department of Homeland Security
IDIQ	indefinite delivery/indefinite quantity
ITDS	International Trade Data System
IV&V	independent verification and validation
I^2V^2	integrated independent verification and validation
OIG	Office of Inspector General
OMB	Office of Management and Budget
PTR	program trouble report
SA-CMM	Software Acquisition Capability Maturity Model
SAT	system acceptance test
SEI	Software Engineering Institute
SIT	system integration test
SWIT	software integration test
UAT	user acceptance test
US-VISIT	United States Visitor and Immigrant Status Indicator

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United States General Accounting Office
Washington, D.C. 20548

May 14, 2004

The Honorable Thad Cochran
Chairman
The Honorable Robert C. Byrd
Ranking Minority Member
Subcommittee on Homeland Security
Committee on Appropriations
United States Senate

The Honorable Harold Rogers
Chairman
The Honorable Martin Olav Sabo
Ranking Minority Member
Subcommittee on Homeland Security
Committee on Appropriations
House of Representatives

In January 2004, U.S. Customs and Border Protection (CBP) within the Department of Homeland Security (DHS) submitted to the Congress its fiscal year 2004 expenditure plan, seeking release of $318.7 million for its Automated Commercial Environment (ACE) program. ACE is to be CBP's new trade system. The program's goals include facilitating the movement of legitimate trade through more effective trade account management and strengthening border security by identifying import and export transactions that have an elevated risk of posing a threat to the United States. As required by CBP's fiscal year 2004 appropriations,[1] we reviewed the expenditure plan. Our objectives were to (1) determine whether the ACE fiscal year 2004 expenditure plan satisfies certain legislative conditions, (2) determine the status of our open ACE recommendations, and (3) provide any other observations about the expenditure plan and DHS's management of the ACE program.

On March 8, 2004, we briefed your offices on the results of this review. This report transmits the results of our work. The full briefing, including our scope and methodology, is reprinted as appendix I.

[1]P.L. 108-90 (October 1, 2003).

Compliance with Legislative Conditions

The expenditure plan satisfied or partially satisfied the conditions specified in DHS's appropriations act. Specifically, the plan, including related program documentation and program officials' statements, satisfied or provided for satisfying all key aspects of (1) meeting the capital planning and investment control review requirements of the Office of Management and Budget (OMB), (2) complying with the DHS enterprise architecture,[2] and (3) review and approval by DHS and OMB. The plan partially satisfied the condition that specifies compliance with the acquisition rules, requirements, guidelines, and systems acquisition management practices of the federal government.[3]

Status of Open Recommendations

CBP is making progress in addressing our open recommendations. Each recommendation, along with the status of CBP's actions to address it, is summarized below.

- *Before building each ACE release (i.e., beginning detailed design and development), certify to Customs' House and Senate appropriations subcommittees that the enterprise architecture has been sufficiently extended to provide the requisite enterprise design content, and has been updated to ensure consistency and integration across business areas.*

With respect to the fiscal year 2004 expenditure plan, CBP has completed action to implement this recommendation by using a process developed by the former Customs Service to certify ACE releases against the former Customs enterprise architecture. Further, DHS is developing a process to ensure alignment of ACE with the departmentwide enterprise architecture it is developing to replace DHS component agency and bureau architectures.

[2]An enterprise architecture is an institutional blueprint for guiding and constraining investments in business process change and systems.

[3]In June 2003, the Department of the Treasury's Office of Inspector General (OIG) issued a report on the ACE program's contract, concluding that the former Customs Service, now CBP, did not fully comply with Federal Acquisition Regulation requirements in the solicitation and award of the contract. CBP disagrees with the Treasury OIG conclusion. To resolve the disagreement, DHS asked us to render a formal decision. We are currently reviewing the matter.

- *Develop and implement a rigorous and analytically verifiable cost-estimating program that embodied the tenets of effective estimating as defined in the Software Engineering Institute's (SEI) institutional and project-specific estimating guidance.*[4]

CBP is in the process of implementing this recommendation. It has developed and begun to implement a cost-estimating program that embodies SEI's models. For example, CBP hired a contractor to define and implement a cost-estimating program and develop independent cost estimates. Additionally, it has defined and documented processes for estimating expenditure plan costs, and tasked contractors with ensuring that expenditure plan estimates are evaluated against SEI criteria for validating software cost and schedule estimates.

- *Immediately develop and implement a human capital management strategy that provides both near- and long-term solutions to program office human capital capacity limitations, and report quarterly to the appropriations committees on the progress of efforts to do so. These efforts should include defining the office's skill and capability needs in terms that will allow the program office to attract qualified individuals and that will provide sufficient rewards and training, linked to performance, to promote their retention.*

CBP is in the process of implementing this recommendation, and it has reported on these actions to the Congress. In particular, the program office developed and began implementing a human capital management plan that called for addressing several areas, including filling vacant positions. However, the program office has continued to experience difficulty in filling key positions and has begun implementing a new staffing plan intended to address DHS's concern that the program office has insufficient government program management staff.

[4]SEI's institutional and project-specific estimating guidelines are defined in Robert E. Park, *Checklists and Criteria for Evaluating the Cost and Schedule Estimating Capabilities of Software Organizations*, CMU/SEI-95-SR-005 (Pittsburgh, Pa.: Carnegie Mellon University Software Engineering Institute, 1995) and *A Manager's Checklist for Validating Software Cost and Schedule Estimates*, CMU/SEI-95-SR-004 (Pittsburg, Pa: 1995), respectively.

- *Develop and implement process controls for SEI's Software Acquisition Capability Maturity Model (SA-CMM[5]) level 2 key process areas and for the level 3 acquisition risk management key process area; develop and implement each of the missing SA-CMM key practices for these key process areas, and until this is accomplished, report to the appropriations committees quarterly on the progress of efforts to do so.*

CBP has implemented this recommendation. In November 2003, SEI assigned the program a level 2 rating, meaning that the program had established basic acquisition management processes. Further, CBP had addressed the two weaknesses SEI identified in the level 3 acquisition risk management area, and has reported to the Congress on the status of its acquisition management improvement activities.

- *Establish an independent verification and validation (IV&V) function to assist CBP in overseeing contractor efforts, such as testing.*[6]

CBP is in the process of implementing this recommendation. The program office has established an IV&V function and has designated its IV&V contractor. However, program documentation describes roles for the IV&V contractor that are so integral to ACE development, testing, and deployment, as well as to ACE program management, that they raise questions about how the contractor could also perform independent ACE-related assessments. CBP officials stated that they plan to address this situation.

- *Have future ACE expenditure plans specifically address any proposals or plans, whether tentative or approved, for extending and using ACE infrastructure to support other homeland security applications, including any impact on ACE of such proposals and plans.*

[5]Capability Maturity Model (CMM) is a service mark of Carnegie Mellon University, and CMM is registered in the U.S. Patent and Trademark Office. The SA-CMM identifies key process areas that are necessary to effectively manage software-intensive system acquisitions. Level 2 is the second level of the SA-CMM's five-level scale; achieving this level means that an organization has the software acquisition rigor and discipline to repeat project successes.

[6]IV&V involves having an independent organization conduct unbiased reviews of management processes, products, and results with the goal of verifying and validating that these meet stated requirements and standards.

CBP plans to implement this recommendation. Program officials acknowledged the potential for ACE infrastructure to support other DHS system applications and the potential for integrating ACE data and applications with those systems. According to program officials, to begin preparing for this potential, they have focused initially on discussing collaboration opportunities with DHS's United States Visitor and Immigrant Status Indicator Technology (US-VISIT) program.[7]

Observations on Management of ACE

We recognize accomplishments to date, including the deployment of the first 2 of 10 planned ACE releases, and address the need for rigorous and disciplined program management practices relating to managing ACE's costs, schedule, and requirements, as well as the degree of concurrent system development activities. An overview of the observations follows:

- *Release 1 and 2 testing revealed a sufficient volume and significance of system defects to affect schedule commitments.* Release 1 testing revealed system defects, which were corrected about 3 months after the testing was concluded. Release 2 testing revealed more system defects than expected; addressing these defects required more time than originally planned for Release 2 testing.

- *Requirements planned for Releases 1 and 2 have been deferred to later releases.* Releases 1 and 2 were originally planned as a single release that would satisfy 465 requirements. Subsequently, 103 of these requirements, which included capabilities related to document management, data recovery, and security, were deferred to Releases 3 and 4, and 14 were deferred to later releases, for a total of 117 deferred requirements.

- *Release 2 delays have set in motion a pattern of increased reliance on concurrent activities, continued release delays, and cost overruns.* The time required to resolve defects resulted in overlap of Release 2 test phases. Delays in completing Release 2 increased its overlap with Release 3 and have contributed to Release 3 delays. Likewise, Release 3 delays will increase overlap with Release 4 and could cause Release 4 delays.

[7]US-VISIT is a governmentwide program to collect, maintain, and share information on foreign nationals in order to enhance national security and facilitate legitimate trade and travel while adhering to U.S. privacy laws and policies.

Finally, the increased concurrency and schedule delays resulted in Releases 1 through 4 costing more than planned.[8]

- *Releases 1 and 2 are largely operating according to adjusted requirements, defect density has stabilized, and the system is mostly up and running when needed.* Defects prevalent in Releases 1 and 2 have stabilized, but nontrivial defects remain. Releases 1 and 2, however, are mostly available when needed.

- *Following problems with Release 1, steps were taken to avoid future problems, but the success of these actions is unclear.* As a result of Release 1 cost overruns and schedule delays, CBP directed its contractor to develop and implement a plan to improve program performance. The objective of this plan was to demonstrate serious, tangible, and measurable actions to resolve program issues. However, program officials could not point to metrics that demonstrated improved performance, and the cost to develop and implement the corrective action plan is unknown.

- *Initial releases represent a small fraction of the total ACE software.* Releases 1, 2, 3, and 4 account for only about 14 percent of ACE software and are to be designed, developed, and deployed within about 3 years. In contrast, the remaining six ACE releases constitute 86 percent of ACE software but are to be designed, developed, and deployed within about 3-1/2 years. CBP officials stated that they are currently studying the extent to which off-the-shelf software can be employed in the remaining six releases.

- *The reliability of key cost estimates in the expenditure plan is unclear.* The cost estimates in the expenditure plan varied from independent cost estimates, and the derivation of the expenditure plan estimates only partially satisfied SEI guidance for assessing the effectiveness of processes used to derive cost estimates.

[8]Our March 8, 2004, briefing to the staffs of the Subcommittees on Homeland Security, Senate and House Committees on Appropriations, reported a $23.3 million overrun for Releases 1 and 2 in addition to a $36.2 million overrun for Releases 3 and 4. Subsequently, CBP's ACE development contractor revised the estimated overrun for Releases 3 and 4 to $46 million.

Conclusions

The fiscal year 2004 ACE expenditure plan, along with program documentation and officials' commitments, largely satisfies the legislative conditions imposed by the Congress. Further, many of the recommendations that we have made to strengthen ACE management have been addressed, and CBP leadership has committed to addressing those that remain. However, much must still be done before these recommendations are fully implemented. Particularly, progress has been slow on overcoming human capital challenges.

To CBP's credit, the first two ACE releases are operating largely as intended. Achieving this initial operating capability, however, has not occurred without difficulty, such as borrowing resources from future releases to overcome problems on near-term releases; similar difficulties that could affect cost, schedule, and capability commitments are being experienced on ongoing releases. This pattern is not likely to change unless the degree of concurrency among activities within and between releases is better controlled, and the underlying reasons for introducing this concurrency are addressed. While time and resources were invested in management improvements over a year ago to address root causes, the absence of meaningful measures for determining whether these investments will be successful, coupled with limited progress on some of our previous recommendations, makes CBP's chances of delivering future ACE release capabilities on time and within budget uncertain at best.

Recommendations for Executive Action

To assist CBP in managing ACE and increasing the chances that future releases will deliver promised capabilities on time and within budget, we recommend that the Secretary of Homeland Security, through the Under Secretary for Border and Transportation Security and the CBP Commissioner, direct the CBP Chief Information Officer to take the following actions:

- Ensure the independence of its IV&V agent.
- Ensure that future expenditure plans are based on cost estimates that are reconciled with independent cost estimates.
- Reconsider the ACE acquisition schedule and cost estimates in light of early release problems, including these early releases' cascading effects on future releases and their relatively small size compared with later

releases and in light of the need to avoid the past levels of concurrency among activities within and between releases.

- Define measures, and collect and use associated metrics, for determining whether prior and future program management improvements are successful.

- Report quarterly to the House and Senate Committees on Appropriations on efforts to address the above, as well as on our previous but unaddressed recommendations.

Agency Comments and Our Evaluation

In written comments on a draft of this report signed by the director, DHS Bankcard Programs and GAO/OIG Liaison, DHS concurred with our recommendations and stated actions that it is taking or plans to take to implement each. DHS also provided recommendations for disclosing certain sensitive information included in our draft report. We modified this report in accordance with DHS's recommendations. DHS's comments are reprinted in appendix II.

We are sending copies of this report to the Chairmen and Ranking Minority Members of other Senate and House committees and subcommittees that have authorization and oversight responsibilities for homeland security. We are also sending copies to the Secretary of Homeland Security, the Under Secretary for Border and Transportation Security, the CBP Commissioner, and the Director of OMB. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

Should you or your offices have any questions on matters discussed in this report, please contact me at (202) 512-3439 or by e-mail at hiter@gao.gov. Other contacts and key contributors to this report are listed in appendix III.

Randolph C. Hite
Director, Information Technology Architecture
and Systems Issues

IT: Early Releases of Customs Trade System Operating, but Pattern of Cost and Schedule Problems Needs to Be Addressed

Information Technology: Early Releases of Customs Trade System Operating, but Pattern of Cost and Schedule Problems Needs to Be Addressed

Briefing to the Staffs of the
Subcommittees on Homeland Security,
Senate and House Committees on Appropriations

March 8, 2004

This briefing has been modified to exclude sensitive material that the Bureau of Customs and Border Protection deemed to be acquisition-sensitive.

