

February 2003

CUSTOMS SERVICE MODERNIZATION

Automated Commercial Environment Progressing, but Further Acquisition Management Improvements Needed



G A O

Accountability * Integrity * Reliability



Highlights of [GAO-03-406](#), a report to congressional committees

Why GAO Did This Study

The U.S. Customs Service is conducting a multiyear, multibillion dollar project, the Automated Commercial Environment (ACE), a new trade processing system that is planned to support effective and efficient movement of goods into the United States. By congressional mandate, Customs' expenditure plans for ACE must meet certain conditions, including being reviewed by GAO. This study addresses whether Customs' latest plan satisfies these conditions and provides observations about the plan and Customs' efforts to implement GAO's open recommendations for improving ACE management.

What GAO Recommends

To ensure that Customs is positioned to effectively manage the acquisition of ACE, GAO is making recommendations to the commissioner aimed at improving Customs' acquisition management capabilities. Customs concurred with GAO's recommendations and described specific actions that it is taking to respond to each.

www.gao.gov/cgi-bin/getrpt?GAO-03-406.

To view the full report, 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.

Automated Commercial Environment Progressing, but Further Acquisition Management Improvements Needed

What GAO Found

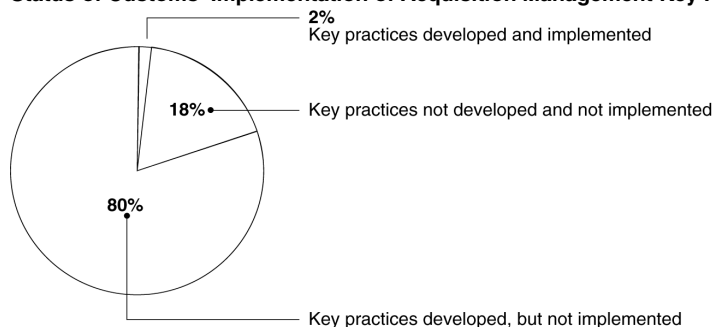
Customs' November 2002 ACE expenditure plan, the fourth in a series of legislatively required plans, provides for certain project management tasks as well as the definition, design, and development of the first release of the second of four planned ACE increments. GAO's analysis of the plan shows that it meets the legislative conditions imposed by the Congress.

In its series of reports on Customs' management of ACE, GAO has made a number of recommendations, which Customs is currently addressing. However, Customs has been slow to correct weaknesses in two areas fundamental to effective acquisition management—people and processes. These weaknesses increase the risk that ACE will be late, cost more than necessary, and not perform as intended.

- While the Customs Modernization Office (CMO) has developed a human capital strategy, neither the strategy nor supporting documentation identifies how the commitments made in the strategy will be met, including what steps will be taken and what resources are needed to execute the steps. Further, based on the strategy's timeline, it will be over a year before the CMO fully implements the strategy.
- Customs' has made slow progress in implementing key acquisition practices, such as project office management and acquisition risk management, which GAO first recommended Customs do in 1999. Since that time many practices have been developed, but almost none of them have been implemented, as shown in the figure below.

Additionally, Customs' ACE contractor is conducting system tests in accordance with best practices, initial test results are positive, and indicators suggest the contractor is delivering a quality product. However, Customs is not employing independent verification and validation (IV&V) in overseeing ACE testing, which is one way to mitigate the acquisition weaknesses cited above. Without IV&V, Customs states that it is relying on the contractor's reputation and maturity level as guarantors of system quality, which is not adequate for a complex and risky program like ACE.

Status of Customs' Implementation of Acquisition Management Key Practices



Source: GAO.

Contents

Letter

	1
Recommendations for Executive Action	4
Agency Comments and Our Evaluation	5

Appendixes

Appendix I: Customs' Fourth Automated Commercial Environment (ACE) Expenditure Plan	7
Appendix II: Comments from the U.S. Customs Service	51

Abbreviations

ACE	Automated Commercial Environment
CIO	Chief Information Officer
CMM	Capability Maturity Model
CMO	Customs Modernization Office
IV&V	independent verification and validation
OMB	Office of Management and Budget
SA-CMM	Software Acquisition Capability Maturity Model
SAT	system acceptance tests
SEI	Software Engineering Institute

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

February 28, 2003

The Honorable Ben Nighthorse Campbell
Chairman
The Honorable Byron L. Dorgan
Ranking Minority Member
Subcommittee on Treasury and General Government
Committee on Appropriations
United States Senate

The Honorable Ernest J. Istook, Jr.
Chairman
The Honorable Steny H. Hoyer
Ranking Minority Member
Subcommittee on Transportation, Treasury, Postal Service,
and General Government
Committee on Appropriations
House of Representatives

In November 2002, the U.S. Customs Service submitted to Congress its fourth expenditure plan, seeking release of \$314 million for its Automated Commercial Environment (ACE) project. ACE is to be Customs' new trade processing system and the first project under the Customs Modernization Program. As required by Customs' fiscal year 2002 appropriation and continuing resolutions,¹ we reviewed the expenditure plan. Our objectives were (1) to determine whether the fourth ACE expenditure plan satisfies certain legislative conditions, (2) to determine whether the plan is consistent with our open ACE recommendations, and (3) to provide observations about the plan and Customs' management of ACE.

On December 27, 2002, 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.

¹For example, P. L. 108-2 appropriated such amounts as may be necessary under the authority and conditions provided in the applicable appropriations act for fiscal year 2002 for continuing projects or activities that were conducted in fiscal year 2002, at a rate for operations not exceeding the current rate, and for which appropriations, funds, or other authority was made available in the Treasury and General Government Appropriations Act, 2002, P. L. 107-67, 115 Stat. 514, 520 (2001). These appropriations shall be available to the extent and in the manner which would be provided by the fiscal year 2002 Treasury Appropriations Act.

Concerning our first objective, Customs' expenditure plan satisfies the legislative conditions specified in Customs' appropriations act. That is, the plan provides for (1) meeting the capital planning and investment control review requirements of the Office of Management and Budget (OMB); (2) complying with Customs' enterprise architecture;² and (3) complying with federal acquisition rules, requirements, guidelines, and systems acquisition management practices. Further, the plan was reviewed and approved by the Joint Capital Investment Review Board³ and OMB.

Concerning our second objective, Customs is making progress in addressing our open recommendations, which are as follows:

- Justify and make investment decisions incrementally.
- Before building each ACE release, certify to Customs' appropriations subcommittees that Customs' enterprise architecture has been sufficiently extended and updated.
- Develop and implement a rigorous and analytically verifiable cost estimating program that embodies the tenets of effective estimating as defined in the Software Engineering Institute's (SEI) institutional and project-specific estimating guidance.
- Immediately develop and implement a human capital management strategy for the Customs Modernization Office (CMO).
- Limit future expenditure plan requests for management reserve funds to 10 percent of the total funds requested for the program, or adequately justify any management reserve requests in excess of 10 percent.

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

³To expedite reviews of ACE expenditure plans, the Customs and Treasury Investment Review Boards were consolidated to form the Joint Capital Investment Review Board.

-
- Develop and implement process controls consistent with SEI's Software Acquisition Capability Maturity Model (SA-CMM⁴), and by September 30, 2002, assess and report to Customs' appropriation subcommittees on the maturity of CMO's software acquisition process.
 - Address the risks associated with the accelerated ACE acquisition strategy and report on the strategy going forward and plans for mitigating the risks associated with this strategy.

While Customs has taken actions to address each of these recommendations, its actions to develop and implement a human capital strategy and acquisition management process controls were only partially consistent with our recommendations. Specifically, while the CMO developed a human capital strategy that specified high-level commitments and satisfied some best practices, there are some notable omissions, including how these commitments will be met. Further, based on the timeline in the strategy, it will be over a year before key practices are implemented.

Also, while Customs reported to its House and Senate appropriations subcommittees on its development of SA-CMM processes, it did not report on implementation. Further, while many of the acquisition processes have been developed, Customs has not yet implemented most of them.

Finally, we made the following observations:

- System integration and acceptance testing performed by the ACE contractor is being conducted in accordance with best practices. The contractor has established a test organization and built an infrastructure for test activities. It has completed system integration and system acceptance tests (SAT) for ACE increment 1, release 1.1, and these test activities were consistent with test management best practices.
- The results of SAT performed by the ACE contractor are positive. All but seven ACE increment 1, release 1.1 requirements successfully passed

⁴Capability 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.

their test cases for SAT. For those that did not pass, only noncritical system defects resulted, and acceptable workarounds were identified.

- Data provided by the ACE contractor on all unresolved system defects for ACE increment 1, release 1.1, show a recent downward trend, suggesting that the contractor is delivering a quality product.
- Customs' oversight of contractor testing does not provide for independent verification and validation (IV&V). Industry best practices include IV&V as a part of effective managerial oversight and control.
- The potential for ACE infrastructure to support other Department of Homeland Security applications could affect both cost and schedule for ACE. Customs is one of several agencies to be merged into the Department of Homeland Security, and it has proposed that the ACE infrastructure be used by these agencies. Because a meaningful understanding of the effect of the new department's use of the ACE infrastructure is not yet known, there is the potential for existing ACE cost and schedule commitments to change.

