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DEFENSE ADP

A Coordinated Strategy Is Needed to Implement the CALS Initiative

GAO/IMTEC-91-54

GAO

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

Information Management and
Technology Division

B-244393

September 13, 1991

The Honorable Earl Hutto
Chairman, Subcommittee on Readiness
Committee on Armed Services
House of Representatives

Dear Mr. Chairman:

This report responds to your request that we review the Department of Defense's Computer-aided Acquisition and Logistics Support (CALS) initiative. The Department began the CALS initiative in 1985 to automate the millions of pages of technical data needed to support weapons systems and thereby reduce the cost of maintenance and support. Our report concludes that CALS' benefits could be significant, but that progress in achieving its objectives has been slow. We believe the Department's decentralized approach for implementing CALS is responsible for this slow progress and make recommendations for improving the initiative.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this letter. At that time, we will send copies to the Secretary of Defense; the Secretaries of the Air Force, Army, and Navy; the Director, Defense Logistics Agency; interested congressional committees; and other interested parties. Copies will be made available to others upon request.

This work was performed under the direction of Samuel W. Bowlin, Director, Defense and Security Information Systems, who can be reached at (202) 275-4649. Other major contributors are listed in appendix III.

Sincerely yours,

Ralph V. Carlone
Assistant Comptroller General

Executive Summary

Purpose

The Department of Defense spends more than $10 billion annually to store, maintain, and revise the technical data needed to support weapons systems. The vast majority of these data are on paper and are managed manually—a situation that can greatly increase the time needed to perform maintenance on or purchase spare parts for a weapons system. In 1985 Defense began the Computer-aided Acquisition and Logistics Support (CALS) initiative to automate virtually all technical data and drawings for weapons systems.

The Chairman, Subcommittee on Readiness, House Committee on Armed Services, requested that GAO review the CALS initiative. GAO's objectives, as agreed upon with his office, were to (1) evaluate Defense's progress in implementing CALS, and (2) determine how well the services are coordinating their CALS-related projects, including the development of automated technical data systems.

Background

Technical data needed to support weapons systems (also referred to as logistics support data) originate with the weapons system design contractor and include all data necessary to support the weapon from its earliest design to when it is no longer used. This information includes the technical data, engineering drawings, and specifications used in the weapon's design, manufacture, operation, and repair throughout its life cycle.

The current manual management process for paper-based logistics support data is complex, tedious, and labor-intensive—especially in managing updates and changes. Automated technical data support systems could save time and money and, potentially, provide a better way of doing business. For example, a private industry contractor said that its automated repair manual system allows its technicians to perform 40-percent more work because of time saved in accessing information. Additionally, changes to technical manuals can be made overnight so technicians have the latest information at their fingertips.

In 1984 Defense recognized that the voluminous amount of technical data generated during a weapons system's life cycle could be digitized and computer technology employed to store, maintain, access, and use the data in a more timely and efficient manner. Defense's concept of digitizing these data became the CALS initiative. The initiative, officially begun in 1985, has the overall goal of accelerating the move to automated weapons systems support by developing (1) standards for data storage and exchange, and (2) automated systems to store, manage, and

GAO/IMTEC-91-54 Coordinated Strategy Needed for CALS

distribute this technical information to Defense's many and varied users.

Results in Brief

The potential benefits of CALS could be significant—especially in the repair and maintenance of weapons and procurement of spare parts. To achieve these benefits Defense set 1990 as a goal for requiring data standards in contracts as well as making substantial progress towards developing the capability within Defense to receive and use digitized data. However, progress in reaching these goals has been slow. Data standards and technical data systems are still being developed, and Defense is a long way from achieving a fully automated weapons system support environment. This situation is due not only to the size of the undertaking, but also to Defense's lack of a coordinated strategy or overall plan for implementing CALS. The Deputy Secretary of Defense established broad goals for CALS, but directed each service to develop its own strategy for achieving these goals.

The services' diversified paths for implementing CALS have led to a fragmented approach with limited progress in some areas and duplication of effort in other areas. This decentralized approach has resulted in the services having differing views on the specific goals and objectives of CALS. Further, individual projects are not separately identified in an overall plan or budget, making it difficult to determine how much is being spent on CALS. GAO found numerous projects ongoing or planned by the services, totaling more than $5.2 billion, but it is not clear how these projects relate to overall CALS goals or to each other. Clearly, a coordinated, Defense-wide approach similar to Defense's Corporate Information Management (CIM) initiative, would improve the implementation of CALS.

Principal Findings

Defense Does Not Have an Overall Implementation Plan

The concept of CALS was developed in 1985 by a joint Defense-industry task force that recommended central management authority and control over resources and projects as the best approach for achieving the CALS goals. However, the then Deputy Secretary of Defense opted instead to establish a CALS policy office within the Office of the Secretary of Defense, with no control over resources and projects, and to allow each service to develop its own implementation strategy. As a result, no

overall plan or interim milestones for achieving CALS objectives were established.

According to Defense officials, this centralized policy and decentralized implementation approach was taken to stimulate CALS development in as many areas as possible. However, the lack of an overall plan has resulted in each of the services having differing opinions of what CALS should be, what it should encompass, and how it should be implemented. In addition, the lack of specific implementation goals, milestones, or mechanisms for identifying CALS-related projects makes it impossible to accurately measure progress or determine how much is being spent on CALS.

CALS Goals Have Not Been Achieved

The guidance that set the direction for CALS was issued in 1985 by the then Deputy Secretary of Defense, and directed the services to rapidly develop the capability to receive, transmit, and use technical information in digital format. Later guidance, issued in 1988 by the Deputy Secretary of Defense, directed that CALS standards be required in all weapons systems entering production in 1990 and beyond. The goals established by this guidance have not been achieved.

Defense must develop a coordinated infrastructure of automated systems, data bases, and networks to receive and use digitized technical data from contractors. The services have made some progress in developing engineering drawing repository systems; however, not as much progress has been made in developing automated systems for other forms of technical data such as technical manuals, repair standards, and specifications. According to service officials, progress has been slow because of a lack of resources and low priority.

