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DOD SYSTEMS MODERNIZATION

Planned Investment in the Naval Tactical Command Support System Needs to Be Reassessed

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GAO-06-215

DOD SYSTEMS MODERNIZATION

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Why GAO Did This Study

Because it is important that the Department of Defense (DOD) adheres to disciplined information technology (IT) acquisition processes to successfully modernize its business systems, GAO was asked to determine whether the Naval Tactical Command Support System (NTCSS) is being managed according to important aspects of DOD's acquisition policies and guidance, as well as other relevant acquisition management best practices. NTCSS was started in 1995 to help Navy personnel effectively manage ship, submarine, and aircraft support activities. To date, about $1 billion has been spent to partially deploy NTCSS to about one-half its intended ashore and afloat sites.

What GAO Recommends

GAO is making recommendations to the Secretary of Defense to develop the analytical basis to determine if continued investment in NTCSS represents prudent use of limited resources. GAO is also making recommendations to strengthen management of the program, conditional upon a decision to proceed with further investment in the program. DOD either fully or partially concurred with the recommendations. It also stated that while some of GAO's findings are valid, the overall findings understated and misrepresented the program's level of discipline and conformance with applicable guidance and direction.

www.gao.gov/cgi-bin/getrpt?GAO-06-215.

What GAO Found

The Department of the Navy has not managed its NTCSS program in accordance with key aspects of the department's policies and related guidance, including federal and recognized best practice guidance. Collectively, these policies and guidance are intended to reasonably ensure that investment in a given IT system represents the right solution to fill a mission need and, if it is, that acquisition and deployment of the system are handled in a manner that maximizes the chances of delivering defined system capabilities on time and within budget. In the case of NTCSS, neither of these outcomes is being realized. Specifically,

- The Navy has not economically justified its ongoing and planned investment in NTCSS. Specifically, it (1) has not reliably estimated future costs and benefits and (2) has not ensured that independent reviews of its economic justification were performed to determine its reliability.

- The Navy has not invested in NTCSS within the context of a well-defined DOD or Navy enterprise architecture, which is necessary to guide and constrain NTCSS in a way that promotes interoperability and reduces redundancy with related and dependent systems.

- The Navy has not effectively performed key measurement, reporting, budgeting, and oversight activities. In particular, earned value management, which is a means for determining and disclosing actual performance against budget and schedule estimates, has not been implemented effectively, and oversight entities have not had the visibility into the program needed to affect its direction.

- The Navy has not adequately conducted requirements management and testing activities. For example, requirements were neither prioritized nor traced to related documentation to ensure that the system delivers capabilities that meet user needs. This contributed to failures in developmental testing that have prevented the latest component of NTCSS from passing operational testing twice over the last 4 years.

Reasons the Navy cited for not following policies and guidance ranged from their not being applicable to the NTCSS program, to lack of time available to apply them, to plans for strengthening system practices not being applied retroactively. Nevertheless, the Navy has begun taking steps and is considering other steps intended to address some of the above problems. Until program management improves, NTCSS will remain a risky program.

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Abbreviations

CDA	central design agency
CIO	Chief Information Officer
DOD	Department of Defense
ERP	enterprise resource planning
EVM	earned value management
IT	information technology
MRMS	Maintenance Resource Management System
NALCOMIS	Naval Aviation Logistics Command Management Information System
OMB	Office of Management and Budget
OOMA	Optimized Organizational Maintenance Activity
NTCSS	Naval Tactical Command Support System
PA&E	Office of Program Analysis and Evaluation
RIT	Rapid Improvement Team
SEI	Software Engineering Institute
SNAP	Shipboard Non-Tactical Automated Data Processing Program
SW-CMM	Software Capability Maturity Model

GAO

Accountability ★ Integrity ★ Reliability

United States Government Accountability Office
Washington, D.C. 20548

December 5, 2005

The Honorable John Ensign
Chairman
The Honorable Daniel K. Akaka
Ranking Minority Member
Subcommittee on Readiness and Management Support
Committee on Armed Services
United States Senate

Because it is so important that the Department of Defense (DOD) adhere to disciplined information technology (IT) acquisition processes in order to successfully modernize its business systems, you requested that we determine whether the department is following its own revised policies and guidance for acquiring systems,[1] which it issued in May 2003. As part of our response to your request, we agreed to review the Naval Tactical Command Support System (NTCSS) program. NTCSS was started in 1995 and is intended to help Navy personnel effectively manage ships, submarines, and aircraft support activities. The Navy expects to spend $348 million on NTCSS between fiscal years 2006 and 2009, for a total of approximately $1.45 billion since program inception.

As agreed, our objective was to determine whether NTCSS is being managed according to important aspects of DOD's acquisition policies and guidance, as well as other relevant acquisition management best practices. We focused on the program's (1) economic justification; (2) architectural alignment; (3) project management, including progress measurement, progress reporting, funding disclosure, and oversight activities; and (4) system development, including requirements management and testing. For requirements management and testing, we focused on the NTCSS application that is currently being developed, known as the Optimized Organizational Maintenance Activity (OOMA).

We conducted our review from September 2004 through November 2005 in accordance with generally accepted government auditing standards. For details on our objective, scope, and methodology, see appendix I.

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[1]DOD, Department of Defense Directive Number 5000.1, *The Defense Acquisition System* (May 12, 2003); Department of Defense Instruction Number 5000.2, *Operation of the Defense Acquisition System* (May 12, 2003); *Interim Defense Acquisition Guidebook* (Oct. 30, 2002).

Results in Brief

The Navy has not managed its NTCSS program in accordance with key aspects of the department's system acquisition policies and related guidance, including federal and recognized best practice guidance. Collectively, these policies and guidance are intended to reasonably ensure that investment in a given IT system represents the right solution to fill a mission need—and if it is, that acquisition and deployment of the system are handled in a manner that maximizes the chances of delivering defined system capabilities on time and within budget. In the case of NTCSS, neither of these outcomes is being realized. As a result, the Navy does not currently have a sufficient basis for determining whether NTCSS is the right systems solution for its aircraft, ship, and submarine tactical command support needs, and it has not pursued the proposed solution in the right way, meaning in a fashion that increases chances of delivering defined capabilities on time and within budget. Key areas in which the Navy did not follow relevant policies and guidance are described here.

- The Navy has not economically justified its ongoing and planned investment in NTCSS on the basis of reliable estimates of future costs and benefits. The most recent economic justification's cost estimates were not reliably derived, and return on investment was not properly calculated. In addition, independent reviews of the economic justification to determine its reliability did not occur, and the Navy has not measured whether already deployed and operating components of the system are producing expected value.

- The Navy has not invested in NTCSS within the context of a well-defined enterprise architecture, which is an institutional blueprint to guide and constrain program investment decisions in a way that promotes interoperability and reduces redundancy among related and dependent systems. As we recently reported,[2] DOD's business enterprise architecture does not contain sufficient context (depth and scope of operational and technical requirements) to effectively guide and constrain business transformation and system modernization efforts. Further, the Navy does not yet have a defined architecture, although it plans to develop one. Investing in systems, in the absence of an enterprise architecture, requires explicit recognition and deliberate

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[2]GAO, *DOD Business Systems Modernization: Long-standing Weaknesses in Enterprise Architecture Development Need to Be Addressed*, GAO-05-702 (Washington, D.C.: July 22, 2005).

consideration of the inherent risks to ensure fully informed investment decision making.

- The Navy has not effectively performed key measurement, reporting, and oversight activities. In particular, earned value management, which is a means for determining and disclosing actual performance against budget and schedule estimates, and revising estimates based on performance to date has not been implemented effectively. Also, complete and current reporting of NTCSS progress and problems in meeting cost, schedule, and performance goals has not occurred, leaving oversight entities without the information needed to mitigate risks, address problems, and take corrective action. In addition, NTCSS budgets have not reflected the proper category of appropriated funds associated with system development efforts. Further, oversight entities' roles and responsibilities have not been fully discharged.

- The Navy has not adequately conducted requirements management and testing activities. For the NTCSS application that is currently under development, the Navy has not adequately managed requirements, as evidenced by the absence of requirements traceability to system design specifications and testing documents, and the lack of prioritization of the requirements. The lack of requirements traceability and other issues have in turn contributed to problems with developmental testing, including the failure of these tests to identify problems that subsequently prevented the system from passing operational testing twice over the last 4 years. Based on the Navy's data, the recent trend in key indicators of system maturity, such as the number and nature of reported systems problems and change proposals, shows that problems with NTCSS persist and that these problems could involve costly and timely rework to address.[3]

Reasons the Navy cited for not following policies and guidance included questioning their applicability to the NTCSS program, having insufficient time in which to apply them, and believing that plans to adopt them were not meant to be applied retroactively. In some cases, the Navy did not acknowledge that any deviations from policies and guidance had occurred, but in these cases, it has yet to provide us with documentation demonstrating that it did adhere to them. Collectively, this means that after investing 10 years and $1 billion on NTCSS, it is unclear whether the Navy's

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[3]We did not independently validate these data.

planned future investment in the program is warranted. Even if key uncertainties are addressed and it can be demonstrated that NTCSS is the right solution, then the manner in which NTCSS is being defined, developed, tested, measured, and overseen is also of concern. Accordingly, we are making recommendations to the Secretary of Defense aimed at developing the basis needed to determine whether continued investment in NTCSS is a prudent use of limited departmental resources. We are also making recommendations to strengthen management of the program, conditional upon a decision to proceed with further investment in the NTCSS program.

The Office of the Assistant Secretary of Defense for Networks and Information Integration provided written comments on a draft of the report. In its comments, DOD concurred with two of the recommendations and partially concurred with the remaining five. DOD also stated that while some of our findings are valid, our overall findings significantly understated and misrepresented the program's level of discipline and conformance with applicable guidance and direction. We do not agree. Our report cites numerous instances, supported by analyses, where the Navy did not comply with either DOD acquisition policies and guidelines or industry best practices. DOD's comments are reprinted in their entirety in appendix IV of this report, along with our detailed responses to each.

Background

The Navy's primary mission is to organize, train, maintain, and equip combat-ready naval forces capable of winning the global war on terror and any other armed conflict, deterring aggression by would-be foes, preserving freedom of the seas, and promoting peace and security. To support this mission, the Navy performs a variety of interrelated and interdependent business functions such as logistics and financial management. The Navy requested, for fiscal year 2005, about $3.5 billion to operate, maintain, and modernize its business systems and related IT infrastructure that support these business functions. This request represents about 27 percent of the $13 billion that DOD requested for all of its business systems for fiscal year 2005. Of the 4,150 business systems that DOD reports in its current inventory, the Navy accounts for 2,353, or about 57 percent, of the total.

In 1995, we designated DOD's business systems modernization efforts as a high-risk program and continue to designate it as such today[4] for several reasons, including the department's challenges in implementing effective IT investment management structures and processes, developing and

implementing an enterprise architecture, and implementing effective IT system acquisition and development processes.

NTCSS Genesis and Status Overview

In the early 1990s, the Navy employed a variety of IT systems to support the management of information, personnel, materials, and funds required to maintain and operate ships, submarines, and aircraft. Three core systems—each managed by a separate program office—consisting of nine major applications, provided this support: (1) the Shipboard Non-Tactical Automated Data Processing Program (SNAP), managed by the Space and Naval Warfare Systems Command; (2) the Naval Aviation Logistics Command Management Information System (NALCOMIS), managed by the Naval Air Systems Command; and (3) the Maintenance Resource Management System (MRMS), managed by the Naval Sea Systems Command. See table 1 for a description of these three legacy systems and a list of their respective applications.

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[4]GAO, *High-Risk Series: An Update*, GAO-05-207 (Washington, D.C.: January 2005).

Table 1: Legacy Systems and Applications

Legacy system	Description	Application
SNAP systems SNAP I SNAP II	Manages systems for maintenance, supply, and financial operations at the organizational and intermediate levels.[a] Manages medical and dental services, pay and personnel administration, food service, retail sales and service, training programs, technical data storage and retrieval, support and test equipment, and other mission support-related areas at the organizational level. SNAP I was developed for the Navy's larger ships, marine aviation logistics squadrons,[b] training sites, and selected activities ashore. SNAP II provides the same functionality as SNAP I, but it was developed for use on smaller ships and submarines. SNAP II was also modified to use microcomputers as the computing platforms when it is deployed on ships with constricted physical space; this version is known as MicroSNAP.	SNAP I: • Shipboard Uniform Automated Data Processing System • Organizational Maintenance Management System • Administration Data Management I SNAP II: • Supply and Financial Management • Organizational Maintenance Management System II Maintenance Data System • Administration Data Management II
NALCOMIS	Supports day-to-day aircraft maintenance and related material maintenance functionality both at sea and ashore. Provides the initial maintenance response when a problem is reported—including aircraft component troubleshooting, servicing, inspection, and removal and replacement at the organizational level. Supports, at the intermediate maintenance level, the repair of components after defective parts have been removed from an aircraft and sent to a central location to be refurbished.	• NALCOMIS Organizational Maintenance Activity • NALCOMIS Intermediate Maintenance Activity
MRMS	Supports intermediate-level ship and submarine maintenance at ashore facilities by providing management information such as planning, scheduling, workload forecasting, work progression, production control, productivity analysis, and resource management.	• Maintenance Resource Management System

Source: Navy.

[a]The "organizational" level is the first stage of aircraft maintenance activity that is performed on individual planes and involves the upkeep and servicing of the aircraft at the location where it is deployed, such as a ship. Components or parts that cannot be repaired at the organizational level are removed from the plane and sent to a central location for repair. This second stage of maintenance is known as the "intermediate" level, and it normally occurs on land. If the defective part cannot be fixed at the intermediate level, it is then sent to a third stage of maintenance, known as the "depot" level, which is not in the scope of the NTCSS program.

[b]Marine aviation logistics squadrons are groups of planes that are land-based but that can be deployed on an aircraft carrier for a specific mission. When the mission is completed, these planes return to their land base.

In 1992, we recommended that the Navy merge the management of all shipboard nontactical programs under a single command that would have authority and control over funding and development.[5] In 1993, the Navy developed a strategy to do so. In 1994, the Navy also identified a number of

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[5]GAO, *ADP Procurement: Prompt Navy Action Can Reduce Risks to SNAP III Implementation*, GAO/IMTEC-92-69 (Washington, D.C.: Sept. 29, 1992).

problems with the three legacy systems. Specifically, the Navy determined that (1) the individual systems did not consistently handle increasing workloads and provide the flexibility to meet changing operational demands; (2) the systems' software architectures were ineffective and inefficient; (3) the hardware was outdated, slow, expensive to maintain, and nonstandard; and (4) the systems could not support modernized applications.

To address these concerns, the Navy initiated the NTCSS program in 1995 to enhance the combat readiness of ships, submarines, and aircraft. To accomplish this, NTCSS was to provide unit commanding officers and crews with information about, for example, maintenance activities, parts inventories, finances, technical manuals and drawings, and personnel. According to the Navy, it spent approximately $1.1 billion for NTCSS from its inception through fiscal year 2005 and expects to spend another $348 million between fiscal years 2006 and 2009, for a total of approximately $1.45 billion.

The Navy defined a three-stage acquisition process for NTCSS.

Stage 1: Purpose was to replace hardware in order to establish a common infrastructure across all force-level ships, unit-level ships, aviation squadrons, Naval air stations, marine aviation logistics squadrons, and other maintenance activities—both at sea and ashore.[6] During this stage, software and business processes were not to be changed. This phase was begun in 1994 under the legacy SNAP and NALCOMIS programs and, according to program officials, it is fundamentally complete—although technology refresh or replacement activities are still occurring.

Stage 2: Purpose was to provide the functionality of the legacy systems software with more efficient, more easily maintained software and to eliminate functional overlap among the systems. This stage was to involve software technology modernization but no changes in software

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[6]Force-level ships include large ships, such as aircraft carriers and submarine tenders. Unit-level ships include command ships, hospital ships, other auxiliary and support ships, and submarines. Aviation squadrons are groups of planes that are always based on a specific aircraft carrier. Naval air stations and Marine aviation logistics squadrons are groups of planes that are land-based. The Naval air stations support land-based planes that are not deployed to ships. The Marine aviation logistics squadrons can be deployed on an aircraft carrier for a specific mission and, when the mission is completed, these planes return to their land base.

functionality or business processes. Existing legacy systems used flat files and hierarchical databases, which were to be converted to relational databases, and the existing application code was to be rewritten using modern software languages. A common hardware and systems software environment was also to be implemented, and functionality found in eight of the nine legacy applications was to be consolidated and rewritten as four new NTCSS applications. Development of these four applications began in 1995 and was reportedly completed in 2000. This stage was known as NTCSS Optimization. See table 2 for a description of the functionality of these new applications.

Stage 3: Purpose was to improve NTCSS's functionality by implementing business process improvements. According to Navy officials, this stage is known as NTCSS Modernization and, to date, includes two efforts: (1) replace the last legacy application and (2) create a Web-enabled version of the three unit-level Optimized NTCSS applications that were developed under Stage 2. See table 3 for a description of the functionality of these business process improvements.

Table 2: Optimized Applications Developed During Stage 2 of the NTCSS Program

NTCSS Optimized applications	Description	Status
Relational Supply	Supports supply chain management, inventory management, and financial management processes. Provides Navy personnel with access to the supply support functions they perform most often—ordering, receiving, and issuing necessary supplies and materials; maintaining financial records; and reconciling supply, inventory, and financial records with the Navy's shore infrastructure.	Operational, as of September 1998, on large force-level ships, smaller unit-level ships, and at air stations and marine aviation logistics squadrons.[a]
Organizational Maintenance Management System—Next Generation	Assists shipboard personnel in planning, scheduling, reporting, and tracking maintenance and related logistics support actions. Maintains online lists of maintenance actions to be performed, parts required to maintain shipboard equipment, and parts carried onboard ship to support maintenance actions. Interfaces with Relational Supply to requisition parts that are not onboard.	Operational, as of September 1998, primarily on large force-level ships and smaller unit-level ships.
Relational Administration Data Management	Automates the management of personnel awards and decorations, work assignments, and berthing assignments.	Operational, as of April 2000, on large force-level ships, smaller unit-level ships, and at air stations and marine aviation logistics squadrons.
Optimized Intermediate Maintenance Activities	Provides online intermediate-level aviation maintenance, configuration, and logistics management support. Interfaces with other major integrated logistics support systems within the Naval aviation community.	Operational, as of April 2000, at force-level ships and at air stations and marine aviation logistics squadrons.

Source: Navy.

[a]Relational Supply is also in use at additional sites that are not a part of the NTCSS program.

Table 3: Modernized Applications Developed During Stage 3 of the NTCSS Program

NTCSS modernized applications	Description	Status
Optimized Organizational Maintenance Activity (OOMA)	Is to support day-to-day maintenance management tools for aviation squadrons and other organizational-level maintenance activities. Is to provide the foundation for achieving a completely automated maintenance environment, such as a single point of data entry, automated and assisted pilot and maintenance debrief, online diagnostics, structural life prognostics,[a] interactive electronic technical manuals, and forecasting and tracking of maintenance schedules.	Initiated in 1999, withdrawn from operational testing[b] in April 2001 when it became clear that it would fail. Failed operational testing again in May 2004. Scheduled for third operational test in the third quarter of fiscal year 2006. Fielded at 77 sites as of June 2005.
eNTCSS	Was to provide a Web-enabled version of NTCSS, and allow users to access the three unit-level Optimized applications from any workstation on a ship's local area network via a standard Web browser and to execute work activities in a Web-server environment.	Initiated in 2001. Cancelled in April 2004. Fielded on one submarine and scheduled to be fielded on one more. Is to be replaced with the Optimized applications, but a date has yet to be determined.

Source: Navy.

[a]According to the U.S. Marine Corps Logistics Directorate, structural life prognostics is defined as the ability to reliably predict the remaining useful life of mechanical or structural components, within an actionable time period, and within acceptable confidence limits.

[b]According to the DOD Defense Acquisition Guidebook, the primary purpose of operational test and evaluation is for representative users to evaluate systems in a realistic environment in order to determine whether these systems are operationally effective and suitable for their intended use before production or deployment.

As of April 2005, legacy applications were still in use at 51 percent of the Navy's 659 sites. These 659 sites either have legacy, Optimized, or modernized applications. Table 4 shows the distribution of the legacy, Optimized, and modernized applications.

Table 4: Applications in Operation as of April 2005

Applications	Number of sites	Percentage of total
Legacy applications		
SNAP I[a, b]	10	
SNAP II[a, b, c]	68	
MicroSNAP	32	
NALCOMIS Organizational Maintenance Activity[d]	214	
NALCOMIS Intermediate Maintenance Activity[b]	10	
Maintenance Resource Management System[e]	2	
Subtotal	**336**	**51**
Optimized applications[f]		
Relational Supply[c]		
Organizational Maintenance Management System – Next Generation		
Relational Administration Data Management		
Optimized Intermediate Maintenance Activities		
Subtotal	**229**	**35**
Modernized applications		
Optimized Organizational Maintenance Activity	93	
eNTCSS	1	
Subtotal	**94**	**14**
Total	**659**	**100**

Source: Navy.

[a]SNAP I and SNAP II are each composed of three different legacy applications (see table 1).

[b]The Navy plans to decommission some of the ships that use these applications and upgrade the remaining ships to NTCSS Optimized applications.

[c]This application also is in use at additional sites that are not a part of the NTCSS program.

[d]The functionality included in this application is to be replaced in the future by Optimized Organizational Maintenance Activity.