Briefing Overview

Introduction

Objectives

Results in Brief

Background

Results

- Legislative Conditions
- Status of Recommendations
- Observations

Conclusions

Recommendations

Agency Comments

Attachment 1: Scope and Methodology

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Introduction

The Department of Homeland Security (DHS) Bureau of Customs and Border Protection (CBP), formed from the former U.S. Customs Service and other entities with border protection responsibility, is acquiring a new trade processing system, known as the Automated Commercial Environment (ACE). The goals of ACE are to

- facilitate the movement of legitimate trade through more effective trade account management;
- strengthen border security by identifying import/export transactions that have an elevated risk of posing a threat to the United States or of violating a trade law or regulation; and
- provide a single system interface between the trade community[1] and the federal government,[2] known as the International Trade Data System (ITDS), and thereby reduce the data reporting burden placed on the trade community while also providing federal agencies with the data and various capabilities to support their respective international trade and transportation missions.

[1] Members of the trade community include importers and exporters, brokers and trade advisors, and carriers.
[2] Federal agencies include CBP and other federal agencies responsible for managing international trade and transportation processes.

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Introduction

The Department of Homeland Security Appropriations Act, 2004,[1] limits obligating any funds for ACE until DHS submits for approval to the House and Senate Committees on Appropriations a plan for expenditure that

1. meets the capital planning and investment control review requirements established by the Office of Management and Budget (OMB), including Circular A-11, part 3;[2]
2. complies with CBP's enterprise architecture;
3. complies with the acquisition rules, requirements, guidelines, and systems acquisition management practices of the federal government;
4. is reviewed and approved by the CBP Investment Review Board,[3] DHS, and OMB; and
5. is reviewed by GAO.

[1] Pub. L. 108-90 (Oct. 1, 2003).

[2] OMB Circular A-11 establishes policy for planning, budgeting, acquisition, and management of federal capital assets.

[3] The purpose of the IRB is to integrate capital planning and investment control, budgeting, acquisition, and management of investments. It is also to ensure that spending on investments directly supports and furthers the mission and that this spending provides optimal benefits and capabilities to stakeholders and customers.

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Introduction

In the Department of Homeland Security Appropriations Act, the Congress appropriated approximately $318.7 million for the ACE program.[1]

DHS submitted its fiscal year 2004 expenditure plan for $318.7 million on January 21, 2004, to its House and Senate Appropriations Subcommittees on Homeland Security.

[1] Pub. L. 108-90 (Oct. 1, 2003).

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Objectives

Objectives

As agreed, our objectives were to

- determine whether the ACE fiscal year 2004 expenditure plan satisfies the legislative conditions,
- determine the status of our open recommendations made on ACE, and
- provide any other observations about the expenditure plan and DHS's management of the ACE program.

We conducted our work at CBP headquarters and contractor facilities in the Washington, D.C., metropolitan area from January through March 2004 in accordance with generally accepted government auditing standards. Details of our scope and methodology are given in attachment 1.

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Results in brief: Objective 1
Legislative Conditions

Fiscal year 2004 ACE expenditure plan satisfaction of legislative conditions

Legislative conditions	Status
1. Meets the capital planning and investment control review requirements established by OMB, including OMB Circular A-11, part 7.[a]	Satisfied[b]
2. Complies with DHS's enterprise architecture.[c]	Satisfied
3. Complies with the acquisition rules, requirements, guidelines, and systems acquisition management practices of the federal government.	Partially satisfied[d]
4. Is reviewed and approved by the CBP Investment Review Board, DHS, and OMB.	Satisfied
5. Is reviewed by GAO.	Satisfied

Source: GAO.

[a] Capital investment and control requirements are now found in OMB Circular A-11, part 7, rather than part 3.

[b] Satisfied or provides for satisfying every aspect of the condition that we reviewed.

[c] As agreed with the staffs of the appropriations subcommittees, we assessed compliance with the DHS enterprise architecture in lieu of the CBP enterprise architecture.

[d] Satisfied or provides for satisfying many, but not all, key aspects of the condition that we reviewed.

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Results in brief: Objective 2
Open Recommendations

Status of actions to implement our open recommendations

GAO recommendations	Status
Before building each ACE release, certify to CBP's appropriations subcommittees that the enterprise architecture has been sufficiently extended and updated.	Complete[a]
Develop and implement a rigorous and analytically verifiable cost estimating program.	In progress[b]
Immediately develop and implement a human capital management strategy that provides both near and long-term solutions; develop and implement missing human capital practices, and report quarterly to Congress on progress.	In progress

Source: GAO.

[a] Actions have been taken to fully implement the recommendation.

[b] Actions are under way to implement the recommendation.

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Results in brief: Objective 2
Open Recommendations

Status of actions to implement our open recommendations

GAO recommendations	Status
Develop and implement process controls for Software Engineering Institute Software Acquisition Capability Maturity Model[a] level 2 key process areas and for the level 3 acquisition risk management key process area; develop and implement missing practices, and report quarterly to Congress on progress.	Complete
Establish an independent verification and validation function to assist CBP in overseeing contractor efforts, such as testing.[b]	In progress
Have future ACE expenditure plans specifically address any proposals or plans for extending and using ACE infrastructure to support other homeland security applications.	Planned[c]

Source: GAO.

[a] The Software Acquisition Capability Maturity Model® developed by Carnegie Mellon University's Software Engineering Institute (SEI) defines five levels of maturity that provide a roadmap for continuously improving an organization's acquisition management processes.

[b] Independent Verification and Validation involves having an independent organization conduct unbiased reviews of test management processes, products, and results with the goal of verifying and validating that these meet stated requirements and standards.

[c] Actions are planned to implement the recommendation.

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Results in brief: Objective 3
Observations

Observations:

- Release 1 and 2 testing revealed a sufficient volume and significance of system defects to impact schedule commitments.
- Requirements planned for Releases 1 and 2 have been deferred.
- Release 2 delays have set in motion a pattern of increased reliance on concurrent activities, continued release delays, and cost overruns.
- Releases 1 and 2 are largely operating according to adjusted requirements; defect density has stabilized and system is mostly up and running when needed.
- Following Release 1 problems, steps were taken to avoid future problems, but success of actions is unclear.
- Initial releases represent a small fraction of the total ACE software.
- Reliability of key cost estimates in expenditure plan is unclear.

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Results in brief: Objective 3
Observations

To better ensure that future ACE releases deliver promised capability within budget and on time, we are making recommendations to the DHS Secretary to address a recurring pattern of cost and schedule problems.

In their comments on a draft of this briefing, DHS, CBP, and ACE officials, including the DHS Chief Information Officer and the CBP Acting Chief Information Officer, generally agreed with the briefing and stated that it was fair and balanced.

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Background
ACE-Related Business Functions

ACE is to support CBP administration, enforcement, and trade compliance business operations.

- Supported administration business operations include (1) processing and recording of revenue generated from trade compliance, and (2) maintaining the general ledger and accounting.
- Supported enforcement business operations include identifying import and export transactions (i.e., cargo, conveyances, crew, and passengers) that have an elevated risk of threatening the United States or violating a trade law or regulation.
- Supported trade compliance business operations include (1) establishing and maintaining trade accounts; (2) processing and releasing cargo for import or export; tracking and monitoring of conveyances, cargo, and individuals involved in importing and exporting; (3) liquidating import entries including the processing of protests and decisions and the potential authorization of refunds; and (4) ruling on import and export legal, regulatory, and policy issues.

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Background

Description of ACE Technical Architecture

The ACE technical architecture is to consist of layers or tiers of computer technology:

- The Client Tier includes user workstations and external system interfaces.
- The Web & Interface Tier provides the mechanisms for the user workstations and external systems to access ACE.
- The Enterprise Application Integration Tier provides the middleware for integrating and routing information between ACE software applications and legacy systems.
- The Applications Tier includes software applications comprising commercial products (e.g., SAP[1]), custom-developed software, and existing legacy systems that provide the applications supporting business processes.
- The Data Tier includes the business data, storage resources, and access services used by the ACE software applications and the legacy systems.

Security and data privacy are embedded in all five layers.

[1] SAP is a commercial enterprise resource planning software product that has multiple modules, each performing separate but integrated business functions. CBP is using SAP as part of a joint project between its Office of Finance to support financial and property management and the CBP Modernization Office (CBPMO) to support such ACE functions as customer relationship management.

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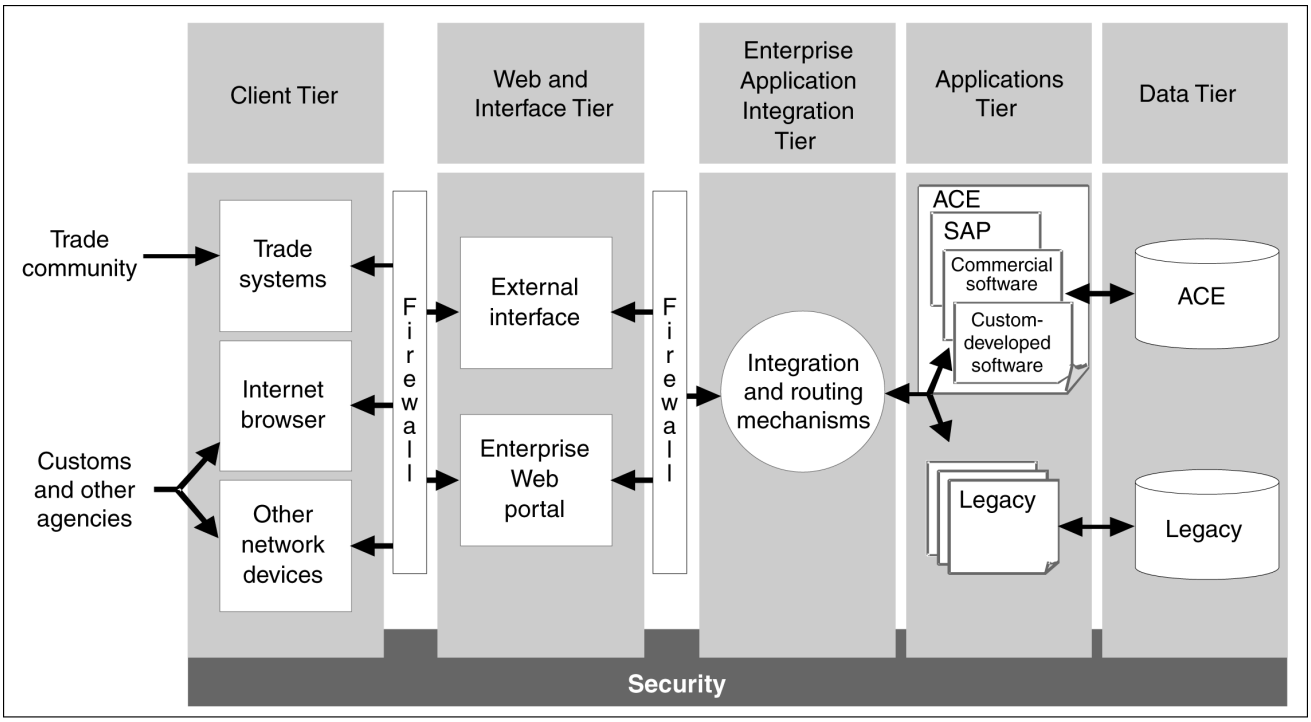
Background
ACE Technical Architecture

Simplified view of ACE technical architecture



Source: GAO based on CBP data.

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Background
Acquisition Strategy

CBP's initial strategy provided for the acquisition of ACE in four increments over 4 years. In September 2002, CBP modified this strategy to acquire and deploy the first two increments in two releases, with all increments and releases acquired over 4 years. In October 2003, CBP changed plans to acquire ACE through the acquisition and deployment of 10 releases over 6 years.

The following figure maps the initial four increments to the 10 releases now planned, 7 of which are called "releases" (e.g., Release 1, Release 2, … Release 7) and 3 of which are called "selectivity" (e.g., Selectivity 1, Selectivity 2, and Selectivity 3).

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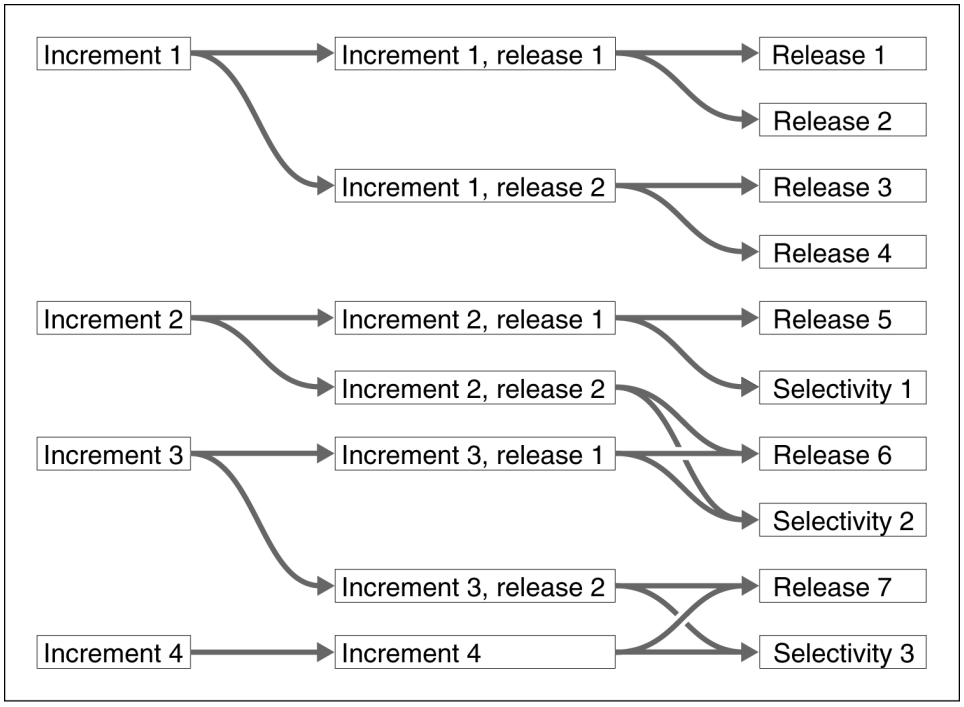
Background
Acquisition Strategy

Evolution of ACE from 4 increments to 10 releases



Source: GAO based on CBP data.

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Background

Composite View of ACE Releases

The functionality associated with, status of, and plans for the 10 ACE releases are as follows.

Release 1: Provide IT infrastructure—computer hardware and system software—to simultaneously support operating the subsequent system releases. This release was deployed in October 2003 and is operating.

