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DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000
and
Headquarters
UNITED STATES MARINE CORPS
Washington, DC 20380-0001

IN REPLY REFER TO
OPNAVINST 4120.5
OP-403
1 July 1992

OPNAV INSTRUCTION 4120.5

From: Chief of Naval Operations, Commandant of the Marine Corps

Subj: DON COMPUTER-AIDED ACQUISITION AND LOGISTICS SUPPORT (CALS) POLICY AND STRATEGIC PLAN

Ref: (a) DEPSECDEF memoranda of 24 September 1985 (NOTAL)
(b) DOD Instruction 5000.2 "Defense Acquisition Management Policies and Procedures" of 23 Feb 91
(c) ASD (P&L) memo of 24 Dec 91 (NOTAL)
(d) 1988 Strategic Plan
(e) CNO memo Ser 00/0U500308 of 20 Nov 90 (NOTAL)
(f) ASN (RD&A) memo of 8 Apr 91 (NOTAL)
(g) SECNAV Strategic Goals of 10 Feb 92 (NOTAL)

Encl: (1) Department of the Navy Computer-aided Acquisition and Logistics Support (CALS) Policy and Strategic Plan

1. Purpose. To issue a Department of the Navy (DON) CALS Policy and Strategic Plan that establishes policy, plans and strategies for implementing CALS within the DON.

2. Background

a. Reference (a) approved a strategy for transitioning from paper-intensive weapon system support processes to a largely automated and integrated mode of operation. Reference (b) directed Department of Defense (DOD) components to develop automated systems to receive, store, distribute, and use digital weapon system technical information. Reference (c) established the DOD CALS Architecture as the framework within which CALS will be managed in DOD. The policies and plans in this instruction conform to the DOD CALS Architecture.

b. Reference (d) issued the original Navy CALS Strategic Plan. This instruction is derived from that plan. Reference (e) stated the Chief of Naval Operations' commitment to the expeditious, managed implementation of CALS throughout the Navy. Reference (f) tasked Program Executive Officers, Direct Reporting

Program Managers, and Systems Commands to aggressively incorporate CALS planning into their acquisition strategy and support implementation of CALS in accordance with the policies, plans, and coordination established by the Chief of Naval Operations (OP-04). This instruction constitutes those policies, plans, and coordination; and is in keeping with the Secretary of the Navy's Strategic Goals as given in reference (g).

3. Definition. CALS is a DOD initiative to transition from paper-intensive, non-integrated weapon system design, manufacturing, and support processes to a highly automated and integrated mode of operation. This transition will be facilitated by acquiring, managing, and using technical data in standardized digital forms.

4. Discussion. Enclosure (1)

a. Identifies key Acquisition and Logistics issues.

b. Establishes CALS as the DON response to these issues.

c. Defines the DON CALS Vision as a shared technical data environment called the Integrated Weapon System Data Base (IWSDB).

d. Establishes the DON CALS policy.

e. Directs the use of incremental implementation planning to reduce risk.

f. Defines three implementation phases:

(1) Current phase (1992-1996)

(2) Transition phase (1996-2000)

(3) Target phase (2000-2010)

g. Defines the functional requirements needed to create, manage, and use digital technical information in an Integrated Weapon System Data Base.

h. Provides a Strategic Plan to implement CALS in the Navy Department.

i. Defines an organizational structure to manage CALS implementation in the Navy Department.

5. Responsibilities

a. The Deputy Chief of Naval Operations (Logistics), OP-04 and the Deputy Chief of Staff, (Installations and Logistics), CMC-L. Responsible for coordinating the expeditious development of CALS within the Navy and Marine Corps.

b. Systems Commands, Program Executive Officers, and Direct Reporting Program Managers. Responsible for supporting the implementation of CALS in accordance with the policies, plans and coordination established by this instruction.

c. Warfare sponsors. Responsible for ensuring weapon system requirements support the expeditious implementation of CALS throughout the DON.

6. Action. All Systems Commands, Program Executive Officers, and Direct Reporting Program Managers will develop CALS implementation plans that support the policies and goals in this instruction. These implementation plans will be coordinated through the Navy and Marine Corps CALS/Flexible Computer Integrated Manufacturing (FCIM) Coordination Office.