[e]The Navy plans to incorporate this functionality into Organizational Maintenance Management System–Next Generation at a future date.

[f]These four applications are deployed as a single software package at all 229 sites.

According to Navy officials, about $1.1 billion was spent on NTCSS between 1995 and 2005. This includes about $1 billion on NTCSS Optimized applications[7] and $91 million on OOMA and eNTCSS. Table 5 shows NTCSS's budget totals from the time the program began in fiscal year 1995 through fiscal year 2005.

Table 5: NTCSS Budget from FY 1995 through FY 2005

Dollars in thousands

	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	Total
NTCSS Optimized	83,537	69,794	69,075	123,469	119,822	91,053	95,322	95,549	82,708	108,087	71,926	**1,010,342**
OOMA		920	700	983	4,724	16,527	20,854	14,920	3,981	2,871	13,291	**79,771**
eNTCSS							5,000	5,309	985			**11, 294**
Total	**83,537**	**70,714**	**69,775**	**124,452**	**124,546**	**107,580**	**121,176**	**115,778**	**87,674**	**110,958**	**85,217**	**1,101,407**

Source: Navy.

NTCSS Oversight and Management Roles and Responsibilities

A number of Navy and DOD organizations are involved in overseeing and managing the NTCSS program. Table 6 lists the organizations involved in NTCSS oversight and their respective roles and responsibilities.

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[7]According to program officials, in addition to development and support of NTCSS Optimized applications, this amount includes legacy application support, shore-based legacy application procurements and installations, and Space and Naval Warfare Systems Command civilian salaries.

Table 6: NTCSS Oversight Roles and Responsibilities

Oversight entity	Roles and responsibilities
Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space	Currently serves as the milestone decision authority. Assigned overall responsibility for the NTCSS program; approves the program to proceed through its acquisition cycle on the basis of a review of key documents, such as an acquisition plan, an independently evaluated life cycle cost-and-benefits estimate, Acquisition Program Baseline documents, and Defense Acquisition Executive Summary reports.
Program Executive Office for Command, Control, Communication, Computers and Intelligence, and Space; Space and Naval Warfare Systems Command	Serves as the program executive office. Assigned overall responsibility for NTCSS program oversight; reviews the component cost analysis, acquisition strategy, and Acquisition Program Baseline prior to approval by the milestone decision authority.
Department of Navy Chief Information Officer	Reviews the acquisition program during the department's planning, programming, budgeting, and execution processes to ensure that the program's goals are achievable and executable; ensures conformance to appropriation law, financial management regulations, and Navy, DOD, and federal IT policies in several areas (e.g., security, architecture, and investment management); works closely with the program office during milestone review assessments.
Assistant Secretary of the Navy, Research Development and Acquisition, Chief Engineer	Ensures system compliance with architectural standards and promotes interoperability of the Navy's systems.
Office of the Secretary of Defense, Office of the Director for Program Analysis and Evaluation	Verifies and validates the reliability of cost and benefit estimates found in economic analyses and provides its results to the milestone decision authority.
Naval Cost Analysis Division	Performs independent cost estimates, maintains cost analysis tools, and focuses on cost analysis policy and oversight.
Executive Steering Committee Members are representatives from: Office of the Chief of Naval Operations for Material Readiness and Logistics Operations (Chairman); Commander in Chief, U.S. Atlantic Fleet; Commander in Chief, U.S. Pacific Fleet; Commandant of the Marine Corps; and Program Executive Office for Command, Control, Communication, Computers and Intelligence, and Space.	Establishes priorities for NTCSS development and implementation and for defining long-term architectural goals; meets after regularly scheduled NTCSS meetings (e.g., Requirements Integrated Product Team meetings and Forum meetings).[a]

Source: Navy.

[a]The Requirements Integrated Product Team is chartered to collect and analyze users' requirements, input these requirements into the NTCSS requirements management process, and provide recommendations to the program office on these requirements. The Forum brings together stakeholders and acquisition and development personnel to (1) discuss issues and requirements related to current and future system readiness, (2) develop specific action items and recommendations that will result in improved program products and services to the Fleet, and (3) facilitate key decisions by senior program leadership at Executive Steering Committee meetings.

There have been three milestone decision authorities for NTCSS since the program was begun. Initially, the milestone decision authority was in the Office of the Assistant Secretary of Defense for Networks and Information

Integration/Chief Information Officer. In July 1999, this authority was delegated to the Assistant Secretary of the Navy for Research, Development, and Acquisition, who then delegated oversight authority to Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space in March 2000.

Table 7 lists the organizations involved in NTCSS management and their respective roles and responsibilities.

Table 7: NTCSS Management and Stakeholder Roles and Responsibilities

Entity	Roles and responsibilities
Program Manager, Warfare; Space and Naval Warfare Systems Command	Serves as the program office. Assigned responsibility for day-to-day program management of NTCSS and, as such, is the single point of accountability for managing the program's objectives through development, production, and sustainment. Manages cost, schedule, and performance reporting. Prepares and updates the acquisition strategy, component cost analysis, and acquisition program baselines. Coordinates all testing activities in coordination with requirements.
Space and Naval Warfare Systems Command, Systems Center Norfolk	Serves as the central design agency. Assigned responsibility for software development, including application design, development, and testing activities. Responsible for managing trouble reports and change proposals.[a] Manages Space and Naval Warfare Systems Command, Systems Center Norfolk Detachment San Diego, which installs the initial NTCSS systems on ships, submarines, and at land sites and performs subsequent on-site software maintenance.
Space and Naval Warfare Systems Command, Systems Center Charleston	Serves as the in-service engineering activity. Provides engineering support and installs and integrates hardware.
Office of the Chief of Naval Operations for Material Readiness and Logistics Operations	Serves as the program and resource sponsor. Balances user requirements with available resources. Works with users to ensure that operational and functional requirements are prioritized correctly and are supported. Addresses various issues pertaining to Navy policy, requirements, resources, and schedules.
Functional Managers Includes representatives from: Naval Sea Systems Command; Naval Supply Systems Command; Naval Air Systems Command; and Commander in Chief, U.S. Atlantic Fleet.	Represent the system users. Participate in the process of establishing functional requirements for input into the change management and system design processes. Prepare test plans and test analysis reports to support functional certification of software.

Source: Navy.

[a]Navy officials provided data regarding trouble reports and change proposals for the Optimized and modernized NTCSS applications. For details see appendix II.

NTCSS Participation in DOD's Rapid Improvement Team Pilot

In 2001, the DOD Chief Information Officer and the Undersecretary of Defense for Acquisition, Technology, and Logistics chartered a pilot project aimed at saving time by significantly reducing the reporting and oversight

requirements. The ultimate goal was to enable the acquisition process to deliver mission-effective IT systems within 18 months. Known as the Rapid Improvement Team (RIT) for IT Acquisition Management Transformation, the pilot was to cover a 2-year period from January 1, 2002, through December 31, 2003. Nine programs from the military services participated in the pilot. NTCSS was selected to participate in the pilot by its milestone decision authority due to its longevity and because of its perceived low risk, stability, and compliance with IT management best practices. It was also believed that little system development remained to be done. NTCSS began participating in the RIT pilot in October 2002.

The RIT pilot relieved the program office of the normal acquisition process activities, such as preplanned, formal milestone decision reviews or briefings, and it granted the program office the authority to pass key milestones once it determined that established requirements had been met. This streamlined approach was considered possible because all information related to these requirements was to be continually updated and available to oversight organizations and stakeholders via a RIT Web site. More specifically, the program office was to update the Web site monthly via a set of electronic forms with the kind of data that were traditionally found in DOD oversight documents. The program office was also to use the Web site to input key acquisition documents (e.g., acquisition plans, economic analyses, requirements documents and test plans) in an electronic library. In turn, the milestone decision authority and other oversight organizations were to review these data on at least a monthly basis and directly retrieve any acquisition documents to be reviewed from the library. No response from the milestone decision authority would indicate implicit approval of the program data. Although the formal RIT pilot ended in December 2003, program officials told us that they continued to operate using the RIT pilot's procedures and continued to update program information on the Web site through December 2004.

According to a memorandum issued by the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer and the Undersecretary of Defense for Acquisition, Technology, and Logistics, the principal output of the pilot would be a blueprint for IT acquisition that is transferable to other systems. A report summarizing the results of the entire RIT pilot program was published in

April 2005.[8] This report concluded that (1) by instituting risk-based governance, the milestone decision authority can be assigned to an organization subordinate to the Office of the Secretary of Defense without adding unacceptable risk to the investment process and (2) the success of risk-based governance and cycle time reduction is predicated on the adoption of net-centricity[9] by the business community.

Prior Review Identified Strengths and Weaknesses in DOD's Acquisition Policies and Guidance

In July 2004, we reported[10] that DOD's revised systems acquisition policies and guidance incorporated many best practices for acquiring business systems, such as (1) justifying system investments economically, on the basis of costs, benefits, and risks, and (2) continually measuring an acquisition's performance, cost, and schedule against approved baselines. However, the revised policies and guidance did not incorporate a number of other best practices, particularly those associated with acquiring commercial component-based business systems, and DOD did not have documented plans for incorporating these additional best practices into its policies. We also reported that the department's revised acquisition policies did not include sufficient controls to ensure that military services and defense agencies would appropriately follow these practices. We concluded that, until these additional best practices were incorporated into DOD's acquisition policies and guidance, there was increased risk that system acquisitions would not deliver planned capabilities and benefits on time and within budget and increased risk that an organization will not adopt and use best practices that were defined. Accordingly, we made 14 recommendations to the Secretary of Defense that were aimed at strengthening DOD's acquisition policy and guidance by including additional IT systems acquisition best practices and controls for ensuring that these best practices were followed. DOD agreed with most of our

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[8]DOD, *Blueprint for Establishing Risk-based Governance of IT Investments in a Net-centric Department of Defense* (Apr. 13, 2005).

[9]Net-centricity is a robust, globally interconnected network environment (including infrastructure, systems, processes, and people) in which data is shared in real time and seamlessly among users, applications and platforms. Net-centricity enables transformation by allowing applications to share data and services more effectively and flexibly, thereby allowing more agile, effective business practices to be used at reduced cost.

[10]GAO, *Information Technology: DOD's Acquisition Policies and Guidance Need to Incorporate Additional Best Practices and Controls*, GAO-04-722 (Washington, D.C.: July 30, 2004).

recommendations and has since issued additional system acquisition guidance.[11]

NTCSS Has Not Been Managed in Accordance with DOD and Other Relevant System Acquisition and Development Guidance

DOD system acquisition and development policies and guidance, along with other federal and best practices guidance, provide an effective framework within which to manage IT business system programs and investments, like NTCSS. Proper implementation of this framework can minimize program risks and better ensure that system investments deliver promised capabilities and benefits on time and within budget. The Navy has not managed NTCSS in accordance with many key aspects of these policies and guidance. For example, the Navy has not economically justified its investment in NTCSS on the basis of cost and benefits. It has not invested in NTCSS within the context of a well-defined enterprise architecture. Further, the Navy has not effectively performed key measurement, reporting, and oversight activities, and has not adequately conducted requirements management and testing activities. Reasons the Navy cited for not following policies and guidance included questioning their applicability to the NTCSS program, having insufficient time in which to apply them, and believing that plans to adopt them were not meant to be applied retroactively. In some cases, the Navy did not acknowledge that any deviations from policies and guidance had occurred but, in these cases, it has yet to provide us with documentation demonstrating that it did adhere to them. As a result, the Navy does not currently have a sufficient basis for determining whether NTCSS is the right system solution for its tactical command support needs, and it has not pursued the proposed solution in a way that increases the likelihood of delivering defined capabilities on time and within budget.

The Navy Has Not Economically Justified Investment in NTCSS on the Basis of Costs and Benefits

The decision to invest in any system should be based on reliable analyses of estimated system costs and expected benefits over the life of the program. DOD policy requires such analyses, and other relevant acquisition management practices provide guidance on how these analyses should be prepared. However, the current economic analysis for the NTCSS program does not meet this guidance. Additionally, the analysis was not independently reviewed in accordance with DOD guidance. Finally, contrary to DOD policy and relevant acquisition management practices, the

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[11]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004).

Navy has not demonstrated that NTCSS Optimized applications are producing expected benefits. Without such reliable analyses, an organization cannot adequately know that a given system investment is justified.

The Latest NTCSS Cost Estimate Was Not Derived Reliably

According to DOD guidance,[12] the cost estimates used to economically justify an investment should be reasonable, traceable, and based on realistic assumptions. Our research shows that a reliable cost estimate should meet nine specific criteria developed by Carnegie Mellon University's Software Engineering Institute (SEI),[13] such as appropriately sizing the task being estimated and identifying and explaining estimate assumptions.

In March 2004, the NTCSS program office prepared its fifth NTCSS economic analysis. This analysis examined the costs associated with three alternative NTCSS hardware, software, operating system and data base management configurations, and was to be used to inform decisions about system development and implementation. The analysis did include estimated costs for each alternative. However, it did not include measurable, quantifiable benefits for each alternative. Rather, it included only qualitative benefits. Further, the cost estimates used in this analysis did not meet six of the nine criteria associated with reliable cost estimates. For example, while the estimate's purpose was stated in writing, the system life cycle used was 6 years rather than the 10 years recommended. Also, documentation showing that the costs were based on data from the program's demonstrated accomplishments has yet to be provided to us, and the assumptions used to create the cost estimate were not identified and explained. See table 8 for the results of our analyses relative to each of the nine criteria.

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[12]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004).

[13]Carnegie Mellon University's SEI is a government-funded research organization that is widely considered an authority on software implementation. The checklist used is CMU/SEI-95-SR-004, *A Manager's Checklist for Validating Software Cost and Schedule Estimates*, January 1995. SEI developed these checklists to help evaluate software costs and schedule. However, SEI states that these checklists are equally applicable to hardware and systems engineering projects.

Table 8: Navy Satisfaction of Cost Estimating Criteria

Criterion	Explanation	Criterion met[a]	GAO analysis
The objectives of the program are stated in writing.	The objectives of the program should be clearly and concisely stated for the cost estimator to use.	Yes	The objective of the program was clearly stated.
The life cycle to which the estimate applies is clearly defined.	The life cycle should be clearly defined to ensure that the full cost of the program—that is, all direct and indirect costs for planning, procurement, operations and maintenance, and disposal—are captured. For investments such as NTCSS, the life cycle should cover 10 years past full operational capability of the system.[b]	No	The life cycle was not clearly defined to ensure that the full cost of the program is included. The life cycle defined was 6 years past full operational capability, instead of the full 10 years defined in the DOD guidance.
The task has been appropriately sized.	An appropriate sizing metric should be used in the development of the estimate, such as the amount of software to be developed and the amount of software to be revised.	Yes	The method used in the model lends itself to being appropriately sized.
The estimated cost and schedule are consistent with demonstrated accomplishments on other projects.	Estimates should be validated by relating them back to demonstrated and documented performance on completed projects.	No	No documentation was provided to show the use of historical data to produce the estimate.
A written summary of parameter values and their rationales accompany the estimate.	If a parametric equation was used to generate the estimate, the parameters that feed the equation should be provided, along with an explanation of why they were chosen.	No	The model used undocumented values as the source of the estimate for multiple elements.
Assumptions have been identified and explained.	Accurate assumptions regarding issues such as schedule, quantity, technology, development processes, manufacturing techniques, software language, etc., should be understood and documented.	No	Any assumptions used in the model were not identified.
A structured process, such as a template or format, has been used to ensure that key factors have not been overlooked.	A work breakdown structure or similar structure that organizes, defines, and graphically displays the individual work units to be performed should be used. The structure should be revised over time as more information becomes known about the work to be performed.	Yes	A work breakdown structure was provided and included all the standards elements.
Uncertainties in parameter values have been identified and quantified.	For all major cost drivers, an uncertainty analysis should be performed to recognize and reflect the risk associated with the cost estimate.	No	No risk analysis was documented in the estimate.

Criterion	Explanation	Criterion met[a]	GAO analysis
If more than one cost model or estimating approach has been used, any differences in the results have been analyzed and explained.	The primary methodology or cost model results should be compared with any secondary methodology (for example, cross-checks) to ensure consistency.	No	No secondary model was discussed in the estimate documentation.

Sources: SEI criteria, DOD guidance, and GAO analysis of Navy data.

[a]"Yes" means that the program provided documentation demonstrating satisfaction of the criterion. "Partially" means that the program provided documentation demonstrating satisfaction of part of the criterion. "No" means that the program has yet to provide documentation demonstrating satisfaction of the criterion.

[b]DOD, *DOD Automated Information System (AIS) Economic Analysis (EA) Guide*, May 1, 1995.

Program officials told us that they did not develop the 2004 cost estimate in accordance with all of the SEI cost estimating criteria because they had only a month to complete the economic analysis. By not following practices associated with reliable estimates, the Navy has decided on a course of action that is not based on one of the key ingredients to sound and prudent decision making— a reliable estimate of system life cycle costs. Among other things, this means that the investment decision made by the Navy has not been adequately justified and, that to the extent that program budgets were based on cost estimates, the likelihood of funding shortfalls and inadequate funding reserves is increased.

The Latest NTCSS Economic Analysis Did Not Meet Key Federal Guidance

According to Office of Management and Budget (OMB) guidance,[14] economic analyses should meet certain criteria to be considered reasonable, such as comparing alternatives on the basis of net present value and conducting an uncertainty analysis of costs and benefits.

The latest NTCSS economic analysis, prepared in March 2004, identified potential costs and benefits from three alternative NTCSS hardware, software, operating system, and data base management configurations. However, the analysis provided only monetized costs for each alternative. It did not provide monetized benefits. Further, the analysis did not meet five of eight OMB criteria. For example, the alternatives were not compared on the basis of their net present values, an appropriate interest

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[14]Office of Management and Budget, Circular No. A-94: *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (Oct. 29, 1992); and Circular No. A-11: *Planning, Budgeting, Acquisition and Management of Capital Assets* (June 21, 2005).

rate was not used to discount the net present values, and the uncertainty associated with the cost estimates was not disclosed and used in the analysis. See table 9 for the results of our analyses relative to each of the eight criteria.

Table 9: Navy Satisfaction of OMB Economic Analysis Criteria

Criterion	Explanation	Criterion met[a]	GAO analysis
The economic analysis clearly explained why the investment was needed.	The economic analysis should clearly explain the reason why the investment is needed, i.e., why the status quo alternative is unacceptable.	Yes	The economic analysis explained why the status quo alternative was not viable.
At least two alternatives to the status quo were considered.	At least two meaningful alternatives to the status quo should be examined to help ensure that the alternative chosen was not preselected.	Yes	Three alternatives to the status quo were considered.
The general rationale for the inclusion of each alternative was discussed.	The general rationale for the inclusion of each alternative should be discussed to enable reviewers of the analysis to gain an understanding of the context for the selection of one alternative over the others.	Yes	The rationale for each alternative was discussed.
The quality of the cost estimate for each alternative was reasonable.	The quality of the cost estimate of each alternative should be complete and reasonable for a net present value to be accurate. One measure of a cost estimate's reasonableness is its satisfaction of earlier cited SEI criteria.	No	The cost estimates were not complete and did not meet a majority of the SEI criteria.
The quality of the benefits to be realized from each alternative was reasonable.	The quality of the benefit estimate of each alternative should be complete and reasonable for a net present value to be calculable and accurate.	No	Monetized estimates of benefits were not provided, and no explanation was given as to why these estimates were not provided.
Alternatives were compared on the basis of net present value.	The net present value should be calculated because it consistently results in the selection of the alternative with the greatest benefit net of cost.	No	The economic analysis stated that all costs and benefits were expressed in undiscounted constant fiscal year 2004 dollars; however, monetized benefits were not reported in the economic analysis. As a result, the net present value was not calculated.
The proper discount rate used for calculating each alternative's overall net present value should be used.	OMB Circular A-94 is the general guidance for conducting cost-benefit analyses for federal government programs and provides specific guidance on the discount rates to be used in evaluating those programs whose benefits and costs are distributed over time.	No	Since all dollar amounts are expressed in undiscounted constant fiscal year 2004 dollars, the discount rate used in the economic analysis is, by default, zero. The discount rates provided by OMB Circular No. A-94 are all positive (i.e., greater than zero).

Criterion	Explanation	Criterion met[a]	GAO analysis
An uncertainty analysis of costs and benefits was included.	Estimates of benefits and costs are typically uncertain because of imprecision in both underlying data and modeling assumptions. Because such uncertainty is basic to virtually any cost-benefit analysis, its effects should be analyzed and reported.	No	No uncertainty analysis for the overall reported costs was included.

Sources: OMB guidance and GAO analysis of Navy data.

[a]"Yes" means that the program provided documentation demonstrating satisfaction of the criterion. "Partially" means that the program provided documentation demonstrating satisfaction of part of the criterion. "No" means that the program has yet to provide documentation demonstrating satisfaction of the criterion.

Program officials told us that they did not adhere to the OMB criteria because they had only a month to complete the economic analysis and, therefore, did not have the time necessary to comply with it. By not following established OMB guidance, the reliability of the latest NTCSS economic analysis is questionable. This further increases the risk that the Navy is following a course of action that will not produce the expected return on investment.

The Latest NTCSS Economic Analysis Was Not Independently Reviewed

DOD guidance[15] states that economic analyses and cost estimates should be independently reviewed and assessed. In this regard, the Office of Program Analysis and Evaluation, located in the Office of the Secretary of Defense, is responsible for verifying and validating the reliability of economic analyses and providing the results to the milestone decision authority; the Naval Cost Analysis Division is responsible for preparing independent cost estimates.