Recommendations for Executive Action

To ensure that Customs has the requisite capability to manage its ACE acquisition, we recommend that the Customs Service Commissioner designate strengthening CMO human capital and acquisition processes as priority matters. To this end, we recommend that the Commissioner direct the Chief Information Officer (CIO) to immediately

- develop and implement each of the missing SEI SA-CMM practices for the key process areas discussed in this report, and until this is accomplished, report to its appropriations subcommittees quarterly on the progress of its efforts to do so;
- develop and implement the missing human capital management practices discussed in this report, and until this is accomplished, report to its appropriations committees quarterly on the progress of its efforts to do so; and
- establish an IV&V function to assist Customs in overseeing contractor efforts, such as testing.

Additionally, we recommend that the Commissioner take steps, as appropriate in light of Customs' merger into the Department of Homeland

Security, to 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.

Agency Comments and Our Evaluation

In written comments on a draft of this report signed by the acting director, Office of Planning, Customs stated that it was pleased with the report, agreed with our recommendations, and described specific actions that are being taken to implement each. Customs' comments are reprinted in appendix II.

Customs also provided additional information regarding our recommendation that it establish an IV&V function to assist in overseeing contractor efforts, such as testing. Specifically, Customs stated that it wanted to modify its earlier statement that it relies on the contractor's reputation and maturity level as guarantors of system quality. Customs said that its modified position is based on a number of practices that it believes are elements of an integrated approach to IV&V. However, the practices that Customs described as elements of IV&V, while additive to system quality, are not independent from program cost and schedule pressures, and therefore do not constitute IV&V.

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 the Customs Service. We are also sending copies to the Secretary of Homeland Security, the Secretary of the Treasury, the Commissioner of the Customs Service, and the Director of OMB. We also will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

Should you or your staff have any questions on matters discussed in this report, please contact me at (202) 512-3439. I can also be reached by E-mail at HiteR@gao.gov. Key contributors to this report were Mark Bird, Harold Brumm, Jr., Barbara Collier, Scott Farrow, Joanne Fiorino, Tamra Goldstein, Michael Holland, Freda Paintsil, Madhav Panwar, Karen Richey, Randolph Tekeley, and Aaron Thorne.

A handwritten signature in black ink that reads "Randolph C. Hite". The signature is written in a cursive style with a large, looping initial "R".

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

Customs' Fourth Automated Commercial Environment (ACE) Expenditure Plan

Customs' Fourth Automated Commercial Environment (ACE) Expenditure Plan

Briefing for the staffs of the
Subcommittee on Treasury and General Government
Senate Committee on Appropriations
and
Subcommittee on Treasury, Postal Service, and General Government
House Committee on Appropriations

December 27, 2002





Briefing Contents

- Introduction
- Objectives, Scope, and Methodology
- Results in Brief
- Background
- Results
- Conclusions
- Recommendations
- Agency Comments

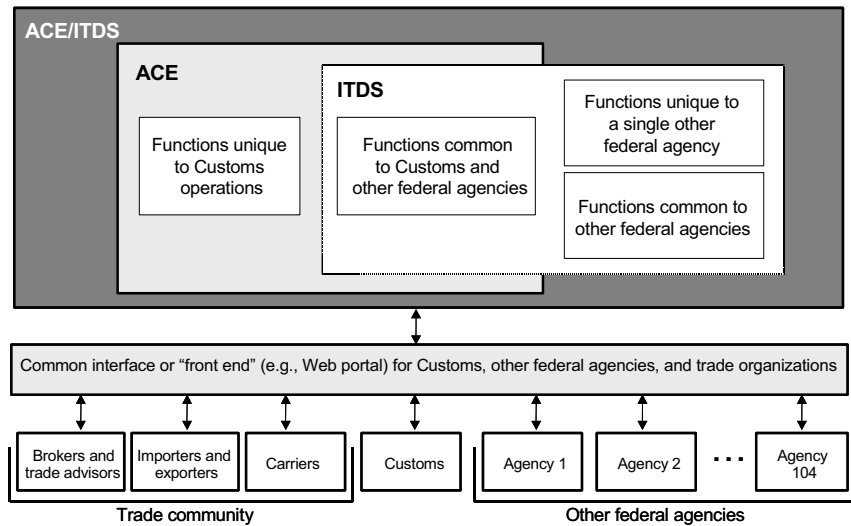
**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Introduction

The U.S. Customs Service is acquiring a new trade processing system known as the Automated Commercial Environment (ACE). ACE is intended to

- promote more efficient movement of legitimate trade and more effective enforcement of trade laws,
- strengthen border security operations, and
- include a single system interface between the trade community and the federal government, known as the International Trade Data System (ITDS), which is to reduce the data reporting burden placed on the trade community and facilitate the collection and dissemination of trade data for agencies with trade-related missions.



Source: GAO.

**Appendix I
Customs' Fourth Automated Commercial
Environment (ACE) Expenditure Plan**



Introduction

Customs is required in its appropriations¹ not to obligate funds for ACE until it submits to the Committees on Appropriations ACE expenditure plans that

- meet the capital planning and investment control review requirements of the Office of Management and Budget (OMB), including security planning;
- comply with the Customs enterprise architecture;
- comply with federal acquisition rules, requirements, guidelines, and systems acquisition management practices;
- are reviewed and approved by the Customs Investment Review Board, Treasury, and OMB; and
- are reviewed by GAO.

Since 1999, we have conducted four reviews of Customs' ACE project, including our reviews of the first three expenditure plans.² In particular, in May 2002, we reported that ACE was a high-risk project and made recommendations for strengthening Customs' ACE management. Customs has implemented some of our recommendations and continues to work on others.

¹ Public Law 107-294 is the current continuing resolution providing funding for ACE through January 11, 2003. The continuing resolution appropriates such amounts as may be necessary under the authority and conditions provided in the applicable appropriations act for fiscal year 2002 for continuing projects or activities that were conducted in fiscal year 2002, at a rate for operations not exceeding the current rate, and for which appropriations, funds, or other authority was made available in the Treasury and General Government Appropriations Act, 2002. The continuing resolution further states that these appropriations shall be available "to the extent and in the manner which would be provided by" the FY 2002 Treasury Appropriations Act.

² U.S. General Accounting Office, *Customs Service Modernization: Third Expenditure Plan Meets Legislative Conditions, but Cost Estimating Improvements Needed*, GAO-02-908 (Washington, D.C.: Aug. 9, 2002); *Customs Service Modernization: Management Improvements Needed on High-Risk Automated Commercial Environment Project*, GAO-02-545 (Washington, D.C.: May 13, 2002); *Customs Service Modernization: Results of Review of First Automated Commercial Environment Expenditure Plan*, GAO-01-696 (Washington, D.C.: June 5, 2001); *Customs Service Modernization: Serious Management and Technical Weaknesses Must Be Corrected*, GAO/AIMD-99-41 (Washington, D.C.: Feb. 26, 1999).



Objectives, Scope and Methodology

Objectives

As agreed, our objectives were to

- determine whether the fourth ACE expenditure plan satisfies the legislative conditions,
- determine whether the plan is consistent with our open ACE recommendations, and
- provide observations about the plan and Customs' management of ACE.

Scope and Methodology

To accomplish our objectives, we analyzed the plan and supporting documents and activities, comparing them to relevant federal requirements and guidance and applicable best practices. In particular, we compared the

- ACE Increment 2 Cost Benefit Analysis to the Office of Management and Budget's (OMB) policy for cost benefit analysis of federal programs;
- Customs Modernization Office (CMO) Human Capital Management Strategy to key principles from private sector organizations;³ and
- CMO's acquisition management improvement program to the Software Engineering Institute's (SEI) Software Acquisition Capability Maturity Model (SA-CMM);⁴ and
- test plans, test results, testing activities, and independent verification and validation (IV&V) activities to industry best practices as discussed in GAO's testing guide.⁵

³ U.S. General Accounting Office, *Human Capital: Key Principles from Nine Private Sector Organizations*, GAO/GGD-00-28 (Washington, D.C.: Jan. 31, 2000).

⁴ Capability Maturity ModelSM 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.

⁵ U.S. General Accounting Office, *Year 2000 Computing Crisis: A Testing Guide* GAO/AIMD-10.1.21 (Washington, D.C.: November 1998).



Objectives, Scope and Methodology

Scope and Methodology (cont.)

We also interviewed ACE program management, support contractors, and modernization contractor officials to understand the scope and content of plans, clarify information in supporting documentation, and seek explanations for deviations from federal or commercial criteria.

As agreed, we did not independently validate the project content and status information that Customs provided. However, we used Customs' provided data and the CostXpert software cost estimating model to check the reasonableness of the software development cost estimate contained in the expenditure plan.

We performed our work from November 2002 through December 2002 in accordance with generally accepted government auditing standards.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results in Brief: Objective 1

Customs' expenditure plan satisfies the legislative conditions.

Legislative conditions	Satisfies	Does not satisfy
1. Meets OMB capital planning and investment control review requirements, including OMB Circular A-11, part 3 ⁶	✓	
2. Complies with the Customs enterprise architecture	✓	
3. Complies with federal acquisition rules, requirements, guidelines, and systems acquisition management practices	✓	
4. Is reviewed and approved by the Customs Investment Review Board, Treasury, and OMB	✓	
5. Is reviewed by GAO	✓	

⁶ Customs provided us with a draft of the expenditure plan before it was submitted to the appropriations subcommittees. We determined that the draft plan did not satisfy the requirements of OMB Circular A-11, part 3 (July 2001). After we discussed our analysis with Customs and support contractor officials, Customs amended the expenditure plan to satisfy the requirements before submitting it to the appropriations subcommittees.



Results in Brief: Objective 2

Customs' expenditure plan is consistent with our open recommendations.