Release 2: Provide initial group of CBP national account managers[1] and 41 importers access to account information, such as trade activity. This release was deployed in October 2003 and is operating.

Release 3: Provide additional account managers and importers, as well as brokers and carriers,[2] access to account information; provide initial financial transaction processing and CBP revenue collection capability, allowing importers and their brokers to make monthly payments of duties and fees. This release is under development and scheduled for deployment in August 2004.

[1] CBP national account managers work with the largest importers to ensure their compliance with trade laws.

[2] Brokers obtain licenses from CBP to conduct business on behalf of the importers by filling out paperwork and obtaining a bond; carriers are individuals or organizations engaged in transporting goods for hire.

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Background
Composite View of ACE Releases

Release 4: Provide truck manifest[1] processing and interfacing to legacy enforcement systems and transaction history data. This release is under development and scheduled for deployment in February 2005.

Release 5: Provide legacy systems interface for airport, seaport, and rail crossing inspectors for accessing supply chain, enforcement, and compliance data, as well as additional manifest functionality for selected federal government agencies (including the Food and Drug Administration) and the trade community. This release is scheduled for deployment in August 2005.

Selectivity 1: Identify shipments that pose a security risk using new and different combinations of data than current legacy systems permit, as well as end-user defined threat identification criteria. This release is scheduled for deployment in September 2005.

[1] Manifests are lists of passengers or invoices of cargo for a vehicle, such as a truck, ship, or plane.

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Background
Composite View of ACE Releases

Release 6: Provide additional account management functionality for daily statement creation, refund identification and generation, and expanded payment acceptance; license, permit, and certificate granting, tracking, and revoking; and cargo, conveyance, and equipment tracking. This release is scheduled for deployment in December 2006.

Selectivity 2: Identify shipments that pose a security risk during authorized movements. This release is scheduled for deployment in May 2006.

Release 7: Provide manifest processing for cargo moving between modes of transportation; additional cargo and conveyance tracking and initial export processing functions; importer activity summary; and regulatory audit, protest, and drawback[1] processing. This release is scheduled for deployment in June 2007.

Selectivity 3: Identify imports and exports (e.g., mail, courier, hand-carried items, and shipments transitioning between modes of transportation) that pose a security risk. This release is scheduled for deployment in November 2006.

[1] A refund of duties on an imported product subsequently exported or used to produce a product for export.

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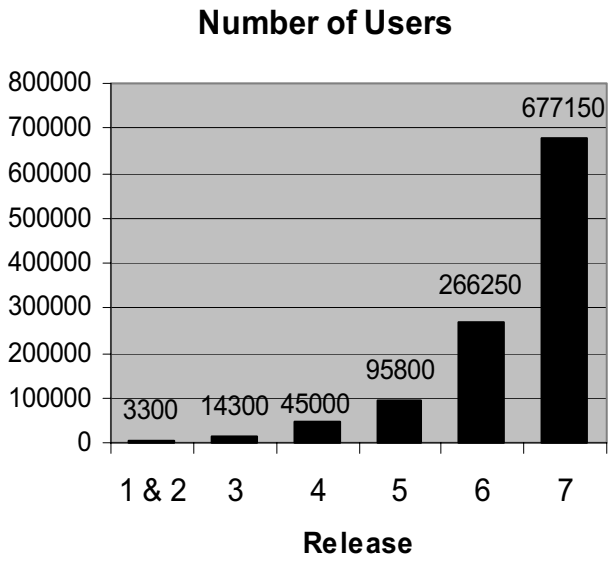
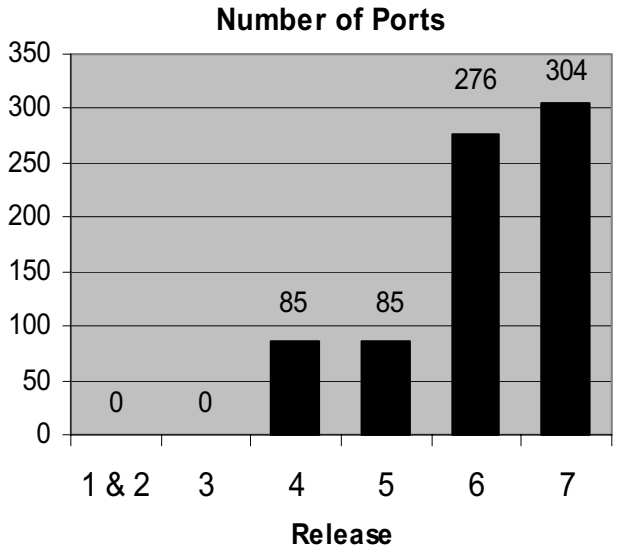
Background
Composite View of ACE Releases

In addition to the expanding functionality planned from one release to the next, the number of users and locations is planned to grow with each release, as shown below.





Note: Selectivity 1, 2, and 3 are planned to be accessible by 37,000 or more users via the CBP network and are not included in the above figures.
Source: CBP.

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Background
Contract Overview

CBP is acquiring and implementing ACE through an indefinite-delivery, indefinite-quantity contract[1] awarded on April 27, 2001, to IBM Global Services. IBM and its subcontractors are collectively called the e-Customs Partnership (eCP). Through a series of contract task orders, CBP plans to acquire and implement ACE.

The following table describes and provides the status of the executed eCP task orders.

[1] An indefinite-delivery, indefinite-quantity contract provides for an indefinite quantity, within stated limits, of supplies or services during a fixed period of time. The government schedules deliveries or performance by placing orders with the contractor.

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Background
Contract Tasks

Status and description of eCP task orders

No.	Name	Start	Status	Description
001	Program management	August 2001	Completed July 2003	Initial program and project management; continued by task 009.
002	Enterprise architecture and engineering	August 2001	Completed June 2003	Initial enterprise architecture and system engineering; continued by task 010.
003	Requirements and planning	August 2001	Completed July 2002	Initial requirements development and program planning effort; continued by tasks for specific increments/releases.
004	Releases 1 and 2	February 2002	Completed October 2003	Design, development, testing, and deployment of Releases 1 and 2 (initially intended to build Increment 1, which was subsequently divided into four releases; Releases 3 and 4 are covered by task 008)
005	Requirements definition	February 2002	Ongoing	Development of Release 5 project plan, documentation of ACE business processes, and development of an ACE implementation strategy.
006	Enterprise process improvement	February 2002	Completed December 2003	Enterprise process improvement integration.

Source: GAO analysis based on CBP data.

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Background
Contract Tasks

Status and description of eCP task orders (cont'd)

No.	Name	Start	Status	Description
007	International Trade Data System	January 2002	Ongoing	Assistance for participating government agencies to define requirements for an integrated ACE/ITDS system.
008	Releases 3 and 4	August 2002	Ongoing	Design, development, testing, and deployment of Releases 3 and 4.
009	Foundation program management	February 2003	Completed October 2003	Follow-on to task 001 to continue program and project management activities; continued by Task 016.
010	Foundation architecture and engineering	February 2003	Completed December 2003	Follow-on to task 002 to continue enterprise architecture and system engineering activities; continued by task 017.
011	Infrastructure and facilities	August 2002	Completed March 2003	Acquisition and setup of the necessary infrastructure and facilities for the contractor to design, develop, and test releases. Infrastructure and facilities work is now part of task 009.
012	Operations and maintenance	April 2003	Ongoing	Establishment of the infrastructure to operate and maintain releases.

Source: GAO analysis based on CBP data.

Background
Contract Tasks

Status and description of eCP task orders (cont'd)

No.	Name	Start	Status	Description
013	Legacy scripts modernization	June 2003	Completed November 2003	Conversion of scripts for interfacing desktop PC applications (MS Word and Excel) and mainframe computer applications.
014	Knowledge-based risk management	September 2003	March 2004 planned completion	Development, demonstration, and delivery of a prototype to provide CBP insight into whether knowledge-based risk management should be used in ACE.
015	Technology prototypes	October 2003	July 2004 planned completion	Development and demonstration of technology prototypes to provide CBP insight into whether the technologies should be used in ACE.
016	Foundation program management - workforce transformation	February 2004	Ongoing	Program management and support to organizational change management through activities such as impact assessments, end user training, communication, and outreach.
017	Business analysis	January 2004	Ongoing	Planning for integrated business framework and evaluation of technology options for future releases.

Source: GAO analysis based on CBP data.

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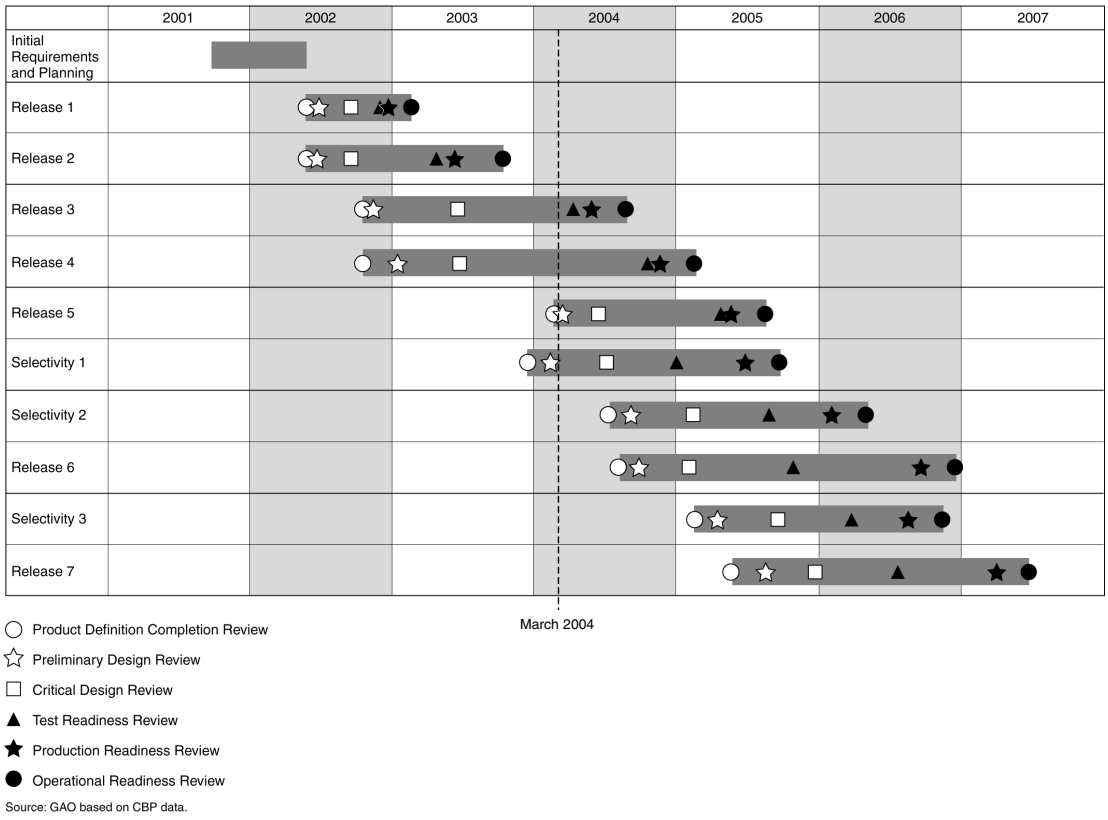
Background
ACE Schedule



Source: GAO based on CBP data.

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Background

Chronology of ACE Expenditure Plans

Since March 2001, five ACE expenditure plans have been submitted.[1]

- On March 26, 2001, CBP submitted to its appropriations committees the *first expenditure plan* seeking $45 million for the modernization contract to sustain CBPMO operations, including contractor support. The appropriations committees subsequently approved the use of $45 million, bringing the total ACE funding to $50 million.
- On February 1, 2002, the *second expenditure plan* sought $206.9 million to sustain CBPMO operations; define, design, develop, and deploy Increment 1, Release 1 (now Releases 1 and 2); and identify requirements for Increment 2 (now Release 5 and Selectivity 1 in addition to part of Release 6 and Selectivity 2). The appropriations committees subsequently approved the use of $188.6 million, bringing total ACE funding to $238.6 million.

[1] In March 2001, appropriations committees approved the use of $5 million in stopgap funding to fund program management office operations.

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Background

Chronology of Five ACE Expenditure Plans

- On May 24, 2002, the *third expenditure plan* sought $190.2 million to define, design, develop, and implement Increment 1, Release 2 (now Releases 3 and 4). The appropriations committees subsequently approved the use of $190.2 million, bringing the total ACE funding to $428.8 million.
- On November 22, 2002, the *fourth expenditure plan* sought $314 million to operate and maintain Increment 1 (now Releases 1, 2, 3, and 4), design and develop Increment 2, Release 1 (now Release 5 and Selectivity 1), and to define requirements and plan Increment 3 (now part of Releases 6 and 7 and Selectivity 2 and 3). The appropriations committees subsequently approved the use of $306.4 million, bringing total ACE funding to $735.2 million.
- On January 21, 2004, CBP submitted its *fifth expenditure plan*, seeking $318.7 million for ACE implementation infrastructure and support, ACE operations and maintenance, and definition and design of Release 6 and Selectivity 2.

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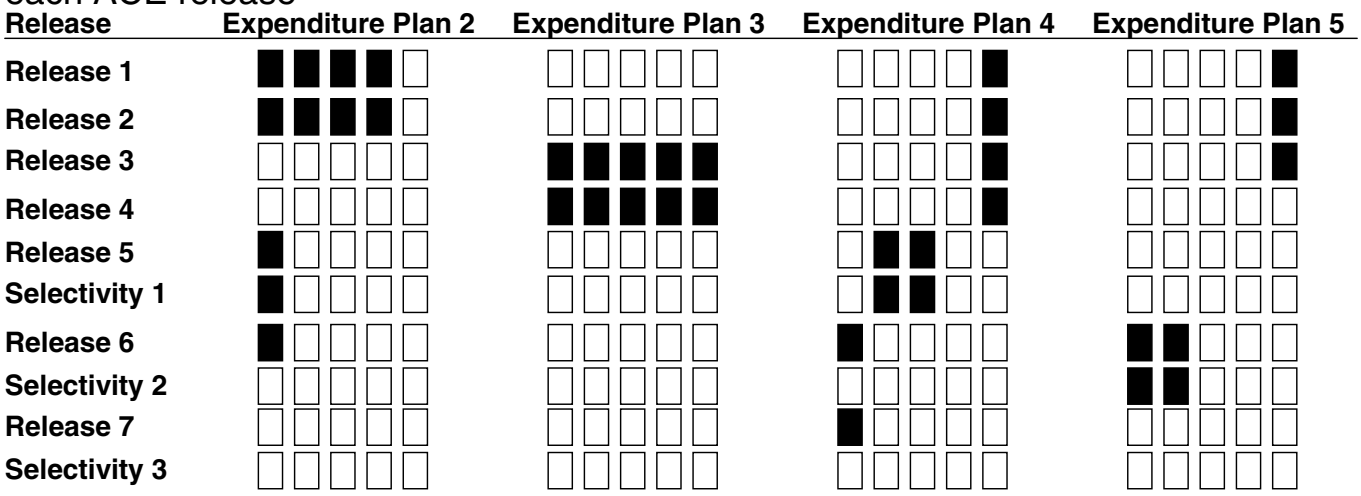
Background

Mapping of ACE Releases to Expenditure Plans

How expenditure plan[1] requests have funded or are to fund life cycle phases of each ACE release



Source: GAO analysis based on CBP data.
[1]Expenditure Plan 1 funded program management and planning only.