During the past 5 years, some progress has been made in developing standards for exchange of CALS-compliant data. These standards are used to specify such things as graphic representations and data formats, and are essential if Defense is to receive and use technical data from different computer systems. Two of seven standards being developed for CALS are completed and ready for implementation, and the other five are in different stages of development and testing. According to service officials, the completed standards are not routinely being required in weapons contracts because of the lack of specific direction for doing so, and because the services are not ready to receive and use digital data.

Services' Diverse Strategies Could Lead to Duplication

Because of a lack of centralized planning, each service has been implementing CALS as it wants to without taking advantage of the opportunity to pool talents and resources. The Army has contracted for the development of an Army-wide CALS architecture and implementation approach. This effort is estimated to cost $843 million. The Navy and Air Force are implementing CALS on a system-by-system or project-by-project basis.

Because Defense lacks a coordinated strategy or overall plan, the services appear to be building islands of automation. Although not readily identifiable in the services' budgets or other documentation, the ongoing and planned CALS-related projects that GAO could identify total over $5.2 billion, with most of this money spent after fiscal year 1990. However, it is not clear how these projects relate to specific CALS objectives or to each other. Many of the automated systems being developed or proposed appear to perform virtually the same tasks, have similar workload characteristics, and face common problems. Similar duplications of effort in other Defense programs are currently being examined under the CIM initiative. While CALS and CIM share similar goals, they are managed by separate Office of the Secretary of Defense organizations.

Recommendations

GAO recommends that the Secretary of Defense ensure that ongoing actions to develop a coordinated, Defense-wide CALS implementation plan with clearly stated objectives and measurable milestones are completed. Specific elements of such a plan are discussed on pages 22 and 23. GAO also recommends that Defense follow through on the actions it has underway to manage CALS as part of the CIM program and that the Secretary clearly designate all CALS automation projects, including those associated with weapons systems development programs, in the annual information technology budget exhibits.

Agency Comments

The Department of Defense provided written comments on a draft of this report. Defense generally agreed with the findings and recommendations and stated that it has begun to implement corrective actions.

Contents

Abbreviations

ADP	automated data processing
CAD	computer-aided design
CALS	Computer-aided Acquisition and Logistics Support
CIM	Corporate Information Management
DLA	Defense Logistics Agency
DOD	Department of Defense
DSREDS	Digital Storage and Retrieval Engineering Data System
EDI	electronic data interchange
GAO	General Accounting Office
IMTEC	Information Management and Technology Division
JUSTIS	Joint Uniform Services Technical Information System
NIST	National Institutes of Standards and Technology
OSD	Office of the Secretary of Defense
PDES	Product Data Exchange Standards

Introduction

The Department of Defense spends more than $10 billion annually to store, maintain, and revise the vast amount of technical information and drawings needed to support weapons systems and other equipment. Most of this information is on paper and is managed manually. In 1985 Defense began the Computer-aided Acquisition and Logistics Support (CALS) initiative. CALS is a concept intended to facilitate the move from paper-based weapons systems support to automated weapons systems support by developing (1) standards for data storage and exchange, and (2) automated systems to store, manage, and distribute this technical information to Defense's many and varied users. The near-term goal is to develop automated systems and data bases for managing technical data. A long-range goal is to create shared rather than separate data bases wherein Defense components and private industry contractors have controlled access to each others' weapons systems technical support data (see figure 1).

Figure 1.1: Evolution of Weapons Systems Technical Data Management Under CALS
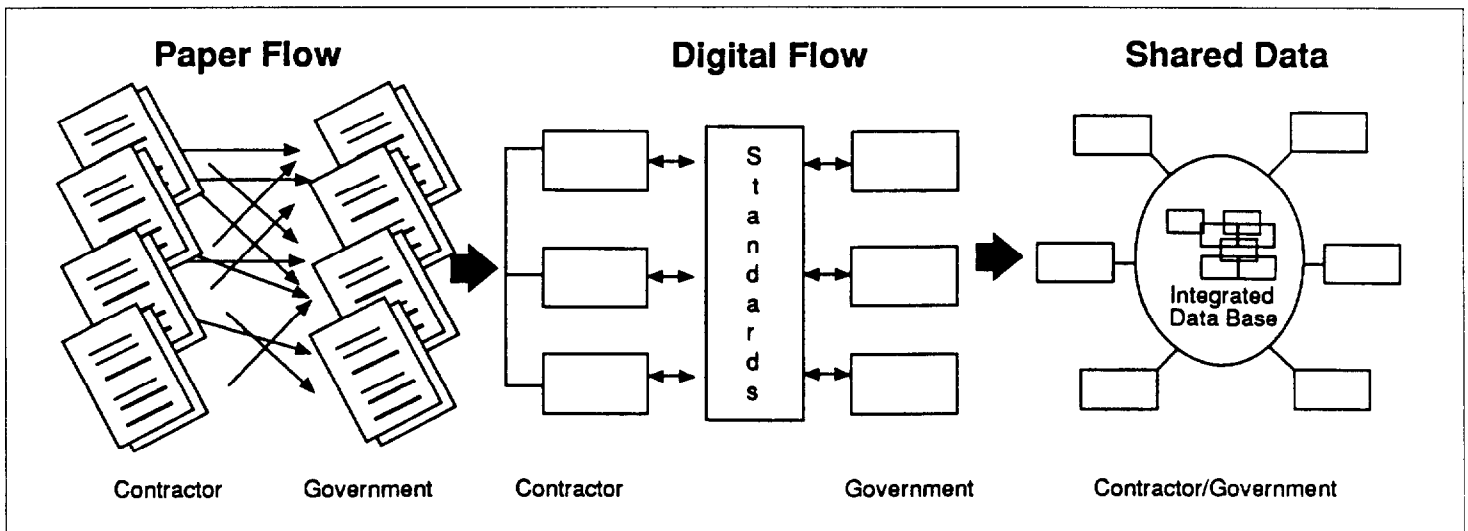
Source: Department of Defense

Weapons Systems Support Requires Tons of Paper

Weapons systems technical data (commonly referred to as logistics support information) is voluminous. Literally tons of paper containing the data are generated and managed each year. For example, the technical manuals needed to perform maintenance and repair on a Navy destroyer, the U.S.S. Vincennes, weigh 23.5 tons. Overall, the Navy maintains more than 237 million drawings and more than 15 million

technical manuals, at an annual cost of $4 billion. The Air Force and the Army maintain similar amounts of data at similar costs.