Open recommendations	Consistent		Status	
	Fully	Partially	Complete	In progress
1. Justify and make investment decisions incrementally.	✓			✓
2. Before building each ACE release, certify to Customs' appropriations subcommittees that Customs' enterprise architecture has been sufficiently extended and updated.	✓			✓
3. Develop and implement a rigorous and analytically verifiable cost estimating program that embodies the tenets of effective estimating as defined in the Software Engineering Institute's (SEI) institutional and project-specific estimating guidance.	✓			✓
4. Immediately develop and implement a Customs Modernization Office (CMO) human capital management strategy.		✓		✓

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results in Brief: Objective 2 (cont.)

Open recommendations	Consistent		Status	
	Fully	Partially	Complete	In progress
5. Limit future expenditure plan requests for management reserve funds to 10 percent of the total funds requested for the program, or adequately justify any management reserve requests in excess of 10 percent.	✓			✓
6. Develop and implement process controls for SEI's SA-CMM, and by September 30, 2002, assess and report to Customs' appropriation subcommittees on CMO's software acquisition process maturity.		✓		✓
7. Address the risks associated with the accelerated ACE acquisition strategy and report on the strategy going forward and plans for mitigating the risks associated with this strategy.	✓			✓



Results in Brief: Objective 3

Other observations:

Contractor-performed system integration and acceptance testing is conducted in accordance with best practices.

Contractor-performed system acceptance test results are positive.

System defect trends suggest contractor is delivering a quality product.

Customs' oversight of contractor testing does not provide for independent verification and validation (IV&V).

Potential for ACE infrastructure to support other Department of Homeland Security applications could effect ACE cost and schedule.

Summary of recommendations:

To ensure that Customs is positioned to effectively perform its role as the acquirer of ACE, we are making recommendations to the Customs Commissioner to expeditiously implement overdue people and process capability improvements and to keep its appropriations committees informed about ACE acquisition matters.

**Appendix I
Customs' Fourth Automated Commercial
Environment (ACE) Expenditure Plan**



Background

ACE Acquisition Strategy

On April 27, 2001, Customs awarded a 5-year, indefinite-delivery, indefinite-quantity contract to International Business Machines (IBM) Global Services. IBM and its subcontractors are collectively called the e-Customs Partnership (eCP). Through a series of contract task orders, Customs plans to acquire and implement ACE in four increments. The first two increments each have two releases.

The following table summarizes primary ACE functions by increment and release.

Functions	ACE increment ⁷					
	1		2		3	4
	Release 1	Release 2	Release 1	Release 2		
Enterprise portal and IT infrastructure	Initial	Additional	Additional	Additional	Additional	Remaining
Data processing (e.g., reference library and data query capabilities)	Initial	Additional	Additional	Additional	Additional	Remaining
Trade agreement (e.g., manage visas, quotas; implement trade agreements)					Initial	Remaining
Integration of ITDS functionality		Initial	Additional	Additional	Additional	Remaining
Account management (e.g., create, access accounts)	Initial	Additional	Additional	Additional	Remaining	
Account revenue (e.g., generate billing statements, accept payments)		Initial	Additional	Additional	Additional	Remaining
Enforcement (e.g., determine violation severity, resolve compliance violations)		Initial	Additional	Additional	Remaining	
Selectivity criteria for assessing noncompliance risk, screening incoming transactions			Initial	Additional	Additional	Remaining
Cargo release and tracking		Initial	Additional	Additional	Additional	Remaining
Ability to process multi-modal goods, full export functions, decommissioning of Automated Commercial System (ACS) ⁸						All

Source: GAO.

⁷ *All* means all capabilities within this function are provided in this increment or release; *initial* means a beginning set of capabilities is provided, and the number and type of users may be limited for certain capabilities; *additional* means an increased set of capabilities is provided, and the number and type of users may be expanded for specific capabilities; *remaining* means that the final set of capabilities is provided to intended users.

⁸ This system tracks, controls, and processes all goods imported into the United States. ACE is expected to provide all functions currently provided by this system.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Background

The following tables summarize complete and ongoing ACE contract task orders. The first table describes tasks associated with managing the Customs modernization program and the ACE project. The second describes tasks associated with developing and implementing ACE.

Management Task	Start	Status	Description
Program Management	August 2001	Ongoing	Apply the Customs enterprise life cycle management process to the various modernization program activities.
Enterprise Architecture and Engineering	August 2001	Ongoing	Updates enterprise architecture and develops Web portal and plan for transitioning to the new modernization environment.
Enterprise Process Improvement Support	February 2002	Ongoing	Supports integrating all process improvement efforts across the enterprise and develops enterprise quality assurance program.
ACE/ITDS Integration Support	February 2002	Ongoing	Establishes a strategy for integrating ITDS with ACE, and secures stakeholder buy-in.

Source: GAO.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Background

ACE Increment Task	Start	Status	Description
ACE Requirements and Planning—Increment 1	August 2001	Completed February 2002	Updates and develops the requirements and desired business results and developed the concept of operations and project plan for ACE increment 1.
ACE Increment 1, Release 1 Implementation	February 2002	Ongoing	Designs, develops, and implements ACE increment 1, release 1.
ACE Increment 1, Release 2 Implementation	August 2002	Ongoing	Designs, develops, and implements ACE increment 1, release 2.
ACE Requirements and Planning—Increment 2	February 2002	Ongoing	Updates requirements and desired business results and develops concept of operations and project plan for ACE increment 2.

Source: GAO.

**Appendix I
Customs' Fourth Automated Commercial
Environment (ACE) Expenditure Plan**



Background

Customs' Fourth Expenditure Plan Summary

On November 22, 2002, Customs submitted its fourth ACE expenditure plan, seeking release of \$314 million.

Activities	Amount \$ millions
Increment 2, release 1 definition, design and development and release 2 definition	\$185.9
Increment 3 requirements and planning	\$14.8
Increment 1 operations and maintenance	\$6.1
eCP ACE program management	\$11.9
Enterprise architecture and engineering	\$15.7
CMO costs	\$37.5
ITDS development and integration into ACE	\$5.4
National Customs Automation Program (NCAP) and Free and Secure Trade (FAST) ⁹ operations and maintenance	\$4.5
SAP ¹⁰ implementation support	\$1.5
Subtotal	\$283.4
Management reserve ¹¹	\$30.6
Total	\$314.0

⁹ NCAP is the ACE prototype system that has served as a pilot for demonstrating certain ACE functionality, including account-based import processing. FAST is an enhancement to NCAP that allows expedited border processing for shipments involving importers, carriers, and commercial drivers who are predetermined to be low risk. ACE funding is being used to operate and maintain both NCAP and FAST.

¹⁰ The SAP Implementation Project, a joint project of the Office of Finance and the Office of Information Technology, is intended to provide automated enterprise resource planning. The SAP product provides multiple modules, each performing separate, but integrated business functions. Some are used to support Customs' financial management, and others may be used to support ACE functions, such as customer relationship management and supply chain management.

¹¹ Customs has accumulated \$34.4 million in management reserve from prior funding releases. As of December 11, 2002, Customs reports that \$0.7 million of the \$34.4 million has been obligated.



Background

ACE Increment 2 Release 1

Customs' fourth expenditure plan includes acquisition activities associated with the second of four ACE increments. Specifically, the plan requests \$185.9 million for the definition of increment 2, releases 1 and 2, and the design and development of increment 2, release 1. Increment 2, release 1, is to be deployed at all ports (truck, rail, sea, and air). Increment 2, release 1, is intended to

- expand account and revenue management capability to high-volume carriers and brokers;
- enhance query capability and provide a data warehouse;
- provide consolidated selectivity, targeting, and enforcement functionality;
- provide access to trade data for four federal agencies;¹² and
- establish a link to Customs Automated Export System.¹³

¹² The four federal agencies are the Food and Drug Administration (Center for Food Safety and Nutrition), Department of Agriculture (Animal and Plant Health Inspection Service), Immigration and Naturalization Service (crew release data only), and Census Bureau.

¹³ This system allows electronic transmissions of key export data from exporters, exporters' agents, and outbound carriers.



Background

Chronology of Prior ACE Expenditure Plans and Funding Releases

In March 2001, Customs' appropriations committees released to Customs \$5 million in stopgap funding for the ACE program to sustain CMO operations.

On March 26, 2001, Customs submitted its first ACE expenditure plan to its appropriations committees, seeking release of \$45 million to award the modernization contract, sustain CMO operations, and provide the support needed to manage the modernization program. Customs' appropriations committees subsequently approved the use of \$45 million, bringing the total ACE funding to \$50 million.

On February 1, 2002, Customs submitted its second ACE expenditure plan to its appropriations committees seeking release of \$206.9 million to sustain CMO operations; define, design, develop, and deploy increment 1, release 1; and identify increment 2 requirements. Customs' appropriations committees subsequently approved the use of \$188.6 million, bringing total ACE funding to \$238.6 million.

On May 24, 2002, Customs submitted its third ACE expenditure plan to its appropriations committees, seeking release of \$190.2 million to finance the definition, design, development, and implementation of ACE increment 1, release 2. Customs' appropriations committees subsequently approved the use of \$190.2 million, bringing total ACE funding to \$428.8 million.