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Background
Summary of Expenditure Plan Funding

Summary of the ACE fiscal year 2004 expenditure plan

Plan activity	
Release 6 definition and design	
Selectivity 2 definition and design	
Implementation infrastructure and support	
Foundation program management	
Foundation architecture and engineering	
Workforce transformation and training	
Operations and maintenance	
CBPMO costs	
Federally Funded Research and Development Center	
International Trade Data System	
SAP[b]	
Management reserve	
Total Expenditure Plan Funding[a]	**$318.7**

Source: GAO based on CBP data.

[a] Millions of dollars.

[b] SAP is a commercial enterprise resource planning software product that has multiple modules, each performing separate but integrated business functions. CBP is using SAP as part of a joint project between its Office of Finance to support financial and property management and the CBPMO to support such ACE functions as customer relationship management.

Objective 1 Results
Legislative Conditions

The fiscal year 2004 ACE expenditure plan satisfied or partially satisfied each of the legislative conditions.

Condition 1. The plan, in conjunction with related program documentation and program officials' statements, satisfied the capital planning and investment control review requirements established by OMB, including Circular A-11, part 7, which establishes policy for planning, budgeting, acquisition, and management of federal capital assets.

Details of our analysis are shown on the table that follows.

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Objective 1 Results
Legislative Condition 1

Examples of A-11 conditions	Results of our analysis
1. Indicate whether the project was approved by the IRB and reviewed by Chief Financial and Procurement Officers	The plan was approved by the DHS IRB, which is chaired by the Deputy Secretary and composed of department executives, including DHS's Chief Financial and Procurement Officers.
2. Provide justification and describe acquisition strategy	The plan provides a high-level justification for ACE. Supporting documentation describes the acquisition strategy for all ACE releases, including Release 6 and Selectivity 2 activities identified in the plan.
3. Summarize life cycle costs and cost/benefit analysis, including the return on investment	CBP's November 2003 cost/benefit analysis summarizes current life cycle and return on investment cost information. CBP reports that the overall ACE benefit to cost ratio for CBP alone is 1.43[a] and 6.66[b] for CBP, other government agencies, and the trade community.

[a] The government benefit to cost ratio of 1.43, which is for CBP only, was calculated by dividing the present value benefits of $3.97 billion by the present value cost of $2.78 billion. According to the cost/benefit analysis, benefits are generated from the efficiency gains of ACE and the decommissioning of the legacy Automated Commercial System.

[b] The national benefit to cost ratio of 6.66, which is for CBP, other government agencies, and the trade community, was calculated by dividing the present value benefits of $18.55 billion by the present value cost of $2.79 billion. The ratio may not be exact due to rounding.

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Objective 1 Results
Legislative Condition 1

Examples of A-11 conditions	Results of our analysis
4. Address enterprise architecture	Alignment of ACE to the enterprise architecture has yet to be determined, but DHS and CBP officials stated that they plan to address this issue.[c]
5. Address security and privacy	The security of Release 2 was certified on August 22, 2003, and accredited on September 16, 2003; CBP plans to certify and accredit future releases. CBP is in the process of preparing a privacy impact assessment for Release 3 and expects to complete it by March 2004.
6. Address Section 508 compliance[d]	Release 2 was deployed without requiring Section 508 compliance by the system development contractor. The requirement for Section 508 compliance was not recognized and was not reflected in the designs of Releases 2 and 3. CBP decided to partially address Section 508 compliance in Release 3 and defer complete compliance to future releases. CBP plans to assess Release 3 with respect to Section 508 compliance, and implement an action plan to ensure that noncompliant areas are corrected in future releases.

Source: GAO.

[c] For more details, see the results of our analysis for the second legislative condition.

[d] Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended by the Workforce Investment Act of 1998 (P.L. 105-220), August 7, 1998, requires federal agencies to develop, procure, maintain, and use electronic information technology in a way that ensures that the technology is accessible to people with disabilities.

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Objective 1 Results
Legislative Condition 2

Condition 2. The plan and related program officials' statements provide for complying with the DHS enterprise architecture.

DHS released version 1 of the architecture in October 2003,[1] and plans to issue version 2 in September 2004.

According to the DHS Chief Information Officer (CIO), DHS is developing a process to align its systems modernization efforts, such as ACE, to its enterprise architecture. Alignment of ACE to the enterprise architecture has yet to be determined, but DHS CIO and CBP officials stated that they plan to address this issue. Moreover, the fiscal year 2004 expenditure plan states that Release 6 and Selectivity 2 will be aligned with the DHS enterprise architecture.

[1] Department of Homeland Security Enterprise Architecture Compendium Version 1.0 and Transitional Strategy.

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Objective 1 Results
Legislative Condition 3

Condition 3. The plan, in conjunction with related program documentation, partially satisfies the condition of compliance with the acquisition rules, requirements, guidelines, and systems acquisition management practices of the federal government.

The Software Acquisition Capability Maturity Model (SA-CMM), developed by Carnegie Mellon University's Software Engineering Institute (SEI), is consistent with the acquisition guidelines and systems acquisition management practices of the federal government, and it provides a management framework that defines processes for acquisition planning, solicitation, requirements development and management, project management, contract tracking and oversight, and evaluation.

On November 5, 2003, SEI assessed ACE acquisition management against the SA-CMM and assigned a level 2 rating, indicating that CBPMO has instituted basic acquisition management processes and controls in the following areas: acquisition planning, solicitation, requirements development and management, project management, contract tracking and oversight, and evaluation.

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Objective 1 Results
Legislative Condition 3

In June 2003, the Department of the Treasury's Office of Inspector General (OIG) issued a report on the ACE program's contract, concluding that the former Customs Service, now CBP, did not fully comply with Federal Acquisition Regulation requirements in the solicitation and award of its contract because the ACE contract is a multiyear contract and not an indefinite delivery /indefinite quantity (IDIQ) contract. Further, the Treasury OIG found that the ACE contract type, which it determined to be a multiyear contract, is not compatible with the program's stated needs for a contract that can be extended to a total of 15 years because multiyear contracts are limited to 5 years. Additionally, the Treasury OIG found that Customs combined multiyear contracting with IDIQ contracting practices. For example, it plans to use contract options to extend the initial 5-year performance period.

CBP disagrees with the Treasury OIG conclusion.

To resolve the disagreement, DHS asked GAO to render a formal decision. We are currently reviewing the matter.

Objective 1 Results
Legislative Condition 4

Satisfies condition 4. The plan satisfies the condition that it be reviewed and approved by the CBP IRB, DHS, and OMB.

On July 15, 2003, the CBP IRB approved the plan. DHS subsequently approved the plan on November 20, 2003, and OMB approved the plan on January 20, 2004.

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Objective 1 Results
Legislative Condition 5

Satisfies condition 5. The plan satisfies the condition that it be reviewed by GAO.

Our review was completed on March 4, 2004.

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Objective 2 Results
Open Recommendation 1

Open recommendation 1: Before building each ACE release (i.e., beginning detailed design and development), certify to Customs' House and Senate appropriations subcommittees that the enterprise architecture has been sufficiently extended to provide the requisite enterprise design content and has been updated to ensure consistency and integration across business areas.

Status: Complete.

In response to our recommendation made in March 2002, the U.S. Customs Service established a process for certifying to its appropriations committees that the Customs enterprise architecture had been sufficiently extended and updated before detailed design and development of each ACE release was begun.

In March 2003, the U.S. Customs Service business operations supported by ACE became part of the DHS CBP.

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Objective 2 Results
Open Recommendation 1

In May 2003, CBP used the process developed by the former Customs Service to certify Releases 3 and 4 against the former Customs enterprise architecture. At this time, DHS also committed to developing a single, departmentwide enterprise architecture to replace DHS component agency/bureau architectures. DHS released version 1 of its enterprise architecture in October 2003,[1] and plans to issue version 2 of its architecture in September 2004.

According to the DHS CIO, DHS is developing a process to ensure alignment of its systems modernization efforts, including ACE, to its enterprise architecture. While this alignment step for ACE has not occurred yet, the fiscal year 2004 expenditure plan states that Release 6 and Selectivity 2 will be aligned with the DHS architecture.

[1] Department of Homeland Security Enterprise Architecture Compendium Version 1.0 and Transitional Strategy.

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Objective 2 Results
Open Recommendation 2

Open recommendation 2: Develop and implement a rigorous and analytically verifiable cost estimating program that embodies the tenets of effective estimating as defined in SEI's institutional and project-specific estimating models.[1]

Status: In progress.

The program office has developed and begun to implement a cost estimating program that embodies SEI's models. For example, CBP hired a contractor to define and implement a cost estimating program. The contractor has responsibility for development of ACE life cycle cost estimates and independent cost estimates to support budget planning, budget execution, and contract task order evaluation. Additionally, the program office has defined and documented processes for estimating expenditure plan costs and management reserve in addition to preparing independent cost estimates. Further, CBP tasked its support and modernization contractors with ensuring that the expenditure plan estimates are evaluated against SEI criteria for validating software cost and schedule estimates.

[1]SEI's institutional and project-specific estimating guidelines are defined in *Checklists and Criteria for Evaluating the Cost and Schedule Estimating Capabilities of Software Organizations* and *A Manager's Checklist for Validating Software Cost and Schedule Estimates*, respectively.

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Objective 2 Results
Open Recommendation 3

Open recommendation 3: Immediately develop and implement a human capital management strategy that provides both near- and long-term solutions to program office human capital capacity limitations, and report quarterly to the appropriations committees on the progress of efforts to do so. These efforts should include defining the office's skill and capability needs in terms that will allow the program office to attract qualified individuals and that will provide sufficient rewards and training, linked to performance, to promote their retention.

Status: In progress

The program office developed and began implementing a human capital management plan. This plan called for addressing several areas, including identification of required core competencies (i.e., defined knowledge and skill requirements), assessing existing capabilities, developing a training program, and filling vacant positions.

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Objective 2 Results
Open Recommendation 3

In its June and October 2003 reports to its appropriations committees on progress in addressing these areas, the program office indicated that it had defined core competencies, was assessing capabilities and developing an annual training plan, and had filled three vacancies and developed a plan for filling its remaining vacancies. However, the program office has continued to experience difficulty in filling key positions, including three responsible for organizational change associated with adopting the business process changes embedded in ACE functionality.

Currently, program officials told us that the capability assessment and the annual training plan were completed and both are awaiting approval. They also told us that they have suspended development of the original plan for filling vacancies, and in January 2004 began implementing a new staffing plan that was developed in response to a DHS IRB statement that the program office has insufficient government program management staff. We made this same observation, along with recommendations to address it, 2 years ago.

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Objective 2 Results
Open Recommendation 4

Open recommendation 4: Develop and implement process controls for SEI's SA-CMM level 2 key process areas and for the level 3 acquisition risk management key process area; develop and implement each of the missing SA-CMM key practices for these key process areas, and until this is accomplished, report to the appropriations committees quarterly on the progress of efforts to do so.

Status: Complete

CBP has taken steps to develop and implement each of the key process areas for the SA-CMM level 2 key process areas and the level 3 acquisition risk management area. SEI assessed the acquisition management of Releases 1 through 4 against the SA-CMM level 2 criteria. On November 5, 2003, SEI assigned the program a level 2 rating, meaning that the program has established basic acquisition management processes.

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Objective 2 Results
Open Recommendation 4

SEI also conducted an unrated assessment of the program's acquisition risk management capability in May 2003. The assessment identified two weaknesses: (1) risk management was not integrated into acquisition planning and (2) a defined organizational process was not used to produce the program's acquisition risk management plan. CBP has addressed these weaknesses by updating its acquisition planning process to include risk management activities and by documenting an acquisition risk management process.

CBP's October 2003 report to its appropriations committees reported on the status of these acquisition management improvement efforts.

Objective 2 Results
Open Recommendation 5

Open recommendation 5: Establish an independent verification and validation (IV&V) function to assist CBP in overseeing contractor efforts, such as testing.

Status: In progress

The program office has established an integrated independent verification and validation (I^2V^2) function, and it has designated its I^2V^2 contractor.

According to CBP's I^2V^2 strategy, the contractor is to review key eCP deliverables and products and provide assessments and reports at various life-cycle stages and milestones. Further, the strategy recognizes the importance of maintaining independence in the conduct of I^2V^2 and outlines (1) a reporting structure that allows the contractor to report its findings to CBP executives and (2) an approach to assigning staff to I^2V^2 tasks that is to ensure contractor independence from program management pressures.

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Objective 2 Results
Open Recommendation 5

However, other program documentation, such as the fiscal year 2004 expenditure plan, the contractor's statement of objectives, and the modernization program work breakdown structure, describes roles for the I^2V^2 contractor that are so integral to ACE development, testing, and deployment, as well as ACE program management, that they raise questions about how the contractor could also perform independent ACE-related assessments. For example, they assign the I^2V^2 contractor responsibility for

- supporting development of long-range and short-term strategic plans for the modernization program;
- developing the task orders that contractually specify eCP's work; and
- developing incentives for improving eCP's performance.

CBP officials stated that they recognize the importance of ensuring the independence of their verification and validation function and plan to address this situation.