However, neither of these offices reviewed the most recent economic analysis for NTCSS. An official from the Office of Program Analysis and Evaluation told us that this office did not review the 2004 economic analysis because, once NTCSS entered the RIT Pilot, the program office no longer provided documentation needed to review the analysis. Officials from the Naval Cost Analysis Division also stated that they did not review the estimates in this economic analysis. According to officials from this office, they are only required to review cost estimates that are prepared for milestone reviews, and staffing limitations do not permit them to review all cost estimates.

[15]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004).

By not having the economic analysis reviewed by independent parties, the Navy has no independent verification that the estimates of life cycle costs and benefits are reasonable and traceable, that the cost estimates are built on realistic program and schedule assumptions, or that the return on investment calculation is valid. This casts further doubt on the reliability of the economic analysis the Navy has used to justify its ongoing investment in NTCSS.

The Navy Has Yet to Measure Whether Actual Benefits Have Accrued from Deployed NTCSS Capabilities

The Clinger-Cohen Act of 1996 and OMB guidance[16] emphasize the need to develop information to ensure that IT projects are actually contributing to tangible, observable improvements in mission performance. DOD guidance[17] also requires that analyses be conducted to validate estimated benefits and measure the extent to which desired outcomes have been achieved. To this end, agencies should define and collect metrics to determine whether expected benefits are being achieved and modify subsequent applications and investments to reflect the lessons learned.

However, the Navy has yet to measure whether NTCSS Optimized applications are actually producing expected benefits commensurate with actual costs. For example, in 1999 the Navy projected that deploying the NTCSS Optimized applications would result in reduced costs associated with NTCSS maintenance, training, and other support activities. However, the Navy does not know the extent to which NTCSS Optimized applications are meeting these expectations—even though these applications have been deployed to 229 user sites since 1998—because metrics to demonstrate that these expectations have been met have not been defined and collected.

Program officials and officials representing the milestone decision authority stated that the Navy is not required to measure actual accrual of benefits because DOD guidance to do so was not yet in effect when the NTCSS Optimized applications were deployed, and there was no explicit requirement to apply this guidance retroactively. Program officials also stated that it will not be possible to measure actual return-on-investment for the already deployed NTCSS Optimized applications until the entire

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[16]Clinger-Cohen Act of 1996, 40 U.S.C. sections 11101-11704, and Office of Management and Budget (OMB) Circular No. A-130, *Management of Federal Information Resources* (Nov. 30, 2000).

[17]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004).

NTCSS system is deployed and operational. Similarly, an official with the milestone decision authority stated that actual NTCSS return-on-investment has not yet been measured.

Because it is not measuring whether cost and benefit projections are being met, the Navy lacks important information that it will need to inform future economic analyses and investment decisions.

The Navy Recently Decided to Prepare a Benefits Assessment

In February 2005, officials from the Office of the Chief of Naval Operations for Material Readiness and Logistics Operations[18] and representatives from key user organizations questioned whether NTCSS can cost effectively meet users' future needs. Initially this office tasked the program office to develop a new economic analysis to determine whether to continue investing in NTCSS or in some other system solution, such as the Navy enterprise resource planning (ERP) program.[19] In November 2005, officials from the Office of the Chief of Naval Operations for Material Readiness and Logistics Operations stated that they were no longer planning to develop a new economic analysis but planning to conduct a benefits assessment to evaluate changing NTCSS to some solution to enable the system to perform future ashore activities. These officials acknowledged that this assessment will be less than the initially planned economic analysis in that it will exclude any analysis of costs and alternative solutions. However, they also acknowledged that DOD policy and guidance does not address benefits assessments as a recognized acquisition program document. They stated that this assessment will be prepared for inclusion in the 2006 budget submission.

Without knowing the extent to which NTCSS Optimized applications are meeting cost and benefit expectations, the Navy is not in a position to make informed, and thus justified, decisions on whether and how to proceed with

[18]The Office of the Chief of Naval Operations for Material Readiness and Logistics Operations serves as the program and resource sponsor for the NTCSS program in order to balance user requirements with available resources. See table 7: NTCSS Management and Stakeholder Roles and Responsibilities.

[19]ERP is an automated system using commercial off-the-shelf software consisting of multiple, integrated functional modules that perform a variety of business-related tasks such as payroll, general ledger accounting, and supply chain management. In August 2002, the Assistant Secretary of the Navy for Research, Development, and Acquisition established a Navy-wide ERP program to converge four ERP pilot programs that had been ongoing since 1998.

the program. Such a situation introduces a serious risk that the Navy will not be able to demonstrate whether NTCSS is cost-effective until it has already spent hundreds of millions of dollars more on the NTCSS Optimized applications and OOMA.

The Navy Has Not Defined and Developed NTCSS within the Context of an Enterprise Architecture

DOD policy and guidance,[20] as well as federal and best practice guidance,[21] recognize the importance of investing in IT business systems within the context of an enterprise architecture. Our research and experience in reviewing federal agencies shows that not doing so often results in systems that are duplicative, not well integrated, unnecessarily costly to interface and maintain, and do not optimally support mission outcomes.[22] NTCSS has not been defined and developed in the context of a DOD or Navy enterprise architecture because a well-defined version of either has not existed to guide and constrain the program, and meaningful analysis showing how NTCSS aligns to evolving DOD and Navy architecture efforts was not produced. This means that the Navy does not have a sufficient basis for

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[20]DOD, Department of Defense Directive Number 5000.1, *The Defense Acquisition System* (May 12, 2003) and Department of Defense Architecture Framework, Version 1.0, Volume 1 (February 2004).

[21]See, for example, Clinger-Cohen Act of 1996, 40 U.S.C. §§ 11312 and 11315(b)(2); E-Government Act of 2002, Pub. L. No. 107-347 (Dec. 17, 2002); GAO, *Information Technology: A Framework for Assessing and Improving Enterprise Architecture Management (Version 1.1)*, GAO-03-584G (Washington, D.C.: April 2003); Chief Information Officer Council, *A Practical Guide to Federal Enterprise Architecture, Version 1.0* (February 2001); and Institute of Electrical and Electronics Engineers, *Standard for Recommended Practice for Architectural Description of Software-Intensive Systems 1471-2000* (Sept. 21, 2000).

[22]See, for example, GAO, *Homeland Security: Efforts Under Way to Develop Enterprise Architecture, but Much Work Remains*, GAO-04-777 (Washington, D.C.: Aug. 6, 2004); *DOD Business Systems Modernization: Limited Progress in Development of Business Enterprise Architecture and Oversight of Information Technology Investments*, GAO-04-731R (Washington, D.C.: May 17, 2004); *Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization*, GAO-04-43 (Washington, D.C.: Nov. 21, 2003); *DOD Business Systems Modernization: Important Progress Made to Develop Business Enterprise Architecture, but Much Work Remains*, GAO-03-1018 (Washington, D.C.: Sept. 19, 2003); *Business Systems Modernization: Summary of GAO's Assessment of the Department of Defense's Initial Business Enterprise Architecture*, GAO-03-877R (Washington, D.C.: July 7, 2003); *Information Technology: DLA Should Strengthen Business Systems Modernization Architecture and Investment Activities*, GAO-01-631 (Washington, D.C.: June 29, 2001); and *Information Technology: INS Needs to Better Manage the Development of Its Enterprise Architecture*, GAO/AIMD-00-212 (Washington, D.C.: Aug. 1, 2000).

knowing if NTCSS, as defined, properly fits within the context of future DOD and Navy business operational and technological environments.

More specifically, a well-defined enterprise architecture provides a clear and comprehensive picture of an entity, whether it is an organization (e.g., a federal department) or a functional or mission area that cuts across more than one organization (e.g., personnel management). This picture consists of snapshots of both the enterprise's current or "As Is" environment and its target or "To Be" environment, as well as a capital investment road map for transitioning from the current to the target environment. These snapshots consist of integrated "views," which are one or more architecture products that describe, for example, the enterprise's business processes and rules; information needs and flows among functions; supporting systems, services, and applications; and data and technical standards and structures. GAO has promoted the use of architectures to guide and constrain systems modernization, recognizing them as a crucial means to a challenging goal: agency operational structures that are optimally defined in both the business and technological environments.

DOD has long operated without a well-defined enterprise architecture for its business environment. In 2001, we first reported that DOD did not have such an architecture and recommended that it develop one to guide and constrain IT business systems, like NTCSS.[23] Over the next 4 years, we reported that DOD's architecture development efforts were not resulting in the kind of business enterprise architecture that could effectively guide and constrain business system investments,[24] largely because the department did not have in place the architecture management structures and processes described in federal guidance. In particular, we most recently reported in July 2005[25] that despite spending about $318 million producing eight versions of its architecture, DOD's latest version still did not have, for example, a clearly defined purpose that could be linked to the department's goals and objectives and a description of the "As Is" environment and a

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[23]GAO, *Information Technology: Architecture Needed to Guide Modernization of DOD's Financial Operations*, GAO-01-525 (Washington, D.C.: May 17, 2001).

[24]GAO, *DOD Business Systems Modernization: Improvements to Enterprise Architecture Development and Implementation Efforts Needed*, GAO-03-458 (Washington, D.C.: Feb. 28, 2003); Information Technology: *Observations on Department of Defense's Draft Enterprise Architecture*, GAO-03-571R (Washington, D.C.: Mar. 28, 2003); GAO-03-877R; GAO-03-1018; GAO-04-731R.

[25]GAO-05-702.

transition plan. Further, we reported that the description of the "To Be" environment was still missing important content (depth and scope) relative to, for example, the actual systems to be developed or acquired to support future business operations and the physical infrastructure (e.g., hardware and software) that would be needed to support the business systems. Over the last several years, we have also reported that DOD's efforts for determining whether ongoing investments were aligned to its evolving architecture were not documented and independently verifiable.[26] On September 28, 2005, DOD issued the next version of its business enterprise architecture,[27] which we are required to review, along with other things such as the department's efforts to review certain investments' alignment with the architecture, pursuant to the Fiscal Year 2005 National Defense Authorization Act.[28]

The Navy has also not had an enterprise architecture to guide and constrain its IT system investments. For example, in February 2002 and November 2003, we reported that while the Navy was developing an enterprise architecture, the architecture products were not complete and they were not, for example, under configuration management.[29] Since that time, the Navy has yet to develop an enterprise architecture. In response to our request for the latest version of its architecture, the Assistant Secretary of the Navy, Research Development and Acquisition, Chief Engineer, provided us documentation that describes high-level principles or goals that the Navy wants to achieve, such as systems interoperability. However, most of the critical products that an enterprise architecture should include were not provided, such as (1) a data dictionary, which is a repository of standard data definitions for applications; (2) a logical database model that provides the data structures that support information flows and that provides the basis for developing the schemas for designing, building, and

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[26]GAO, *DOD Business Systems Modernization: Billions Being Invested without Adequate Oversight*, GAO-05-381 (Washington, D.C.: Apr. 29, 2005).

[27]The Under Secretary of Defense for Acquisition, Technology, and Logistics and the Under Secretary of Defense (Comptroller) are responsible for overseeing the development of DOD's business enterprise architecture.

[28]Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005, Pub. L. No. 108-375, § 332, 118 Stat. 1811, 1851-1856, (Oct. 28, 2004) (codified in part at 10 U.S.C. § 2222).

[29]GAO, *Information Technology: Enterprise Architecture Use across the Federal Government Can Be Improved*, GAO-02-6 (Washington, D.C.: Feb. 19, 2002); and *Information Technology: Leadership Remains Key to Agencies Making Progress on Enterprise Architecture Efforts*, GAO-04-40 (Washington, D.C.: Nov. 17, 2003).

maintaining the existing physical databases; and (3) an analysis of the gaps between the baseline and target architecture for business processes, information/data, and services/application systems to define missing and needed capabilities. According to the Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space, the Navy does not have an enterprise architecture. However, these officials stated that the Navy recognizes the importance of developing and using one and is taking steps to do so. They did not have a time frame as to when this would be accomplished, however.

In addition, NTCSS program officials told us that the system has been assessed against DOD's business enterprise architecture, and based on this assessment, the system is aligned. However, our analysis of the alignment documentation showed while NTCSS could be mapped to several enterprise architecture elements (e.g., strategic goals and organizational roles), it was not mapped to other important elements (e.g., technical standards and data model). Moreover, as previously discussed, the version of the enterprise architecture used to assess alignment lacked utility and did not provide a sufficient basis for making informed investment decisions.

These officials stated that they have not yet assessed the system against the Navy's architecture because (1) the architecture has yet to be sufficiently developed and (2) compliance with this architecture may not be required.

Without having a well-defined architecture to set the institutional context within which a given investment like NTCSS must fit and taking proactive and verifiable steps to understand the extent to which the system as it is defined fits within this context, misalignments can occur that can introduce redundancies and incompatibilities and that can produce inefficiencies and require costly and time consuming rework to fix. In the case of NTCSS, this could be a problem because of the Navy's ongoing investment in its ERP program.[30] As we recently reported,[31] this program is intended to provide functionality in such areas as supply and workforce management for ashore activities, which is functionality similar to that of NTCSS for afloat activities. However, both programs have proceeded

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[30]GAO, *DOD Business Systems Modernization: Navy ERP Adherence to Best Practices Critical to Avoid Past Failures*, GAO-05-858 (Washington, D.C.: Sept. 29, 2005).

[31]GAO-05-858.

without a common, institutional frame of reference (i.e., enterprise architecture) that can be used to effectively manage their relationships and dependencies. Our research and experience in reviewing federal agencies shows that managing such relationships on a program to program basis is untenable and has proven unsuccessful. This is why the inherent risks associated with investing in systems in the absence of a well-defined architecture need to be explicitly disclosed and deliberately evaluated in order to make a well-informed investment decision.

Key Program Management and Oversight Activities Have Not Been Effectively Performed

Key aspects of effective program management include reliable progress measurement and reporting, appropriate budgeting, and meaningful oversight. DOD policy requires such activities, and DOD and other industry best practices provide guidance on how these activities should be conducted. However, these activities have not been effectively performed on the NTCSS program. Specifically, the Navy has not adequately measured progress against planned cost and scheduled work commitments, fulfilled defined reporting requirements, properly budgeted for expenditures, and conducted meaningful program oversight. As a result, opportunities for proactive program intervention and actions to address risks and problems were missed, allowing the program to proceed largely unchecked.

The Navy is Not Adequately Measuring Progress Against Planned Cost and Scheduled Work Commitments

Measuring and reporting progress against cost and schedule commitments is a vital element of effective program management. DOD policy and guidance recognize this by requiring the use of earned value management, and describing how it is to be performed. The NTCSS program has elected to use earned value management; however, it is not doing so effectively. As a result, the program, as well as Navy and DOD oversight authorities, have not had access to the kind of reliable and timely information they need to make informed decisions.

DOD Has Adopted Industry Standards for Earned Value Management

According to DOD policy and guidance,[32] program offices should obtain data from contractors and central design agencies on work progress, and these data should relate cost, schedule, and technical accomplishments.

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[32]DOD, Department of Defense Instruction Number 5000.2, *Operation of the Defense Acquisition System* (May 12, 2003) and *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004).

Moreover, the guidance states that these data should be valid, timely, and auditable. The tool that many DOD entities, including the NTCSS's program office and its central design agency, use to obtain and report these data is known as earned value management (EVM). Through EVM, program offices and others can determine a contractor's or central design agency's ability to perform work within cost and schedule estimates. It does so by examining variances between the actual cost and time to perform work tasks and the budgeted/estimated cost and time to perform the tasks.

In 1996, DOD adopted industry guidance[33] that identifies 32 criteria that a reliable EVM system should meet. The 32 criteria are organized into five categories: organization, planning and budgeting, accounting, analysis and management reports, and revisions and data maintenance (see app. III for the 32 criteria). As we previously reported,[34] EVM offers many benefits when done properly. In particular, it is a means to measure performance and serves as an early warning system for deviations from plans. It therefore enables a program office to mitigate the risk of cost and schedule overruns.

NTCSS Has Not Effectively Implemented EVM

The EVM system that NTCSS has implemented to measure program performance does not provide the kind of reliable and timely data needed to effectively identify and mitigate risks. According to the NTCSS central design agency's self-assessment of its earned value management system, 17 of the 32 industry best practice criteria are not being satisfied by the EVM system it has implemented. For example, the central design agency reported that the system cannot (1) establish and maintain a budget baseline against which program performance can be measured over time, (2) identify management reserves in case of contingencies, (3) record all indirect costs[35] that will be allocated to the work, (4) summarize data elements and associated variances through the work breakdown structure

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[33]American National Standards Institute (ANSI) /Electronic Industries Alliance (EIA) EVM System Standard (ANSI/EIA-748-98), Chapter 2 (May 19, 1998).

[34]GAO, *Missile Defense: Additional Knowledge Needed in Developing System for Intercepting Long-Range Missiles*, GAO-03-600 (Washington, D.C.: Aug. 21, 2003).

[35]Indirect costs are also known as "burden" or overhead costs. All organizations have indirect costs, which may include, for example, the cost of an office building, its depreciation, fringe benefits, office furniture, supplies, computers, vacations, sick pay, and telephone costs. By omitting indirect costs, NTCSS is understating the true program costs.

to support management needs, and (5) develop revised estimates of cost at completion based on performance to date.

Beyond this self-assessment, our review showed that 29 of the 32 criteria were not satisfied. For example, the system does not (1) provide for the integration of planning, scheduling, budgeting, work authorization, and cost accumulation management process; (2) identify physical products, milestones, technical performance goals, or other indicators used to measure progress; (3) reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning; and (4) control retroactive changes to records. See appendix III for the Navy's complete self-assessment and our full analysis of the extent to which the 32 criteria are satisfied.

Officials with the program office and the central design agency stated that although they chose to use EVM, they are not required by DOD policy to do so and, therefore, do not have to comply with the 32 criteria. These officials stated that one reason they are not required to use it is because the program office and the central design agency are part of the same organization (the Space and Naval Warfare Systems Command) and thus a formal contract or written agreement between them does not exist. They also stated that although the program as a whole exceeds dollar thresholds for which EVM is required,[36] they have chosen to break the program into smaller projects managed on a fiscal year basis, and none of these projects individually exceeds either the new or old DOD policy thresholds that would require the use of EVM.

We do not agree that the absence of a contractual relationship or the decomposition of the program into small, fiscal year-based projects is a valid reason for not effectively implementing EVM. DOD and OMB guidance require that the Navy base programmatic decisions on reliable analyses of estimated system's costs and expected benefits over the life of the program. The program office chose to use EVM as a means to satisfy these requirements and to measure progress and identify potential problems early, so that they could be effectively addressed. To accomplish this, EVM must be performed correctly. By not implementing it correctly on

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[36]Before April 2005, DOD policy required the use of EVM and the use of integrated baseline reviews for programs with (1) contracts or agreements for research and development or test and evaluations over $73 million or (2) procurement or operations and maintenance contracts over $315 million (both in fiscal year 2000 constant dollars). Since April 2005, DOD now requires the use of EVM for all cost or incentive contracts over $20 million.

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NTCSS, the Navy is losing an opportunity to gain the kind of visibility into program progress needed to identify problems and risks early and better ensure program success. Moreover, by tracking individual projects on a yearly basis the program office cannot adequately understand the status of the NTCSS program as a whole, which hinders its ability to accurately forecast program costs at completion and provide realistic schedule projections. In short, without reliable, timely, and auditable EVM data, the program office cannot adequately manage technical, cost, and schedule risks and problems.

Two NTCSS Projects Illustrate How EVM Has Been Poorly Implemented

Two of the individual NTCSS projects for which EVM activities were reportedly being performed are (1) 2004 OOMA software development and (2) 2004 NTCSS hardware installation and integration (for both OOMA and Optimized NTCSS). For the OOMA software project, EVM was performed by the central design agency and for the NTCSS hardware project it was performed by the Space and Naval Warfare Systems Command Systems Center, Charleston. On both projects, we found several examples of ineffective EVM implementation, including the following:

- An integrated baseline review was not conducted for either of the projects. According to DOD guidance and best practices, an integrated baseline review should be conducted as needed throughout the life of a program to ensure that the baseline for tracking cost, technical, and schedule status reflects (1) all tasks in the statement of work, (2) adequate resources in terms of staff and materials to complete the tasks, and (3) integration of the tasks into a well-defined schedule. Further, program managers are to use cost performance reports that have been validated by an integrated baseline review. Without verifying the baseline, monthly cost performance reporting, which is to track against a set budget and schedule, does not have sufficient meaning or validity.

- The estimate at completion for the 2004 OOMA software project, which is a forecast value expressed in dollars representing the final projected costs of the project when all work is completed, showed a negative cost for a 6-month period (November 2003 to April 2004). When EVM is properly implemented, this amount should include all work completed and always be a positive number. The negative estimate at completion for this project would mean that the central design agency had incurred

a savings rather than spending money, even though during that time more than $1.7 million had been spent.

- The schedule performance index for the OOMA software project, which is to reflect the critical relationship between the actual work performed versus the costs expended to accomplish the work, showed program performance during a time when the program office stated no work was being performed. Specifically, the reports showed the schedule performance fluctuating between $0.21 worth of work performed for every dollar spent to more than $3.75 worth of work performed for every dollar spent during a time that the program office claims all work was halted. Perfect performance would indicate schedule indices equal to 1.0 at best (i.e., for every dollar spent there was 100 percent of the schedule achieved).