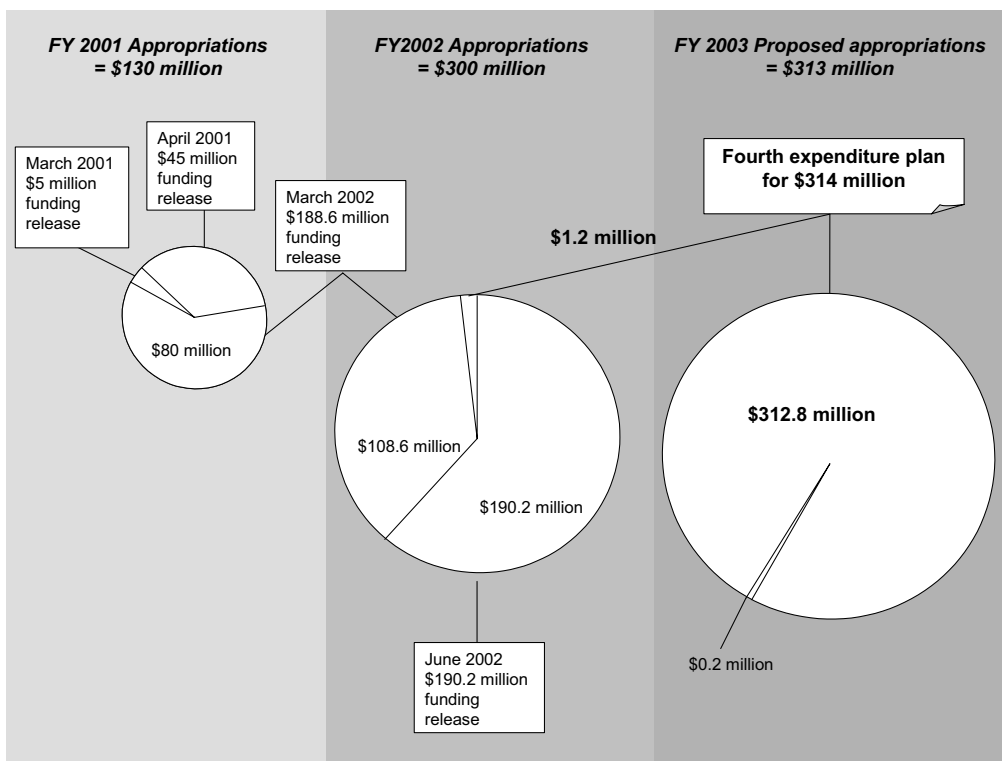
The following figures chronicle the history of ACE appropriations, expenditure plans, and funding releases.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Background

ACE appropriations, expenditure plans, and funding releases



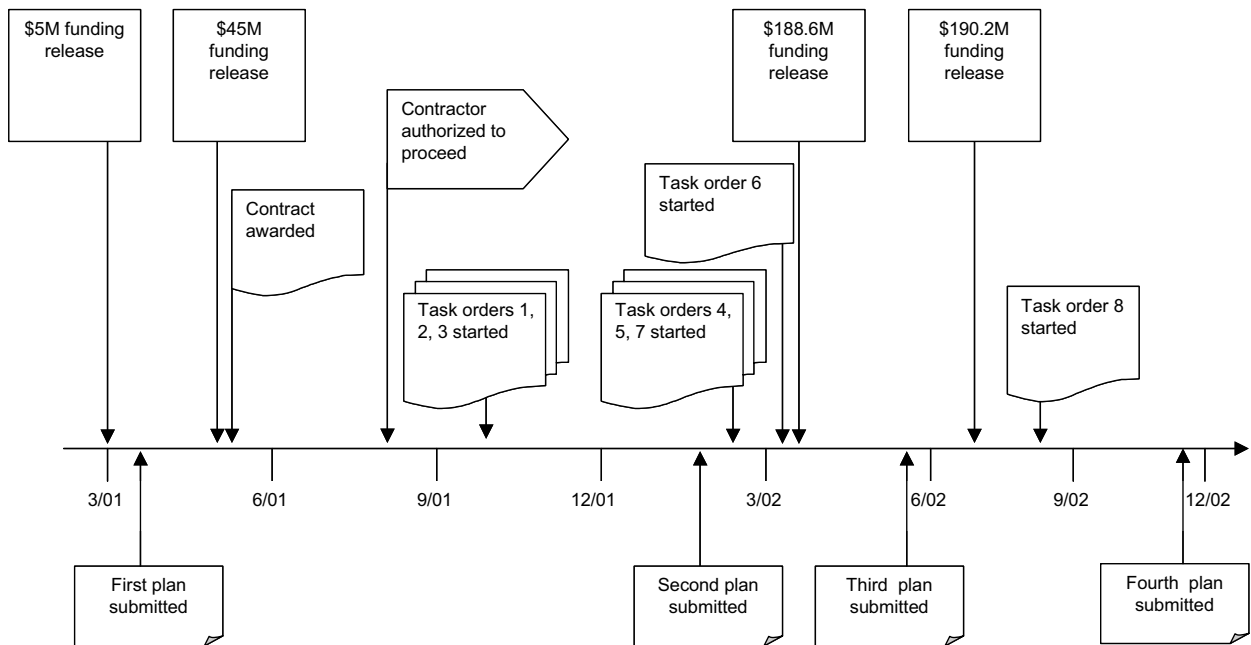
Source: GAO.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Background

Illustrated chronology of ACE expenditure plans, funding releases, and contractual events

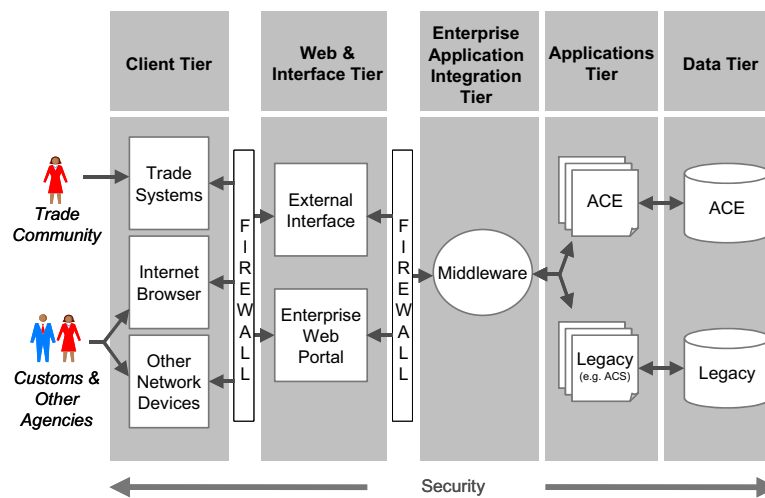


Source: GAO.

Cumulative funding through third expenditure plan = \$428.8 million.



Conceptual View of the ACE Architecture



Source: GAO and Customs.

The Client Tier includes the user's workstation and external systems that access ACE.

The Web & Interface Tier provides the interface required to access functionality and data, as well as the infrastructure required to support that access.

The Enterprise Application Integration Tier provides middleware connecting business applications and users across Customs.

The Applications Tier includes the modernized systems (i.e., ACE) and legacy systems (e.g., ACS) that provide the automated business applications supporting execution of Customs' business processes.

The Data Tier provides data storage resources.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results: Objective 1

Legislative Requirement	Satisfies?	Results of our analysis
1. Plan meets OMB Capital planning and investment control review requirements, including OMB Circular A-11, part 3.	✓	The expenditure plan addresses OMB capital planning and investment control review requirements, including OMB Circular A-11, part 3. For example, the expenditure plan addresses <ul style="list-style-type: none"> • federal security and privacy regulations; • Government Paperwork Elimination Act requirements; • Government Performance Results Act requirements; • how the project will use a performance-based management system; and • cost, benefit, and schedule information.
2. Plan complies with Customs' enterprise architecture	✓	The expenditure plan is for, among other things, the definition, design, and development of ACE increment 2, release 1 (61 percent of requested funding). Customs plans to certify that increment 2, release 1, is compliant with Customs' enterprise architecture before beginning detailed design activities.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results: Objective 1

Legislative Requirement	Satisfies?	Results of our analysis
3. Plan complies with federal acquisition rules, requirements, guidelines, and systems acquisition management practices.	✓	The expenditure plan is for, among other things, continuation of Customs' acquisition management improvement efforts based on the SEI's SA-CMM, as well as for implementation of OMB acquisition and investment management requirements. ¹⁴
4. Plan is reviewed and approved by Customs Investment Review Board, Treasury, and OMB.	✓	The Customs and Treasury Investment Review Boards were consolidated to form the Joint Capital Investment Review Board, which approved the plan on October 15, 2002. OMB approved the plan on November 12, 2002.
5. Plan is reviewed by GAO.	✓	Customs delivered its expenditure plan to Congress on November 22, 2002. Our review was completed December 26, 2002.

¹⁴ OMB Circular A-130 and A-11, part 3 (July 2001).



Results: Objective 2

Open recommendation: Justify and make investment decisions incrementally, and for each increment,

- use disciplined investment processes;
- prepare realistic and supportable benefit expectations;
- require a favorable return on investment and compliance with Customs architecture before making an investment decision; and
- validate actual costs and benefits once an increment is piloted.

Customs' actions to address this recommendation are fully consistent and in progress.

Customs has committed to and defined process controls for justifying and making investment decisions incrementally. For ACE increment 2, Customs

- followed its investment management process, which we determined meets OMB's policy for management of federal information resources;¹⁵
- prepared benefit expectations, which we determined are consistent with OMB's policy for cost benefit analyses of federal programs;¹⁶
- reported a favorable return on investment (benefit/cost ratio for Customs of 1.09¹⁷) and plans to certify compliance with Customs architecture before beginning detailed design activities; however, this return on investment assumes a 4-year implementation schedule, and Customs is planning to extend this schedule—this extension could increase costs and delay benefits and thus decrease the benefit/cost ratio; and
- plans to validate actual costs and benefits during post-implementation reviews.