The amount of paper generated is high because of the many types and uses for the data. These data, which originate with the contractors who produce technical support data as the weapons system is being designed and developed, are delivered to Defense with the weapons system. Eventually, weapons systems support data include the technical data and drawings used for the design, engineering, development, procurement, maintenance, and repair throughout the weapon's life cycle. Some examples of technical data are (1) technical orders and manuals describing operation, repair, and test procedures for the weapons systems and (2) engineering drawings and specifications used to prepare what Defense refers to as bid packages to contract for the manufacture of spare parts once the weapons systems design contractors are no longer involved.

Paper-Based Logistics Support Is Time-Consuming and Expensive

The current manual management process for logistics support is complex, tedious, and labor-intensive, especially in managing updates and changes. According to Defense officials, when changes to existing technical manuals are made it can take months for the changed pages to be duplicated, sent to each holder of a technical manual, and incorporated into the manuals. Therefore, a repair technician does not always have the latest version of the technical manual.

According to Defense officials, the manual management of logistics support data can greatly increase the time needed to prepare the bid packages used to purchase spare parts for older weapons. Information for spare parts is kept on aperture cards—punched cards with a microfilm picture of a technical diagram or engineering drawing inserted in the middle. In most cases, only one card for each part exists at a facility, and if the card is missing, it can take some time to locate or replace it.

CALS Is Defense's Move Toward an Automated Support System

In 1984 Defense realized if the data generated to support a weapons system were digitized,[1] it could take advantage of computer technology to access and generate technical information in a more timely and efficient manner, and thereby significantly reduce the cost of supporting a weapons system over its useful life. The concept of CALS was developed in a joint Defense-industry study under the auspices of the Institute for Defense Analyses. This study, chartered by the Assistant Secretary of Defense (Manpower, Installations, and Logistics) and the Under Secretary of Defense (Research and Engineering) in 1984, looked at Defense's and industry's information requirements, architecture needs, and the policy and technical issues that needed to be resolved for successful implementation of CALS.

The study provided recommendations for CALS development and implementation that were the basis for two memorandums from the Deputy Secretary of Defense, one dated September 24, 1985, and one dated August 5, 1988. These memorandums, which compose the only official guidance for implementation of CALS, stated that the goal of CALS was to "establish plans to acquire, process, and use logistics technical information in digital form."

The scope of the CALS initiative has changed since 1985. Originally conceived to digitize technical orders and manuals, it was known as the Computer-aided Logistics Support initiative. The concept soon was expanded to include the technical data generated during the weapons systems design, manufacture, and procurement processes, and CALS was changed to the Computer-aided Acquisition and Logistics Support initiative. By incorporating the principles of computer-aided design and manufacturing, as well as concurrent engineering, with the existing CALS concept of digitizing technical manuals, creating data once and using them many times for different purposes became a technical possibility for CALS. This possibility was included as one of the goals of the CALS initiative.

The CALS initiative requires not only Defense's commitment, but private industry's commitment and cooperation as well. Industry also faces the need to change from a paper-intensive to a digitized environment. In both cases, the proliferation of disparate automation efforts has resulted in what are known as islands of automation, creating a need for interoperability and communication between dissimilar systems. The

[1]A process to convert existing drawings and data to electronic pulses. Once the data are digitized, the electronic pulses can be stored for future retrieval on magnetic, optical, or laser devices.

solution proposed to satisfy these needs was the development and use of internationally accepted, commercially available standards for data exchange.

Benefits Could Be Significant, but Difficult to Quantify

CALS has the potential to save time and money, and provide a better way of doing business. Changes to automated manuals could be made virtually overnight, and the technicians would have the latest information at their fingertips. A report issued by the CALS Industry Steering Group concluded that CALS benefits are significant, but remain difficult to measure using traditional cost/benefit methodologies.[2] The report further stated that, as the implementation of CALS proceeds, better and more comprehensive CALS benefits information will become available.

Defense believes CALS will provide benefits in four areas: engineering (up to 60 percent time savings in design activities); acquisition (up to 98 percent reduction in data errors); manufacturing (up to 80 percent improvement in quality); and life cycle support (up to 50 percent reduction in time for technical document changes). Private industry experience seems to confirm such savings. A major airline company that has an automated technical manual system for its aircraft maintenance facilities reports that its technicians perform 40-percent more work because of time saved in accessing information. In commenting on a draft of this report, Defense officials indicated that they are establishing an organization and process for documenting the business value of CALS.

Defense's Management Structure for Implementing CALS

The CALS management structure consists of the CALS Steering Group, the Office of the Secretary of Defense (OSD) CALS Policy Office, and the individual services' CALS management offices. (The CALS Industry Steering Group, composed of representatives from private industry, serves in an advisory role.) No single entity has authority or budget control over CALS projects. The Defense CALS Steering Group provides executive direction and serves as the corporate board of directors in formulating CALS policy and implementing the CALS program within Defense. It is composed of deputy-secretary-level representatives from each of the military services, the Defense Logistics Agency (DLA), and OSD.

The OSD CALS Policy Office provides the chairman for the CALS Steering Group, and acts as a "catalyst and liaison" for CALS among the services

[2]Computer-aided Acquisition and Logistic Support (CALS) Benefits Working Group Report. CALS Industry Steering Group (Sept. 8, 1989).

and between the services and private industry. Additionally, the Policy Office coordinates work between Defense and the Industry Steering Group, and is responsible for the standards development and testing. Each of the services and DLA has established CALS management offices to coordinate CALS-related activities within their respective departments. The figure below shows the CALS management structure, and how the components we discuss in this report relate. In commenting on a draft of this report, Defense officials indicated that they were restructuring the CALS organization. As a result, some of the organizational names and lines of authority depicted in the figure may change.