- The estimate at completion for the OOMA hardware installation project showed that almost $1 million in installation costs had been removed from the total sunk costs, but no reason for doing so was provided in the cost performance report.

- The cost and schedule indices for the OOMA hardware installation project showed improbably high program performance during a time when the installation schedules and installation budget had been drastically cut because OOMA software failed operational testing. Specifically, the reports between March 2004 and July 2004 showed the current cost performance fluctuating between $0.07 worth of work performed for every dollar spent to $8.48 worth of work performed for every dollar spent.

Navy officials cited several reasons for these shortcomings. For the software project, program officials stated that prior to the operational testing of OOMA in 2003, the central design agency's implementation of EVM was primitive at best and that the resulting data were not usable. They also stated that after the project failed operational testing, they did not see the value in rebaselining the project and thus all EVM analysis was halted. They did, however, continue to invest in OOMA. For the hardware installation project, a Charleston Center official responsible for developing the installation reports stated that there were problems with collecting actual costs because the individuals responsible for doing the work were covered by other contracts, and there was no way to ensure that the costs were being reported consistently. Regarding the approximately $1 million in installation costs that were removed from the total sunk costs, this

official stated that these costs were erroneously charged to this project and were thus removed because they were not part of the original plan.

Ineffective implementation of EVM, as occurred on these two projects, precludes NTCSS program officials from having reliable and timely information about actual program status and does not provide these officials with a sound basis for making informed program decisions.

The Navy Has Not Adequately Reported NTCSS's Progress and Problems

One essential aspect of effective program management is complete and current reporting by the program office to oversight organizations responsible for making decisions regarding the program's future. DOD policy recognizes this, stating that the program office is accountable for providing credible schedule, performance, and cost reporting information to the milestone decision authority. Officials from the NTCSS milestone decision authority told us that they relied on the program office to fully disclose progress against, and deviations from, program cost, schedule, and performance goals. However, the program office has not reported consistently or reliably on the program's progress and, as a result, has not fully disclosed program status to Navy and DOD oversight authorities who are responsible for making proper investment decisions.

Navy Reporting Requirements for NTCSS Have Changed over the Last Several Years

Since program inception, NTCSS requirements for reporting cost, schedule, and performance information have changed. Prior to October 2002, the program office was required to comply with applicable DOD acquisition policies and guidance.[37] This guidance generally required the program office to provide oversight organizations with the following three key reports:

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[37]DOD, Department of Defense Directive Number 5000.1, *The Defense Acquisition System* (Oct. 23, 2000) (current version dated May 12, 2003); DOD Instruction Number 5000.2, *Operation of the Defense Acquisition System* (Apr. 5, 2002) (current version dated May 12, 2003); and DOD 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs* (Apr. 5, 2002) (canceled, replaced by DOD *Defense Acquisition Guidebook* [Oct. 17, 2004]).

- The Acquisition Program Baseline, which describes the program's cost, schedule, and performance goals. This baseline document is to be developed when the program is initiated, and it is to be updated for each milestone review. Within 90 days of a program breach,[38] unless the program is back within its baseline goals, a new Acquisition Program Baseline is to be prepared by the program office and approved by the milestone decision authority.

- The Program Deviation Report, which is to be prepared when the program office identifies deviations from the approved Acquisition Program Baseline goals. More specifically, when the program office has reason to believe that a program breach will occur, it is to immediately notify the milestone decision authority. Within 30 days, the program office is to inform the milestone decision authority of the reason for the deviation and the actions it considers necessary to bring the program back within baseline goals.

- The Defense Acquisition Executive Summary, which is prepared to inform the milestone decision authority on the program's progress against cost, schedule, and performance goals reflected in the Acquisition Program Baseline. Prepared quarterly, the summary is designed to provide an early warning to the DOD Chief Information Officer (CIO) and the milestone decision authority by identifying existing and potential program problems and describing mitigating actions that have been taken.

Between October 2002 and December 2004, the reporting requirements for the program changed.[39] As previously discussed, NTCSS was selected by its milestone decision authority to participate in the RIT pilot, which was aimed at saving time in the acquisition management process by reducing traditional DOD reporting and oversight requirements, while still adhering to DOD acquisition guidance. Under the RIT pilot, the program office was required to prepare the following two monthly electronic reports:

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[38]A program breach occurs when the program office has reason to believe that a cost, schedule or performance goal, as documented in an Acquisition Program Baseline, will not be reached.

[39]NTCSS participated in the formal RIT pilot program between October 2002 and December 2003, when the pilot ended. However the program office, with agreement from the milestone decision authority, continued to use the RIT pilot procedures until December 2004.

- The Monthly Acquisition Program Review, which was to assess the current health of the program on a monthly basis in such areas as cost and schedule performance, testing, funding, and contracting. This report was broken into eight parts. According to the program office, the main part for NTCSS was the Program Manager Assessment.

- The Smart Chart, which was to address risks for different projects within the program, including a description of the risk, actions taken to address the risk, and recommendations for further actions. The Smart Chart was also to contain any updates to the Acquisition Program Baseline.

In short, the RIT reporting was to provide the same information reported via the traditional acquisition baseline and the summary report, but it was to be more frequent (monthly versus quarterly) and use a different format (electronic versus paper). In addition, under the RIT pilot, certain acquisition documents, such as acquisition plans, economic analyses, requirements documents, and test plans, were to be posted to the RIT Web site's electronic library rather than sent in hard copy to the program's stakeholders.

In December 2004, the program office and the milestone decision authority agreed to discontinue use of the RIT pilot procedures. In January 2005, the reporting requirements reverted to the acquisition policies and procedures as prescribed in the updated DOD 5000 series. Currently, the program office is required to prepare the summary report quarterly and the acquisition baseline as needed. Also, in January 2005, the Navy required the program office to begin making entries into the Dashboard. The Dashboard, like the summary report, is prepared by the program office on a quarterly basis for the milestone decision authority and is to provide an assessment of the program in such areas as cost, schedule, and performance characteristics.

The Navy Has Not Satisfied All NTCSS Reporting Requirements

The program office did not comply with the reporting requirements that were in effect during the 27 months of the RIT pilot. Specifically:

- The Smart Chart was not updated for 19 of the 27 months. Specifically, the data were updated eight times between October 2002 and November 2003; the data were not updated after November 2003.

- The Program Manager Assessment was not updated for 11 of the 27 months. In addition, the updates were not always made in a timely manner. For the 16 months that were updated, 7 were done after the month had ended, and most of these updates were a month late.

- Of the 15 essential acquisition documents that the program office committed to entering in the RIT electronic library, 10 were not entered. For example, the most recent economic analysis and the test and evaluation master plan for OOMA were not entered.

- The Program Deviation Report and Acquisition Program Baseline were not prepared in a timely manner. Specifically, in April 2004, the acquisition of eNTCSS was cancelled and, in May 2004, OOMA did not pass operational testing—two events that caused the related cost and schedule thresholds in the Acquisition Program Baseline to be breached. While program officials had notified the milestone decision authority of these events via (1) e-mail, (2) entries into the Program Manager Assessment on the RIT Web site, and (3) briefings, the program office did not prepare a Program Deviation Report until about 15 months later. Moreover, this deviation report addressed only the OOMA failure, not the cancellation of eNTCSS and reprogramming of unexpended eNTCSS funding. In addition, program officials have yet to provide us with a new Acquisition Program Baseline to reflect the program breach or documentation showing that this revised baseline has been approved by the milestone decision authority.

For the DOD and Navy reporting requirements in effect since January 2005, the Navy has satisfied some, but not all, of the reporting requirements. For example, the program office has prepared the Dashboard reports quarterly as required. However, it has not prepared the Defense Acquisition Executive Summary quarterly as required; the first report was not prepared until June 2005—6 months after the requirement resumed and the report was due.

Program officials provided various reasons why the required program reporting has not occurred. In the case of the Smart Charts and the Program Manager Assessment reports, a contractor supporting the Assistant Program Manager stated that the data may have been entered into the Web site but not properly saved. Regarding the posting of documents into the electronic library, an official from the milestone decision authority stated that there was no documentation from the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief

Information Officer that directed which, if any, acquisition documents were to be entered into the RIT Web site. Similarly, a contractor supporting the Assistant Program Manager stated that the folders in the electronic library were established by the Army and thus the Navy was not required to use them. However, our review of documentation provided by the program office shows that it clearly states which specific documents should be included in the electronic library. Regarding the delay in preparation of the Program Deviation Report and subsequent Acquisition Program Baseline revision, a contractor supporting the Assistant Program Manager stated that a new baseline should have been prepared sooner, but that this reporting was delayed due to the uncertainty of which reporting methods to use after the end of the formal RIT pilot.

Officials representing the milestone decision authority stated that they relied on program office reporting on program status and progress, and that they expected the program office to inform them if the program exceeded its cost, schedule, and performance thresholds. Without adequate reporting, oversight officials were not positioned to effectively execute their roles and responsibilities.

The Navy Has Not Properly Budgeted for NTCSS

In September 1999, the Navy Comptroller issued guidance directing program offices to review their budgets and identify efforts that were being improperly funded and to take the steps necessary to realign these funds to "Research, Development, Test and Evaluation" as quickly as possible. Further, DOD Financial Management Regulation[40] requires that IT development, test, and evaluation requirements generally be funded in the "Research, Development, Test and Evaluation" appropriations. More specifically it states that, "The Research, Development, Test and Evaluation funds should be used to develop major upgrades increasing the performance envelope of existing systems, purchase test articles, and conduct developmental testing and/or initial operational test and evaluation prior to system acceptance." Similarly, Navy financial management policy[41] states that, "All costs associated with software development/modification efforts that provide a new capability or expand the capability of the current software program (i.e., expand the

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[40]DOD Financial Management Regulation 7000.14-R, (FMR) Vol. 2A, Chap. 1, section 010213 (June 2004).

[41]Navy Financial Management Policy Manual, NAVSO P-1000, section 075371.2.a (December 2002).

performance envelope) are funded in the Research, Development, Test and Evaluation appropriation."[42]

However, this has not occurred. Since 1997, the program office has not identified "Research, Development, Test and Evaluation" funds in five of its seven Acquisition Program Baseline documents, three of which were prepared after the guidance was issued by the Comptroller of the Navy. Instead, the Navy funded these activities primarily out of the "Operations and Maintenance," "Other Procurement," and "Ship Construction" appropriations. (See table 10.)

Table 10: Threshold Amounts in NTCSS Acquisition Program Baselines

Dollars in thousands

Acquisition program baseline	Date prepared	Operations and maintenance	Other procurement	Ship construction	Research, development, test and evaluation
Revision 0	March 1997	182,986	199,636	11,683	0
Revision 1	March 1998	257,542	303,565	23,836	3,026
Revision 2	December 1998	223,370	285,550	18,220	0
Revision 3	January 2001	276,100	382,000	27,300	0
Revision 4	January 2003	276,100	382,000	27,300	0
Revision 5	July 2003	276,100	382,000	27,300	0
Revision 6	January 2004	376,400	346,600	25,700	29,800

Source: Navy.

Program officials agreed that they have funded NTCSS development activities, such as those associated with OOMA, out of the "Operation and Maintenance" appropriation rather than the "Research, Development, Test and Evaluation" appropriation. A contractor supporting the Assistant Program Manager stated that, although they were aware of the Comptroller of the Navy's budget guidance, the program office chose not to comply because program officials believed in 1999 that the OOMA application, which had been under development for 3 years, would pass developmental

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[42]In some circumstances, software modernization costs under $250,000 may be considered "expenses," and funded with "Operation and Maintenance" appropriations. (DOD Financial Management Regulation 7000.14-R, (FMR) Vol. 2A, Chap. 1, section 010212 [June 2004]). The threshold in the current Navy guidance is $100,000. (Navy Financial Management Policy Manual, NAVSO P-1000, section 075371. [December 2002]).

testing and operational testing by 2001. As a result, program officials determined that the effort required to reprogram funding from the "Operation and Maintenance" appropriation into the "Research, Development, Test and Evaluation" appropriation was not warranted. Further, the official stated that although OOMA did not pass operational testing in 2001, the program office did not fund OOMA with "Research, Development, Test and Evaluation" funds until 2004 because it continued to consider OOMA as being close to becoming operational.

The lack of proper budgeting for "Research, Development, Test and Evaluation" funding has given oversight authorities the misleading impression that NTCSS development activities were completed and that the system was fully operational. Specifically, officials from the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer, which was the original NTCSS milestone decision authority, stated that since most of the "Research, Development, Test and Evaluation" funding appeared to have been spent, they concluded that the development portion of NTCSS was essentially complete. As a result, these officials stated that they had considered taking NTCSS off of the list of programs subject to oversight reviews. However, after 9 years and over $79 million in expenditures, the OOMA application still has not passed operational testing and thus is still in development.

Navy Oversight of NTCSS Has Not Been Adequate

DOD and Navy policies task a number of organizations with oversight of IT system acquisition and development programs. For example, DOD policy states that a milestone decision authority has overall program responsibility. In addition, the Navy Chief Information Officer is responsible for reviewing programs at certain points in the acquisition cycle. Finally, the NTCSS Executive Steering Committee is responsible for monitoring the near-term development and evolution of the NTCSS program. However, effective oversight by these entities has not occurred. As a result, opportunities to address long-standing program weaknesses have been missed, and the program has been allowed to proceed virtually unchecked.

The Milestone Decision Authority Has Not Adequately Overseen the Program

DOD acquisition policy[43] states that a milestone decision authority is the designated individual with overall responsibility for a program and is to ensure accountability and maximize credibility in program cost, schedule, and performance reporting. In this role, the milestone decision authority is responsible for reviewing the program throughout its acquisition life cycle, including: (1) whenever the program reaches a milestone decision point; (2) whenever cost, schedule, or performance goals are baselined or must be changed; and (3) periodically through review of management information such as that found in the Defense Acquisition Executive Summary reports.

However, the Navy milestone decision authority[44] has not conducted such reviews. Specifically:

- The NTCSS program has not reached a milestone decision point in over 5 years. The last such milestone was in April 2000 when the final two NTCSS Optimized applications became operational. The next scheduled milestone was to be in 2001, but because OOMA operational testing was stopped and has yet to be successfully completed, a milestone decision point has yet to occur. As a result, there has not been a triggering event that would cause the milestone decision authority to formally review the program or any of its projects. We discussed the state of NTCSS in March 2005 with the milestone decision authority's representatives. In July 2005, the authority was briefed by the program office. According to program officials, this was the first formal program review to occur since termination of the RIT pilot in December 2003. These officials also stated that quarterly acquisition team meetings have since resumed—with the first meeting having occurred in September 2005 and the next

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[43]DOD, Department of Defense Directive Number 5000.1, *The Defense Acquisition System* (May 12, 2003).

[44]There have been three milestone decision authorities for NTCSS since the program was begun. Initially, the milestone decision authority was in the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer. In July 1999, this authority was delegated to the Assistant Secretary of the Navy for Research, Development and Acquisition, who then delegated oversight authority to Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space in March 2000.

scheduled for December 2005—to prepare for the next milestone review of OOMA.

- The program office notified the milestone decision authority in April and June 2004 that OOMA failed operational testing and that eNTCSS was cancelled via e-mail, entries into the Program Manager Assessment on the RIT Web site, and briefings. According to officials with the milestone decision authority, they followed up with the program office and provided guidance; however, these events did not trigger a formal program review.

- The milestone decision authority did not contact the program office to inquire as to the reason why monthly reports were not being prepared as agreed to after the formal RIT pilot had ended. For example, Smart Charts were not prepared after November 2003. However, according to milestone decision authority officials, they did not seek an explanation from the program office as to why. Milestone decision authority officials told us that they were relying on the Dashboard report in order to stay informed on the program's progress. However, they did not require the program office to begin preparing the Dashboard report until January 2005.

According to DOD and Navy officials, including officials from the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer, the Navy milestone decision authority, and the program office, NTCSS participation in the RIT pilot resulted in disruption of normal oversight activities, which have yet to be fully restored. They added that compounding this is the fact that the Navy's milestone decision authority's staffing has been reduced in recent years. According to these officials, approximately 2 years ago the number of full time staff in the Office of the Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space was reduced from 16 to 6 people, and these 6 are responsible for reviewing approximately 60 acquisition programs. The officials stated that, given the large number of programs and limited staffing, they are unable to fully perform oversight activities so they have increasingly relied on the program executive office's assistance to perform detailed oversight of this program. Without adequate oversight by the milestone decision authority, the NTCSS program has been allowed to proceed despite the program weaknesses discussed in this report.

Other Navy Organizations Have Not Conducted Program Oversight

While the milestone decision authority is the main program oversight entity, two other Navy organizations have oversight responsibilities. However, these entities also have not performed effective oversight of the program. Specifically,

- Department of Navy CIO is responsible for reviewing programs at certain points in the acquisition cycle to ensure, among other things, that program goals are achievable and executable and that the program is providing value (i.e., producing a positive return-on-investment). Navy CIO officials stated that they have overseen NTCSS primarily by reviewing the Capital Investment Reports[45] prepared by the program office. They stated that they have not performed any proactive activities to verify and validate the program's status and progress. Instead, they rely on information in the Capital Investment Reports, such as economic justification; budget information by appropriation type; and cost, schedule, progress, and status. However, as was discussed previously, the program office does not have or has not reported reliable information on these topics.

- The NTCSS Executive Steering Committee is responsible for establishing priorities for NTCSS development and implementation and determining the strategic direction of the program. Among other things, it is to meet immediately following each major NTCSS program meeting. However, it has not met since December 2002, even though the program office convened both a Requirements Integrated Product Team meeting and a Forum meeting in February 2005. Further, during this period, major setbacks occurred on the program, including the failure of OOMA to pass operational testing and the cancellation of eNTCSS, which were issues that affected the direction of the program and its priorities and thus were consistent with the committee's charter. Program officials agreed that the Executive Steering Committee has not formally convened during this time frame. However, program officials stated that members of the committee informally met to discuss and provide advice regarding OOMA concerns, and Navy officials higher than the Executive Steering Committee made the decision to cancel eNTCSS. Therefore, these officials stated there was no need to formally convene an

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[45]Capital Investment Reports, also known as Exhibit 300s, are prepared annually by DOD for each major IT initiative and submitted to OMB.

Executive Steering Committee meeting. Program officials stated that the Executive Steering Committee will be meeting in January 2006.

NTCSS Requirements and Test Management Weaknesses Have Contributed to Deployment Delays and System Quality Problems

As we have previously reported,[46] the effectiveness of the processes used to develop a system is a reliable predictor of the quality of the system products produced. Two key system development processes are requirements development and management and test management. For the NTCSS application currently under development, we found weaknesses with both of these process areas. While improvements are planned, until they are implemented effectively, the risk of continued NTCSS cost, schedule, and performance shortfalls persists.

The Navy Has Not Adequately Managed Requirements for the NTCSS Application Currently Under Development

Well-defined requirements can be viewed as a cornerstone of effective system development and implementation. Accordingly, DOD guidance and industry best practices recognize effective requirements development and management as an essential system development and acquisition management process. For the NTCSS application that is currently under development—OOMA—the Navy has not adequately managed its 732 requirements, as evidenced by a lack of requirements traceability and prioritization. NTCSS program officials told us that NTCSS requirements development practices have historically been poor, but that improvements are under way. Without effective requirements management, it is likely that the Navy's challenges to date in developing NTCSS applications that meet user needs on time and on schedule will continue.

Requirements for OOMA Release 4.10 Were Not Traced

DOD guidance and industry best practices also recognize the importance of requirements traceability.[47] The purpose of requirements traceability is to ensure that the finished product is compliant with the requirements. To do this, the system documentation should be consistent and thus complete, allowing for requirements traceability. Requirements traceability involves

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[46]GAO, *Customs Service Modernization: Serious Management and Technical Weaknesses Must Be Corrected*, GAO/AIMD-99-41 (Washington, D.C.: Feb. 26, 1999).

[47]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004). Software Engineering Institute, Software Acquisition Capability Maturity Model® version 1.03, CMU/SEI-2002-TR-010 (Pittsburgh, PA: March 2002).

both the alignment and consistency backward to system documentation and forward to system design and test documentation.

OOMA release 4.10 requirements were not traced to an Operational Requirements Document. According to DOD guidance,[48] an Operational Requirements Document translates nonsystem-specific statements of a needed operational capability into a set of validated and prioritized user requirements. However, the Navy did not develop an Operational Requirements Document for NTCSS. As a result, the Navy did not take a basic validation step to ensure that the requirements to which it designed and built the application were complete and correct. In addition, release 4.10 requirements were not always traceable to associated system specifications. Specifically, we were unable to trace 215 requirements found in the system segment specification to the requirements listed in the requirements checklist. Requirements should also be traced to test cases, but the program office has yet to provide us with the developmental test cases used to test the OOMA release 4.10 so that we could verify this traceability.

Program officials acknowledged that release 4.10 requirements were not traceable but that improvements are planned for the next OOMA release. We found that 97 percent of the OOMA release 5.0 requirements found in the system segment specification were traceable to the requirements listed in the requirements checklist. However, these documents have yet to be approved. Requirements should also be traced to test cases, but the program office has yet to provide us with the developmental test cases used to test the OOMA release 5.0 so that we could verify this traceability. Without this traceability, the Navy has not had a sufficient basis for knowing that the scope of its development efforts, including testing, provides adequate assurance that applications will perform as intended.