¹⁵ OMB Circular A-130.

¹⁶ OMB Circular A-94.

¹⁷ This ratio includes costs and benefits to Customs, exclusive of costs and benefits that are identified as positive to the trade community.



Results: Objective 2

Open recommendation: 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.

Customs' actions to address this recommendation are fully consistent and in progress.

On July 16, 2002, before beginning detailed design and development of ACE increment 1, release 1, Customs certified to its House and Senate appropriations subcommittees that the enterprise architecture had been sufficiently extended to provide the requisite enterprise design content and has been updated to ensure consistency and integration across business areas. Customs plans to recertify its enterprise architecture before building ACE increment 1, release 2 (scheduled for recertification in January 2003), and to continue doing so on all future ACE releases.



Results: Objective 2

Open recommendation: 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. Customs' actions to address this recommendation are fully consistent and in progress.

On September 26, 2002, Customs hired a contractor to define and implement a cost estimating program for CMO. Customs has specified that the program comply with industry best practices and SEI guidance.¹⁸ Customs expects to initiate the program in December 2002. As a result, this program was not in place during the development of the cost estimates contained in the fourth expenditure plan.

To validate the reliability of the fourth expenditure plan cost estimate for ACE increment 2, Customs tasked its support and modernization contractors with comparing the estimate against SEI criteria for validating software cost and schedule estimates. The results of this comparison are shown in the following table.

SEI Question	Satisfies? ¹⁹		Description
	Fully	Partially	
1. Are the objectives of the estimate clear and correct?	✓		The objective of the estimate was clearly stated. The tasks and activities to be included in the estimate were clearly identified.
2. Has the task been appropriately sized?	✓		The task was appropriately sized. For example, software sizing estimates were determined by requirements, and function point counts were performed by certified staff. ²⁰

¹⁸ SEI's institutional and project-specific estimating guidelines are defined in *Checklist 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.

¹⁹ *Fully* means that Customs' actions have completely addressed the question; *partially* means that Customs' actions have not completely addressed the question as indicated in the description.

²⁰ The International Function Point Users' Group maintains the recognized industry standard for function point analysis, which is a methodology for software sizing. The group offers professional certification for practitioners of function point analysis as Certified Function Point Specialists.



Results: Objective 2

SEI Question	Satisfies?		Description
	Fully	Partially	
3. Are the estimated cost and schedule consistent with demonstrated accomplishments on other projects?		✓	The estimated costs are consistent with other projects. For example, the cost and schedule models used to develop the estimate were calibrated to eCP historical data of other programs. However, sufficient project experience has not been acquired to confirm the validity and relevance of the selected historical data.
4. Have the factors that affect the estimate been identified and explained?	✓		The factors that affect the estimate were identified and explained. For example, uncertainties in software and other parameter values were identified, and estimates were developed and documented.
5. Have steps been taken to ensure the integrity of the estimating process?		✓	Steps were taken to ensure the integrity of the estimating process. For example, a second software estimating tool, Software Life Cycle Model was used for validating the software cost estimate. Cost models produced software estimates for normal and compressed schedules. However, the cost models do not support schedules with the extensive level of parallel development activities that are necessary to achieve the proposed ACE schedule.
6. Is the organization's historical evidence capable of supporting a reliable estimate?		✓	Historical evidence was capable of supporting a reliable estimate. For example, eCP draws from a database that contains productivity data and support cost percentages from a large set of completed projects. However, the data did not support the extensive level of parallel ACE development activities.
7. Has the situation changed since the estimate was prepared?	NA		Because the situation had not changed, this question was not applicable to planning estimates.

We reviewed the contractors' analysis and found no reason to question it. For example, using a different cost estimating tool (CostXpert) with eCP's software size estimates and assumptions, we found that the estimate for ACE increment 2, release 1, was reasonable.



Results: Objective 2

Open recommendation: Immediately develop and implement a CMO human capital management strategy that provides both near-term and long-term solutions to CMO's human capital capacity limitations.

Customs' actions to address this recommendation are partially consistent and in progress.

We made our recommendation in March 2002, with the intent that Customs specify in its strategy how it would accomplish its human capital goals (i.e., who would do what and by when, what resources would be needed, and how progress would be measured).

CMO released a human capital management strategy in October 2002 that specifies high-level commitments, including time frames, such as completing vacancy action plans by April 2003, creating an acquisition program management career track by April 2004, and defining performance standards by June 2003.

Based on our analysis of the strategy against 10 human capital management principles drawn from commercial best practices,²¹ we found that the strategy either fully or partially recognizes each of the principles (see following table for a comparison). However, neither the strategy nor supporting documentation identifies, for example, how the commitments made in the strategy will be met, including what steps will be taken and what resources are needed to execute the steps. Moreover, based on the strategy's timeline, it will be over a year before CMO implements certain principles.

According to Customs officials, development and implementation of its human capital management strategy has been delayed because CMO staff have been addressing higher priority areas.

²¹ U.S. General Accounting Office, *Human Capital Key Principles from Nine Private Sector Organizations*, GAO/GGD-00-28 (Washington, D.C.: January 2000).

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results: Objective 2

Human Capital Principles	Satisfies? ²²		Summary of Comparison
	Fully	Partially	
Treat human capital management as being fundamental to strategic business management.	✓		The human capital management strategy ties the organization's human capital policies, processes, and practices to the modernization mission and strategic goals.
Integrate human capital functional staff into management teams.		✓	The strategy does not provide for integrating human capital functional staff into CMO. However, a human capital staff member assisted in developing the strategy.
Leverage the internal human capital function with external expertise.	✓		The CMO person responsible for human capital management is assisted by external expertise from its support contractor.
Hire, develop, and retain employees according to competencies.		✓	The strategy states that CMO will hire, develop, and retain employees according to a planned training program and CMO-specific competencies that are yet to be defined. The date for completing competency definitions was extended from November 25 to December 31, 2002. The date for initiating training program development was extended from September 30 to December 31, 2002.
Hire, develop, and sustain leaders according to leadership characteristics identified as essential to achieving specific missions and goals.		✓	The strategy states that CMO will hire, develop, and sustain leaders according to leadership characteristics, which are expected to be defined in CMO-specific competencies.

²² *Fully* means that the strategy provides for implementing the principle and the actions associated with implementing the principle have been completed. *Partially* means that (1) the strategy states that the principle will be implemented, but does not specify the actions necessary to do so; (2) the strategy describes some, but not all, actions necessary to implement the principle, but these actions have been delayed; or (3) the strategy does not state that the principle will be implemented, but Customs took some other action related to implementing the principle.



Results: Objective 2

Human Capital Principles	Satisfies?		Summary of Comparison
	Fully	Partially	
Communicate a shared vision that all employees, working as one team, can strive to accomplish.		✓	The strategy states that CMO will develop guidance that is intended to communicate a shared vision that all employees, working as one team, can strive to accomplish. The strategy states further that this guidance will define performance objectives linked to team accomplishments.
Use performance management systems, including pay and other meaningful incentives, to link performance to results.		✓	The strategy states that CMO will develop and use a performance management system, including pay and other meaningful incentives, to link performance to results. According to the strategy, performance standards will be defined by June 2003 and development goals will be set by September 2003.
Support and reward teams to achieve high performance.		✓	The strategy states that CMO will support and reward teams through existing incentives.
Integrate employee input into the design and implementation of human capital policies and practices to achieve high performance.		✓	The strategy states that CMO will integrate employee input into the design and implementation of human capital policies and practices.
Measure the effectiveness of human capital policies and practices to achieve high performance.		✓	The strategy states that CMO will measure the effectiveness of human capital policies and practices.

Customs' efforts to date are not fully consistent with our recommendation, because (1) they have not been immediate and are taking too long to accomplish, and (2) although the strategy commits to doing what we recommended, Customs has not developed and implemented key human capital management practices to address the recommendation.

As a result, CMO's ability to manage its human capital resources according to these best practices, and thereby ensure that it has the capacity to acquire ACE, is over a year away.



Results: Objective 2

Open recommendation: Limit future expenditure plan requests for management reserve funds to 10 percent of the total funds requested for the program, or adequately justify any management reserve requests in excess of 10 percent.

Customs' actions to address this recommendation are fully consistent and in progress.

Customs' fourth expenditure plan requests \$30.6 million for management reserve, which is 10.8 percent of the total funds requested, excluding the management reserve itself.²³

Management reserves are intended to earmark funding to address project risks, including known risks that, if not sufficiently mitigated, become actual problems that require resources to correct. Thus, estimating the amount of funding to earmark in the reserve should be closely aligned with the project's risk management program, including risk identification and risk probability and impact assessment, and it should be based, in part, on the estimates of costs to correct the potential impacts associated with known risks.

The methodology used to develop the Customs' \$30.6 million management reserve request provides for identifying ACE risk elements, assessing risk probability and impact, and estimating the cost to correct the potential impacts associated with known risks. Moreover, the risk elements are aligned with the risks included in the ACE risk management program, meaning that the risk elements used in estimating the reserve are legitimate. As a result, we found no reason to question the \$30.6 million request.

The management reserve breakdown by expenditure plan activities is shown in the following table.