Figure 1.2: CALS Management Organization
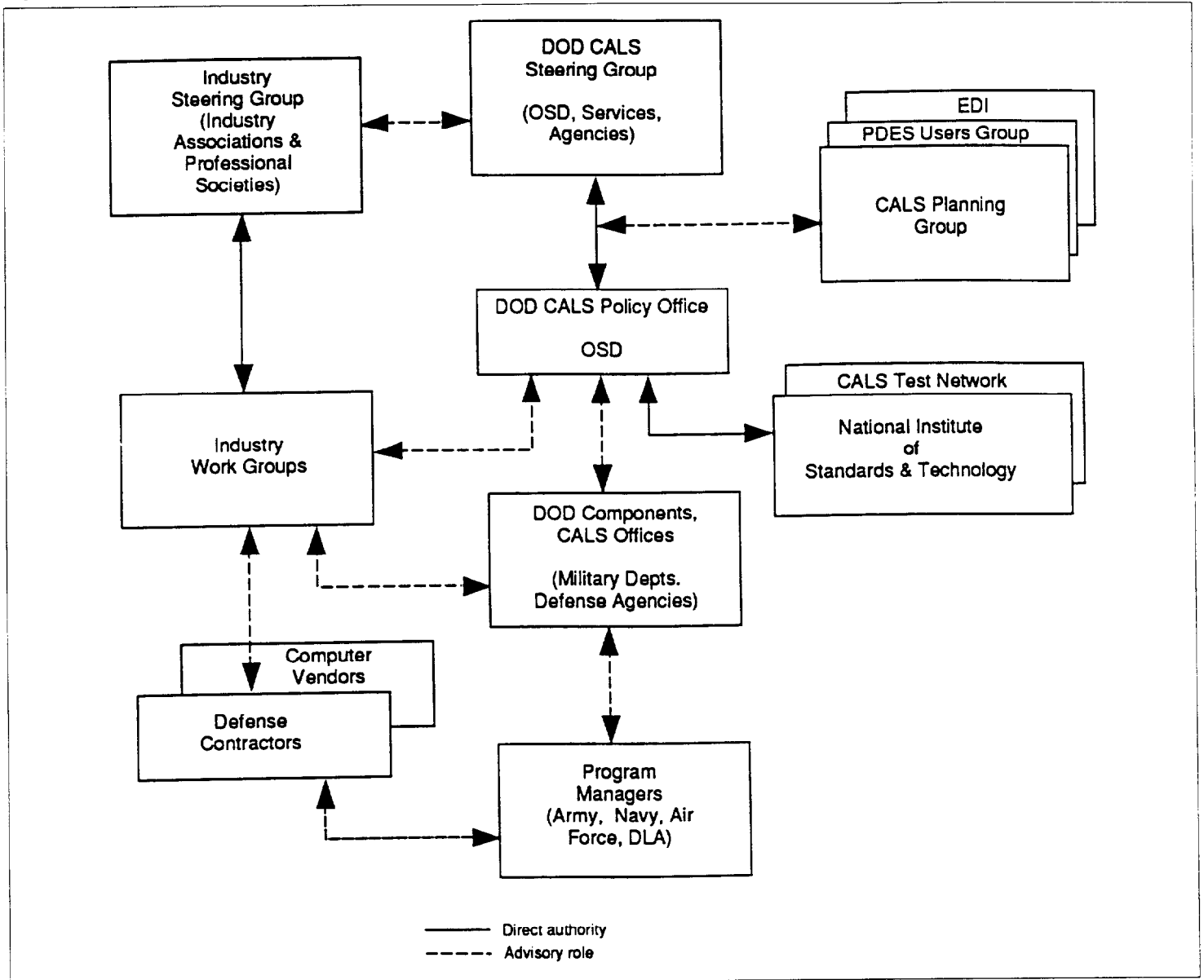
Source: Department of Defense

Objectives, Scope, and Methodology

In March 1990, the Chairman, Subcommittee on Readiness, House Committee on Armed Services, requested that we review the CALS initiative. Our objectives, as agreed with his office, were to (1) evaluate Defense's progress in implementing CALS, and (2) determine how well the services

are coordinating their CALS-related projects, including the development of automated technical data systems. This report focuses on the importance of CALS to Defense.

To evaluate the progress made in implementing CALS, we identified existing guidance, and measured the services' progress against this guidance. We then assessed the services' individual efforts in fostering implementation of CALS within their own units. This included analyzing policies and procedures issued by the services to their subordinate units, as well as any follow-up efforts. We interviewed officials of the CALS Policy Office, as well as Air Force, Army, DLA, and Navy officials involved with CALS management. We also met with Air Force Audit Agency officials concerning their recent review of Air Force CALS implementation activities. Because the Army had focused its CALS implementation efforts on the development of the Army CALS system, we received technical briefings and conducted interviews with several of the competing contractors for that system. To obtain information on how private industry was progressing toward an automated support system, we interviewed officials in private industry.

To evaluate the extent of coordination among the services' CALS-related projects and to determine if duplication of effort exists, we analyzed and compared documents describing system requirements, justification, and economic analysis. We interviewed program managers responsible for systems identified by the services as CALS-related to obtain information on both the similarity and interoperability of the systems.

To evaluate Defense's overall CALS implementation strategy, we examined the role of OSD to determine if an expanded role might result in better direction and coordination of CALS implementation efforts. We examined an Institute of Defense Analyses study and recommendations on how CALS should be managed.

We performed our work at the OSD CALS Policy Office and the Air Force, Army, and Navy CALS management offices at the Pentagon, Washington, D.C.; the DLA CALS management office in Alexandria, Virginia; and the Air Force CALS office and Air Force Audit Agency at Andrews Air Force Base, Maryland. We visited CALS-related systems development offices at Air Force Systems Command and Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio; the Navy Printing and Publishing Service at the Navy Yard, Washington, D.C.; and the Army Configuration and Engineering Data Management Division, Fort Belvoir, Virginia. We

also visited the CALS standards development office at the National Institutes of Standards and Technology (NIST), Gaithersburg, Maryland. We visited Army CALS program offices at BDM Corporation, McLean, Virginia; Computer Sciences Corporation, Moorestown, New Jersey; and TRW, Incorporated, Redondo Beach, California. We met with CALS Industry Steering Group members at Northrop Corporation, Los Angeles, California; Boeing Corporation, Seattle, Washington; and General Electric Company, Aircraft Engine Division, Evendale, Ohio.