Requirements for OOMA Release 4.10 Were Not Prioritized

According to published best practices guidance,[49] any project with resource limitations should establish the relative priorities of the requested features or requirements. Prioritization helps the project office resolve

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[48]Defense Acquisition University, *Test and Evaluation Management Guide*, Fourth Edition (November 2001).

[49]Software Engineering Institute, *Issues in Requirements Elicitation*, CMU/SEI-92-TR-12 (Pittsburgh, PA: September 2002).

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conflicts, make trade-off decisions among competing requirements, and helps to ensure that the delivered system will be operationally suitable.

However, OOMA's approximately 732 requirements have never been prioritized, and a program official told us that they are all considered to be equally important. This means, for example, that a requirement that dictates basic application functionality (e.g., if text can be entered on a particular screen) is as important as a requirement addressing safety issues that, if not met, could result in the loss of an aircraft or even a life.

This lack of requirements prioritization contributed to release 4.10 passing developmental testing but failing operational testing. (See later section of this report for a detailed discussion of OOMA testing.) A developmental testing threshold that the Navy set for release 4.10 was that each requirement was to be tested, and 95 percent of the requirements had to pass in order for the application to proceed to operational testing. For developmental testing of the OOMA release 4.10, 97 percent of the requirements passed. Of the 3 percent of the requirements that failed this test, some of these deficiencies seriously impacted squadron level operations. Further, for operational testing of OOMA release 4.10, 96 percent of the requirements passed. However, the remaining 4 percent contained significant defects. Specifically, the release provided inconsistent and inaccurate flight and usage hours, as well as incorrect aircraft usage records. According to the Navy's independent operational test organization, these deficiencies impacted aircraft and component time-based inspection cycles and thus were the basis for the system failing operational testing. The Navy has yet to provide evidence that the requirements have been prioritized for the OOMA release 5.0.

The Navy's Developmental Testing for OOMA Has Not Been Effective, but Improvements Planned

Both DOD policy and relevant guidance recognize that effective testing is an essential component of system development or acquisition programs. Generally, testing can be viewed as consisting of two major phases—a developmental phase in which tests are performed to ensure that defined system requirements and specifications are met and an operational phase that includes tests to determine if the system meets user needs and is suitable in an operational environment. The OOMA application has failed operational testing twice over the last 4 years reportedly because of deficiencies in developmental testing. Program officials attributed developmental testing deficiencies to poor software development practices, such as the earlier discussed requirements development problems. These testing deficiencies can also be attributed to incomplete testing documentation. Without effective developmental testing, there is an

increased risk that application problems will be detected later in the system life cycle when they are more expensive and difficult to fix.

Navy Operational Testing Organization Reported That Developmental Testing Has Failed to Identify Problems

According to DOD guidance and recognized best practices,[50] the purpose of developmental testing is to provide objective evidence that the product (e.g., software module, application, system) satisfies defined requirements and performs as intended. Successful completion of developmental testing provides the basis for proceeding into operational testing to determine whether the integrated product (e.g., application, system, system of systems) performs as intended in an operational or real-world setting.

OOMA operational testing results over the last 4 years show that the program office's developmental testing efforts have not been effective in identifying critical product problems. In particular, the application has failed operational testing twice during this time frame and, according to an official in the office of the Director of Navy Test and Evaluation and Technology Requirements, the failures occurred in operational testing because they were not identified during developmental testing. More specifically,

- In March 2001, the program office certified that OOMA release 3.25 had passed developmental testing and was ready for operational testing. However, 1 month into a scheduled 3-month operational test, the decision was made to cease further testing because of significant problems with system reliability, data transfer between the application and the database, and user training on the application. As a result, the program office decertified this release, and the Navy's independent test organization recommended discontinuing OOMA deployment.

- Using results from the failed operational test, the central design agency developed release 4.0. In February and March 2002, developmental testing of this release was conducted. Test results showed that the application was not ready for operational testing because it did not satisfy key functional requirements. Subsequently, the central design

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[50]Software Engineering Institute, Software Acquisition Capability Maturity Model® version 1.03, CMU/SEI-2002-TR-010 (Pittsburgh, PA: March 2002); and Defense Acquisition University, *Test and Evaluation Management Guide*, Fourth Edition (November 2001).

agency incorporated software fixes in release 4.10. In August and September 2002, developmental testing was conducted on this release and, while a number of deficiencies were verified as fixed, additional corrections were needed. From January to June 2003, developmental testing was again conducted on OOMA release 4.10.

- From August 2002 to April 2003, the Naval Audit Service[51] reviewed OOMA and reported several problems that would affect the application's readiness for operational testing. For example, it reported that controls to prevent unauthorized access were not in place, Privacy Act information was not adequately protected, and backup and recovery procedures were not in place. It also reported that the program had not adopted and implemented a risk-based system life cycle management approach. According to the report, these weaknesses could compromise safety, affect planning, and distort readiness reporting if OOMA was implemented throughout the Navy.

- In June 2003, the program office certified OOMA release 4.10 as having passed developmental testing and being ready for operational testing. The Navy's independent operational test organization subsequently conducted testing from August to December 2003 and, in May 2004,[52] this organization concluded that OOMA was not operationally effective or suitable and thus it again failed operational testing. In particular, the operational testing results showed that the application was incorrectly calculating flight and component usage hours—defects, which according to an official in the office of the Director of Navy Test and Evaluation and Technology Requirements, could have resulted in the loss of aircraft or life. The Assistant Program Manager also told us that release 4.10 did not address all of the deficiencies reported by the Naval Audit Service.

For about a year, the central design agency has been developing and testing OOMA release 5.0 to fix the problems found in the prior version. The

[51]Naval Audit Service, *Audit Report Reliability and Validity of the Optimized Naval Aviation Logistics Command Management Information System*, July 22, 2003. NAVAUDSVC P-7520.1, N2003-0060.

[52]Naval Aviation Logistics Command Management Information System (NALCOMIS) Optimization for Organizational Maintenance Activities (OOMA) Follow-on Operational Test and Evaluation OT-IIIA Report to the Chief of Naval Operations, May 7, 2004, Commander, Operational Test and Evaluation.

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program office expects that this release will be certified as ready for operational testing sometime between April and June 2006. In preparation for operational testing, the Navy's independent operational test organization has been observing OOMA 5.0 developmental testing. A memo from this organization states that this release is an improvement over the previous releases.

According to Navy officials, including the NTCSS Assistant Program Manager and the official responsible for OOMA developmental testing, previous application development practices were poor, which led to testing problems. Specifically, they cited poor requirements definitions, poor documentation, and concurrent development of application releases as examples. Further, Navy officials stated that the central design agency has not had a developmental testing lab to facilitate effective testing of application components and their integration. To address the poor development practices, program officials told us that they are in the process of implementing a new system life cycle management process that they said incorporates industry best practices, including those related to testing. However, the program office has yet to provide us with information defining how the practices in this plan will be implemented. To address the need for a developmental testing lab, the Naval Air Systems Command organization representing NTCSS users recently created a lab to strengthen the program's developmental testing capability. According to officials associated with the lab, they are finding defects that the central design agency should have found.

It is important that the NTCSS program improve its developmental testing. Without effective developmental testing, there is an increased risk that system application problems will be detected late in the system life cycle, such as during operational testing. Generally, problems discovered late in the cycle are more expensive and difficult to fix than those discovered early.

Developmental Test Documentation Has Not Been Adequate, but Improvements Planned

To be effective, testing should be approached in a rigorous and disciplined fashion. One aspect of such testing is developing and using various testing

documentation. DOD policy, guidance, and related best practices[53] state that such documentation includes a test and evaluation master plan for the program, as well as documentation that is system product (e.g., module, application, system) and test type (e.g., integration, stress, regression, developmental) specific. This documentation includes approved test plans, test procedures and cases, and test results. According to DOD and other guidance, test plans should include, among other things, objectives, responsibilities, resources (tools, people, and facilities), schedules, and performance and exit criteria; test procedures should include detailed test scenarios, test events, steps, inputs, and expected outputs that are traced back to requirements. Test results include the test scenarios that passed and failed, assessments of deviations from test plans, and the extent to which requirements have been met.

The NTCSS test and evaluation master plan identified, among other things, three phases of developmental testing for OOMA release 4.10. However, key test documentation for each of these phases was not produced. Specifically,

- For the first phase, a test report was produced that contained detailed information on test results, but the program office has yet to provide us with a test plan or test procedures.

- For the second phase, a test report was produced but it only contained the number of defects found (organized by severity) and did not include any other information on test results. Moreover, the program office has yet to provide us with a test plan or test procedures.

- For the third phase, both a test plan and test report were produced, and the plan included the test purpose and objectives, schedule, responsibilities, and people resources, while the test report described test issues and contained detailed test results. However, the program office has yet to provide us with test procedures.

According to Navy officials, including the Assistant Program Manager and officials responsible for developmental testing, the previously mentioned

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[53]Software Engineering Institute, Software Acquisition Capability Maturity Model® version 1.03, CMU/SEI-2002-TR-010 (Pittsburgh, PA: March 2002); Defense Acquisition University, *Test and Evaluation Management Guide*, Fourth Edition (November 2001); and DOD Instruction Number 5000.2, *Operation of the Defense Acquisition System* (Apr. 5, 2002) (current version dated May 12, 2003).

poor application development practices contributed to the absence of testing documentation. To address these poor practices, the program has developed a system life cycle plan that they said incorporates industry best practices, including those associated with testing documentation. However, the program has yet to provide us with plans defining how these practices will be implemented. Moreover, while the plan contains a recommended list of testing documents (e.g., test plan, test procedures, and test results report), our review of OOMA release 5.0 developmental testing documentation shows that not all the documentation is being prepared. Specifically, available documentation included an updated test and evaluation master plan and two test reports. Documentation not yet provided to us included test procedures, which would include documentation tracing test cases to requirements.

The lack of a full set of developmental test documentation is a problem. Without such documentation, the adequacy and reliability of developmental testing cannot be substantiated, and thus the quality of the associated system products is in doubt.

Central Design Agency Reports Management Improvements are Under Way

In an effort to improve its performance on NTCSS and other programs, central design agency officials told us that they chose to undergo an SEI Capability Maturity Model Software Capability Appraisal in July and August 2005. Carnegie Mellon University's SEI, recognized for its expertise in software and system processes, has developed the Capability Maturity Model™ for Software (SW-CMM)[54] to provide guidance on how to gain control of their processes for developing and maintaining software and how to evolve toward a culture of software engineering and management excellence.

In brief, SW-CMM calls for assessing different process areas—clusters of related activities such as project planning, requirements management, and quality assurance—by determining whether key practices are implemented and whether overarching goals are satisfied. Successful implementation of these practices and satisfaction of these goals result in the achievement of successive maturity levels. SW-CMM maturity levels range from 1 to 5, with level 1 meaning that the process is either characterized as ad hoc and occasionally even chaotic with few processes defined and success depending on individual effort; level 2 meaning that the process is

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[54]CMM®, Capability Maturity Model, and Capability Maturity Modeling are registered in the U.S. Patent and Trademark Office.

repeatable; level 3 meaning that the process is defined; level 4 meaning that the process is managed; and level 5 meaning that the process is optimized.

According to the central design agency they achieved a maturity rating of level 3 against the SW-CMM based on 13 process areas, including requirements management, software project planning, software project tracking and oversight, subcontract management, software quality assurance, software configuration management, organizational process focus, organizational process definition, training program, integrated software management, software product engineering, intergroup coordination, and peer reviews. Further, we were told that NTCSS was one of the programs included in the review. However, we have yet to receive the appraisal report to determine the extent to which the appraisal addressed the weaknesses discussed in this report. Nevertheless, our research has shown that properly performing such appraisals can be a useful starting point for making software and system related development improvements.

Conclusions

It is unclear whether the Navy's planned investment in NTCSS is warranted. Of particular concern is the absence of reliable analysis showing that further investment will produce future mission benefits commensurate with estimated costs, as well as the void in information concerning whether the deployed and operational components of NTCSS are actually producing expected value. Compounding this uncertainty is the inherent risk of defining and developing NTCSS outside the context of either a well-defined DOD or Navy enterprise architecture. Without this information, the Navy cannot determine whether NTCSS as defined, and as being developed, is the right solution to meet its strategic business and technological needs.

Even if these uncertainties were to be addressed, and the Navy had the data needed to demonstrate that NTCSS plans are the right course of action, then the manner in which NTCSS is being defined, developed, tested, measured, and overseen would still be of concern. While any one of the concerns that we found is troubling, their combination subjects the program to an unacceptably high risk of failure. These effects are being realized on NTCSS, as evidenced by the cancellation of one system component and the repeated failure of another key component to pass testing.

It is extremely important that Navy and DOD authorities responsible and accountable for ensuring prudent use of limited resources reassess whether allowing NTCSS to continue as planned is warranted. It is also

important that the decision on how to proceed be based on reliable data about program cost, benefits, risk, and status.

Recommendations for Executive Action

We recommend that the Secretary of Defense direct the Secretary of the Navy to determine if continued investment in NTCSS, as planned, represents a prudent use of the department's limited resources. To accomplish this, the Secretary of the Navy should direct the program office to take the following three actions:

- collaborate with the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer, the Office of Program Analysis and Evaluation, and the Naval Cost Analysis Division to prepare a reliable economic analysis that encompasses all viable alternatives, including the Navy's recent enterprise resource planning program;

- ensure that development of this economic analysis (1) complies with cost estimating best practices, including recognition of costs to resolve open trouble reports and change proposals, and relevant OMB cost benefit guidance and (2) incorporates available data on whether deployed NTCSS capabilities are actually producing benefits; and

- collaborate with the Undersecretary of Defense for Acquisition, Technology, and Logistics and the Under Secretary of Defense (Comptroller) to ensure that NTCSS is adequately aligned with evolving DOD and Navy enterprise architectures.

In addition, we recommend that the Secretary of Defense direct the Secretary of the Navy to present the results of these analyses to the Deputy Secretary of Defense, or his designee, and seek a departmental decision on how best to proceed with the program. Until this is done, we recommend that the Secretary of Defense direct the Secretary of the Navy to halt further deployment of NTCSS and to limit future investment in already deployed applications to essential operation and maintenance activities and only developmental activities deemed essential to national security needs.

If—based on reliable data—a decision is made to continue the NTCSS program, we recommend that the Secretary of Defense direct the Secretary of the Navy to ensure that the following two actions are taken:

- the NTCSS program implements effective program management activities, including earned value management, requirements development and management, and test management; and

- key stakeholders, such as the central design agency and the developmental testing organization, have the people, processes, and tools to effectively execute their respective roles and responsibilities.

Finally, we recommend that Secretary of Defense reestablish the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer as the milestone decision authority and direct the Secretary of the Navy to take steps to ensure that Navy oversight entities fulfill their roles and responsibilities on NTCSS, including ensuring that reliable program reporting occurs and is acted upon.

Agency Comments and Our Evaluation

In its written comments on our draft report, signed by the Deputy to the Assistant Secretary of Defense for Networks and Information Integration (Command, Control, Communications, Intelligence, Surveillance, and Reconnaissance and Information Technology Acquisition) and reprinted in appendix IV along with our detailed responses, DOD stated that some of our findings are valid. For example, it acknowledged that NTCSS was defined and implemented without a complete and formal enterprise architecture. However, it also commented that our overall findings significantly understated and misrepresented the program's level of discipline and conformance with applicable guidance and direction. The department added that NTCSS "has proven to be the right solution to meet the Navy's strategic business and technological needs," and that sound program management practices are in place and improving.

Neither DOD's comment about our overall findings nor its claims about NTCSS being the right solution and being effectively managed are adequately supported, as evidenced by the numerous factual instances that we site in the report where the Navy did not comply with either DOD acquisition policies and guidelines or industry best practices. Specifically, the report shows that the program's latest economic analysis did not provide the Navy a reliable basis upon which to make investment decisions. For example, the analysis did not include measurable, quantifiable benefits for each alternative, and the cost estimates did not meet six of the nine criteria associated with reliable cost estimates. The analysis also was not independently reviewed in accordance with DOD guidance and the Navy had yet to demonstrate that already deployed

NTCSS Optimized applications are producing expected benefits. We appropriately concluded that the Navy does not know whether the program as defined is the right solution to meet the Navy's strategic business and technological needs.

With respect to our recommendations, DOD fully concurred with two of the recommendations and partially concurred with the remaining five recommendations. The five areas of disagreement, DOD's basis for its disagreement, and our response to DOD's position follow.

First, DOD stated that it does not see merit in conducting a formal economic analysis for the NTCSS program that would address all viable alternatives because, at this late stage, NTCSS is a "very mature program," and the final application (OOMA) is about to be fielded. Further, DOD said it saw no merit in seeking Office of Program Analysis and Evaluation (PA&E) review of the economic analysis. Instead, it said that it will "coordinate" with PA&E in analyzing the relationship of NTCSS with other programs that may provide similar functionality and "brief the results" to selected stakeholders.

We do not agree that NTCSS is a "very mature program." In particular, the Navy still plans to spend in fiscal years 2006 through 2009 an additional $348 million, which is approximately one-third of what has been spent on the program to date. Further, there is no evidence to support the claim that the OOMA application is about to be fielded. OOMA has failed operational testing twice and is not yet fully developed or tested despite the Navy's initial plan to field it in 2001. In addition, the Navy's stated intention to develop an economic analysis for OOMA only and then, separately, prepare an "analysis to determine the relationship" of NTCSS and other alternative programs is not consistent with guidance and best practice, which advocate basing such analyses on the full scope of the planned investment. In addition, the proposal to limit key stakeholders' involvement in developing the economic justification to "coordinating" and "briefing would be inappropriate." These stakeholders have specific expertise and roles relative to economically justifying system investments that should be exploited. Until it conducts a complete and disciplined analysis of the entire NTCSS program (reviewed and approved by PA&E and the Naval Cost Analysis Division) and provides this analysis to all key stakeholders, the Navy's investment decisions will continue to be made without complete and reliable data.

Second, the department stated that further deployment of NTCSS should not be limited at this time. Nevertheless, it stated that it will use the results of the analysis referred to above that depicts NTCSS's relationship with other programs to provide appropriate direction to the program. We do not agree that development should not be limited and would note that the department's own comment acknowledges the need to decide on an appropriate direction for the program. In our view, prudent use of taxpayer resources warrant both a reliable economic analysis that can be used to inform any decision on this direction and fiscal restraint to investing until an informed decision can be made.

Third, DOD said that the Navy does not need to be directed to ensure that effective program management activities are implemented because it is continuously improving program management activities. Further, DOD stated that, although it is not required to implement an earned value management system because the individual projects do not meet the dollar threshold and there are no formal contract deliverables, it is nevertheless adhering to the 32 earned value management criteria set forth in applicable standards. The department added that it intends to have the Navy Inspector General conduct a separate study to further ensure that the program is using the best program management activities.

We do not agree with these comments. In particular, neither during our review nor in its comments did the Navy provide evidence that it has implemented effective program management activities or has improvements under way. As we state in our report, neither the decomposition of the program into small, fiscal year-based projects nor the absence of a contractual relationship is a valid reason for not effectively implementing earned value management. Further, the Navy's earned value management self-assessment showed that it had not adhered to 17 of the 32 earned value management standards. Without reliable, timely, and auditable earned value management data, the program office cannot adequately manage technical, cost, and schedule risks and problems.

Fourth, the department stated that key stakeholders of the NTCSS program have the necessary people, processes, and tools to effectively execute their respective roles and responsibilities, noting in particular that the central design agency has demonstrated its competency and capability and was certified as SW-CMM maturity level 3. Nevertheless, the department agreed to address this recommendation.

We support the Navy's stated commitment to address this recommendation. In addition, we would note that DOD's comment that stakeholders have the resources they need is not consistent with statements from stakeholders during our review who said that there were manpower and resource shortfalls that affected the oversight and execution of program activities. Further, despite the Navy's statement that the central design agency achieved SW-CMM maturity level 3, no documentation supporting this statement, such as appraisal reports, were provided. Furthermore, Navy officials told us that the central design agency did not have a development testing lab and was therefore unable to effectively execute testing activities.

Fifth, DOD stated that it is "premature" to reestablish the DOD Chief Information Officer as the milestone decision authority as NTCSS development is over 95 percent complete. Instead, it stated that existing oversight entities would ensure that effective program management and reporting was occurring.

We do not agree that elevating the milestone decision authority at this time is premature based on the statement that the program is 95 percent complete. For programs that have not been developed using industry best practices and technical and management discipline, which is the case for NTCSS, such claims of being essentially complete have historically proven inaccurate because they are not grounded in reliable performance data. Moreover, the Navy still plans to spend $348 million on NTCSS over the next three fiscal years. Finally, as stated in our report, the current milestone decision authority has allowed the program to operate unchecked although a major application has repeatedly failed operational testing, and another application was cancelled.

We are sending copies of this report to interested congressional committees; the Director, Office of Management and Budget; the Secretary of Defense; the Deputy Secretary of Defense; the Under Secretary of Defense for Acquisition, Technology and Logistics; the Under Secretary of Defense (Comptroller); the Assistant Secretary of Defense (Networks and Information Integration)/Chief Information Officer; the Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space; the Program Executive Office for Command, Control, Communication, Computers and Intelligence, and Space within the Space and Naval Warfare Systems Command; the Department of the Navy Chief Information Officer; and the Office of the Chief of Naval

Operations for Material Readiness and Logistics Operations. This report will also be available at no charge on our Web site at http://www.gao.gov.