²³ Customs has accumulated \$34.4 million in management reserve from prior funding releases. As of December 11, 2002, Customs reports that \$0.7 million of the \$34.4 million has been obligated.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results: Objective 2

Activity	Cost (\$ millions)	Reserve (\$ millions)	Percentage (reserve/cost)
Increment 2, releases 1 and 2, definitions	\$17.7	\$2.9	16%
Increment 2, release 1, design and development	\$168.2	\$23.8	14%
Increment 3 requirements and planning	\$14.8	\$0.8	5%
Increment 1 operations and maintenance	\$6.1	\$0.2	3%
eCP ACE program management	\$11.9	\$0.8	7%
Enterprise architecture and engineering	\$15.7	\$1.1	7%
CMO costs	\$37.5	\$0.9	2%
ITDS development and integration into ACE	\$5.4	\$0.0	0%
NCAP operations and maintenance and FAST implementation	\$4.5	\$0.0	0%
SAP implementation support	\$1.5	\$0.0	0%
Total	\$283.4	\$30.6	10.8%



Results: Objective 2

Open recommendation: Develop and implement process controls for the SEI SA-CMM level 2 key process areas and for the level 3 acquisition risk management key process area, and by September 30, 2002, conduct and report to Customs' House and Senate appropriation subcommittees on the results of an internal assessment of CMO's maturity against these key process areas.

Customs' actions to address this recommendation are partially consistent and in progress.

The SEI, recognized for its software engineering expertise, defines key process areas that are necessary for effective acquisition management. SEI research shows that not having effective acquisition management processes increases the probability of systems not performing as intended and costing more and taking longer than planned. The SA-CMM process areas are described in the following table.

Key process area	Description
Software acquisition planning (SAP)	Ensures that reasonable planning for the software acquisition is conducted and that all elements of the project are included
Solicitation (SOL)	Ensures that award is made to the contractor most capable of satisfying the specified requirements
Requirements development and management (RDM)	Establishes a common and unambiguous definition of software acquisition requirements understood by the acquisition team, system user, and the contractor
Project office management (PM)	Manages the activities of the project office and supporting contractor(s) to ensure a timely, efficient, and effective software acquisition
Contract tracking and oversight (CTO)	Ensures that the software activities under contract are being performed in accordance with contract requirements, and that products and services will satisfy contract requirements



Results: Objective 2

Key process area	Description
Evaluation (EVAL)	Determines that the acquired software products and services satisfy contract requirements before acceptance and transition to support
Transition to support (TTS)	Provides for the transition of the software products being acquired to the software support organization
Acquisition risk management (ARM)	Identifies risks as early as possible, adjusts acquisition strategy to mitigate those risks, and develops and implements a risk management process as an integral part of the acquisition process

We first recommended that Customs develop and implement the SA-CMM level two key process areas in February 1999, and in March 2002 we reiterated this recommendation, adding that Customs report to its appropriations committees on its progress in doing so by September 2002.

On September 30, 2002, Customs reported to its House and Senate appropriations subcommittees the results of an internal assessment of its efforts to develop and implement SA-CMM key process areas. Customs reported that its process development effort was 90 percent complete.

However, Customs did not report on its *implementation* of developed processes. Progress in implementing its processes as of November 2002 is shown in the following figure and table.

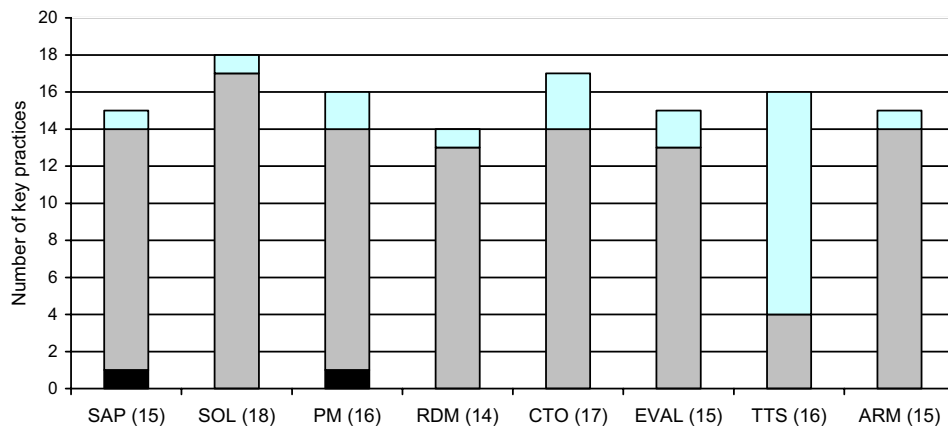
According to Customs officials, its progress in developing and implementing software acquisition processes is behind schedule because resources (i.e., staff) are being diverted to higher priority activities.

Because Customs has not yet established effective software acquisition processes, it does not have the means to adequately ensure that promised ACE capabilities will be delivered on time and within budget.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results: Objective 2



Totals

Key practices not developed and not implemented	1	1	2	1	3	2	12	1	18%
Key practices developed, but not implemented	13	17	13	13	14	13	4	14	80% ²⁴
Key practices developed and implemented	1	0	1	0	0	0	0	0	2%
									100%

Source: GAO.

²⁴ This percentage of key practices developed is based on each key practice having equal weight; Customs' method for determining that its process development effort was 90 percent complete was based on a method that weighted key practices.

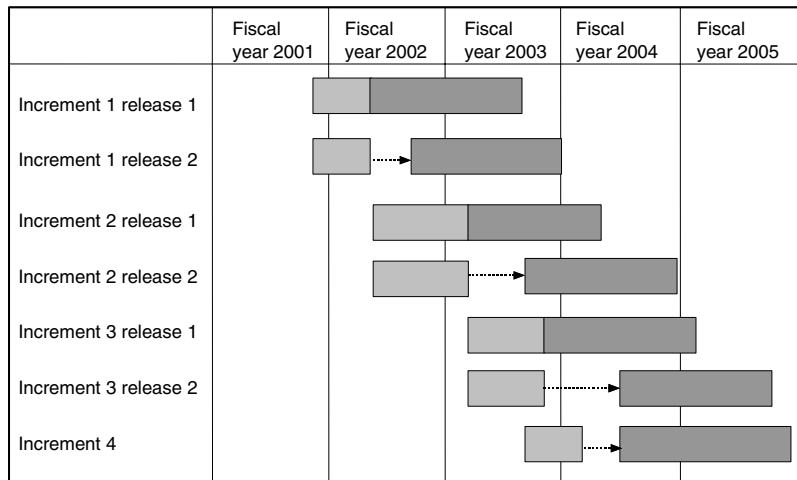
**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results: Objective 2

**Open recommendation: Address the risks associated with the accelerated ACE acquisition strategy.
 Customs' actions to address this recommendation are fully consistent and in progress.**

Customs' third expenditure plan contained a 4-year accelerated schedule (see figure). Before this, Customs was following a 5-year schedule.



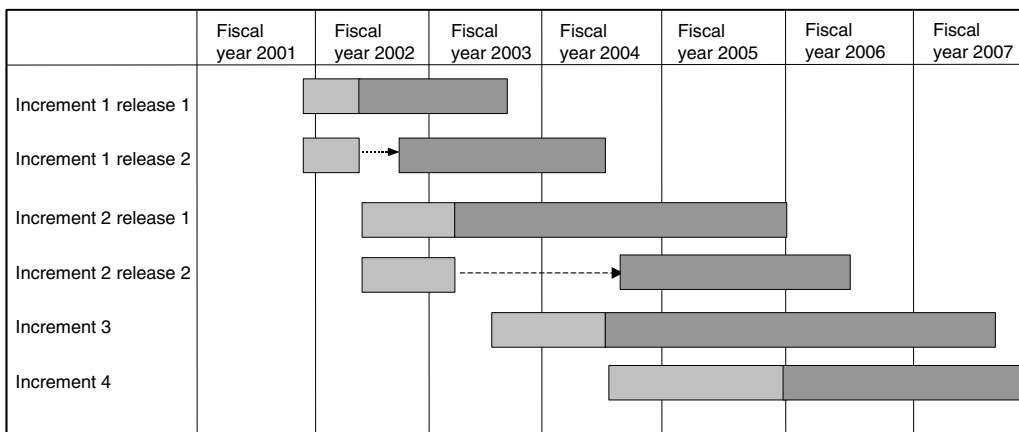
Requirements & planning
 Design (preliminary & detailed), develop, deploy
 Source: GAO.

**Appendix I
 Customs' Fourth Automated Commercial
 Environment (ACE) Expenditure Plan**



Results: Objective 2

Customs current ACE schedule is not set, although it appears that Customs will not be pursuing the accelerated 4-year schedule. Specifically, Customs officials told us that they began rethinking the 4-year schedule because the funding needed to support such an accelerated schedule was not received and that they expect to follow a 5-year schedule.²⁵ According to Customs, a new schedule is expected to be completed and approved by April 2003. At the same time, Customs fourth expenditure plan includes a 6-year schedule (see figure).²⁶



Requirements & planning
 Design (preliminary & detailed), develop, deploy
 Source: GAO and Customs.

²⁵ Actually 5 years, 7 months beginning in March 2002 and ending in September 2007.

²⁶ Actually 6 years, 2 months beginning in August 2001 and ending in September 2007. According to Customs, this schedule is intended to portray a high level representation of project phases and is not intended to represent a detailed schedule.