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Objective 2 Results
Open Recommendation 6

Open recommendation 6: Have future ACE expenditure plans specifically address any proposals or plans, whether tentative or approved, for extending and using ACE infrastructure to support other homeland security applications, including any impact on ACE of such proposals and plans.

Status: Planned

Program officials acknowledge the potential for ACE infrastructure to support other DHS system applications and the potential for integrating ACE data and applications with those systems. To begin preparing for this potential, program officials told us they have focused initially on discussing collaboration opportunities with DHS's United States Visitor and Immigrant Status Indicator Technology (US-VISIT) system.[1] To date, those discussions have included

- sharing lessons learned on leveraging contractors and
- coordinating enterprise architecture activities.

[1]US-VISIT is a governmentwide program to collect, maintain, and share information on foreign nationals for enhancing national security and facilitating legitimate trade and travel, while adhering to U.S. privacy laws and polices.

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Observation 1: Release 1 and 2 testing revealed a sufficient volume and significance of system defects to impact schedule commitments.

Development of each ACE release includes software integration, system integration, and system acceptance testing by eCP, followed by user acceptance testing by CBP. Generally, the purpose of these tests is to identify defects or problems in either meeting defined system requirements or in satisfying system user needs. A brief description of the four types of testing is provided below.

Test	Description
Software integration test (SWIT)	Verify that the software subsystems and modules perform as intended.
System integration test (SIT)	Verify that related system, subsystem, or module components are capable of integrating and interfacing with each other.
System acceptance test (SAT)	Verify that the developed system, subsystem, or module operates in accordance with requirements.
User acceptance test (UAT)	Verify that the functional scope of the release meets the business functions for the users.

Source: eCP.

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Objective 3 Results
Observation 1

Release 1 user acceptance testing revealed problems.

According to CBP's test results report, user acceptance testing (UAT) for Release 1 was intended to ensure that the design of the users' workstation screens, the capabilities for navigating among screens, and the functionality associated with these screens satisfied user needs.[1] Additionally, CBP's stated goal of Release 1 UAT was to collect feedback from users and identify defects and improvement opportunities.

UAT began on January 8, 2003, and was completed on January 24, 2003. It consisted of users (1) completing 28 test cases and (2) responding to 10 questions designed to solicit their satisfaction (on a scale of 1 to 5, with 1 being very poor and 5 being excellent) about different aspects of Release 1, such as screen design, quality, reliability, availability, response time, and training.

[1] In GAO-03-406, we reported that the first ACE release had completed SAT.

Objective 3 Results
Observation 1

UAT results show that the average user satisfaction rating for Release 1 was slightly less than 3 out of 5, and that this resulted in 38 defects, referred to as program trouble reports (PTRs). Of these 38, 11 were judged to be either critical or severe. These and other categories of PTRs are described below.

Category	Description
Critical	Defect prevents or precludes the performance of an operational or mission-essential capability, jeopardizes safety or security, or causes the system, application, process, or function to fail to respond or end abnormally.
Severe	Defect prevents or precludes system from working as specified or produces an error that degrades or impacts system performance or user functionality.
Moderate	Defect prevents or precludes system from working as specified or produces an error that degrades or impacts system performance or user functionality. An acceptable (reasonable and effective) workaround is in place that rectifies the defect until a permanent fix can be made.
Minor	Defect is inconsequential, cosmetic, or inconvenient but does not prevent users from using the system to accomplish their tasks.

Source: GAO based on eCP data.

In order to successfully complete UAT and make Release 1 operational, CBP reported that it resolved 17 PTRs and deferred to Release 2 the remaining 21. About 3 months after UAT concluded, CBP reported that all 38 PTRs were resolved.

Objective 3 Results
Observation 1

Release 2 integration, acceptance, and user acceptance testing revealed problems that required additional time to address.

System integration testing (SIT). As previously stated, SIT is intended to verify that related system, subsystem, or module components are capable of integrating and interfacing with each other. Successfully completing SIT requires that all test cases achieve a "test passed" status, meaning that the test procedures were successfully executed and completed, and the test objectives were met.

Release 2 SIT, which began on December 31, 2002, and was to end on April 4, 2003, consisted of 46 test cases. Of these 46, 33 were reported to be successfully completed. According to the test results, of the remaining 13 test cases, either they could not be executed for various reasons (such as a capability not being available in the current release) or a test case was changed during attempts to execute it. The 46 test cases, according to eCP's projection, were expected to disclose 389 defects; however, they resulted in 745.

Objective 3 Results
Observation 1

When SIT concluded in June 2003 (about 2.5 months later than planned), 49 PTRs remained open (6 severe, 36 moderate, and 7 minor). However, because none of the tested items failed the SIT and the defects identified were either resolved or deferred to SAT or a later release, the SIT test procedures were judged to be successfully executed.

As of January 2004, the program office reports that all the critical and severe PTRs have been resolved, and that 16 PTRs are still open, of which 11 are moderate and 5 are minor.

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Objective 3 Results
Observation 1

System acceptance testing (SAT). According to CBP's test results report, SAT is intended to show that a system performs according to its specified functional and performance requirements. To pass SAT, all test cases must pass without identification of critical or severe defects.

Release 2 SAT was to begin April 7, 2003, and conclude on April 28, 2003, but because of the large number of unexpected defects, SAT began on May 1, 2003, and ended on June 5, 2003, which is about a 1 month delay. Of the SAT test cases executed, all but 19 reportedly passed. Of these 19, one resulted in a critical PTR, which was closed within 2 days, and 18 produced moderate or minor PTRs. The program office reports that those 18 were either corrected or deferred to future releases based on implementation of acceptable procedural workarounds.

As of January 2004, 11 of the deferred PTRs reportedly remain open. An example of a deferred PTR is Release 2's inability to identify duplicate accounts. According to a system integration manager, this defect was not categorized as critical or severe because an acceptable workaround was available (i.e., establishing a manual process to identify possible duplicate accounts until Release 3 is ready).

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Objective 3 Results
Observation 1

User acceptance testing (UAT). According to CBP's test results report, UAT is intended to verify that the system meets the needs of the users.

Release 2 UAT began on July 10, 2003, and was to end on August 15, 2003. It consisted of CBP and the trade community users executing 19 and 23 test cases, respectively, and being asked to rate the release in several areas using a 1 to 5 scale (with 1 indicating very dissatisfied and 5 indicating very satisfied). The test areas addressed the account management functionality included in Release 2, such as creating a new account, managing account details, and creating reports. The average user satisfaction rating was slightly more than 4 out of 5, which indicated user satisfaction, according to the test results report.

UAT nevertheless resulted in the identification of 17 defects. As of January 2004, 15 of the associated PTRs are reported to have been resolved, and the remaining 2 are categorized as moderate.

The shaded portion of the graph on the following page shows the number of PTR's open (i.e., unresolved) each week during Release 2 testing.

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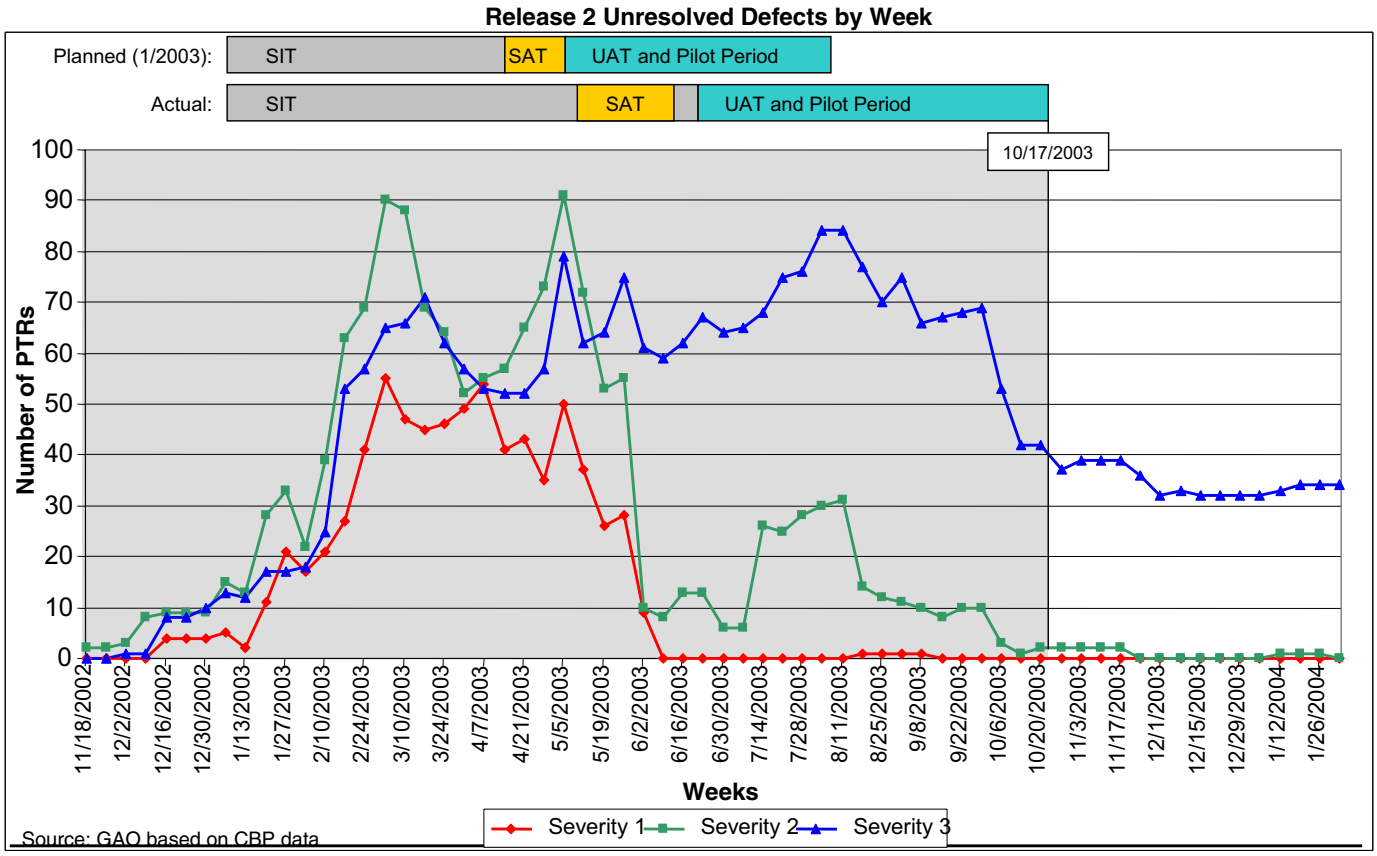
Objective 3 Results
Observation 1



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Objective 3 Results
Observation 2

Observation 2: Requirements planned for Releases 1 and 2 have been deferred.

As previously described, each ACE release is expected to contain specific functionality and performance capabilities. These capabilities are defined in a system requirements document, which lists the overall requirements for the entire ACE system. The requirements specification set breaks these into more detailed requirements and assigns them to releases.

Releases 1 and 2 were originally planned as a single release that was to satisfy 465 requirements. Subsequently, 103 of these requirements were deferred to Release 3 and 4, and 14 requirements were deferred to later releases, for a total of 117 deferred requirements. Also, 25 of 465 requirements were deleted from the baseline. In total, 142 requirements were either deferred or deleted from the original baseline, representing about 31 percent of the original baseline of 465 requirements.

At the same time, 36 new requirements were added to the baseline for Release 1 and 2, meaning that Release 1 and 2 satisfied 359 total requirements. The next slide summarizes the requirements changes in Release 1 and 2.

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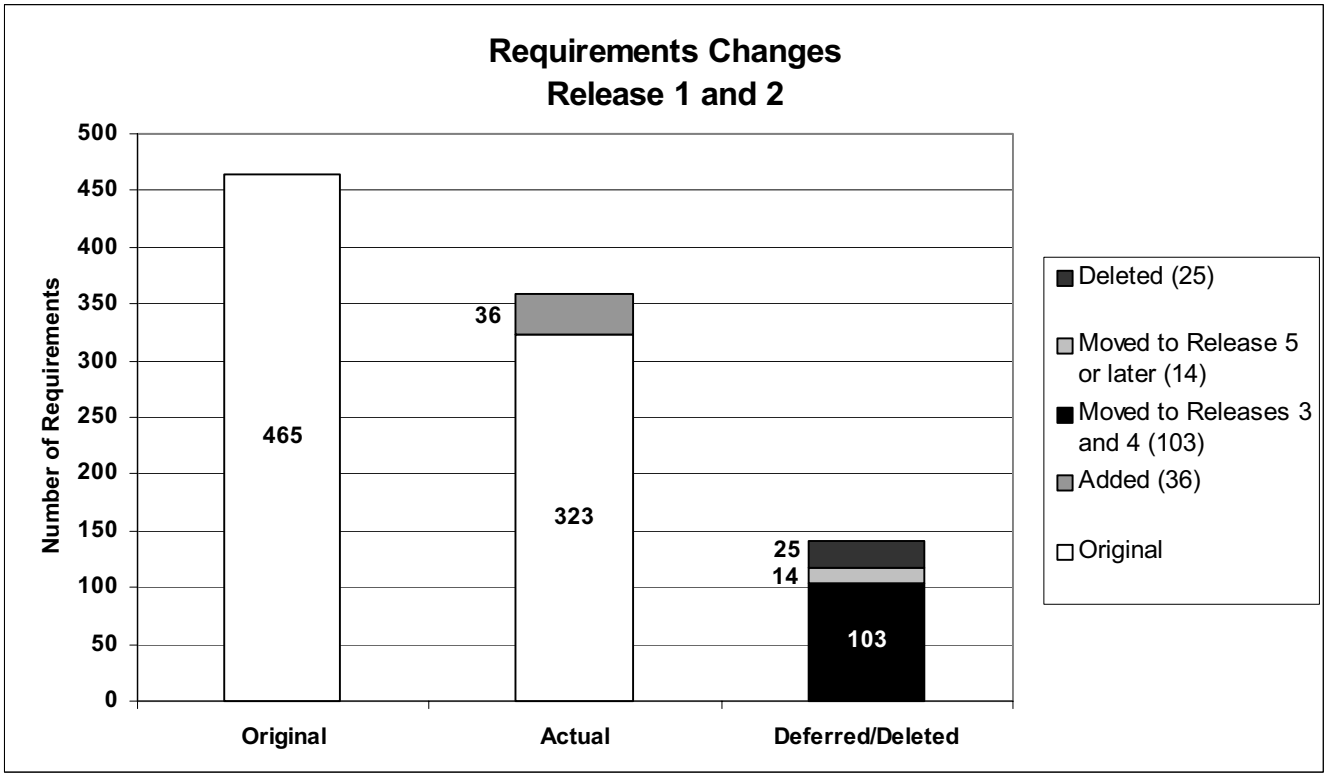
Objective 3 Results
Observation 2



Source: GAO analysis based on eCP data

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Objective 3 Results
Observation 2

According to the requirements specification set for Release 3 and 4, the following categories of capabilities and functionality were deferred from Releases 1 and 2 to Releases 3 and 4:

- document management, document retention, workflow, and data recovery;
- network response time; and
- security (remote access authentication, data security during network transfer, audit trails).