Our review was performed between March 1990 and July 1991, in accordance with generally accepted government auditing standards. The Department of Defense provided written comments on a draft of this report. These comments are incorporated throughout the report as appropriate, and are reprinted in appendix II.

Lack of a Coordinated Approach Slows CALS Implementation

Since the CALS initiative began in 1985, Defense has made limited progress in achieving its primary goal—a completely automated weapons systems support environment. To achieve CALS' overall goal, the Deputy Secretary of Defense set 1990 as a target for requiring data standards in contracts as well as making substantial progress toward developing the capability within Defense to receive and use digitized data. However, Defense is still a long way from achieving its goal. Further, the early CALS guidance left it to each service to develop its own implementation strategy, and this decentralized, fragmented approach led to some duplication of effort and could lead to more unless a coordinated, Defense-wide plan is developed.

Defense Does Not Have an Overall Implementation Plan

The concept of CALS was developed in a 1985 joint Defense-industry task force study that looked at Defense and industry's information requirements, architecture needs, and the policy and technical issues that needed to be resolved for successful implementation of CALS.[1] In its report, the task force recommended five options for implementing CALS and cited the establishment of an OSD-level office with overall authority and control of the resources as the most effective option. However, the Deputy Secretary of Defense did not implement any of the recommended options. He established a policy office within OSD responsible for coordination with industry and the development of CALS standards, but gave the services responsibility for developing their own implementation strategies and plans and control of the resources needed to implement CALS projects.

The task force report was the basis for the two Deputy Secretary of Defense memorandums, one dated September 24, 1985, and the other dated August 5, 1988. These two memoranda and a recently revised Defense instruction[2] constitute the only overall guidance on CALS to date. These memorandums established the goal of requiring data standards in contracts and making substantial progress toward developing the capability within Defense to receive and use digitized data by 1990. However, no overall implementation plan or interim milestones were established for meeting these goals.

[1] Report of the Joint Industry-DOD Task Force on Computer Aided Logistics Support (CALS), Institute for Defense Analyses (June 1985).

[2] Department of Defense Instruction 5000.2, Feb. 23, 1991, provides limited additional guidance for implementing CALS.

Because the Deputy Secretary directed a decentralized approach to implementing CALS, each service has pursued a different strategy. Each service has its own definition and implementation strategy for CALS, each has established a CALS management office, and each is at a different stage in its CALS implementation efforts. The Air Force established a CALS management office in 1986, and the Navy, Army, and DLA all established offices within the past 2 years. These service offices disseminate information from the OSD CALS Policy Office and CALS Steering Group and coordinate CALS-related activities within their respective departments. Only the Air Force has developed a specific implementation plan, but it has not been updated since 1987. Each service develops, manages, and defends its own CALS development projects and budgets. This decentralized approach has resulted in a scattered, uncoordinated approach, causing limited progress in some areas and duplication of effort in other areas.

According to the Policy Office, this centralized policy and decentralized implementation approach was taken to stimulate CALS implementation in as many areas as possible. However, the lack of an overall plan and specific implementation milestones has resulted in each of the services and OSD having differing opinions of what CALS should be, what it should encompass, and how it should be implemented. In addition, without measurable goals or milestones it is impossible to measure progress. Further, the costs of CALS-related projects are not centrally collected or readily identifiable in the budget submissions, making it difficult to determine how much has been spent on CALS over the past 5 years and how much will be spent in the future.

In commenting on a draft of this report, Defense officials indicated that they have begun to develop a baseline of current CALS projects and systems, an assessment of this baseline, and a roadmap for achieving both near-term and long-term CALS' benefits. They further indicated that this assessment and roadmap will form the basis for the development of a Defense-wide implementation plan for CALS.

CALS Goals Have Not Been Achieved

The early CALS guidance directed the services to require CALS data exchange standards in all weapons systems entering production in 1990 and beyond, and to rapidly develop the capability to receive, transmit, and use technical information in digital format. However, data exchange standards are still being developed and the services have made only limited progress in acquiring the systems they need to receive and use data in digital format.

Data Exchange Standards Are Still Being Developed

The CALS guidance issued by the Deputy Secretary of Defense in 1988 directed the services to require compliance with CALS standards in any weapons system contracted for after 1988 or entering production in 1990 or beyond. However, the standards are in various stages of development, and confusion exists over whether they are ready to be required in all contracts. In addition, service officials contend that most program managers believe the Deputy Secretary's guidance was too vague to be followed and that consideration of CALS is sufficient to comply with the guidance.

There are seven CALS standards being developed by NIST, under contract to the OSD CALS Policy Office. The CALS standards include specifications for graphic representations, text, two types of data formats, communication protocols, data base queries, and compression/decompression algorithms for both storing and transmitting data. These standards are important because, under CALS, many different organizations will be sharing data from different computer systems. Without standards, this sharing would be impossible. According to NIST officials, standards are reached by consensus among interested parties, there are no time frames for their development, and they are subject to many revisions. According to NIST, the two standards pertaining to data base queries and compression/decompression algorithms are complete and ready to be incorporated into contracts. The remaining five are in different stages of completion and testing.

Some confusion exists within Defense components on the adoption of CALS standards. While two of the seven standards are complete, some Defense contractors believe that the two are not ready to be required in contracts because they have not been thoroughly tested. OSD has not established target dates for completing the standards or incorporating them into weapons contracts.

Services Are Not Ready to Receive and Use Digital Data

The Deputy Secretary of Defense's 1985 guidance directed the services to aggressively work toward achieving CALS goals by, among other things, rapidly increasing the capability to receive and transmit information in digital form by 1990. To do this, Defense needs to develop automated systems and networks to receive and use digitized data from contractors, but it has not. Contractors have stated that they are ready to deliver weapons system technical data in digitized format (and in compliance with the two completed CALS standards), but the services do not have the capability to receive it.