MARCORPS Signature

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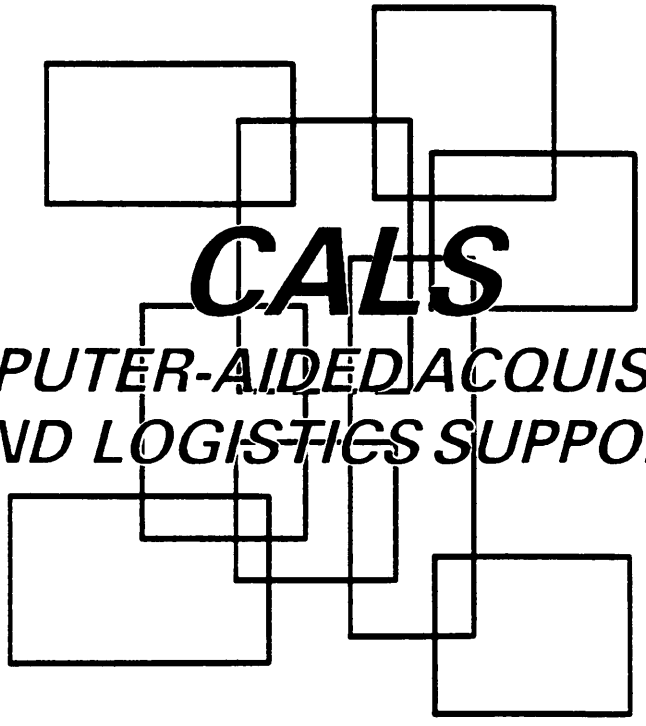

POLICY AND STRATEGIC PLAN

Enclosure (1)

DON CALS POLICY AND STRATEGIC PLAN

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CHAPTER 1

TECHNICAL DATA CHALLENGES IN THE 21ST CENTURY

1. The Challenge

a. The Navy and Marine Corps team is at a crossroads in its history. World events and the nation's economy are producing intense pressures to reduce defense expenditures. At the same time, combat ready forces continue to be essential to the nation's freedom. The need for properly equipped sailors and marines to deter aggression may well outstrip the resources available -- unless a commitment is made to significantly improve business processes. Maintaining naval strength under significantly reduced funding and manning levels demands that acquisition and logistics support processes become more efficient and effective. This must be done with considerable urgency.

b. To meet this challenge, the Secretary of the Navy has tasked the Navy and Marine Corps to optimize the effectiveness of the Navy-Marine Corps team by leading people and managing systems as an integrated force within a quality-focused organization. Specifically, three of the the Secretary's Strategic Goals require the Department of the Navy (DON) to:

(1) Continue improvement in the acquisition process to achieve timely design, development, test, manufacture, and support of maritime weapon systems for the Navy-Marine Corps team.

(2) Reduce operating and support costs in all aspects of system design and field fully supported systems, emphasizing interoperability and operational availability.

(3) Foster improved contractor/government working relationships

c. Improving technical data management processes will significantly enhance the DON's ability to achieve these goals. Technical data is the lifeblood of the acquisition and logistics infrastructure. Virtually all policies and decisions are based on technical data. Technical data is also required to implement policies, execute decisions, and monitor results. Improving the quality of technical data will improve the quality of the processes it supports.

d. Business as usual with limited funding and inefficient processes will eventually compromise readiness. The DON's ability to maintain mission readiness with allocated resources depends directly upon its ability to efficiently use technology and improve processes. A clear-cut need exists for efficiency "multipliers" - tools that will permit the DON to be more productive. Computer-aided Acquisition and Logistics Support (CALS) is one such tool. The remaining sections of this chapter describe current process inefficiencies and show how CALS can improve them and contribute to the achievement of the Secretary's goals.

2. Technical Data Dependent Acquisition and Logistics Processes

a. Acquisition and logistics processes support operations in the following ways. Acquisition develops and procures the means to satisfy strategic or tactical mission needs. Logistics fields the weapon systems and provides operators with the support for accomplishing their missions.

Figure 1-1 illustrates the technical data dependent acquisition and logistics support processes. These operations-supporting processes (and their enabling detailed business processes) span the entire life cycle of any weapon system from conception to it's eventual retirement.