Results: Objective 3

Observation: Contractor-performed system integration and acceptance testing is conducted in accordance with best practices.

To be effective, test activities should be planned and conducted in a structured and disciplined fashion. Industry best practices provide a framework for managing testing activities. This framework includes steps for establishing a testing organization and the infrastructure for conducting test activities, and for planning and conducting incremental phases of testing, including integration and system acceptance testing.

The contractor's integration and system acceptance test programs are consistent with best practices. In particular, eCP has established a test organization and built an infrastructure for test activities. Additionally, eCP has conducted system integration and acceptance tests for ACE increment 1 release 1.1,²⁷ and these test activities satisfied each of the major steps associated with test management best practices, as summarized in the following table.

Major Test Steps	Satisfies?	
	Integration Test	System Acceptance Test
Schedule and plan test	✓	✓
Prepare test procedures	✓	✓
Define test exit criteria	✓	✓
Execute tests	✓	✓
Document test results	✓	✓
Correct defects ²⁸	✓	✓
Ensure that test exit criteria are met	✓	✓

²⁷ ACE increment 1, release 1, consists of two sub-releases, designated releases 1.1 and 1.2.

²⁸ ACE increment 1, release 1.1, still had system defects at the end of both integration and acceptance testing. However, because the defects were noncritical, and defined test exit criteria allow for noncritical defects, this step was satisfied.



Results: Objective 3

Observation: Contractor-performed system acceptance test results are positive.

System Acceptance Testing (SAT) is intended to show that a system performs according to the system specification (i.e., performs specified functions within defined performance parameters). Acceptance testing is generally conducted by the developing organization (i.e., eCP), with the participation of the acquiring organization (i.e., CMO). The criteria for passing SAT generally provide for executing prescribed test cases without the realization of material defects.

All but seven requirements for ACE increment 1, release 1.1, successfully passed their test cases for SAT. The seven requirements that did not pass resulted in only noncritical system defects. Accordingly, these defects were deferred for correction in future ACE releases. For example:

- One of the defects related to the requirement for the portal to print search results. This defect was deemed non-critical because an acceptable workaround (e.g., selecting the search results and using the Web browser's print function) will be used.
- Another defect related to the requirement that the portal user sessions automatically time out if the session is not active after a certain amount of time. This failure resulted in identification of a defect because Customs policy requires users to invoke their screensavers or log off when leaving their workstations. However, the defect was deemed noncritical because an acceptable workaround will be used (i.e., Customs plans to reinforce this policy during the training that will be required before using the system).

Because all the ACE requirements for increment 1, release 1.1, either passed their tests or, in the case of the seven failures, acceptable workarounds were identified, the first ACE release successfully completed SAT.



Results: Objective 3

Observation: System defect trends suggest contractor is delivering a quality product.

One measure of system maturation and quality is downward trends in unresolved system defects, particularly defects that are categorized as material.

Defects are system problems (hardware and software) that require a solution. A defect can be due to a failure to meet the system specifications, or it can occur because specified requirements are not complete and correct. To facilitate the management of defects identified in testing, eCP documents defects in program trouble reports (PTRs) and categorizes them by their severity (impact). The categories are shown in the following table.

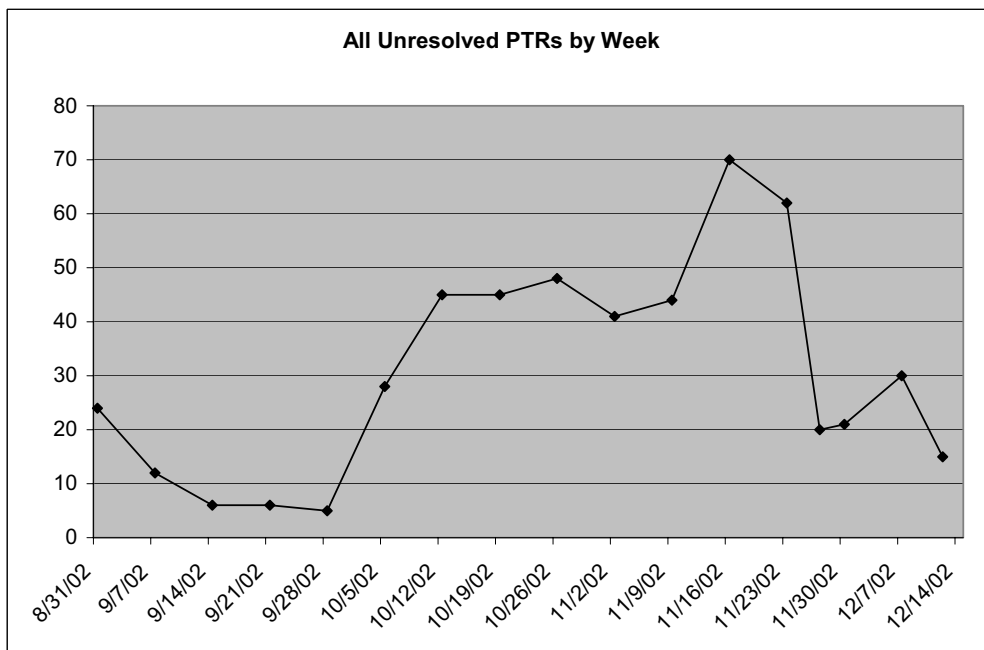
Category	Description
Critical (1)	A problem that makes it impossible to execute a test case
Severe (2)	A problem that adversely affects the execution and completion of a test case and for which no acceptable workaround can be found
Moderate (3)	A problem with an acceptable workaround that allows the test case to be executed
Minor (4)	An inconvenience or annoyance that does not affect test case execution

Data provided by eCP on all unresolved defects for ACE increment 1, release 1.1, show a recent downward trend, which suggests that eCP is delivering a quality product (see following figure). To more thoroughly analyze defect trends, we requested defect data on critical and severe defects, as the existence of these defect types carry material consequences. Customs and eCP could not provide documentation on the status of critical and severe defects in time for this briefing because it did not readily exist. Instead, they stated that there were no critical or severe defects as of December 16, 2002.

Appendix I
Customs' Fourth Automated Commercial
Environment (ACE) Expenditure Plan



Results: Objective 3



Source: GAO.



Results: Objective 3

Observation: Customs' oversight of contractor testing does not provide for independent verification and validation (IV&V).

Industry test management best practices include steps for effective managerial oversight and control, including employing independent verification and validation (IV&V).

IV&V involves having an independent organization conduct unbiased reviews of test management processes, products, and results. The goal is to verify and validate that these meet stated requirements and standards. Independence is important in ensuring that the IV&V personnel are unaffected by program management pressure.

However, Customs' managerial oversight and control of ACE testing does not include IV&V. Customs officials stated that they did not establish an IV&V function because they hired a "world class" contractor to develop ACE and have required that the contractor be a Software Capability Maturity Model (SW-CMM)²⁹ level 3 organization. Customs officials also stated that they are relying on the contractor's capabilities and reputation as a guarantor of ACE quality,³⁰ and that CMO (Customs and support contractors) oversees the contractor's testing.

These actions are not an adequate substitute for IV&V, because the oversight being performed by CMO lacks independence from program cost and schedule pressures. For large, complex, and inherently risky programs like ACE, IV&V is a recognized best practice. Without it, Customs is unnecessarily exposing itself to risks that ACE increments will not perform as intended or be delivered on time and within budget.

²⁹ The SW-CMM identifies key process areas that are necessary to effectively develop software-intensive systems. Level 3 is the third level of the SW-CMM's five-level scale; achieving this level means that an organization has defined and implemented effective software engineering and management processes across all projects.

³⁰ In its comments on our report, Customs modified this statement. Customs' modified statement is reflected in the letter transmitting this briefing.



Results: Objective 3

Observation: Potential for ACE infrastructure to support other Department of Homeland Security applications could affect ACE cost and schedule.

Customs' current cost and schedule commitments for its ACE program, as previously described in this briefing, are based on a set of Customs' enterprise infrastructure and ACE-specific requirements. As with any such program, changes to scope will affect these commitments. Also, a meaningful understanding of the magnitude of these cost and schedule effects requires a complete understanding of the scope changes.

Customs is one of several agencies to be merged into the Department of Homeland Security and is to support the new department's border and transportation security mission area. Customs has proposed to the Office of Homeland Security that the ACE infrastructure be used by the various agencies involved in carrying out this mission. According to Customs, its infrastructure is being designed and developed in a way to make it expandable and extendable, and thus able to support other border and transportation security applications. However, Customs' Chief Information Officer told us that Customs has yet to receive an official response from the Office of Homeland Security on this proposal, and a meaningful understanding of the effect of the new department's use of the ACE infrastructure is not yet known, because the detailed engineering analysis needed to understand the associated program scope changes (e.g., workload sizing, security) has not been done.

As a result, while the potential exists for the cost and schedule commitments defined in the ACE expenditure plan to change, the magnitude of such changes is not yet known.



Conclusions

Customs' fourth expenditure plan satisfies its legislative conditions and is fully consistent with most of our open recommendations. Nevertheless, Customs has moved slowly in addressing our recommendation for immediately correcting its CMO human capital weaknesses, thus far only having made statements calling for implementing human capital management best practices. Compounding this, Customs has not satisfied the intent of our recommendation for disclosing to its appropriations committees where it stands in putting in place acquisition management best practices. Moreover, its progress in implementing these practices has been slow, and where it stands today continues to put ACE at risk.