The services have made some progress in their ability to receive digital data by making existing engineering drawing repository systems compliant with the completed CALS standards. These repository systems are storage systems for engineering drawings; however, these repository systems do not have the capability to distribute and generate digital support data such as technical manuals, repair standards, test procedures, specifications, and training materials. The systems needed for these types of technical data have not been developed, nor have the services developed plans for integrating data from various sources.

Services' Diverse Strategies Could Lead to Duplication

The services have a number of automated system development projects in various stages of completion designed to increase their ability to receive, store, manage, and transmit digital data. However, because these projects are not part of a single overall plan and are not clearly identified in budget submissions or other documentation, it is difficult to precisely determine the scope and cost of these projects or how they relate to each other. None of the services treat CALS development efforts as a separate budget line item, nor are they separately identified as CALS projects in the information technology budget exhibits. Rather, they are listed in miscellaneous ADP budget line items or buried in weapons systems budget line items. Despite these limitations, we identified over $5.2 billion in ongoing and planned CALS-related projects over the next several years (see app. I).

The joint Defense-industry task force report recommended that a policy be established to direct and encourage the integration of existing islands of automation. The Deputy Secretary's 1988 memorandum that provided CALS guidance directed the services to follow CALS principles of standardized data and shared data bases for the automation of technical information used for weapons systems entering production in 1990 and beyond. Although the guidance allows the Defense components to develop their own implementation strategy to meet their particular needs, it also mandates that these implementation strategies be coordinated.

In the past, the services have invested more in engineering drawing systems than in any other type of technical data systems, and some duplication of effort has occurred. As we reported earlier, many of these technical data systems perform virtually the same tasks, have similar

work-load characteristics, and face common problems.[3] Each service
developed a system to automate the receipt, storage, and distribution of
engineering drawings. The Army and Air Force systems are older sys-
tems, and these services plan to spend about $212 million to modernize
these systems and to enter existing engineering drawings into the sys-
tems. According to Navy officials, the Navy system is a more current,
state-of-the-art system that could be used by the Army and Air Force.
However, no effort is being made to coordinate or consolidate these
system modernization efforts.

Other service CALS projects are in early system development phases, and,
if not coordinated, could lead to duplication of effort. For example,
while the Army is developing Army CALS—a project to develop an
overall architecture for automated technical data systems and networks
for Army bases—the Air Force and the Navy are beginning to develop
their own CALS architectures. The Army believes that its CALS architec-
ture development can serve the needs of the Air Force and Navy, but no
effort was made to coordinate and consolidate these development
efforts until the Army was directed to do so by Defense's Major Auto-
mated Information System Review Committee in January 1991. The
Army has an effort underway to identify the other services' require-
ments and determine if they can be met through Army CALS.

Similarly, the Air Force last year proposed to develop the Joint Uniform
Services Technical Information System (JUSTIS) as a standard CALS
system for managing technical orders. However, the objectives of Army
CALS, discussed above, and JUSTIS seem to overlap and the relationship
between the two programs is not clear. JUSTIS was formerly the Air Force
Technical Order Management System. However, it never progressed
beyond the design phase because, according to Air Force officials, it suf-
fered from low priority and lack of funding. The Air Force is currently
surveying the Navy and Army to determine what changes need to be
made for JUSTIS to fit their needs. However, JUSTIS is only in the planning
stage—no user systems or overall technical order architecture has been
developed—and it is not funded.

The implementation of CALS is spawning in each of the services many
separate technical data system development efforts as part of major
weapons systems programs such as the B-2 bomber, Advanced Tactical
Fighter, Light Helicopter, and SSN-21 submarine. Although the costs of

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[3]Data Management: DOD Should Redirect Its Efforts to Automate Technical Data Repositories, (GAO/
IMTEC-86-7, Mar. 13, 1986).

these systems are not easily identified because they are part of the overall weapons costs, they will undoubtedly cost millions of dollars. For example, the Improved Technical Data System is being developed to automate technical data associated with the B-2 bomber. The estimated cost of developing this system is nearly $300 million. It is not clear how this technical data system will relate to other such weapons-system-unique systems or to centrally developed technical order data systems, such as JUSTIS. No effort currently exists to define the relationship or coordinate the development of these systems.

Defense Has Begun to Address the Need to Better Coordinate CALS

Defense has begun to address the need for better coordination among the services through its Corporate Information Management (CIM) initiative. CIM, which was established by the Deputy Secretary of Defense in October 1989, has three main objectives: to identify and implement management efficiencies throughout the information system's life cycle, to eliminate duplication of effort in the development and maintenance of multiple information systems designed to meet a single functional requirement, and to ensure that information systems support policy directions.

While CALS and CIM share some goals—to develop standard information management practices and automated systems—they are managed by separate OSD organizations. CIM is managed by the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence and encompasses all of Defense's functional or business areas. CALS is managed by the Assistant Secretary of Defense for Production and Logistics and encompasses one large business area—technical data management. In commenting on a draft of this report, Defense officials indicated that CALS has been established as a CIM program and will be managed in accordance with CIM principles and procedures.

Conclusions, Recommendations, and Agency Comments

Conclusions

CALS—the initiative to move from paper-based, manual logistics support to fully automated logistics support—is probably one of Defense's most ambitious automation projects. CALS is certainly a worthwhile effort, but Defense's current approach to implementing CALS is not providing the central direction needed to implement it effectively and in a timely fashion. Defense's approach—developing standards at the OSD level and leaving implementation to the services—has had mixed success. Standards are being developed and this is clearly a step in the right direction. However, leaving implementation to the services has resulted in little progress in the services' ability to receive, manage, and distribute CALS-compliant data and has resulted in duplication of each others' efforts.

In order for CALS to succeed, Defense needs a vision of what it wants to achieve and a step-by-step plan describing how it will achieve its vision. Additionally, a Defense-wide strategy for implementing CALS would help solve the problem of whether or not CALS standards are ready to be used. Once this is determined, Defense can set milestones for requiring their use. Further, a centralized strategy could address the past and potential duplication of effort that appears to exist in developing CALS systems.