If you or your staff have any questions on matters discussed in this report, please contact me at (202) 512-3439 or hiter@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix V.

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

Objective, Scope, and Methodology

Our objective was to determine whether the Naval Tactical Command Support System (NTCSS) is being managed according to important aspects of the Department of Defense's (DOD) acquisition policies and guidance, as well as other relevant acquisition management best practices. To accomplish our objective, we focused on the program's (1) economic justification; (2) architectural alignment; (3) program management, namely progress measurement and reporting, funding disclosure, and oversight; and (4) key system development activities, namely requirements development and management, test management, and system maturity indicators. For requirements and test management, we focused on the one NTCSS application that is currently being acquired, known as the Optimized Organizational Maintenance Activity (OOMA).

To determine whether the Navy has economically justified its investment in NTCSS, we reviewed the latest economic analysis to determine the basis for the cost and benefit estimates and net present value calculations. This included evaluating the analysis against DOD and Office of Management and Budget (OMB) guidance, as well as relevant best practices.[1] It also included interviewing program officials, including the Assistant Program Manager; the office of the Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space; the Office of Program Analysis and Evaluation; and the Naval Cost Analysis Division as to their respective roles, responsibilities, and actual efforts in developing and/or reviewing the economic analysis. In addition, we also interviewed the Assistant Program Manager and the office of the Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space about the purpose and use of the analysis for managing the Navy's investment in the NTCSS program including the extent to which measures and metrics showed that projected benefits in the economic analysis were actually being realized.

To determine whether the Navy has aligned NTCSS to either the DOD business enterprise architecture[2] or a Navy architecture, we relied on our

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[1]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004). Office of Management and Budget, Circular No. A-94: *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, October 29, 1992; and Circular No. A-11: *Planning, Budgeting, Acquisition and Management of Capital Assets*, June 21, 2005. Software Engineering Institute, A Manager's Checklist for Validating Software Cost and Schedule Estimates, CMU/SEI-95-SR-004 (Pittsburgh, PA.: January 1995).

[2]GAO-05-702; GAO-02-6; and GAO-04-40.

prior reports addressing DOD and Navy architecture development and implementation efforts, a memo and analysis results on NTCSS's compliance with the business enterprise architecture, and documents on the Navy's architecture efforts. We also interviewed Navy officials from the program office; the office of the Deputy Assistant Secretary of the Navy for Command, Control, Communication, Computers and Intelligence, and Space; the office of the Navy Research, Development, and Acquisition Chief Engineer; and the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer about DOD and Navy architecture efforts and NTCSS's alignment to them.

To determine whether the Navy was effectively measuring, reporting, and overseeing the program, we did the following:

• We first asked the central design agency to self-assess their satisfaction of 32 best practice criteria regarding their earned value management system. Using the results of their self-assessment to target our analysis, we then assessed those aspects of the earned value management system the self-assessment reported as meeting the criteria, by comparing the documentation with relevant DOD guidance and best practices.[3] We selected these two projects as case studies to determine the degree to which earned value management was being implemented. The two projects selected were (1) 2004 OOMA software project and (2) 2004 NTCSS hardware installation and integration (for both OOMA and Optimized NTCSS). We selected these two because they were the projects for which Navy provided us the most earned value management related documentation. To understand the Navy's reasons why they were not performing certain elements of earned value management, we interviewed officials including the Assistant Program Manager, and officials at the central design agency in Norfolk and the in service engineering agency in Charleston.

• To assess reporting capabilities, we reviewed program documentation such as Acquisition Program Baselines, program deviation reports, and Defense Acquisition Executive Summary reports. We also reviewed information and documentation on the Rapid Improvement Team pilot Web site including a report that assesses the current health of the

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[3]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004); and American National Standards Institute (ANSI) /Electronic Industries Alliance (EIA) EVM System Standard (ANSI/EIA-748-98), Chapter 2 (May 19, 1998).

program on a monthly basis and a report that address risks for different projects within the program.

- To assess compliance with budget policies and guidance, we compared NTCSS budget documentation with DOD and Navy financial management policies and guidance.

- To assess oversight of the program, we interviewed the program manager, milestone decision authority, functional sponsor, Navy Chief Information Officer, and a representative of the program's executive steering committee.

- To determine whether the Navy was effectively managing key system development activities, namely requirements management, testing, and system maturity indicators, we did the following:

- To assess requirements development and management capabilities, we reviewed program documentation such as the official list of requirements and system specifications, and evaluated them against relevant best practices[4] for several characteristics including traceability and prioritization. We attempted to trace requirements to both higher level documents and lower level specifications. We also attended the NTCSS Forum where requirements were gathered and discussed. We interviewed Navy officials such as the Assistant Program Manager, Commanding Officer and Executive Director of the central design agency, and the OOMA Functional Manager to discuss their roles and responsibilities for developing and managing requirements.

- To assess test management, we reviewed program documentation such as the test and evaluation master plan, test plans, test reports, and guidance. We then compared these documents with DOD guidance and best practices and focused on the effectiveness of developmental testing and the adequacy of developmental testing documentation.[5] Our review

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[4]Software Engineering Institute, Software Acquisition Capability Maturity Model® Version 1.03, CMU/SEI-2002-TR-010 (Pittsburgh, PA: March 2002).

[5]Software Engineering Institute, Software Acquisition Capability Maturity Model® Version 1.03, CMU/SEI-2002-TR-010 (Pittsburgh, PA: March 2002). Defense Acquisition University, *Test and Evaluation Management Guide*, Fourth Edition (November 2001).

- also included an audit report prepared by the Naval Audit Service[6] and a test report prepared by Navy's independent operational test organization.[7] We interviewed Navy officials such as the Assistant Program Manager, Commanding Officer and Executive Director of the central design agency, OOMA Functional Manager, and an official in the office of the Director of Navy Test and Evaluation and Technology Requirements to discuss their roles and responsibilities for test management.

We did not independently validate information on the program's cost and budget or the number of trouble reports and change proposals.

We conducted our work at DOD headquarters in Arlington, Virginia; at Space and Naval Warfare Center, San Diego, California; Space and Naval Warfare Systems Center, Norfolk, Virginia; and Naval Air Systems Command in Patuxent River, Maryland. We performed our work from September 2004 through November 2005 in accordance with generally accepted government auditing standards.

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[6]Naval Audit Service, Audit Report Reliability and Validity of the Optimized Naval Aviation Logistics Command Management Information System, July 22, 2003. NAVAUDSVC P-7520.1, N2003-0060.

[7]Naval Aviation Logistics Command Management Information System (NALCOMIS) Optimization for Organizational Maintenance Activities (OOMA) Follow-on Operational Test and Evaluation OT-IIIA Report to the Chief of Naval Operations, May 7, 2004, Commander, Operational Test and Evaluation.

Trouble Reports and Change Proposals Assessment

One indicator of system quality, and thus the effectiveness of the development activities used to produce system products, is the volume and significance of system problems and change proposals. For the Naval Tactical Command Support System (NTCSS), trouble reports are prepared to document system defects, and change proposals are prepared to introduce additional system functionality. Priority levels are assigned to trouble reports and change proposals, with 1 being the most critical and 5 being the least critical. Table 11 defines the 5 priority levels.

Table 11: NTCSS Trouble Report and Change Proposal Priorities

Priority level	Definition
Priority 1	Prevents the accomplishment of an operational or mission-essential capability; and jeopardizes safety or security.
Priority 2	Adversely affects the accomplishment of an operational or mission-essential capability, and no work-around solution is available.
Priority 3	Adversely affects the accomplishment of an operational or mission-essential capability, but a work-around solution is available.
Priority 4	Results in user/operator inconvenience or annoyance but does not affect a required operational or mission-essential capability.
Priority 5	Any other effect.

Source: Navy.

Available data on the number and significance of open trouble reports and change proposals over the last 2 years do not demonstrate that NTCSS overall is a high-quality system that is delivering promised or expected capabilities. Specifically, the data shows that hundreds of open (yet to be resolved) trouble reports and change proposals have continued to affect the system.

Trouble Reports

The total number of NTCSS priority 1, 2, and 3 trouble reports have stayed about the same over the last 2 years—totaling about 700. Of this total, NTCSS priority 1 and 2 trouble reports have decreased by 117, with priority 1 trouble reports being virtually eliminated. While this is movement in a positive direction, about 300 priority 2 trouble reports still remain open and these by definition are adversely affecting accomplishment of an operational or mission-essential capability. (See figs. 1 and 2.)
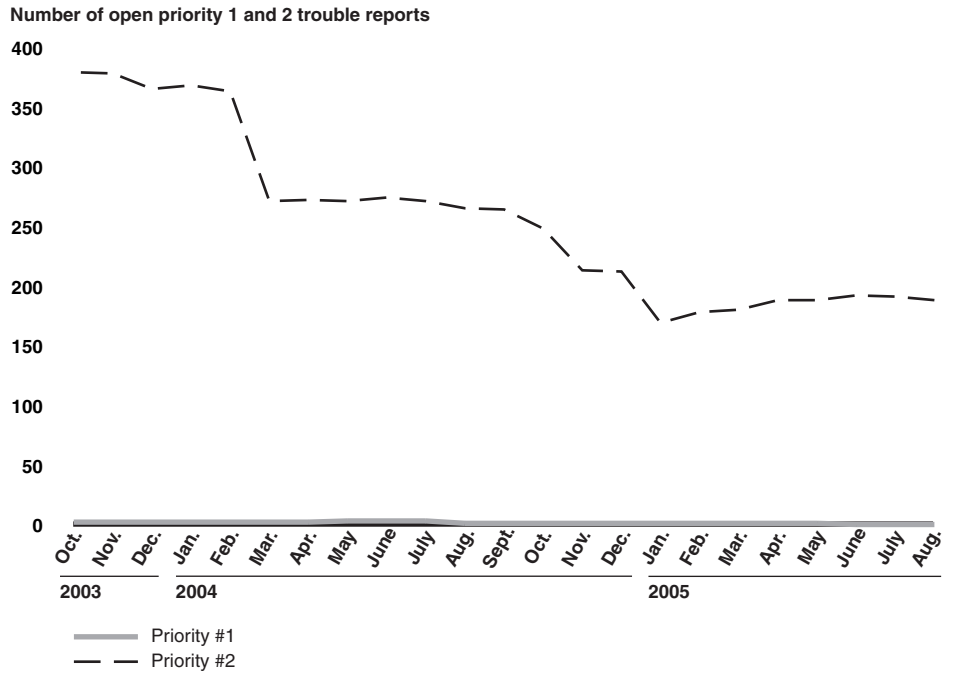
Figure 1: Total Number of Open NTCSS and OOMA Priority 1, 2, and 3 Trouble Reports

Number of open trouble reports

Priority 3 trouble reports

Priority 1 and 2 trouble reports
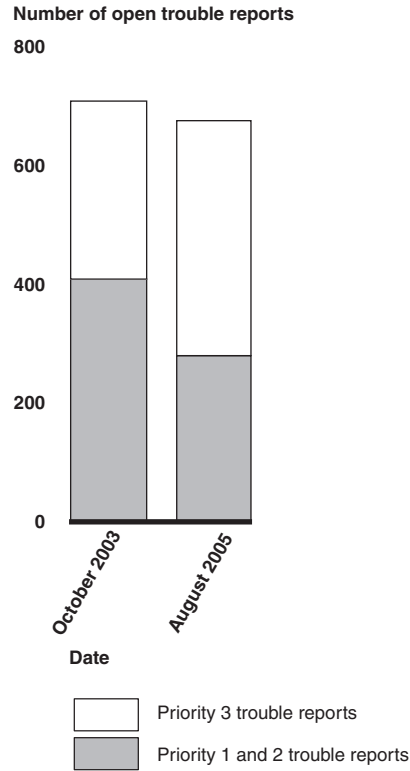
Source: Navy.

Figure 2: Open NTCSS Priority 1 and 2 Trouble Reports

Number of open priority 1 and 2 trouble reports

Priority #1

Priority #2

Source: Navy.

Further, open priority 3 trouble reports have increased during this time to about 250 and, given that priority 3s require work-arounds, they decrease system capability and performance. Neither the number of priority 2 trouble reports, which continue to be in the hundreds, nor the upward trend in priority 3 trouble reports are indicative of a maturing, high-quality system. (See fig. 3.)

Figure 3: Open NTCSS Priority 3 Trouble Reports

Number of open priority 3 trouble reports
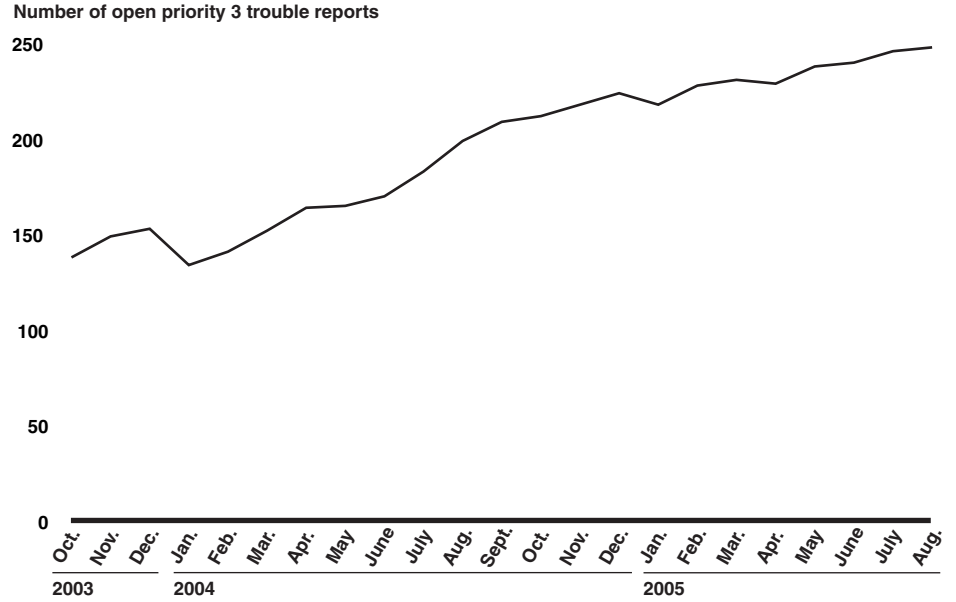
Source: Navy.

With respect to the OOMA application in particular, the trend in the volume of significant trouble reports shows that this application is particularly problematic. Specifically, while priority 1 OOMA open trouble reports have been virtually eliminated, the number of open priority 2 OOMA trouble reports has risen significantly from 12 to 90 in about the last 2 years. (See fig. 4.)

Figure 4: Open OOMA Priority 1 and 2 Trouble Reports

Number of open priority 1 and 2 trouble reports for OOMA
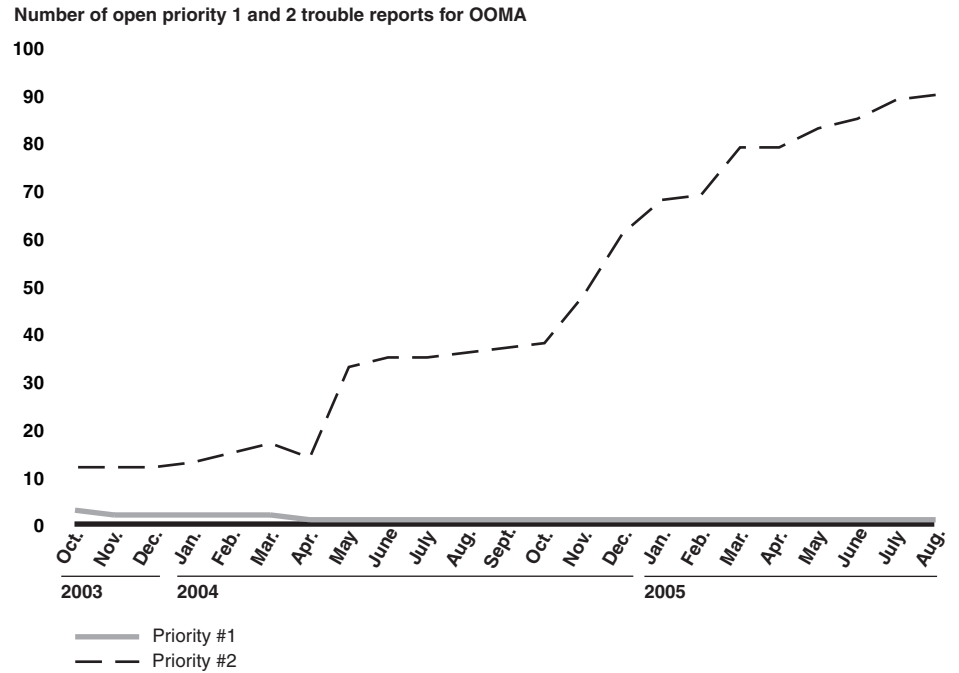
Source: Navy.

Moreover, the number of open OOMA priority 3 trouble reports has not significantly declined over the last 2 years, with these remaining at roughly 160. (See fig. 5.)

Figure 5: Open OOMA Priority 3 Trouble Reports

Number of open priority 3 trouble reports for OOMA
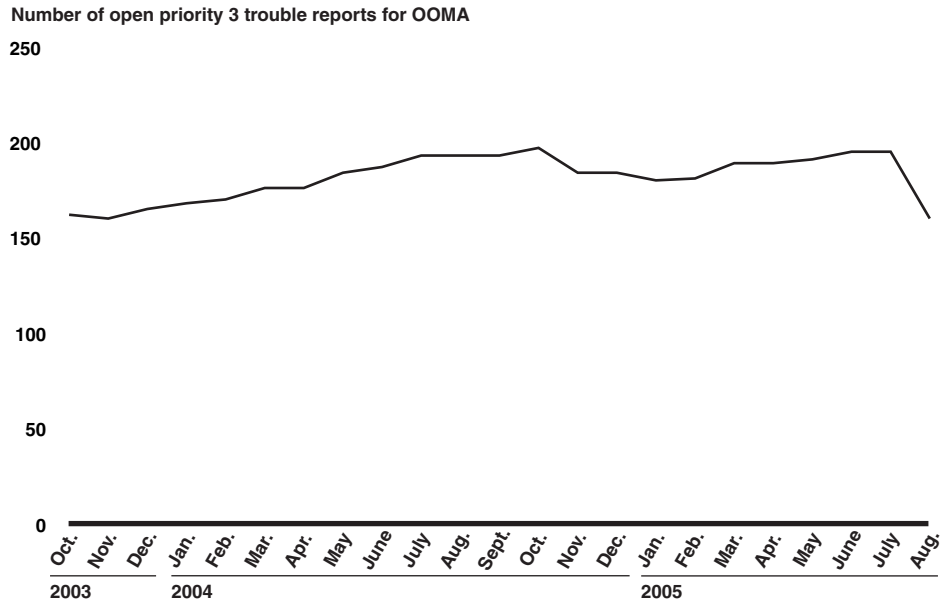
Source: Navy.

Change Proposals

The picture for NTCSS change proposals is similar to that for trouble reports. Specifically, the total number of open NTCSS priority 1, 2, and 3 change proposals has increased over the last 2 years—going from about 325 to 425. Of this total, NTCSS priority 2 change proposals have increased by 72, with 247 priority 2 proposals still being open. (See figs. 6 and 7.)

Figure 6: Total Number of Open NTCSS and OOMA Priority 1, 2, and 3 Change Proposals
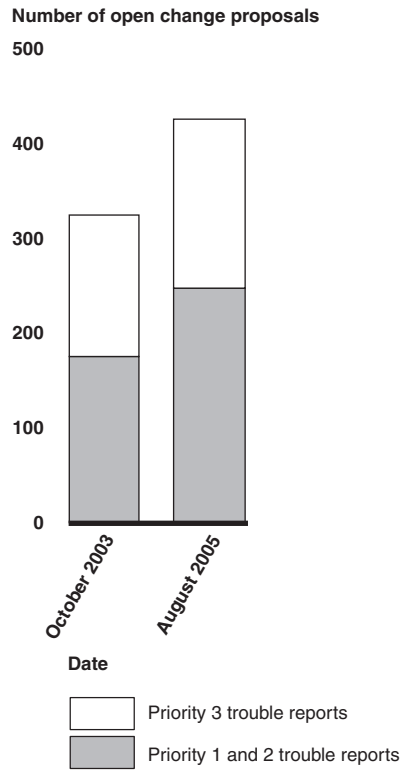
Number of open change proposals

Source: Navy.