According to program officials, the deferred security requirements must be implemented by Release 4.

Program change requests cite the reasons for the respective requirements deferral. Reasons include the following:

- Document management and retention requirements were deferred because neither Release 1 nor 2 needed to be able to accommodate either paper or electronic documents.

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Objective 3 Results
Observation 2

- Workflow requirements were deferred because eCP and CBP needed additional time to evaluate and select among commercial product options.
- Data recovery functionality was deferred because CBP chose to delay implementation of disaster recovery for ACE until Releases 3 and 4.
- Broker and carrier account functionality was deferred because full support for the functionality was not needed until Releases 3 and 4.

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Objective 3 Results
Observation 3

Observation 3: Release 2 delays have set in motion a pattern of increased reliance on concurrent activities, continued release delays, and cost overruns.

As we previously reported,[1] the importance of ACE to our country's security and trade facilitation prompted CBP to take steps aimed at expediting ACE acquisition and deployment, including introducing greater reliance on performing release design, development, and testing activities concurrently. While such concurrency can permit faster acquisition and deployment, it also introduces risks, which the ACE contractor has said include limited understanding of requirements before design and development activities begin, uncertainty regarding the timely availability of commercial hardware and software products, and increased near-term funding requirements. Other risks include contention for limited resources (such as key personnel, as well as development and testing equipment and facilities) and dependencies among releases not being met.

[1]U.S. General Accounting Office, *Customs Service Modernization: Management Improvements Needed on High-Risk Automated Commercial Environment Project,* GAO-02-545 (Washington, D.C.: May 13, 2002).

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Objective 3 Results
Observation 3

Time required to resolve defects resulted in overlap of Release 2 integration and acceptance testing.

Resolving Release 2 defects also resulted in more overlap between testing activities. The original Release 2 testing schedule projected an overlap of about 1.5 months between SWIT and SIT, and no overlap between SIT and SAT. However, due to the extension of testing periods caused by the high number of defects, the overlap between SWIT and SIT was about 4.5 months, and the SAT period was completely concurrent with SIT. The next slide shows the overlap of Release 2 testing activities.

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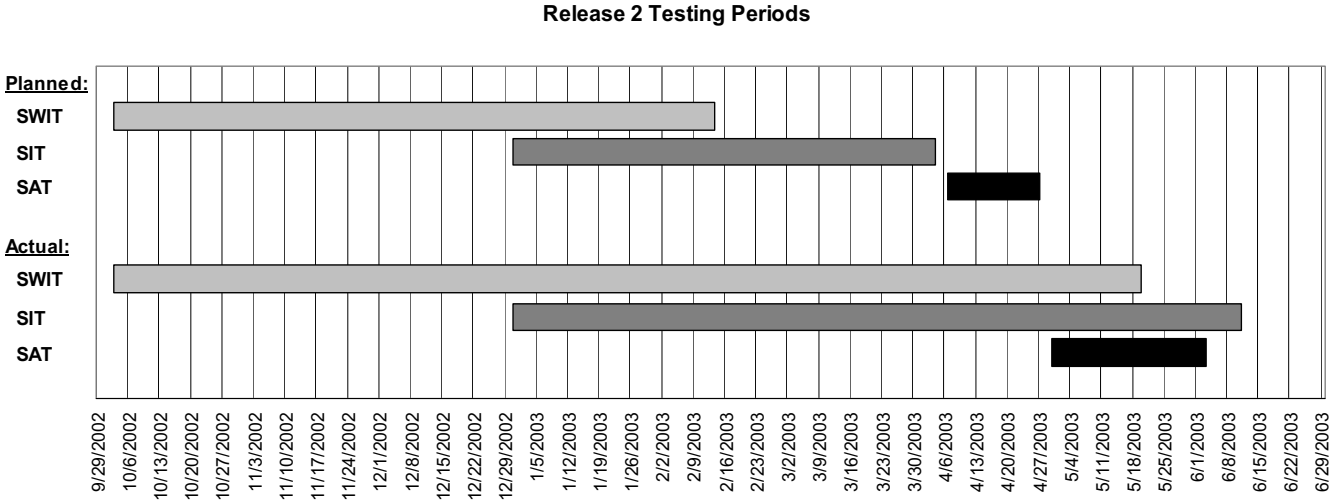
Objective 3 Results
Observation 3



Source: GAO analysis based on CBP data.

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Objective 3 Results
Observation 3

Delays in completing Release 2 increased its overlap with Release 3 and have contributed to Release 3 delays.

According to program officials and variance reports, some ongoing Release 3 work had to be curtailed when key resources slated for Release 3 (e.g., test and development environment, equipment, and key personnel) had to be diverted to address Release 2 PTRs and complete Release 2 test activities. Although some resource diversion continued through June 2003, as Release 3 resources were used to complete Release 2 SIT (including regression testing of software changes made to address PTRs), one report states that after June 2003, about 50 percent of the planned Release 3 SIT resources were redirected to support Release 2 deployment activities.

According to program officials, Release 1 delays, coupled with Release 2 dependencies on Release 1 and subsequent contention for key resources between Releases 2 and 3, have had a domino effect, causing Release 3 resource shortfalls and consequent delays. For example, as of January 2004, a delay of 5 to 6 months in the March 2004 milestone for determining Release 3 operational readiness was reported.

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Objective 3 Results
Observation 3

Release 3 delays will increase overlap with Release 4 and could cause Release 4 delays.

According to program officials and documentation, Release 3 and 4 development began in August 2001, concurrent with ongoing Release 1 and 2 testing, but before they were aware of the large number of Release 1 and 2 defects. According to these officials, work was undertaken concurrently to minimize the time between releases and thereby maximize the efficiency in deploying releases.

While these officials agreed that the cascading Release 1 and 2 problems will continue to impact Release 3, they stated that Release 4 will not be affected. One reason that they cited is that Release 4 will be tested in a recently acquired separate laboratory environment from Release 3, thus eliminating the contention for these key resources.

Despite these statements, program variance reports show that Release 4 is being impacted. According to the reports, Release 3 resources targeted for Release 4 are not becoming available as early as planned because of delayed Release 3 development and SWIT activities. Unless resources from an alternative source are forthcoming, this could impact Release 4 schedule commitments.

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Objective 3 Results
Observation 3

Increased concurrency and schedule delays resulted in Releases 1 through 4 costing more than planned.

The baseline cost estimate for Releases 1 and 2 was $86.1 million. However, the actual cost was reported to be $109.4 million—an overrun of $23.3 million (27 percent).

The baseline cost estimate for Release 3 and 4 was $149.5 million. However, CBP now estimates the cost to be $185.7 million—an overrun of about $36.2 million (24 percent).

According to program documentation, including cost variance analysis reports, factors contributing to the cost overruns included

- resources to eliminate Release 1 and 2 defects;
- overtime to minimize Release 3 and 4 schedule delays;
- unavailability of testing and development environments;
- Release 3 delays caused by resources being used to support delayed Release 2 activities;

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Objective 3 Results
Observation 3

- added Release 3 and 4 scope as a result of requirements shift from Release 2; and
- Release 3 receipt of unresolved defects from Release 2.

CBP reported that it funded the $23.3 million Release 1 and 2 overrun with a $7.9 million forfeiture of eCP's incentive fees and a $15.4 million reallocation of funds from Release 5. CBP also reported that it is considering funding the $36.2 million Release 3 and 4 overrun out of its accumulated management reserve.

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Objective 3 Results
Observation 4

Observation 4: Releases 1 and 2 are largely operating according to adjusted requirements; defect density has stabilized and system is mostly up and running when needed.

Two indicators of how well a system is operating are defect density (i.e., the volume and severity of unresolved problems) and system availability (i.e., the time the system is operating satisfactorily, expressed as a percentage of time that the system is required to be operational).

Releases 1 and 2 began operating on October 17, 2003. According to CBP, these releases are providing support to 73 import accounts and 3300 users. Further, these accounts represent (1) about seven percent of the 1100 accounts expected to be supported by the end of 2004 and (2) about 19 percent and 20 percent of annual import value and trade duties collected, respectively.

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Objective 3 Results
Observation 4

Release 1 and 2 defect density has stabilized, but nontrivial defects remain.

As indicated by the shaded area on the following graph representing the period since Releases 1 and 2 began operating, the defect density associated with both releases has stabilized. In particular, CBP defect data show that as of October 17, 2003, these releases had no severe or critical PTRs, and 44 moderate and 21 minor PTRs open. As of January 2004, these data show improvement, with 1 severe, 34 moderate, and 17 minor PTRs open, and documentation shows that the severe defect was resolved on February 3, 2004.

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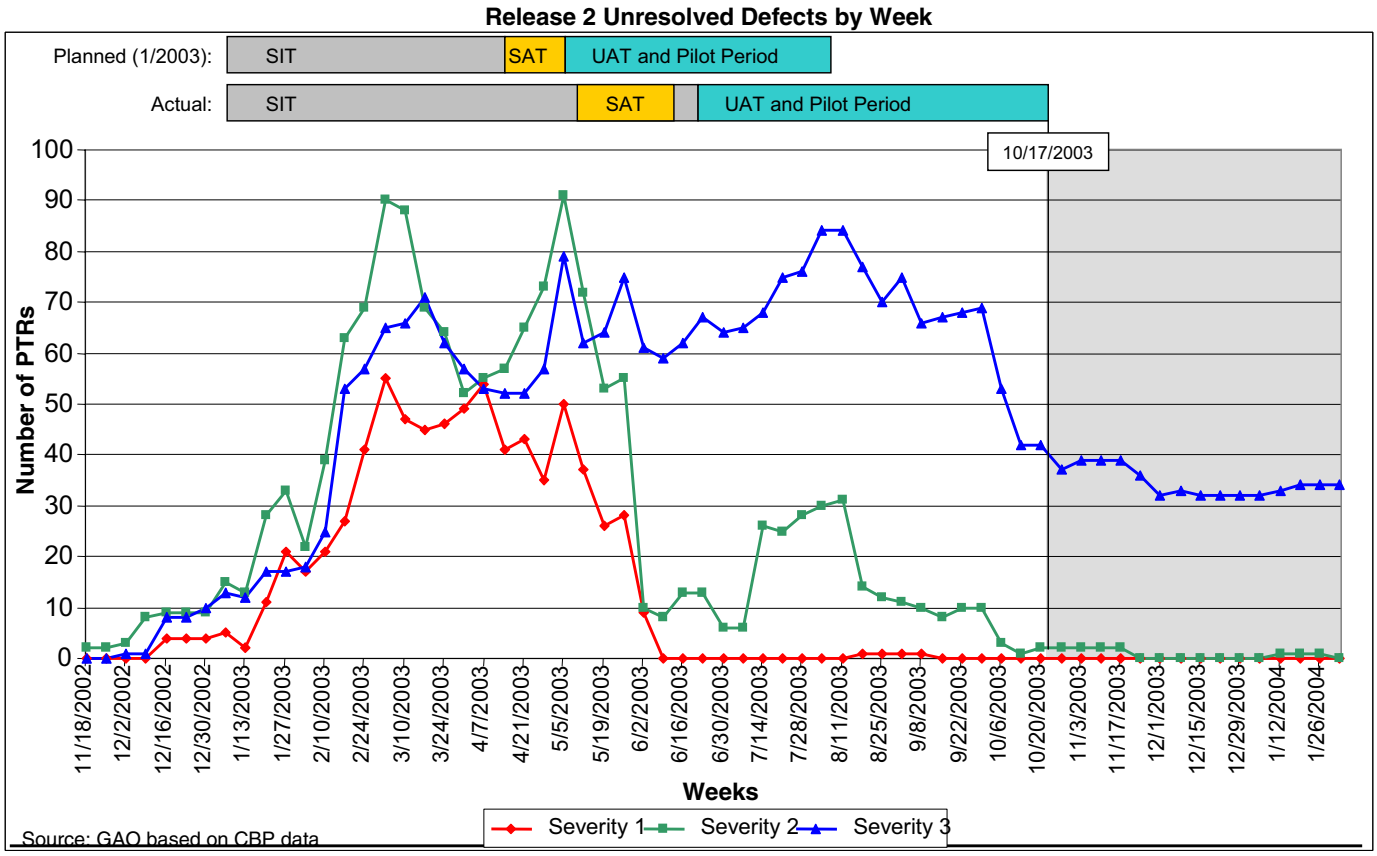
Objective 3 Results
Observation 3



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Objective 3 Results
Observation 4

Notwithstanding the stabilization of PTRs represented by these data, 34 moderate PTRs remain open, and by definition these relate to instances where Releases 1 and 2 do not work as specified or produce an error that degrades or impacts system performance or user functionality. The only reason that they are not viewed as severe is that an acceptable (reasonable and effective) workaround is in place as a temporary fix, but such workarounds generally produce efficiency losses.

Release 1 and 2 mostly available when needed.

ACE is required to be available 99.9 percent of the time (24 hours a day, 7 days a week). Based on available eCP data, Releases 1 and 2 have met this requirement on all but 4 days since October 17, 2003, when they began operating. These days, outages, and the respective availability levels are provided in the table.

Date	System availability	Outage time
December 22, 2003	82.51 percent	4 hours, 12 minutes
January 12, 2003	99.65 percent	5 minutes
January 23, 2003	96.53 percent	50 minutes
January 26, 2003	97.15 percent	41 minutes

Source: eCP data.