Furthermore, a centralized approach to implementing CALS has other potential benefits, similar to those hoped to be achieved by Defense's CIM initiative—improved business practices through standard information management, data, and automated systems. In these times of budget constraints, Defense must make every effort to eliminate redundancy and duplication, build standard systems where practical, and ensure that the funds available for CALS development and implementation are optimized. Clear goals and a Defense-wide plan would focus CALS efforts in these areas. Additionally, Defense could capitalize on the services' expertise by assigning responsibility for accomplishment of specific areas of the plan or specific CALS efforts to each service.

Recommendations

Because of CALS' tremendous potential benefits to almost every aspect of weapons systems support, we recommend that the Secretary of Defense ensure that ongoing actions to develop a coordinated, Defense-wide CALS implementation plan with clearly stated objectives and measurable milestones for completing those objectives are completed.

Such an implementation plan should include

- specific target dates for completing CALS technical data exchange standards for Defense and a decision process for determining when each standard is ready to be required in weapons systems contracts,
- a clear description of the relationship between ongoing and planned CALS projects and CALS overall objectives,
- clear areas of responsibility for each of the services and DLA with an emphasis on the development of common automated systems that conform to CALS standards, and
- clear lines of responsibility and authority within OSD for central direction and budgetary control of the services' efforts to implement CALS.

In addition, to facilitate coordination, oversight, and control of CALS initiatives, we also recommend that Defense follow through on the actions it has underway to manage CALS as part of Defense's CIM program and that the Secretary of Defense clearly designate all CALS automation projects, including those associated with weapons systems development programs, in the annual information technology budget exhibits.

Agency Comments

In commenting on a draft of this report, Defense agreed with our assessment of the CALS initiative and recognized that a coordinated approach for implementing the initiative was lacking. Defense identified several positive actions it is taking in response to the report. These actions include

- establishing CALS as a CIM program and managing it in accordance with CIM principles and procedures;
- restructuring and strengthening Defense's CALS organization to (1) clarify lines of authority and responsibility within OSD, (2) develop a baseline of the military services' CALS projects and systems, and (3) prepare a roadmap for achieving and measuring CALS benefits; and
- developing and implementing a Defense-wide implementation plan for CALS.

We are encouraged by Defense's positive actions and believe that, if properly carried out, these actions will go a long way in responding to our recommendations. The CALS implementation plan, which Defense expects to complete later this year, should provide a better basis for evaluating the adequacy of Defense's planned corrective actions. Defense's comments are included as appendix II.

CALS-Related Projects

Dollars in thousands

Service/system	Purpose	Cost[a]	Life cycle stage
Air Force			
Aircraft Battle Damage Repair	Develops data and methods to quantify aircraft battle damage resources	$5.110	Operational
Automated Technical Order System	Automates technical order changes	100,000	Operational
Automated Testability Decision Tool	Provides software for testing computer-aided design (CAD) systems	350	Development
CALS Research Center	Identifies and corrects problems in implementing CALS standards	50	Operational
Computer-Aided Design for Built-In Test	Provides test data base for CAD systems	700	Acquisition
Computer Model of a Maintenance Technician	Creates 3-dimensional model for CAD systems	2,487	Development
Depot Maintenance Automated Machining Technology Initiatives	Develops capability to link digital product data to automated manufacturing systems	2,785	Design
Engineering Data Computer-Assisted Retrieval System	Provides repository automation	85,600[b]	Operational
Engineering Information System	Improves integration, management, and use of engineering tools	4,310	Demonstration
Engineering Technical System	Manages digital engineering within Air Logistic Centers	2,480	Planning
Enterprise Integration Program	Demonstrates ability to create infrastructure to facilitate rapid introduction of advanced technologies	11,783	Acquisition
Geometric Modeling Applications Interface	Provides enhancements to CAD systems	0	Completed
Improved Technical Data System	Is a system acquisition program for B-2 bomber	296,000	Design
Integrated Design Support	Provides real-time access to technical data	3,580	Development
Integrated Information Support System	Is a demonstration project for integrating and interchanging information	0	Completed
Integrated Maintenance Information System	Is a user system for base-level maintenance	39,180	Development
Intersite Gateway	Provides communications for logistics management systems	0	Operational
Joint Uniform Services Technical Information System	Automates technical order management	800,000	Design
Logistics Assessment Work Station	Provides work stations for logistics support systems	0	Completed
Logistics Support Management Information System	Is a user system for B-2 bomber	Unknown[c]	Operational
Reliability, Availability, and Maintainability in Computer-Aided Design	Incorporates reliability, availability, and maintainability in CAD systems	2.038	Development
Spare Parts Production and Reprocurement Support System	Automates acquisition of spare parts	11,783	Acquisition

(continued)

Service/system	Purpose	Cost[a]	Life cycle stage
Weapon System Composite Demonstration	Demonstrates use of CALS for Advanced Tactical Fighter	0	Completed
Army			
Army CALS	Provides architecture for implementing CALS in the Army	842,800	Development
Diagnostic and Repair Expert	Is a user system for diagnostic maintenance of Abrams tank	959	Development
Digital Storage and Retrieval Engineering Data System (DSREDS)	Provides repository automation	126,300	Operational
Tactical Computer Processor Interactive Electronic Technical Manual	Is a project to generate and field digital technical manuals	60	Development
Technical Data/ Configuration Management System	Provides configuration management information for DSREDS	23,500	Redesign
DOD			
CALS Test Network	Provides means for testing of CALS standards	22,500[d]	Development
Navy			
Advanced Industrial Management	Supports integration of technical data bases	71,000	Implementation
Authoring Instructional Materials System	Is an automated authoring system for use in developing training	16,500	Implementation
Automation of Procurement and Accounting Data Entry	Automates clerical procurement tasks	946	Operational
Computer-Aided Design Acquisition 2	Is a hardware procurement for CAD systems	1,121,000	Acquisition
Drawings Procurement	Enhances technical data procured as part of a weapon system	50,000	Development
Engineering Data Management Information and Control System	Provides repository automation	696,400[e]	Development
Engineering Drawings Print on Demand System II	Provides printers to output CALS data	2,000	Procurement
Integrated Diagnostic Support System	Improves automation of weapon systems testability and diagnostics	39,994	Testing
Navy Automated Integrated Logistics System	Demonstrates compatibility between shore-based and shipboard logistics support systems	11,000	Development
Navy Print on Demand System	Provides specifications in CALS format for bid packages	5,000	Implementation
Navy Sea Command Engineering Drawing Asset Locator System	Will provide detailed index system to aid repository automation	2,300[f]	Completed
Purchase Early Procurement	Automates procurement tasks	[g]	Implementation
Rapid Acquisition of Manufactured Parts	Is a demonstration project for testing CALS capabilities and standards	41,929	Development
Shipboard Non-Tactical ADP Program III	Is an automated information system for management of CALS data on board ships	790,000	Development