Figure 7: Open NTCSS Priority 1 and 2 Change Proposals

Number of open priority 1 and 2 change proposals

Priority #1
Priority #2
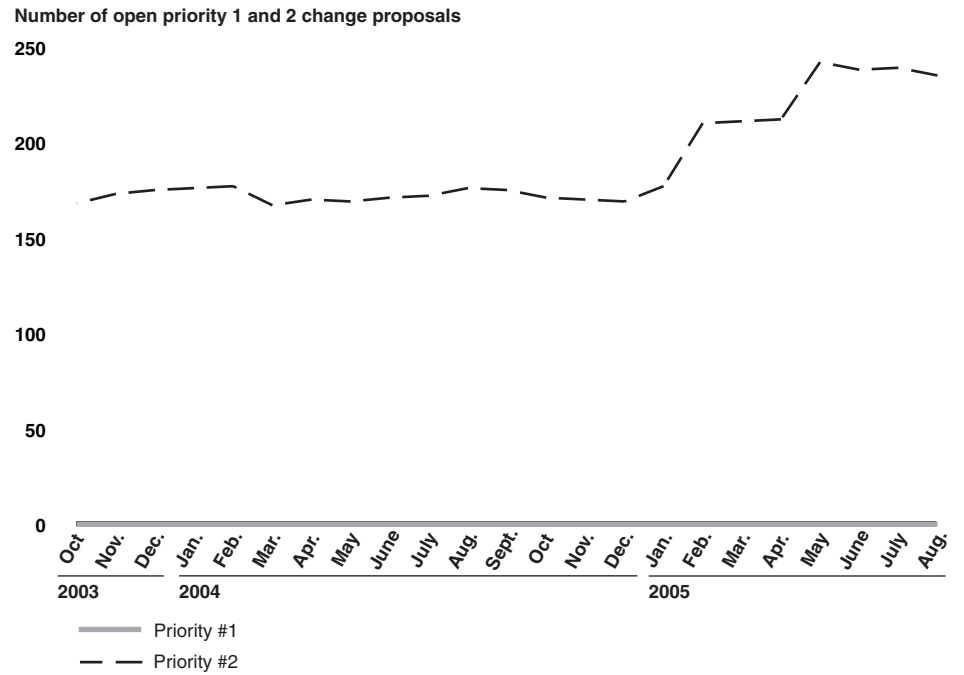
Source: Navy.

Further, NTCSS priority 3 change proposals have increased during this time to about 81, and given that priority 3 change proposals require current work-arounds, this is not a positive trend. (See fig. 8.)

Figure 8: Open NTCSS Priority 3 Change Proposals

Number of open priority 3 change proposals
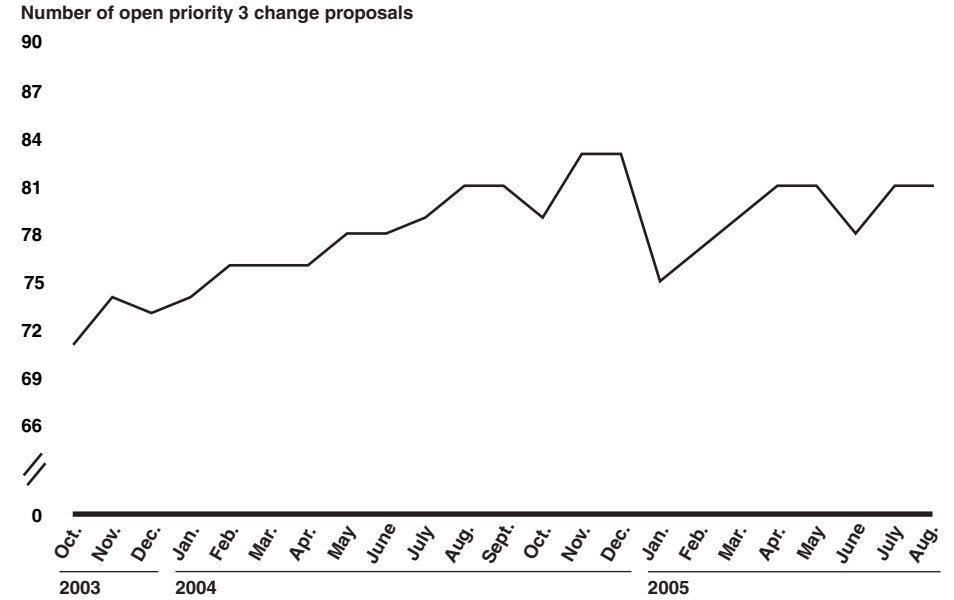
Source: Navy.

With respect to OOMA specifically, the number of open priority 2 change proposals has risen slightly from 7 to 12. (See fig. 9.) Similarly, the number of open priority 3 change proposals has also increased somewhat from 78 to 97. (See fig. 10.) While the number of priority 2 change proposals is not large, the trend in these, as well as the trend in the more significant number of priority 3 change proposals, is not consistent with those of a maturing system.

Figure 9: Open OOMA Priority 1 and 2 Change Proposals
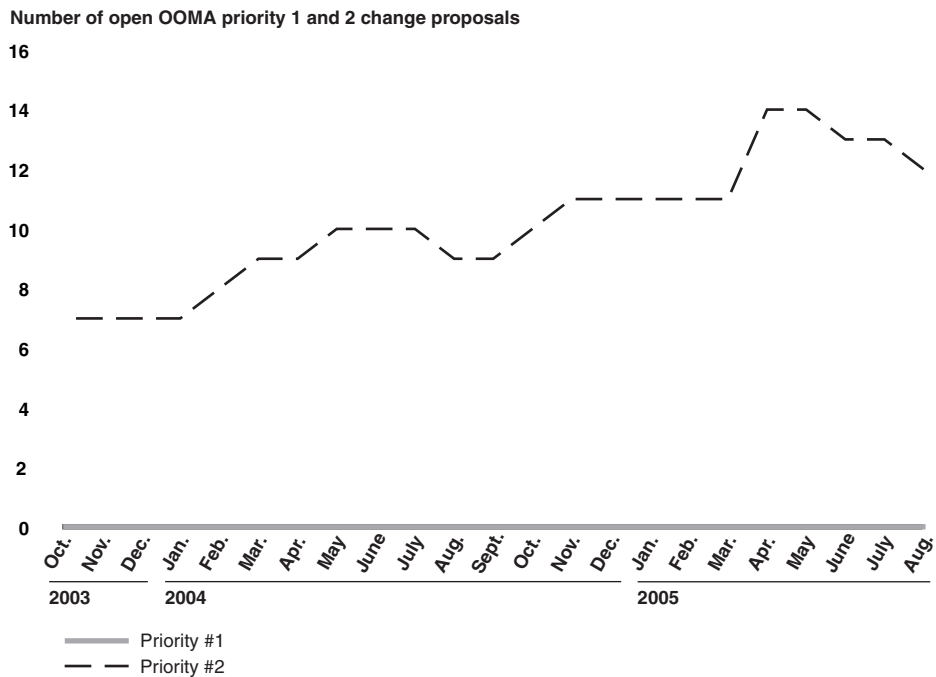
Number of open OOMA priority 1 and 2 change proposals

Priority #1
Priority #2

Source: Navy.

Figure 10: Open OOMA Priority 3 Change Proposals

Number of open OOMA priority 3 change proposals
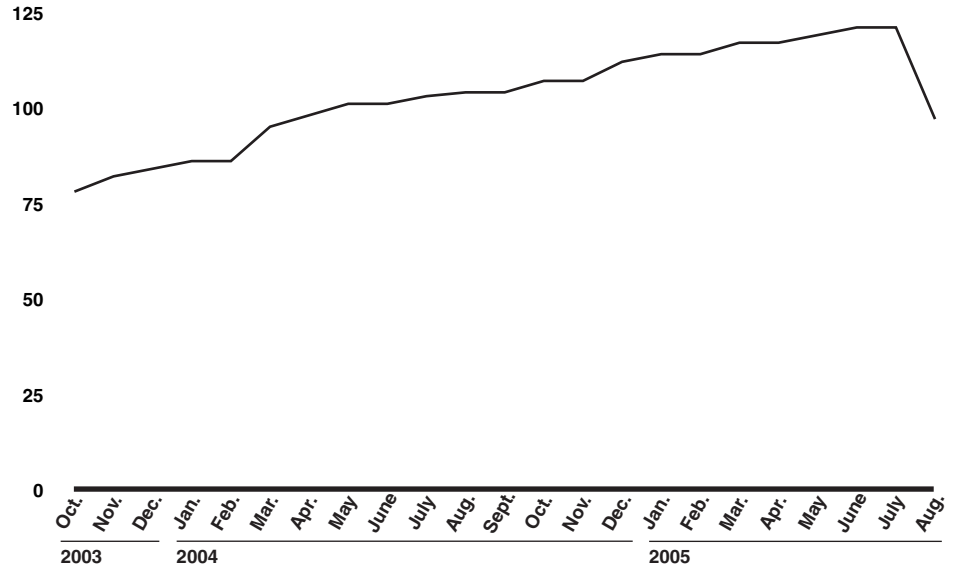
Source: Navy.

Earned Value Management Assessment

Earned value management (EVM) guidance was developed by the American National Standards Institute/Electronic Industries Alliance.[1] This guidance identifies 32 criteria that reliable EVM systems should meet. The 32 criteria are organized into the following five categories:

- *Organization*: Activities that define the scope of the effort and assign responsibilities for the work;

- *Planning and budgeting*: Activities for planning, scheduling, budgeting, and authorizing the work;

- *Accounting*: Activities to accumulate the costs of work and material needed to complete the work;

- *Analysis*: Activities to compare budgeted, performed, and actual costs; analyze variances; and develop estimates of final costs; and

- *Revisions and data maintenance*: Activities to incorporate internal and external changes to the scheduled, budgeted, and authorized work.

NTCSS central design agency (CDA) officials provided a self-assessment of their compliance with each of the criteria, reporting that they met 15 of the 32 criteria (see table 12). Using the results of their self-assessment to target our analysis, we then assessed those aspects of the EVM system the self-assessment reported as meeting the criteria, by comparing the documentation with relevant Department of Defense (DOD) guidance and best practices.[2] Our assessment indicates that the NTCSS program satisfied two, and partially satisfied one, of the 32 criteria (see table 12).[3]

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[1]American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA) EVM System Standard (ANSI/EIA-748-98), Chapter 2 (May 19, 1998).

[2]DOD, *Defense Acquisition Guidebook*, Version 1.0 (Oct. 17, 2004); and American National Standards Institute (ANSI) /Electronic Industries Alliance (EIA) EVM System Standard (ANSI/EIA-748-98), Chapter 2 (May 19, 1998).

[3]"Yes" means that the program provided documentation demonstrating satisfaction of the criterion. "Partially" means that the program provided documentation demonstrating satisfaction of part of the criterion. "No" means that the program has yet to provide documentation demonstrating satisfaction of the criterion.

Table 12: Navy Satisfaction of EVM Criteria

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Organization				
Define the authorized work elements for the program. A work breakdown structure, tailored for effective internal management control, is commonly used in this process.	The work breakdown structure is a direct representation of the work scope in the project, documenting the hierarchy and description of tasks to be performed and the relationship to the product deliverables. The work breakdown structure breaks down all authorized work scope into appropriate elements for planning, budgeting, scheduling, cost accounting, work authorization, measuring progress, and management control. It also ensures the statement of work is entirely captured and allows for integration of technical, schedule, and cost information.	Yes	Yes	The EVM reports for the OOMA software development project and the NTCSS hardware installation project had a work breakdown structure.
Identify the program organizational breakdown structure, including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.	The organizational structure identifies the organization responsible for each segment of work, including subcontracted and intra-organizational effort. In order to meet this guideline, objective evidence requires a work breakdown structure intersection with an organizational breakdown structure.	Yes	No	CDA officials have yet to provide documentation to demonstrate satisfaction of this criterion. Such documentation includes an organizational breakdown structure with detail regarding subcontractors.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Provide for the integration of the company's planning, scheduling, budgeting, work authorization, and cost accumulation processes with each other and, as appropriate, the program work breakdown structure and the program organizational structure.	The integration of planning, scheduling, budgeting, work authorization, and cost accumulation management processes provides the capability for establishing the performance measurement baseline, identifying work progress, and collecting of actual costs for management analysis and corrective actions.	Yes	No	The CDA has yet to provide documentation to demonstrate satisfaction of this criterion. Such documentation includes copies of master, intermediate, and detailed schedules; operational schedules; control account plans; performance reports by work breakdown structure and organizational breakdown structure; responsibility assignment matrix; statement of work; work authorization documents; and work breakdown structure and organizational breakdown structure documentation.
Identify the company organization or function responsible for controlling overhead (indirect costs).	Visibility into direct and indirect costs is essential for successful management of a project. Therefore, project managers should clearly identify managers who are responsible for controlling indirect costs, including overhead, burden, general and administrative costs, and who has authority to approve expenditure of resources. They should also document the process for management and control of indirect costs.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures, as needed.	The integration of the work breakdown structure and organizational breakdown structure establishes where the performance measurement necessary for project management is performed. This intersection results in designation of a focal point for management control (the control account manager). It is also the initiation point for work authorization, performance management, and performance measurement. The control account manager identifies the plan for work task accomplishment, including defining the effort required, cost elements (labor, material, etc.), and the resources required to do the job.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Planning and budgeting				
Schedule the authorized work in a manner that describes the sequence of work and identifies significant task interdependencies required to meet the program requirements.	The scheduling of authorized work facilitates effective planning, reporting, and forecasting, which is critical to the success of all projects. An integrated network scheduling system has distinct tasks that can be summarized by work breakdown structure and organizational breakdown structure identifiers to track progress and measure performance.	Yes	Yes	Detailed schedule documents for both projects describe the sequence and interdependence of work relative to project requirements.
Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.	Objective indicators enable measurement of work accomplished, thereby allowing accurate comparison to planned work. Meaningful performance metrics enable better management insight and decision making, allowing maximum time for management action to keep the project on plan.	Yes	No	The metrics in the NTCSS hardware installation project reports contained unexpectedly and unrealistically large improvements in performance that were not explained. In addition, the program office told us that the measurement data for the OOMA software project is distorted due to numerous baseline changes and requirements changes. Satisfying this criterion requires valid data.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. Budget for far-term efforts may be held in higher-level accounts until an appropriate time for allocation at the control account level. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost, including estimates for authorized but undefinitized work. On government contracts, if an over-target baseline is used for performance measurement reporting purposes, prior notification must be provided to the customer.	The assignment of budgets to scheduled segments of work produces a plan against which actual performance can be compared. This is called the performance measurement baseline. The establishment, maintenance, and use of the performance measurement baseline are indispensable to effective program management.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Establish budgets for authorized work with identification of significant cost elements (e.g., labor and material) as needed for internal management and for control of subcontractors.	An essential part of project planning and establishing a performance measurement baseline is the establishment of budgets for all work authorized. Identification of the budget cost elements documents the required resources and integrates the work scope with the performing organization.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
To the extent it is practical to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far-term effort in larger planning packages for budget and scheduling purposes.	The effort contained within a control account is distributed into either work packages or planning packages. Work packages are single tasks, assigned to a performing organization for completion, and should be natural subdivisions of control account effort resulting in a definable end product or event. Budgets established at the work package level provide the detail for effective execution of the baseline plan. This approach provides meaningful product or management-oriented events for performance measurement.	Yes	No	The CDA has yet to provide documentation to demonstrate satisfaction of this criterion. Such documentation includes control account plans divided into work and planning packages, or control account schedules and time-phased budgets.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Provide that the sum of all work package budgets, plus planning package budgets within a control account, equals the control account budget.	The integrity of the performance measurement baseline is maintained when the budget of the control account equals the sum of its work and planning package budgets. This prevents duplicate recording of budgets.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Identify and control the level of effort activity by time-phased budgets established for this purpose. Only that effort that is unmeasurable or for which measurement is impractical may be classified as level of effort.	Meaningful events are critical for performance measurement. Measurement of level of effort activity provides no visibility into actual performance. Level of effort activity is defined as having no measurable output or product at the work package level and, therefore, must be limited to avoid distorting project performance data.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Establish overhead budgets for each significant organizational component of the company for expenses that will become indirect costs. Reflect in the program budgets, at the appropriate level, the amounts in overhead accounts that are planned to be allocated to the program as indirect costs.	Indirect costs are for common activities that cannot be specifically identified with a particular project or activity and should typically be budgeted and controlled separately at the functional or organization manager level. It is important to have an indirect budgeting and forecasting process because indirect costs account for a major portion of the cost of any project. As such, the budgetary control and management of this category cannot be overlooked or minimized.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Identify management reserves and undistributed budget.	Project managers need to realize the performance measurement baseline planning process contains risk and identify a management reserve contingency for unplanned activity within the project scope.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.	A project baseline that reflects the common agreement between the two parties provides a common reference point for progress assessment. It provides recognition of contractual requirements and precludes unauthorized changes to the performance measurement baseline.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Accounting considerations				
Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.	A project cost-charging structure established in the accounting system ensures that actual direct costs are accumulated and reported in a manner consistent with the way the work is planned and budgeted.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
When a work breakdown structure is used, summarize direct costs from control accounts into the work breakdown structure without allocation of a single control account to two or more work breakdown structure elements.	Actual costs need to be available at all levels of the work breakdown structure to support project management with performance measurement data. Cost collection accounts mapped to the work breakdown structure ensure performance measurement data integrity.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Summarize direct costs from the control accounts into the contractor's organizational elements without allocation of a single control account to two or more organizational elements.	To ensure performance measurement data integrity, actual costs need to be available at all levels of the organizational breakdown structure.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Record all indirect costs that will be allocated to the project.	All indirect costs should be recorded in the accounting system. Allocating indirect costs to the appropriate direct costs assures that all projects benefiting from indirect costs receive their fair share.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Identify unit costs, equivalent unit costs, or lot costs when needed.	A manufacturing accounting system capable of isolating unit and lot costs in a production environment allows the flexibility to plan, measure performance, and forecast in a more efficient way when there are multiple projects in the same production line.	Yes	No	The CDA has not yet provided documentation to demonstrate satisfaction of this criterion. Such documentation includes a manufacturing resource planning project cost collection structure or an enterprise resource planning system that supports the identification of unit costs, equivalent unit costs, or lot costs when needed including differentiation of work in process.
For EVM, the material accounting system will provide (1) accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques; (2) cost performance measurement at the point in time most suitable for the category of material involved, but no earlier than the time of progress payments or actual receipt of material; and (3) full accountability of all material purchased for the program, including the residual inventory.	Material items consumed in the production of project deliverables are accounted for and progress is measured at the point most closely aligned to the actual consumption. Material accounting systems should adhere to these three characteristics: (1) the material accounting system provides full accountability and effective measurement of all material purchased; (2) material costs should be accurately charged to control accounts using recognized, acceptable costing techniques; and (3) when necessary, the use of estimated actual costs to ensure accurate performance measurement should be used.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Analysis and management reports				
At least on a monthly basis, generate the following information at the control account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system: (1) comparison of the amount of planned budget and the amount of budget earned for work accomplished (this comparison provides the schedule variance) and (2) comparison of the amount of the budget earned and the actual (applied where appropriate) direct costs for the same work (this comparison provides the cost variance).	Visibility into project performance helps the project manager focus resources on those areas in need of attention. Accurate and reliable EVM data supports management control needs by allowing the project manager to identify root causes for variances and establish actions to minimize impact at the control account level.	Yes	No	In order to produce reliable and accurate variance reports, many of the aforementioned criteria that our analysis showed that the CDA did not perform must be satisfied. Therefore, this criterion is not being satisfied.
Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance and provide the reasons for the variances in the detail needed by program management.	The analysis of deviations from plan for both schedule and cost at least monthly provides management at all levels the ability to rapidly and effectively implement corrective actions with an understanding of the project risk and causes of risk.	Yes	No	The metrics in the NTCSS hardware installation project reports contained unexpectedly and unrealistically large improvements in performance that were not explained. In addition, the program office told us that the measurement data for the OOMA software project is distorted due to numerous baseline changes and requirements changes. Satisfying this criterion requires valid data.
Identify budgeted and applied (or actual) indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances.	Ongoing indirect cost analysis provides visibility into potential indirect cost overruns and the opportunity to develop and implement management action plans to meet project objectives.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the project.	Variances provide an understanding of the conditions, allowing the project manager to properly allocate available resources to mitigate project risk. They also identify significant problem areas from all levels of the organization and project scope of work, derived from the same data sources. Thus, variances provide valuable management information.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.
Implement managerial actions taken as the result of earned value information.	Earned value data must be utilized by all levels of management for effective project execution. Because of this, the data produced by the EVM system must be available to managers on a timely basis and must be of sufficient quality to ensure that effective management decisions can be made as a result of its analysis.	Yes	No	The metrics in the NTCSS hardware installation project reports contained unexpectedly and unrealistically large improvements in performance that were not explained. In addition, the program office told us that the measurement data for the OOMA software project is distorted due to numerous baseline changes and requirements changes. Satisfying this criterion requires valid data.
Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements, including statements of funding requirements.	Estimates at completion based on predictive performance measures increase the probability that the project can be executed within the reported estimates at completion. When estimates at completions are analyzed at least monthly and updated as required, the robustness of the financial reporting requirements is enhanced, thereby reducing the potential for surprises. Monthly estimates at completion reviews are essential for management decisions including the planning of project future funding requirements.	No	No	We did not analyze this criterion because it was self-assessed by the CDA as not being met.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Revisions and data maintenance				
Incorporate authorized changes in a timely manner, recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations.	The incorporation of authorized changes in a timely manner maintains the integrity of the performance measurement baseline and thus its effectiveness as a baseline against which to manage and control performance.	Yes	No	The CDA has yet to provide documentation to demonstrate satisfaction of this criterion. Such documentation includes change control logs and work authorization documents.
Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control.	Budget changes should be controlled and understood in terms of scope, resources, and schedule, and that budgets should reflect current levels of authorized work. Furthermore, budget revisions should be traceable to authorized contractual targets and control account budgets.	Yes	No	The CDA has yet to provide documentation to demonstrate satisfaction of this criterion. Such documentation includes change documents or change control logs.
Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data.	Retroactive changes to the baseline may mask variance trends and prevent use of the performance data to project estimates of cost and schedule at completion. Retroactive budget adjustments may delay visibility of overall project variance from plan, thus reducing the alternatives available to managers for project redirection or termination.	Yes	No	The CDA has yet to provide documentation to demonstrate satisfaction of this criterion. Such documentation includes change control logs or approved retroactive change controls.
Prevent revisions to the program budget except for authorized changes.	Changes made outside the authorized baseline control processes compromise the integrity of performance trend data and delay visibility into overall project variance from plan.	Yes	No	The CDA has yet to provide documentation to demonstrate satisfaction of this criterion. Such documentation includes change control logs, control accounts, and work package plans.