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Objective 3 Results
Observation 4

For each of these outages, eCP documents a root cause analysis. Some of the outages can be attributed to problems such as an expired secure socket layer certificate, full log file for servers, and loss of database connection between two subsystems. In addition to identifying the root cause, eCP reports on the mitigation actions taken to prevent a reoccurrence of the problem. For example, to address the problem with the log file, eCP has opened a PTR for automated monitoring of file systems. Until the PTR is resolved, eCP reported that it is performing manual monitoring of the log file systems daily.

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Objective 3 Results
Observation 5

Observation 5: Following Release 1 problems, steps were taken to avoid future problems, but success of actions is unclear.

Effective project management, including directing a contractor to perform a particular task (e.g., developing and implementing a corrective action plan), requires, among other things, a clear statement of objectives, identification of necessary resources, and defined measures of progress and results.

As a result of the Release 1 cost overruns and schedule delays, CBP directed eCP, in February 2003, to develop and implement a plan to improve program performance. According to the plan, which is dated April 2003, the objective was to demonstrate serious, tangible, and measurable actions to resolve core program issues and achieve fundamental program improvement.

The plan identified eight problem areas that eCP was to correct:

- Ineffective leadership
- Unclear roles and responsibilities
- Misaligned priorities

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Objective 3 Results
Observation 5

- Weak system engineering
- Poor program planning
- Inaccurate and inconsistent financial data
- Unmet contract commitments
- Unstable system performance

However, the plan did not define the level of resources required to execute it, and it did not specify how progress and improvement in each of these areas would be determined, including any specific measures and metrics.

In October 2003, program management review documents show that all the corrective actions were reported to be completed. In January 2004, CBP conducted an evaluation to assess eCP's performance. Although the resulting January report was not available in time to be included in our review, CBP officials told us that implementation of eCP's corrective action plan is complete. They provided the following examples of corrective actions that eCP has taken to address each of the eight problem areas (see following slides).

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Objective 3 Results
Observation 5

Problem areas	CBP-provided examples of eCP actions to correct problems
Ineffective leadership	Increased the number and caliber of resources. For example, eCP has brought on board an Enterprise Resource Planning[1] expert, a chief technology officer, a systems architect, and a workforce transformation leader.
Unclear roles and responsibilities	Business process owners now manage functional areas through the system life cycle. In the prior operating model, the business process teams would only be responsible for planning and defining the requirements, while the engineering teams would be responsible for building, preparing, and delivering the support for accounts management. In the new operating model, the business process owner would be responsible for ensuring that accounts management in Release 1 and 2 is planned and executed throughout all phases of the systems life cycle.
Misaligned priorities	Assessed each release to identify the desired business results that are being addressed so that there is visibility into the benefits and capabilities that are being gained through ACE.

[1] Enterprise resource planning is an integrated software solution used to manage a company's resources.

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Objective 3 Results
Observation 5

Problem areas	CBP-provided examples of eCP actions to correct problems
Weak system engineering	Improved testing and configuration management. For example, the environment engineering group is now using a repeatable environment build process, and the business process owners participate in the testing activities and provide an internal check outside the software development team. Improved quality of products as a result of using the Ascendant Life Cycle Methodology[1] and tailoring it to the ACE program. For example, the deliverables now require less rework than previously and are more aligned with CBP's expectations.
Poor program planning	Revised the program plan to include more detail on the content of the various releases, descriptions of the end-state architecture, descriptions of testing and development needs integrated with cost and schedule; and cost and schedule estimates based on historical performance.
Inaccurate and inconsistent financial data	Improved financial controls and financial reporting as a result of new tools and automation, evident in the monthly cost performance reviews and program management reviews.
Unmet contract commitments	Improved quality of deliverables with higher standards of acceptance evident with the requirements, integrated baseline reviews, and preparation for proposals. Improved collaboration between eCP and the government with active monitoring and control.

[1] The Ascendant Life Cycle methodology is a specific development methodology for use with the SAP Enterprise Resource Planning software package.

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Objective 3 Results
Observation 5

Problem areas	CBP-provided examples of eCP actions to correct problems
Unstable system performance	Stable and controlled testing environments. For example, for Release 3, more defects were identified in early testing activities, while in Release 2, the majority were identified in later tests, which is an indication of infrastructure stability.

Source: GAO based on CBP data.

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Objective 3 Results
Observation 5

Despite the examples offered, program officials could not point to metrics that demonstrate improved performance. Instead they stated that the corrective actions have not been implemented long enough to see substantial improvements and that the corrective actions will require time to demonstrate results. They added, however, that they have continued to see some improvement in the quality of deliverables.

More concrete measures of performance that are available do not suggest adequate improvements. For example, as previously noted, Releases 3 and 4 have experienced 5 to 6 month delays and are over budget by $36.2 million. Program officials attributed the problems that occurred to problems experienced in Release 1 affecting Releases 2, 3, and 4, before the corrective action plan was developed and implemented. They also stated that contract task orders are generally completed on time and under budget.

According to program officials, the effect of the corrective actions will only be evident when eCP begins achieving milestones on schedule and within budget.

Objective 3 Results
Observation 5

CBP expects these results to be seen with the delivery and approval of the Global Business Blueprint[1] in May 2004, which is the first major activity to be initiated after the corrective actions were implemented.

Cost to develop and implement corrective action plan is unknown.

Effective project management, including directing a contractor to perform a particular task (e.g., developing and implementing a corrective action plan), includes estimating the associated cost and monitoring the activity to ensure that cost estimates are met.

According to program officials, they do not know the costs that the government incurred and the payments that the government made to eCP to develop and implement its plan for correcting problems associated with its delivery of proposed system capabilities on time and within budget. Rather, they said that these costs are spread across multiple contract tasks and are not identifiable.

Program officials told us that while CBP requested eCP to track the costs of implementing the corrective actions, eCP representatives told them that it would be impossible to track these costs separately because they would be incurred as part of other ongoing tasks that eCP is required to perform under executed task orders.

[1] Global Business Blueprint is a planning project for future releases that is to establish an integrated business framework and identify appropriate technology enablers to support ACE cargo management.

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Observation 6: Initial releases represent a small fraction of the total ACE software.

A system's software size can be expressed in function points. Function points are standard units of measure that describe software in terms of end-user inputs and resulting outputs. They can be used to measure the size of any software regardless of the language, development method, or platform. Function point counts are derived from a variety of sources, including requirements documentation, interviews with end users, and business process descriptions. The International Function Point Users Group (IFPUG) maintains the standards for identifying and quantifying function points. The ACE system has been sized using function points with IFPUG-certified counters.

All ACE releases collectively consist of 11,936 function points. Releases 1 and 2 together contain 618 function points, and Releases 3 and 4 together contain 1,016 function points. The remaining 10,302 function points are contained in the three selectivity releases and Releases 5, 6, and 7, with the majority (8400) contained in Releases 6 and 7.

The following chart summarizes the function point counts for Releases 1 and 2, Releases 3 and 4, and Releases 5 through 7 plus Selectivity 1 through 3.

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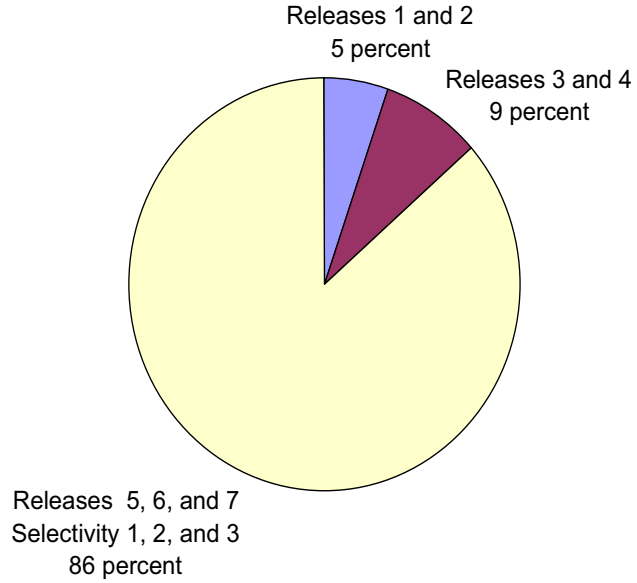
Objective 3 Results
Observation 6

Size of ACE Software by Releases Groupings



Source: GAO based on CBP data.

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Objective 3 Results
Observation 6

Releases 1, 2, 3, and 4 reportedly account for 1634 function points being addressed by custom software and COTS, including SAP. In contrast, Releases 5, 6, and 7 plus Selectivity 1, 2, and 3 constitute 10,302 function points, 5450 of which are to be addressed by custom software and other COTS with the balance of 4852 to be addressed by the SAP product. The graph on the following page provides this information by release.

Despite these relative sizes, the scheduled time for completing the last six releases is about the same as the time anticipated to complete the first four releases, even though the software size of the last six is over three times that of the first four, and this does not include SAP software. Specifically, as of January 2004, the total time projected for design, development, and deployment of Releases 1 to 4 is approximately 3 years. According to program documentation, the total time projected for design, development, and deployment of Releases 5, 6, and 7 and Selectivity 1, 2, and 3 is approximately 3-1/2 years.

Program officials stated that they expect the Global Business Blueprint activity that they are currently performing to better identify the extent to which function points can be addressed by custom software, other COTS, and SAP in Releases 5, 6, and 7 and Selectivity 1, 2, and 3.

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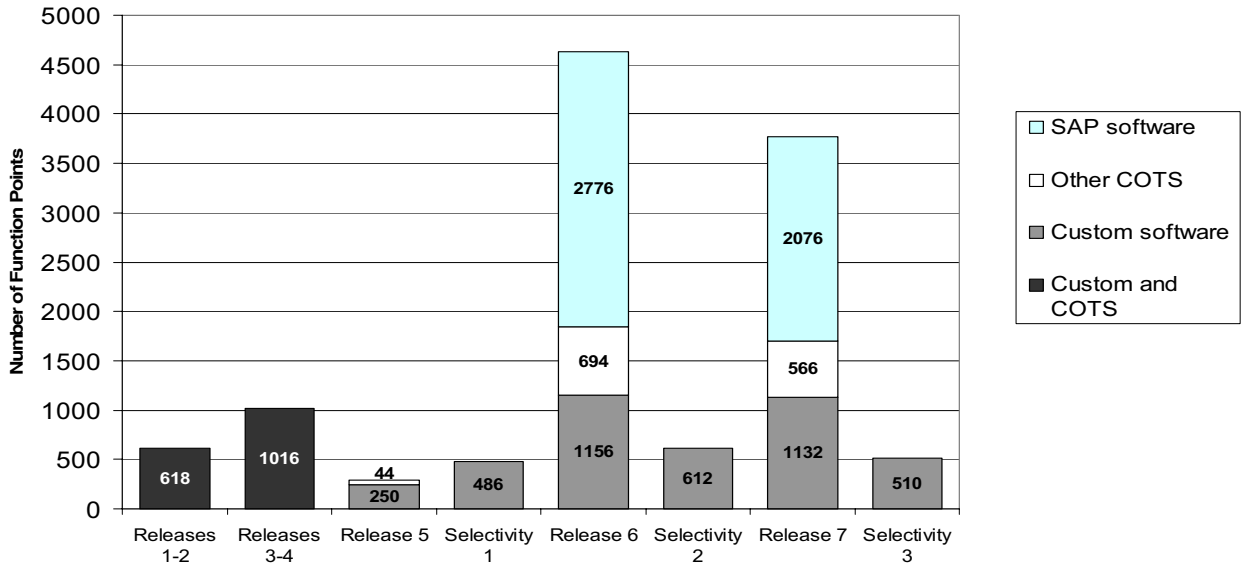
Objective 3 Results
Observation 6

The following graph illustrates the amount of custom software, other COTS, and SAP software associated with each release:[1]



Source: GAO based on eCP data

[1]Releases 1 to 4 function points were not allocated between custom, other COTS, and SAP; however, these releases consist of custom and COTS software, including SAP.

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Observation 7: Reliability of key cost estimates in expenditure plan is unclear.

Cost estimates in expenditure plan varied from independent cost estimates.

CBP has established a process for developing cost estimates in expenditure plans. This process calls for estimates from both eCP and from an independent cost estimating contractor. The process also calls for reconciling these estimates before cost estimates are incorporated into an expenditure plan.

In formulating the fiscal year 2004 ACE expenditure plan, CBP obtained eCP cost estimates in early October 2003, and most independent cost estimating contractor estimates in late October 2003**.** However, CBP used the eCP estimates in the expenditure plan without reconciling them to those of the independent cost estimator. According to program officials, the reconciliation step was not done because CBP did not have sufficient time to do so before completing the plan and submitting it for DHS review in mid-October 2003. However, CBP did task its support contractor with reconciling the estimates, including analyzing the reasons for differences. This reconciliation was completed in mid-November 2003, about 2 months before the expenditure plan was submitted to the appropriations committees. The net difference between eCP's estimates in the plan and the independent estimates is $3.4 million. However, the sum of the differences for individual expenditure plan elements is $39.8 million, as shown on the following table.

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Objective 3 Results
Observation 7

Comparison of expenditure plan cost estimates to independent estimates

Element[1]	Difference between Expenditure Plan Cost Estimates and Independent Cost Estimates: Net	Difference between Expenditure Plan Cost Estimates and Independent Cost Estimates: Total	Explanation of difference
Release 6 definition and design	0.4	0.4	eCP used a broader interpretation of the Release 6 scope than the independent estimator.
Selectivity 2 definition and design	2.7	2.7	eCP used a 21 percent higher software size estimate and 9 percent higher assumed labor rate than the independent estimator.
Implementation infrastructure and support	0	0	N/A
Foundation program management	–4.4	4.4	Cost data reflecting previous experience with this activity were not incorporated into the independent estimate.
Foundation architecture and engineering	7.8	7.8	Scope was not defined, and the movement of 10 to 13 positions to this activity was not identified in the independent estimate.
Workforce transformation and training	10.7	10.7	eCP used a broader view of the scope of the workforce transformation task statement than the independent estimator.
Operations and maintenance	–13.8	13.8	Independent cost estimate used a broader view of hardware and software maintenance costs.
Total	3.4	39.8	

Source: GAO analysis based on CBP data.

[1]Additional expenditure plan elements (i.e., CBPMO, Federally Funded Research and Development Center, International Trade Data System, SAP, and management reserve) were not estimated by the independent estimator and thus not included in this analysis.