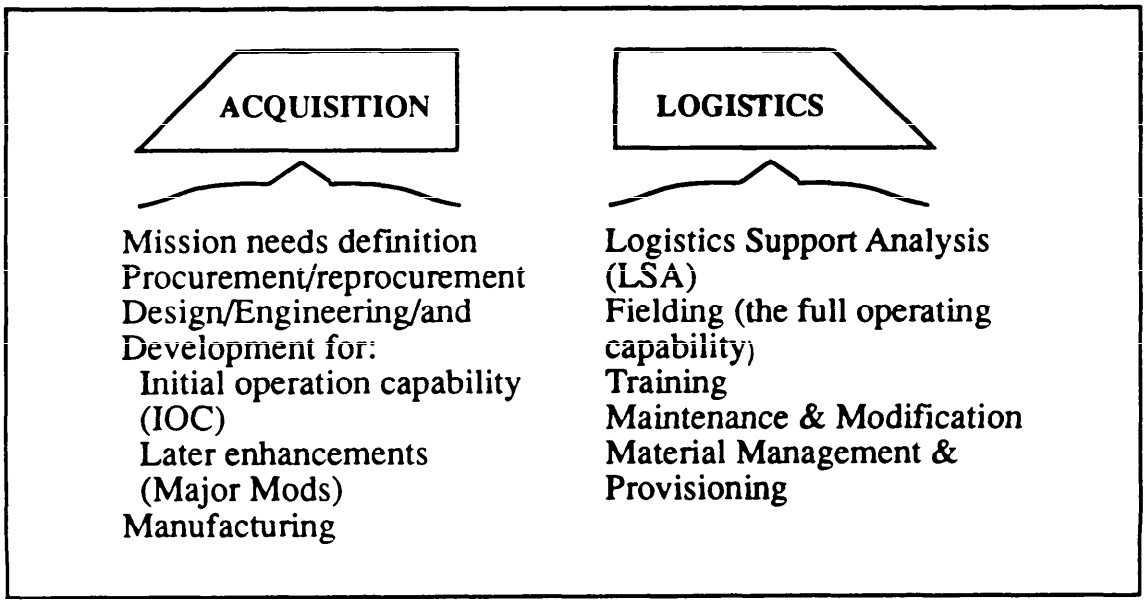

Figure 1-1. Data Dependent Acquisition and Logistics Support Processes

b. To achieve greater operational effectiveness, today's weapon systems are more complex, requiring more logistic support and use of more detailed maintenance and operating instructions. This trend towards complexity, combined with the accelerating evolution of computer technologies, will continue well into the next century. The acquisition and logistics infrastructure must therefore keep pace.

3. Technical Data Dependent Acquisition and Logistics Process Issues.

a. Today's acquisition and logistics processes are the product of work methods that have been designed and re-configured to satisfy many specific and narrow needs. Managers of these processes are now struggling to deal with increasing technical data complexity in different ways. Today's acquisition and logistics support processes do not permit available funds to be used efficiently. Rather than creating technical data once and using it several times, the opposite takes place. Each group of data for a given system is often maintained separately from the others, and is duplicated in different forms and data formats. Key issues are:

(1) A large percentage of the existing inventory of technical data is still not in useful digital formats. Despite ongoing paper-to-digital conversion efforts, most existing technical documents are not readily available digitally. The available technical data supports only limited functions. Value will be added when data can be processed automatically, integrated, and enhanced for more advanced uses.

(2) Acquisition is principally a non-integrated, paper-based process. Little digital integration exists among the three primary acquisition processes: procurement/reprocurement, design/engineering and development, and manufacturing. Acquisition involves numerous independently managed organizations, both contractor and government. This results in many variations in acquired data.

(3) Logistics is a largely non-integrated, paper-based process. Logistics support has little digital integration across its various processes (e.g., between maintenance processes and material management processes). Some logistic support applications have used some automation. Yet these systems are typically not integrated and require human intervention to pass data from one system to another and to interpret results.

(4) Technical, functional, and data content/meaning standards to support automation are incomplete. Existing standards are immature. Numerous standards still need to be developed and implemented.

4. Paper-based Technical Data Operating and Support Issues. Today's sailors and marines are inundated with the technical data needed to support their weapons. Today's technical data inventory totals millions of pages of text and illustrations, requiring updating at the rate of thousands of pages per year. One technical manual update can cost hundreds of dollars and take several months to complete. Rework caused by inaccurate technical data can account for as much as 10 percent of ship maintenance costs. The Ticonderoga class cruiser has over 23 tons of paper stored above the main deck in the form of operating and maintenance manuals, parts catalogs, engineering drawings, etc. Storage requirements are over 3000 cubic feet of space (the equivalent space and weight of 5300 gallons of fuel). The Navy and Marine Corps can no longer afford to do business this way.