(Continued From Previous Page)

Criteria[a]	Definitions	Self-assessment	GAO assessment	GAO analysis
Document changes to the performance measurement baseline.	By ensuring that budget and schedule revisions are documented and traceable, the integrity of the performance measurement baseline is maintained and can be verified. The performance measurement baseline should reflect the most current plan for accomplishing the effort. Authorized changes should be quickly recorded in the system and incorporated into all relevant planning. Planning and authorization documents must also be updated accordingly prior to commencement of new work.	Yes	Partial	We were provided documentation showing eight baseline changes for the NTCSS hardware installation project. However, the program office told us that the EVM data for the OOMA software project is distorted due to numerous baseline changes and requirements changes.
Number satisfied		15	2	
Number partially satisfied		0	1	
Number not satisfied		17	29	
Total		**32**	**32**	

Sources: Navy CDA self-assessment and GAO analysis of Navy provided data.

[a]Based on the National Defense Industrial Association Program Management Systems Committee Intent Guide (January 2005).

Comments from the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

NETWORKS AND INFORMATION
INTEGRATION

NOV 2 3 2005

Mr. Randolph C. Hite
Director, Information Technology Architecture and Systems Issues
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Hite:

This is the Department of Defense (DoD) response to the GAO draft report (06-215), "DoD SYSTEMS MODERNIZATION: PLANNED INVESTMENT IN THE NAVAL TACTICAL COMMAND SUPPORT SYSTEM NEEDS TO BE REASSESSED," dated November 3, 2005 (GAO Code 310287).

See comment 1.

We appreciate the opportunity to comment on the draft report and the time your staff afforded us during their preparation of the report.

See comment 2.

As acquisition milestone decision authority for NTCSS has been delegated to the Navy since 1999, the Navy provided significant analysis and comment regarding the report. The Navy recognizes that some of the report's findings are valid but believes that the overall findings significantly understate and misrepresent the level of discipline and conformance with applicable guidance and direction achieved by the NTCSS Program. They also believe that although NTCSS was defined and implemented without a complete and formal enterprise architecture, it has proven to be the right solution to meet Navy's strategic business and technological needs; and that sound management practices are in place and improving. The Navy Acquisition Executive particularly emphasizes that no manpower or resource shortfalls have hampered oversight or execution of the NTCSS program.

See comment 3.

See comment 4.

See comment 5.

Rather than providing detailed comments on the report's findings, we have chosen to focus our response on the report's recommendations. Our reply to each recommendation is enclosed. Our point of contact is Lt Col Alex Holder at 703-602-2720, ext 123.

Sincerely,

John R. Landon
Deputy to the ASD(NII)
(C3ISR & IT Acquisition)

Enclosure:
As stated

DoD Comments to GAO draft report (06-215), "DoD SYSTEMS MODERNIZATION: PLANNED INVESTMENT IN THE NAVAL TACTICAL COMMAND SUPPORT SYSTEM NEEDS TO BE REASSESSED," dated November 3, 2005 (GAO Code 310287)

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense direct the Secretary of the Navy to determine if continued investment in Naval Tactical Command Support System (NTCSS) as planned represents a prudent use of the department's limited resources. To accomplish this, the Secretary of the Navy should direct the program office to collaborate with the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer, the Office of Program Analysis and Evaluation, and the Naval Cost Analysis Division to prepare a reliable economic analysis (EA) that encompasses all viable alternatives, including the Navy's recent enterprise resource planning (ERP) program. (p. 60/GAO Draft Report)

DoD RESPONSE: Partially concur.

See comment 6.

See comment 7.

As planned for some time, the NTCSS program office will continue to collaborate with the Naval Cost Analysis Division to conduct a reliable EA to support the Optimized Organizational Maintenance Activity (OOMA) fielding decision. However, at this late phase of this very mature program, when the final application is about to be fielded, we do not see merit in conducting a formal EA that would address all viable alternatives, or in seeking Office of Secretary of Defense (OSD) Office of Program Analysis and Evaluation (PA&E) review of the EA.

See comment 8.

However, we will direct the Navy to (1) conduct, in coordination with OSD PA&E, an analysis to determine the relationship of NTCSS, the Navy ERP Program and other programs that may provide similar functionality and (2) brief the results of that analysis to the Networks and Information Integration (NII) Overarching Integrated Product Team (OIPT) within 120 days.

See comment 9.

The NTCSS Program Office has conducted three EAs to support the program's milestone decisions. These EAs were conducted in accordance with the DoD 5000 series and OMB Circulars A-94 and A-11.

- The 1997 and 1999 EAs focused on NTCSS Optimization (less Optimized Organizational Maintenance Activity (OOMA)).

See comment 10.

- The 2004 EA focused on OOMA, the final NTCSS application.

See comment 11.

- These EAs were independently reviewed by the Office of the Secretary of Defense (Program Analysis and Evaluation) and the (then) Navy Center for Cost Analysis, both of whom found that the EAs supported the milestone decision being requested.

See comment 12.

- The OOMA 2004 EA was conducted in March 2004 and concurred upon by the Navy Cost Analysis Division (NCAD) in support of the upcoming Fielding Decision for the Optimized Organizational Maintenance Activity (OOMA) application. This OOMA EA is being updated in collaboration with NCAD to reflect Program plans established pursuant to upcoming OOMA version 831-01.05.00 Follow-on Operational Testing and Fielding Decision.

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See comment 13.

The NTCSS EAs did not address the Navy's Enterprise Resource Planning (ERP) Program, and the Navy ERP Program did not exist when the original NTCSS AoA was conducted.

See comment 14.

In addition to EAs supporting milestone decision points, NTCSS has historically used Business Case Analyses (BCA) to evaluate investment decisions, including two conducted in 2001 and one in 2004. The 2004 Fielding Alternatives BCA was conducted by the Program Office at the request of Chief of Naval Operations for Material Readiness and Logistics Operations (OPNAV N4) in order to assess POM06 funding decisions and plan a way-ahead for modernizing naval afloat logistics systems. The 2004 Fielding Alternatives BCA was conducted largely consistent with the procedures outlined in OMB Circulars A-94 and A-11 and the Federal Chief Information Officers Council, Best Practices Committee report, "Value Measuring Methodology (VMM), How to Guide."

RECOMMENDATION 2: The GAO recommended that the Secretary of Defense direct the Secretary of the Navy to determine if continued investment in NTCSS as planned represents a prudent use of the department's limited resources. To accomplish this, the Secretary of the Navy should direct the program office to ensure that development of this economic analysis (1) complies with cost estimating best practices, including recognition of costs to resolve open trouble reports and change proposals, and relevant OMB cost benefit guidance and (2) incorporates available data on whether deployed NTCSS capabilities are actually producing benefits. (p. 60/GAO Draft Report)

DoD RESPONSE: Concur.

As stated above, the 2004 OOMA EA is being updated in collaboration with NCAD to reflect program plans established pursuant to upcoming Follow-on Operational Testing of OOMA version 831-01.05.00 in support of the OOMA Fielding Decision. As was the case with the 1997 and 1999 NTCSS Optimized EAs, this OOMA EA is being compiled in compliance with cost and benefit guidance and best practices of the DoD 5000 series, OMB Circular A-94 and OMB Circular A-11 as recommended in the GAO report.

Software Trouble Reports and Change Proposals are prioritized by the NTCSS Requirements Integrated Product Team in accordance with Program Office policy and available funding, and, if approved for implementation, will be slated for subsequent maintenance updates to the application baseline.

In accordance with DoDI 5000.2 and current DoD CIO guidance on Clinger-Cohen Act (CCA) Compliance Certification, and to demonstrate the benefits realized by NTCSS, outcome measures of effectiveness (MOEs) and a post implementation review (PIR) plan will be developed for the deployed NTCSS capabilities and for the OOMA Fielding Decision. The OOMA PIR will be conducted 6 to 12 months after the OOMA Fielding Decision. Results of these reviews will be reported to the appropriate Navy and DoD stakeholders.

RECOMMENDATION 3: The GAO recommended that the Secretary of Defense direct the Secretary of the Navy to determine if continued investment in NTCSS as planned represents a prudent use of the department's limited resources. To accomplish this, the Secretary of the Navy

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should direct the program office to collaborate with the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Under Secretary of Defense (Comptroller) to ensure that NTCSS is adequately aligned with evolving DoD and Navy enterprise Architecture. (p. 60/GAO Draft Report)

DoD RESPONSE: Concur.

DoD concurs that the NTCSS program should be adequately aligned with the evolving DoD and Navy Enterprise Architecture. The NTCSS program was reviewed in FY05 and FY06 as part of the Secretary of Defense Business Management Modernization Program (BMMP). As part of these annual reviews, the program was evaluated against and found to be aligned with the evolving DoD and Navy Enterprise Architecture. Ultimately, these reviews led to Under Secretary of Defense (Comptroller) certification and (in FY06) Defense Business Systems Management Committee (DBSMC) approval for system modernization investment. On a continuing basis, the NTCSS Program Office works to ensure that it is properly aligned to the currently defined DoD and Navy business architecture.

See comment 15.

As part of the BMMP review in FY05, the Program Office worked in conjunction with OPNAV N4 and the Office of the Deputy Undersecretary of Defense Logistics and Materiel Readiness within the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). In FY06, the Program Office worked closely with the Navy Investment Review Board (IRB) that was established as part of the BMMP process. To ensure architecture alignment, the NTCSS program will collaborate with the new Business Transformation Agency (BTA). The BTA reports to the DBSMC through the USD(AT&L) and manages the DoD IRB process.

RECOMMENDATION 4: The GAO recommended that the Secretary of Defense direct the Secretary of the Navy to present the result of the analysis outlined in Recommendation 1 to the Deputy Secretary of Defense, or his designee, and seek a departmental decision on how to best proceed with the program. Until this is done, the GAO recommended that the Secretary of Defense direct the Secretary of the Navy to halt further deployment of NTCSS and to limit future investment in already deployed applications to essential operations and maintenance activities and only developmental activities deemed essential to national security needs. (p. 61/GAO Draft Report)

DoD RESPONSE: Partially concur.

See comment 16.

See comment 17.

We do not agree that further deployment of NTCSS should be limited at this time. However, we will direct the Navy to work with OSD(PA&E) to conduct the analysis described in our response to Recommendation 1 above, and the Navy will present the results of their analysis to the NII OIPT within 120 days. Appropriate direction will be given to the program, based on the results of that analysis.

RECOMMENDATION 5: The GAO recommended that if based on reliable data, a decision is made to continue the NTCSS program, the Secretary of Defense direct the Secretary of the Navy to ensure that the NTCSS program implements effective program management activities,

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including earned value management, requirements development and management, and test management. (p. 61/GAO Draft Report)

DoD RESPONSE: Partially Concur

Agree that the NTCSS program should implement effective program management activities but do not agree that the Secretary of Defense needs to give direction to the Secretary of the Navy regarding this issue.

The Navy's position is as follows:

See comment 18.

- The NTCSS Program has implemented and is continuously improving program management activities, including earned value management, requirements development and management, and test management in accordance with applicable directives and industry best practices.

See comment 19.

- The Program Office has instituted a tailored approach to formal reporting and extends performance measurement principles to the Central Design Activity (CDA) even though the projects fall below the dollar threshold requiring use of an EVMS and despite the absence of formal contract deliverables. Projects selected for earned value application are based on risk level, resource limitations, and the level of management oversight required. The value of the individual projects contained in NTCSS did not warrant the CDA having a certified EVMS but adherence to the 32 criteria set forth in ANSI/EIA standards are actively applied. The CDA has set internal definitions on which project(s) warrant earned value reporting and these are specified in the CDA Software Measurement Plan.

See comment 20.

See comment 21.

- To further ensure that the program is using the best program management practices, the Navy Acquisition Executive will ask the Navy Inspector General to conduct a study to see where improvement could be made in NTCSS program management activities.

RECOMMENDATION 6: The GAO recommended that if based on reliable data, a decision is made to continue the NTCSS program, the Secretary of Defense direct the Secretary of the Navy to [ensure that] key stakeholders, such as the central design agency and the developmental testing organization, have the people, processes, and tools to effectively execute their respective roles and responsibilities. (p. 61/GAO Draft Report)

DoD RESPONSE: Partially Concur.

See comment 22.

We concur with the GAO that all acquisition programs should have the necessary people, processes and tools to effectively execute their respective roles and responsibilities. It is the Navy's position that key stakeholders of the NTCSS program do, in fact, have the people, processes and tools to effectively execute their respective roles and responsibilities. For example, SPAWARSYSCEN Norfolk, the Central Design Activity, demonstrated their competency and capability and was certified CMM-SW Maturity Level 3.

A review of this area will be part of the NII OIPT meeting discussed under Recommendation 1. A determination of whether further action is needed will be made by the OIPT at that time.

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See comment 23.

RECOMMENDATION 7: The GAO recommended that the Secretary of Defense reestablish the Office of the Assistant Secretary of Defense for Networks and Information Integration/Chief Information Officer as the milestone decision authority, and direct the Secretary of the Navy to take steps to ensure that Navy oversight entities fulfill their roles and responsibilities on NTCSS, including ensuring that reliable program reporting occurs and is acted upon. (p. 62/GAO Draft Report)

DoD RESPONSE: Partially Concur

We believe it is premature to reestablish the ASD(NII)/DoD CIO as the milestone decision authority for NTCSS, given the fact that over 95% of the development work is complete. However, we will revisit that decision based on the results of the analysis discussed in our replies to Recommendations 1, 4 and 6 above.

The NII OIPT Leader and the Navy Acquisition Executive will ensure that Navy oversight entities fulfill their roles and responsibilities on NTCSS, including ensuring that reliable program reporting occurs and is acted upon. Currently, NTCSS is overseen by:

- PEO (C4I and Space)

- SPAWAR Comptroller and NCAD

- Domain Functional Managers (FAM process)

- OPNAV N4

- NTCSS Executive Steering Committee

- DASN (C4I and Space)

- NII OIPT Leader (through the review of quarterly Defense Acquisition Executive Summaries)

NTCSS will continue to comply with all statutory and regulatory reporting requirements, including:

- Navy CIO and DoD CIO Clinger-Cohen Act certification for the OOMA full-rate production decision
- All reports and documents required for each Milestone Decision.

- The ASN (RDA) DASHBOARD

- The PEO (C4I and Space) Acquisition Management Office Database

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The following are GAO's comments on the Department of Defense's letter dated November 23, 2005.

GAO Comments

1. See the Agency Comments and Our Evaluation section of this report.

2. We disagree. Our report contains numerous instances where the Navy did not comply with either DOD acquisition policies and guidelines or industry best practices, in the areas of (1) economic justification; (2) architectural alignment; (3) project management, including progress measurement and reporting, funding disclosure, and oversight activities; and (4) system development, including requirements management and testing. Moreover, the Navy has not provided any evidence to demonstrate that our report is incorrect with respect to the level of program discipline and conformance with applicable policy and guidance in the areas that we reviewed.

3. We disagree. Knowing that NTCSS is the right solution to meet the Navy's strategic business and technological needs would require that a frame of reference articulating these needs be available as a point of comparison. Such a frame of reference is an enterprise architecture. However, the Navy stated the system was defined and implemented without a complete and formal enterprise architecture. Our experience with federal agencies has shown that investing in an information technology solution without defining the solution in the context of an architecture often results in systems that are duplicative, not well integrated, and unnecessarily costly to maintain and interface. In addition, in February 2005, key program stakeholders and representatives from user organizations questioned whether NTCSS as defined was the right solution to cost effectively meet users' needs. At that time, program officials stated their intent to develop a new economic analysis to gather the information needed to determine whether to continue investing in NTCSS. In November 2005, program officials told us that they no longer planned to develop this economic analysis. Without a well-defined architecture and a reliable economic analysis, the Navy cannot be sure that NTCSS is the right solution.

4. See comment 2.

5. We acknowledge DOD's comment but would note that it is contrary to statements made to us during the audit. For example, officials with the milestone decision authority stated that, due to staffing reductions, the

office was unable to fully perform oversight activities and has had to delegate completion of these activities. Also, Naval Cost Analysis Division officials stated that they only review cost estimates that are prepared for milestone reviews because staffing limitations do not permit them to review all cost estimates. Further, Navy officials stated that the central design agency was unable to effectively execute testing activities because it did not have a development testing lab.

6. We disagree with this approach because its scope is narrower than our recommendation. Specifically, we recommended that the Navy develop a reliable economic analysis of the NTCSS program that includes all viable alternatives, including the Navy's Enterprise Resource Planning program. DOD acquisition policy and guidance provide detailed instructions on how economic analyses should be performed to obtain information that is critical for decisions regarding investments of scarce resources. Without such information, Navy risks that its continued investment in the system may not be justified.

7. We disagree. With respect to the statement that NTCSS is a "very mature program," NTCSS has been under development for about 10 years at a cost of about $1.1 billion, and the Navy plans to spend an additional $348 million between fiscal years 2006 and 2009. Further, as appendix II of our report shows, there are hundreds of open trouble reports and change proposals that need to be addressed before the system can deliver promised or expected capabilities. In addition, should the OOMA application pass operational testing and be fielded, there are over 200 sites where the necessary hardware must be installed and related training must occur. These two efforts will require a significant investment of time and resources, and it is therefore critical that the Navy ensure that NTCSS is the proper system before investing additional funds. With respect to the statement that "the final application is about to fielded," there is no evidence to support this. Since its originally planned fielding date of 2001, OOMA has failed operational testing twice, and the application is still under development. Therefore, it is premature to assert that the application will soon pass developmental and follow-on operational testing.

8. See comment 6. Further, we disagree with the proposal to limit key stakeholders' involvement in developing the economic justification to "coordinating" and "briefing." These stakeholders have specific expertise and roles relative to economically justifying system investments that should be exploited. Until it conducts a complete and

disciplined analysis of the entire NTCSS program (reviewed and approved by the Office of Program Analysis and Evaluation and the Naval Cost Analysis Division) and provides this analysis to all key stakeholders, the Navy's investment decisions will continue to be made without complete and reliable data.

9. We disagree. As discussed in our report, the 2004 economic analysis did not adhere to five of eight criteria elements contained in the Office of Management and Budget Circulars A-94 and A-11.

10. We disagree. The 2004 economic analysis that the Navy provided us focused on three fielding alternatives for the NTCSS program, not just the OOMA application. The Navy did not provide a 2004 economic analysis for just OOMA as the final NTCSS application.

11. We disagree. As stated in our report, officials from the Office of Program Analysis and Evaluation and the Naval Cost Analysis Division told us that they did not review the 2004 NTCSS economic analysis.

12. See comment 10.

13. We agree that the Navy ERP program did not exist when the original NTCSS analysis of alternatives was conducted. However, the Navy ERP program was initiated in 1998 and therefore did exist when the Navy conducted subsequent analysis of alternatives.

14. See comment 9.

15. We do not question whether these annual reviews occurred and what resulted from them. However, the point in our report is that NTCSS has not been defined and developed in the context of a DOD or Navy enterprise architecture because a well-defined version of either has not existed to guide and constrain the program. As a result, meaningful analysis showing how NTCSS aligns to evolving DOD and Navy architecture efforts could not be produced. This means that the Navy does not have a sufficient basis for knowing if NTCSS, as defined, properly fits within the context of future DOD and Navy business operational and technological environments.

16. We disagree. Our recommendation to limit further deployment of NTCSS is a way of ensuring that the Navy takes a "strategic pause" while it takes the time to ensure that decisions regarding future

investment are made using reliable information, which our report shows has not historically been the case. As long as the Navy is not appropriately limiting work on NTCSS, it is continuing to invest resources without having justified doing so.

17. See comment 6.

18. See comment 2.

19. We disagree. As we state in our report, neither the decomposition of the program into small, fiscal year-based projects nor the absence of a contractual relationship is a valid reason for not effectively implementing earned value management. Without reliable, timely, and auditable earned value management data, the program office cannot adequately manage technical, cost, and schedule risks and problems.

20. We disagree. The Navy's own self-assessment of compliance with the 32 criteria, detailed in appendix III of our report, showed that 17 of these criteria were not being satisfied. Further, our assessment showed that the Navy did not satisfy 29 of the 32 criteria, and program officials did not provide any evidence to refute the results of our assessment.

21. The Navy did not provide us with a copy of the CDA Software Measurement Plan.

22. See comment 5. Further, the Navy's position that "key stakeholders of the NTCSS program do, in fact, have the people, processes and tools to effectively execute their respective roles and responsibilities," is not consistent with its comment that this area will be part of a planned review.

23. We disagree. Although the Navy states that the program is 95 percent complete, it still plans to spend $348 million over the next three fiscal years, which is approximately 32 percent of what has been spent on the program to date. In addition, because the Navy lacks disciplined acquisition management practices, as discussed in our report, including earned value management, we question how it is able to reliably determine what percentage of the work has been completed and the percentage that remains to be done. As stated in our report, the current milestone decision authority has allowed the program to proceed while a major application repeatedly failed operational testing, and another

application was cancelled. In addition, the Navy stated its intent to revisit the need to change milestone decision authority.

GAO Contact and Staff Acknowledgments

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Staff Acknowledgments

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