(continued)

Service/system	Purpose	Cost[a]	Life cycle stage
Stock Point Logistics Integrated Communications Environment	Provides communication access for logistics	Unknown[h]	Implementation
Technical Manual Print On Demand System	Prints technical manuals	7,700	Acquisition

Note: The information on the projects contained in this appendix was supplied by the Air Force, Army, and Navy, in response to our request for "CALS-related systems." The information is presented to show the magnitude of the CALS initiative and is not intended to be a precise accounting of all CALS projects. We did not validate the information or determine whether information on all CALS-related projects was provided. Many of these projects and systems are developed as part of large weapon systems and it is, therefore, difficult to break out the costs. In addition, we recognize that some of the projects are not solely to support the CALS initiatives.

[a]Unless otherwise noted, costs shown in this appendix are those for fiscal year 1990 and beyond.

[b]Figure represents costs from fiscal years 1988 through 1995.

[c]According to Air Force officials, the costs for this program are embedded in the cost for the B-2

[d]Figure is based on cost estimate of $4 5 million per year for 5 years.

[e]Figure represents total life cycle costs of system, beginning in fiscal year 1989

[f]Figure represents total costs from fiscal years 1989 through 1991.

[g]Costs not separately maintained for this system.

[h]Costs provided us for this program were not broken down by year.

Comments From the Department of Defense

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-8000

PRODUCTION AND
LOGISTICS

JUL 30 1991

Mr. Ralph V. Carlone
Assistant Comptroller General
Information Management and
  Technology Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Carlone:

      This is the Department of Defense (DoD) response to the
General Accounting Office (GAO) draft report GAO/IMTEC-91-54,
"DEFENSE ADP: Improved Strategy Needed for Automated Logistics
Support Initiative," dated June 24, 1991 (GAO Code 510547), OSD
Case 8741. The Department is in general agreement with the
findings.

      The Department is currently taking actions to revitalize and
strengthen the DoD Computer-aided Acquisition and Logistics Support
(CALS) initiative. Those actions include: (1) establishing CALS as
a Corporate Information Management program; (2) restructuring the
DoD CALS organization; and (3) developing and implementing a DoD-
wide implementation plan for CALS.

      The DoD CALS initiative has recently been established as a
Corporate Information Management program. As such, information
systems developed to support the CALS initiative will be managed in
accordance with Corporate Information Management principles and
procedures. The CALS systems will be developed and deployed to
meet Defense Management Report functional cost reduction targets.
Elements of acquisition, design, manufacture, and support processes
will be redesigned, as necessary, to realize the full benefits of
CALS systems. In order to achieve timely results with low risk,
CALS systems will be developed and deployed through an evolutionary
acquisition approach.

      In order to better align limited DoD resources, the DoD CALS
initiative is undergoing a reorganization. The new organization is
based upon an integrated concept of operations that brings together
both the acquisition and logistics communities. The functional
responsibility for CALS rests with the Assistant Secretary of
Defense (Production and Logistics), who will ensure that CALS
requirements are incorporated in weapon system acquisition programs
as appropriate, and that CALS systems are developed and implemented
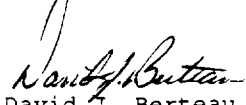in accordance with the DoD Corporate Information Management
program.

The management of the DoD CALS initiative will remain under the leadership of the Deputy Assistant Secretary for Production Resources. The Policy Office has been restructured and renamed the CALS Evaluation and Integration Office. That office will integrate personnel from the Office of the Secretary of Defense and the military services, as well, as technical personnel, currently working on the CALS initiative. The new office will have three divisions. The business division will be responsible for CALS budget preparation and tracking; the development of business case analyses for CALS; and outreach and training efforts, including small business issues. The functional division will be responsible for defining the user requirements for CALS in such areas as weapon system acquisition management, weapon system design and development, manufacturing, and logistic support. The technical division will be responsible for the development and refinement of CALS standards, testing, and ensuring that CALS systems are being developed and implemented in accordance with Corporate Information Management technical tools, methodologies, and policies.

The CALS Evaluation and Integration Office will be served by two advisory groups. The DoD CALS Steering Board will be enhanced to include participation from the Service acquisition community and the Flag Officers Steering Group. The CALS Industry Steering Group, under the leadership of the National Security Industrial Association, will be a focal point for industry input to the DoD CALS Evaluation and Integration Office.

The first task of the newly formed CALS Evaluation and Integration Office will be to develop a baseline of current CALS projects and systems. That effort will involve collecting and synthesizing business (including budget), functional, and technical information on each project or system. The information will be used in conjunction with an initial joint architecture, developed by the Joint CALS Management Office this past June, to prepare an assessment of the current baseline and a roadmap which will permit an evolutionary approach for achieving both near-term and long-term measurable benefits from DoD investments in CALS. This assessment and roadmap will form the basis for the development of a DoD-wide implementation plan for CALS.

In summary, the DoD recognizes that a coordinated approach for implementing CALS was lacking. However, the three major actions, which are currently underway, will result in an integrated approach that will better leverage limited resources, reduce duplication, and achieve and document the business value of CALS to the Department.

Sincerely,

David J. Berteau
Principal Deputy ASD(P&L)

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