5. Contractor/Government Data Exchange Issues

a. Technical data that is ultimately delivered to the government is created from disparate databases, frequently reduced to paper, and then often reentered into government databases. Both the amount of paper, as well as the great potential for errors due to uncontrolled duplicate data have created the need to improve the weapon system acquisition and support processes. The current paper-oriented, non-integrated systems cannot keep up with the additional volume and cannot support demands for accurate and timely technical data for acquisition, logistics, and support activities.

b. The lack of integration makes it hard to design systems "right the first time" and leads to costly design changes to ensure producibility and supportability. Currently, many different incompatible automated systems are used by weapon

system contractors to enter, update, manage, and retrieve data from weapon system databases.

6. Current Automation Efforts. Various DON activities have responded to these technical issues by developing several automated technical data management systems that capture specific sets of data. These data management systems are often referred to as islands of automation (IOAs). IOAs have been developed by individual commands and offices with different and sometimes divergent responsibilities who have placed little emphasis on integrating systems and data reusability. In addition, declining budget and personnel allocations will add to the difficulty of maintaining and operating these diverse systems.

7. The CALS Response

a. CALS is a joint initiative to improve the quality of weapons system design, acquisition, and logistics support processes. CALS is intended to improve technical data accuracy and timeliness while also reducing lead times and costs. CALS represents a commitment on the part of both industry and DOD to change the way business is conducted today by replacing traditional paper-based processes with automation-assisted innovative processes.

b. CALS will enable many of the process improvements required to achieve the Secretary's goals. Some examples are:

(1) Shortened weapon system design, development, production and resupply times will be possible through creating a shared data environment designed to generate and transfer required data to appropriate functions.

(2) The labor intensive development of duplicate data used for separate processes in design, manufacturing, and support will be eliminated.

(3) The amount of paper will be drastically reduced and replaced by accurate, timely, and cost effective digital technical data for acquisition, logistics, and field operations.

(4) Reduced "out of service" times for repair and overhaul will increase combat capability. This will result from integrated planning, automated tool design and setup, and more rapid parts support.

(5) Data will be shared by multiple systems, and common system applications will help achieve interoperability.

(6) Data consistency will be significantly enhanced as databases are linked together.

(7) Fewer errors in weapon system design and manufacturing will result from integrating key databases which can support these functions in a near real time environment. Producibility, reliability, and maintainability considerations will be integrated with computer-aided engineering and design tools.

(8) Improved Industry responsiveness will result from developing integrated data, automating of plant facilities, and industrial networking.

c. CALS is a long-term and complex undertaking. A comprehensive DON-wide technical data management process improvement strategy is needed. Without a comprehensive strategy, the DON will continue to manage acquisition and logistics support using data from separate sources, none of which can fully provide the needed services.

d. The efficient management of technical data will play a critical role in improving acquisition and logistics support processes. Technical data is a key DON resource that needs to be managed in a coordinated fashion. The DON CALS initiative is designed to provide the fleet and shore establishments readily accessible, integrated, and customized technical data that will enable efficient operations, acquisition, and logistics support.

e. Each new generation of ships and planes will be more complex. Requirements for additional technical data to support complex weapons systems are accelerating. Achieving the Secretary's goals requires technical data that is understandable, meaningful for the work at hand, accurate, and readily available. Furthermore, it must be delivered to DON fleet and shore establishment users at a low cost. The rising cost trends associated with the acquisition, management, and distribution of technical data using current processes are unsatisfactory.

f. CALS is the foundation for innovative acquisition and logistics processes. As shown in Figure 1-2, CALS provides access to integrated technical data for such major end user acquisition and logistics activities as Computer-Aided Design (CAD) and Flexible Computer Integrated Manufacturing (FCIM). This access will improve acquisition and logistics processes. Only with ready access to integrated digital technical data will the Navy and Marines be ready to meet the challenges of the 21st century.

g. The fact that this acquisition and logistics support dilemma is increasing is not due to lack of effort, but to the inadequacies of past approaches. Technology is no longer the barrier; appropriate technology is available to effect the necessary changes and integration. What is missing is a comprehensive DON vision and the cultural environment necessary for change. Improving DON acquisition and logistics processes will not be an easy task. The proliferation of more IOAs and the growing inventory of technical data will make improvements even more difficult and costly if delayed to the future.

h. The Navy Department is at a crossroads in its history. It can continue on its present course and try to do more with less using traditional approaches or it can chart a new course. The Secretary of the Navy has chosen a new course. That course is improved quality in support of the sailor and the marine. CALS will improve the quality of acquisition and logistics support processes by providing readily accessible, integrated, and customized technical data to all fleet and shore activities.