Both of these areas—people and processes—are fundamental components of an organization's capability to acquire a system like ACE. Despite this, Customs has not given either sufficient priority, instead focusing to date on expediting eCP development activities and expressly compensating for its lagging acquisition capabilities by relying on eCP, without the benefit of IV&V, to be the guarantor of ACE quality.

Customs' approach of offsetting weaknesses in its acquisition process and its people management by relying on its contractor has to date not produced visible and measurable cost, schedule, and quality shortfalls, as evidenced by reported defect trends and system acceptance test results for ACE increment 1, release 1. However, research has linked weaknesses in an organization's ability to acquire software-intensive systems with such shortfalls. Thus, until Customs fully addresses its weaknesses in its acquisition process and its people management, it will be at risk of experiencing such shortfalls. This risk is increased by the potential changes in store for ACE should its expanded role in the Department of Homeland Security be realized. Therefore, it is critical that Customs, as the acquirer of ACE, treat advancing its acquisition capabilities as a priority matter.



Recommendations

To ensure that Customs has the requisite capability to manage its ACE acquisition, we recommend that the Customs Service Commissioner designate strengthening CMO human capital and acquisition processes as priority matters. To this end, we recommend that the Commissioner direct the Chief Information Officer (CIO) to immediately

- develop and implement the missing human capital management practices discussed in this briefing, and until this is accomplished, report to its appropriations committees quarterly on the progress of its efforts to do so;
- develop and implement each of the missing SEI SA-CMM practices for the key process areas discussed in this briefing, and until this is accomplished, report to its appropriations committees quarterly on the progress of its efforts to do so; and
- establish an IV&V function to assist Customs in overseeing eCP efforts, such as testing.

Additionally, we recommend that the Commissioner take steps, as appropriate in light of Customs' merger into the Department of Homeland Security, to 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.



Agency Comments

We provided Customs a draft of this briefing and discussed its contents with Customs' Assistant Commissioner for Information and Technology (CIO) and with CMO and eCP officials. In its oral comments, Customs agreed with our findings, conclusions, and all but one recommendation. Regarding our recommendation to employ IV&V, Customs agreed that it does not currently have an IV&V function or agent. Customs also agreed to take the recommendation under advisement. However, Customs stated that to date it has satisfied the intent of IV&V through various process management controls practiced by eCP, such as risk management, metrics collection, and test management, and through CMO oversight of eCP. We do not dispute the performance of these activities by eCP and CMO. However, none satisfies the express purpose of IV&V, which is to provide a perspective on project performance independent of eCP and CMO. In light of CMO's current acquisition management capabilities, both people and processes, we strongly believe that because of the magnitude and complexity of ACE, appropriately targeted IV&V activities are a necessary measure to reduce acquisition management risk.

Comments from the U.S. Customs Service



U.S. Customs Service

Memorandum

DATE: February 13, 2003

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

FROM: Acting Director
Office of Planning

SUBJECT: General Accounting Office (GAO) Draft
Report: Customs Service Modernization
Automated Commercial Environment (ACE)
Progressing, but Further Acquisition Management
Improvements Needed

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

Overall, we are pleased with the GAO report. GAO concludes that Customs has met the legislative requirements imposed by Congress and continues to progress in addressing prior GAO recommendations. GAO also reports a positive assessment of the testing practices and results of the ACE contractor.

GAO characterizes progress in implementing a human capital strategy and key acquisition management practices as slow and recommends quarterly reporting of progress to the appropriations committees. While we certainly agree with the recommendations, we briefly note actions taken that show that Customs continues to work diligently to address these two critical program management dimensions.

Customs continues to implement its Modernization Strategic Human Capital Management Plan (HCMP) in accordance with the GAO principles. Priority attention was given to gaining Commissioner approval for an expanded Customs Modernization Office (CMO) organizational structure and filling these positions. This has been accomplished, and a talented cadre of executives is trained and functioning to oversee the Modernization task orders. In addition, our quarterly report will show that we have taken responsive actions across the range of GAO principles, such as the following:

TRADITION

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SERVICE

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HONOR

- 2 -

- Integration of human capital functional staff into management teams through the inclusion of the OIT Resources Management Group (RMG) in the HCMP implementation and through participation of the Director of the RMG and Customs Office of Human Resources Management in the Modernization Management Team.
- Issuance of the new "Customs Leadership Development Guide" in December 2002 that clearly identifies a comprehensive leadership competency model, as well as a Customs Succession Management System.
- Establishment of performance plans for the CMO staff in October 2002, and the inclusion of Modernization objectives in the performance plans of an array of OIT executives and managers.
- CMO recognition of staff for their contributions at a quarterly ceremony with both cash and non-traditional awards.

The CMO is also continuing to implement key acquisition practices. Its January assessment found substantial progress in implementing key practices, but Customs agrees that much more progress is needed. To ensure that progress is made:

- CMO and other Customs managers and personnel have been assigned responsibilities to manage and implement the acquisition processes and have been trained on the process improvement goals, timeframes, and their roles in achieving these goals.
- The CMO continues to internally assess progress against the CMO process improvement goals. Additionally, Customs is contracting with the Software Engineering Institute (SEI) to conduct both rated and non-rated Software Acquisition – Capability Maturity Model (SA-CMM) assessments to measure progress towards becoming a Level 2 organization.
- Deficiencies identified in the process asset audit have been distilled into Corrective Action Requests (CARs) that are tracked in an OIT database. The CMO is aggressively working to close these CARs and continues to move as rapidly as possible through process implementation.

These are examples of the progress Customs will include in its quarterly report.

OIT also agrees to implement actions responsive to GAO's recommendation relative to an independent verification and validation function (IV&V). However, OIT wishes to modify the characterization of its IV&V function provided to GAO in the short timeframe we had for a

- 3 -

response. To state that we rely upon the contractor's reputation and maturity level as guarantors of system quality is not reflective of the range of practices the CMO has implemented as part of its integrated approach to IV&V. Such practices have included:

- Independent review of the e-Customs Partnership (eCP) requirements products by end users.
- Involvement of the OIT Software Development and Infrastructure Services Divisions in conducting IV&V of the technical design and implementation products.
- Engagement of the MITRE Corporation, as the CMO's Federally Funded Research and Development Center (FFRDC), to provide technically knowledgeable and independent reviews of all critical eCP products.

These practices represent elements of an Integrated Independent Verification and Validation (I²V²) function that enables us to accomplish the needs of a complex Modernization program. Customs recognizes that these functions could benefit from being formalized into a process. As a result, where appropriate, Customs will strengthen and formalize this process, as well as establish formal accountability for the I²V² function, including formal sign-off. MITRE, as the Customs FFRDC, will take the lead in reviewing, documenting, and strengthening the I²V² process.

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



Brenda B. Smith

Attachment

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

Recommendation 1: Develop and implement the missing human capital management practices discussed in this briefing, and until this is accomplished, report to its (Customs) appropriations committees quarterly on the progress of its (Customs) efforts to do so.

Response:

Customs concurs with GAO's recommendation to implement the actions identified in the Modernization Strategic Human Capital Management Plan (HCMP) and further develop the Customs Modernization Office (CMO) human capital practices. Customs also shares GAO's desire to speed implementation and thereby mitigate program risks. Customs will report quarterly on its progress in implementing its HCMP.

Milestone Date: March 31, 2003 for CMO concurrence on Job and Core Competencies

Recommendation 2: Develop and implement each of the missing Software Engineering Institute (SEI) Software Acquisition—Capability Maturity Model (SA-CMM) practices for the key process areas discussed in this briefing, and until this is accomplished, report to its (Customs) appropriations subcommittees quarterly on the progress of its efforts to do so.

Response:

Customs agrees with GAO on the immediate need to develop and implement all of the SEI SA-CMM practices in the key process areas, and believes substantial progress is being made toward that end. Customs will provide quarterly progress reports to Customs appropriations committees in accordance with Congressional direction.

Milestone Date: April 2003 for updated process asset audit

-2-

Recommendation 3: Establish an independent verification and validation (IV&V) function to assist Customs in overseeing contractor efforts, such as testing.

Response:

The opportunity afforded by the comment period on the GAO draft report leads the Office of Information and Technology (OIT) to modify the position it took in responding to GAO's short turnaround request of December 26, 2002 for a characterization of its IV&V activities. OIT believes it has in place a number of elements of an Integrated Independent Verification and Validation (I²V²) function that conforms to contemporary practices and has provided value in terms of reduced risks. However, Customs recognizes that these functions could benefit from being formalized into a process. As a result, where appropriate, Customs will strengthen and formalize this process, as well as establish formal accountability for the I²V² function, including formal sign-off. MITRE, as the Customs Federally Funded Research and Development Center (FFRDC), will take the lead in reviewing, documenting, and strengthening the I²V² process.

Milestone Date: May 30, 2003 for an I²V² strategic plan
July 31, 2003 for documented I²V² process

Recommendation 4: Take steps, as appropriate in light of Customs merger into the Department of Homeland Security, to 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.

Response:

Customs recognizes the importance of apprising the appropriations committees of any changes in ACE plans that might arise from merger into the Department of Homeland Security. However, Customs questions the appropriateness of the GAO recommendation that "tentative proposals or plans" be included. Customs will continue its practice of providing the appropriations committees with expenditure plans that are well justified and are vetted and approved across the Executive Branch. When the ACE infrastructure is used or extended to support other Homeland Security applications, this will be noted in the appropriate Expenditure Plans.

Milestone Date: August 2003 for release of Expenditure Plan to the Congress and GAO

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