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Objective 3 Results
Observation 7

Expenditure plan cost estimates partially satisfy relevant guidance.

One indicator of the reliability of cost estimates is the effectiveness of processes used to derive the estimates. SEI has defined guidelines for assessing such processes and determining the reliability of estimates.[1]

To determine the reliability of the cost estimates in the expenditure plan, the support contractor and eCP analyzed the estimates against SEI guidance. The cost estimates analyzed pertained to the following plan elements: Release 6 definition and design, Selectivity 2 definition and design, foundation program management, architecture and engineering, workforce transformation and training, and operations and maintenance. The analysis shows that the expenditure plan estimates partially satisfy the SEI's guidance. The results of this analysis follow.

[1] SEI's institutional estimating guidelines are defined in *Checklists and Criteria for Evaluating the Cost and Schedule Estimating Capabilities of Software Organizations*, and project-specific estimating guidelines are defined in *A Manager's Checklist for Validating Software Cost and Schedule Estimates*.

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Objective 3 Results
Observation 7

SEI guidance	Satisfied	Assessment of criteria satisfaction
1. Are the objectives of the estimate clear and correct?	Yes[a]	According to the support contractor, the objective of the estimate was clearly stated. Also, the tasks and activities to be included in, and excluded from, the estimate were clearly identified.
2. Has the task been appropriately sized?	Partially[b]	According to the support contractor, software sizing estimates were determined by requirements and function point count performed by certified staff. However, the process for estimating the size of the task was not adequately documented.
3. Are the estimated cost and schedule consistent with demonstrated accomplishments on other projects?	Partially	According to the support contractor, the cost and schedule models used to develop the estimate were calibrated to eCP's historical data on other programs and demonstrated experience from release 2. However, eCP has not demonstrated how its estimating models take into account demonstrated performance across different system development methodologies (e.g., custom development versus SAP implementation).
4. Have the factors that affect the estimate been identified and explained?	Partially	According to the support contractor, parameter values and planning assumptions were documented. However, uncertainties in parameter values were not identified.

Source: GAO.

[a] Satisfies every aspect of the condition that we reviewed.

[b] Satisfies many, but not all, key aspects of the condition that we reviewed.

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Objective 3 Results
Observation 7

SEI guidance	Satisfied	Assessment of criteria satisfaction
5. Have steps been taken to ensure the integrity of the estimating process?	Partially	According to the support contractor, eCP set up a planning team that includes certified analysts and experienced estimators. However, eCP's schedule estimating process was not adequately documented, the cost models do not support schedules with the extensive level of parallel development activities that are necessary to achieve the proposed schedule, and the shift of requirements from Release 2 to future releases may not be accurately reflected in the estimate.
6. Is the organization's historical evidence capable of supporting a reliable estimate?	Partially	According to the support contractor, eCP draws from a database that contains productivity data and supports cost percentages from a large set of completed projects. However, cost models did not have consistent methods for recording historical data, and eCP has not demonstrated how it measures and improves its software processes based on historical evidence.
7. Has the situation changed since the estimate was prepared?	Yes	According to the support contractor, program changes (e.g., schedule changes) were incorporated in estimates. Additionally, the estimate was used as the basis for assigning resources, deploying relevant schedules, and making commitments.

Source: GAO.

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Conclusions

The fiscal year 2004 ACE expenditure plan, along with program documentation and officials' commitments, largely satisfies the legislative conditions imposed by Congress. Further, many of the recommendations that we have previously made to strengthen ACE management have been addressed, and CBP leadership has committed to addressing the remaining recommendations. However, much remains to be done before these open recommendations are fully implemented. In particular, progress on overcoming human capital challenges has been slow.

To CBP's credit, the first two ACE releases are operating largely as intended. Achieving this initial operating capability, however, has not occurred without some difficulty, such as borrowing resources from future releases to overcome problems on near-term releases; similar difficulties that could impact cost, schedule, and capability commitments are being experienced on ongoing releases. Prospectively, this pattern is not likely to change unless the degree of concurrency among activities within and between releases is better controlled, and the underlying reasons for introducing this concurrency are addressed. While time and resources were invested in management improvements over a year ago to address the root causes, the absence of meaningful measures for determining whether these investments will be successful, coupled with limited progress on some of our previous recommendations, makes the chances of CBP delivering future ACE release capabilities on time and within budget uncertain at best.

Recommendations

To assist CBP in managing ACE and increasing the chances that future releases will deliver promised capabilities on time and within budget, we recommend that the DHS Secretary, through the Under Secretary for Border and Transportation Security and the CBP Commissioner, direct the CBP CIO to

- ensure the independence of its IV&V agent;
- ensure that future expenditure plans are based on cost estimates that are reconciled with independent cost estimates;
- reconsider the ACE acquisition schedule and cost estimates in light of early release problems, including these early releases' cascading effects on future releases and their relatively small size compared to later releases, and in light of the need to avoid the past levels of concurrency among activities within and between releases;
- define measures, and collect and use associated metrics, for determining whether prior and future program management improvements are successful; and
- report quarterly to the House and Senate Appropriations Committees on efforts to address the above, as well as our previously made but still open recommendations.

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Agency Comments

We provided this briefing to and discussed its contents with DHS, CBP, and ACE program officials. These officials, including the DHS Chief Information Officer and the CBP Acting Chief Information Officer, generally agreed with our findings, conclusions, and recommendations, and stated that the briefing was fair and balanced. They also provided some technical comments, which we have incorporated into the briefing, as appropriate.

Attachment 1
Scope and Methodology

Scope and Methodology

To accomplish our objectives, we analyzed the ACE fiscal year 2004 expenditure plan and supporting documentation, comparing them to relevant federal requirements and guidance and to applicable best practices; and we interviewed DHS and CBP officials and ACE program contractors. In particular, we reviewed

- DHS and CBP investment management practices, using OMB A-11, part 7;
- DHS and CBP activities for assessing ACE compliance with the DHS enterprise architecture;
- CBP acquisition management practices, using the Software Engineering Institute's (SEI) Software Acquisition Capability Maturity Model (SA-CMM);[1]

[1] The Software Acquisition Capability Maturity Model® developed by Carnegie Mellon University's Software Engineering Institute (SEI) defines five levels of maturity that provide a roadmap for continuously improving an organization's acquisition management processes.

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Attachment 1
Scope and Methodology

- CBP cost estimating program, using SEI's institutional and project-specific estimating guidelines;[1]
- CBP human capital management activities, against its human capital management strategy;
- ACE testing activities, system defect data, and system performance data using industry best practices;[2]
- independent verification and validation (IV&V) activities using the Institute of Electrical and Electronics Engineers Standard for Software Verification and Validation;[3]

[1] SEI's institutional estimating guidelines are defined in *Checklists and Criteria for Evaluating the Cost and Schedule Estimating Capabilities of Software Organizations,* and SEI's project-specific estimating guidelines are defined in *A Manager's Checklist for Validating Software Cost and Schedule Estimates*.

[2] U.S. General Accounting Office, *Year 2000 Computing Crisis: A Testing Guide,* GAO/AIMD-10.1.21 (Washington, D.C.: November 1998).

[3]Institute of Electrical and Electronics Engineers (IEEE) Standard for Software Verification and Validation, IEEE Std 1012-1998 (New York: Mar. 9, 1998).

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Attachment 1
Scope and Methodology

- cost and schedule data, and functional requirements from program management documentation; and
- CBP and its contractor activities for improving the ACE program with program improvement action plans.

We did not independently verify DHS-, CBP-, and contractor-provided data or calculations nor do we attest to their accuracy.

For DHS-, CBP-, and contractor-provided data that we did not substantiate, we have made appropriate attribution indicating the data's sources.

We conducted our work at CBP headquarters and contractor facilities in the Washington, D.C., metropolitan area from January through March 2004 in accordance with generally accepted government auditing standards.

Comments from the U.S. Department of Homeland Security

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

Homeland Security

DATE: April 30, 2004

MEMORANDUM FOR RANDOLPH C. HITE
U.S. GENERAL ACCOUNTING OFFICE

FROM: Anna F. Dixon
Director, Bankcard Programs and
GAO/OIG Liaison

SUBJECT: General Accounting Office (GAO) Draft Report: Information Technology: Early Releases of Customs Trade System Operating, but Pattern of Cost and Schedule Problems Needs to be Addressed (GAO-04-587)

Thank you for providing us with a copy of your draft report and the opportunity to discuss the issues in this report.

U.S. Customs and Border Protection (CBP) either has underway or has completed actions responsive to the recommendations in the report. Responses to the specific recommendations are included as Attachment 1.

Additionally, it is CBP's recommendation that specific budget line item amounts contained in the Fiscal Year 2004 Modernization Expenditure Plan be excluded from the final version of the GAO report. Continuing to report the total expenditure plan funding amount (318M) is acceptable and does not impact upcoming contract negotiations. Specific edits to the draft GAO report to resolve this issue are included as Attachment 2.

If you have any questions regarding these comments, please contact Ms. Michele Donahue at (202) 927-0957.

Mary Lou Alderman
for Anna F. Dixon
Director, Bankcard Programs and
GAO/OIG Liaison

Attachments as stated

www.dhs.gov

Attachment 1 Attachment 1

U.S. Customs Service
General Accounting Office (GAO) Review of Fifth Automated Commercial Environment (ACE) Expenditure Plan

To assist CBP in managing ACE and increasing the chances that future releases will deliver promised capabilities on time and within budget, we recommend that the DHS Secretary, through the Under Secretary for Border and Transportation Security and the CBP Commissioner, direct the CBP CIO to:

Recommendation 1: Ensure the independence of its IV&V agent

Response:

CBP will address GAO's concern about the independence of its IV&V agent by clarifying that management and financial oversight of the agent is separate from the Customs and Border Protection Modernization Office (CBPMO) and rests with the Special Assistant for Audit and Quality Management.

Milestone Date: May 31, 2004

Recommendation 2: Ensure that future expenditure plans are based on cost estimates that are reconciled with independent cost estimates.

Response:

The CBPMO's Expenditure Plan Development and Approval Process has been updated to reflect a more significant role for CBPMO's independent cost estimating (ICE) contractor. The ICE contractor will be actively involved in the development process and will be the primary source of cost, schedule and risk input.

Milestone Date: July 1, 2004

Attachment 1 Attachment 1

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Recommendation 3: Reconsider the ACE acquisition schedule and cost estimates in light of early release problems, including these early releases' cascading effects on future releases and their relatively small size compared to later releases, and in light of the need to avoid the past levels of concurrency among activities within and between releases.

Response:

CBP will respond to this recommendation through the current effort to develop the next ACE program plan.

Milestone Date: July 31, 2004

Recommendation 4: Define measures, and collect and use associated metrics, for determining whether prior and future program management improvements are successful.

Response:

CBP has taken recent steps responsive to this recommendation. CBPMO has developed a metrics plan that is currently undergoing final review. This plan draws upon measures that have been used as well as incorporating new metrics into a balanced scorecard to enable analysis within CBP and with eCP regarding program performance trends.

Milestone Date: May 15, 2004 for final plan approval

Recommendation 5: Report quarterly to the House and Senate Appropriations Committees on efforts to address the above, as well as our previously made but still open recommendations.

Response:

CBP will respond to this recommendation by continuing its practice of incorporating status reports on its progress addressing GAO open recommendations in its quarterly reports to the Appropriations and Authorization Committees.

Milestone Date: Considered closed based upon prior congressional reports.

ATTACHMENT 2 ATTACHMENT 2

Pages 29 and 84 of the draft GAO report contain specific budget information that, if published, could weaken the government's negotiating position in a number of upcoming contract actions that total approximately $60 million. The CBP recommends removing the detailed budget line data as illustrated in the modified versions of pages 29 and 84 below and adding the appropriate disclaimer in the footnote of each page.

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Background
Summary of Expenditure Plan Funding

Summary of the ACE fiscal year 2004 expenditure plan

Plan activity	Funding[a]
Release 6 definition and design	
Selectivity 2 definition and design	
Implementation infrastructure and support	
Foundation program management	
Foundation architecture and engineering	
Workforce transformation and training	
Operations and maintenance	
CBPMO costs	
Federally Funded Research and Development Center	
International Trade Data System	
SAP[b]	
Management reserve	
Total	**$318.7**

Source: GAO based on CBP data

[a] Millions of dollars. Specific budget line information has been excluded to preserve the government's negotiating position.

[b] SAP is a commercial enterprise resource planning software product that has multiple modules, each performing separate but integrated business functions. CBP is using SAP as part of a joint project between its Office of Finance to support financial and property management and the CBPMO to support such ACE functions as customer relationship management.

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Objective 3 Results
Observation 7

Comparison of expenditure plan cost estimates to independent estimates

Element[1]	Expenditure plan cost estimate[2]	Independent cost estimate[2]	Difference Net	Difference Total	Explanation of difference
Release 6 definition and design			0.4	0.4	eCP used a broader interpretation of the Release 6 scope than the independent estimator.
Selectivity 2 definition and design			2.7	2.7	eCP used a 21 percent higher software size estimate and 9 percent higher assumed labor rate than the independent estimator.
Implementation infrastructure and support			0	0	N/A
Foundation program management			–4.4	4.4	Cost data reflecting previous experience with this activity were not incorporated into the independent estimate.
Foundation architecture and engineering			7.8	7.8	Scope was not defined, and the movement of 10 to 13 positions to this activity was not identified in the independent estimate.
Workforce transformation and training			10.7	10.7	eCP used a broader view of the scope of the workforce transformation task statement than the independent estimator.
Operations and maintenance			–13.8	13.8	Independent cost estimate used a broader view of hardware and software maintenance costs.
Total	244.7	241.3	3.4	39.8	

Source: GAO analysis based on CBP data.
[1] Additional expenditure plan elements (i.e., CBPMO, Federally Funded Research and Development Center, International Trade Data System, SAP, and management reserve) were not estimated by the independent estimator and thus not included in this analysis.
[2] Specific budget line information has been excluded to preserve the government's negotiating position.

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GAO Contact and Staff Acknowledgments

GAO Contact

Mark Bird, (202) 512-6260

Staff Acknowledgments

In addition to the person named above, Barbara Collier, Bill Cook, Neil Doherty, Scott Farrow, Michael P. Fruitman, Tamra Goldstein, Neela Lakhmani, and Freda Paintsil made key contributions to this report.

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