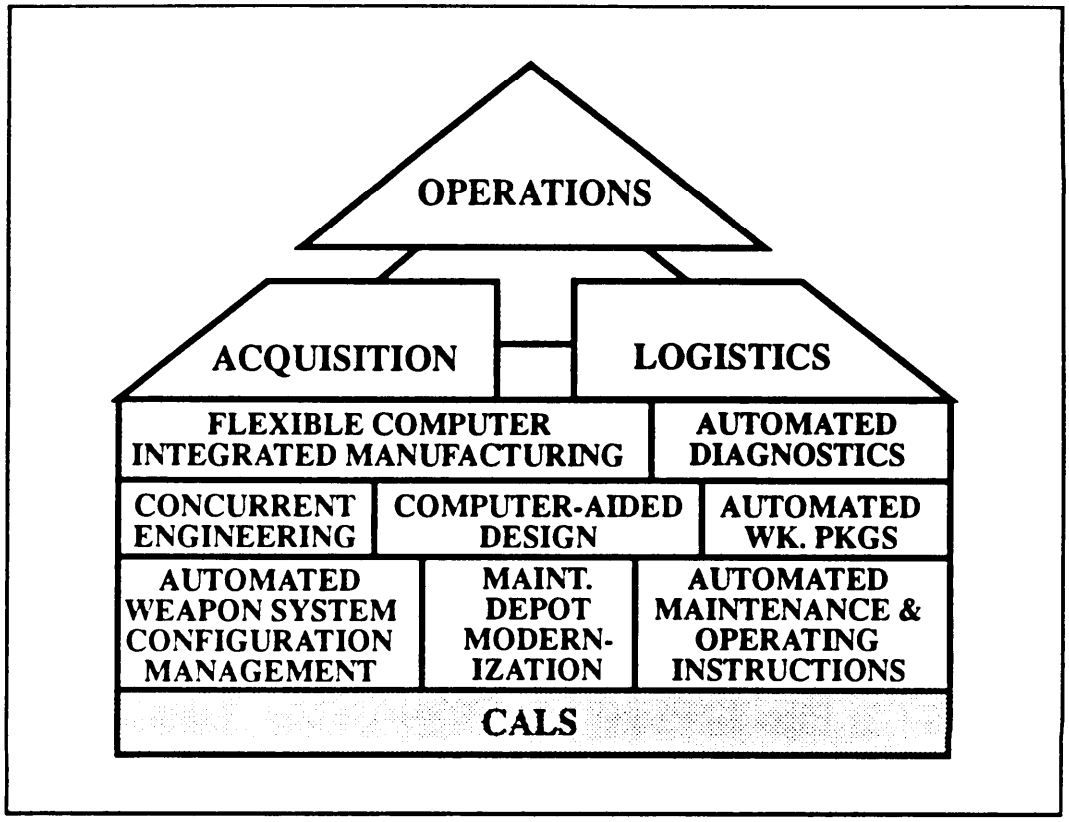

Figure 1-2. Innovative Acquisition and Logistics Support Processes Enabled By CALS

CHAPTER 2

THE CALS VISION

1. The 2010 DON CALS Vision. The 2010 CALS Vision is a shared technical data environment called the Integrated Weapon System database (IWSDB). The IWSDB will store and manage in accessible forms vast quantities of technical information on a large number of operational weapon systems and equipment. This information will support many DON acquisitions and logistics processes. The IWSDB is the central element required to support innovative business processes and continuously improve the efficiency of existing processes. Its concept is rooted in principles for structuring and managing complexity. Further discussion of these structuring principles will clarify the IWSDB.

2. Complexity Structuring Principle

a. Albert Einstein, the physicist, once noted that complexity is "nothing more than the structured replication of simplicity." Such controlled replication is absolutely essential in defining, developing, and loading the DON CALS IWSDB. To demonstrate how the complexity structuring principle can be used repetitively to accomplish very powerful and innovative results, consider a large, "informal," integrated, and still evolving database with which most people are quite familiar; the English language.

b. The English language now has 26 alphabetic characters, 10 single digits, and an additional small set of punctuation characters that make up a complete set of simple building blocks. The language also contains a set of evolving grammatical and syntactical rules that govern how these simple building blocks can be joined and structured through replication into larger reusable components such as words, phrases, and sentences. These reusable components have utility and are labeled for later referencing and locating, e.g., the U.S. Bill of Rights to the Constitution or a MIL-STD specification. Such combination of simpler components into more useful complex components is analogous to the Integrated Weapon System Data Base (IWSDB). The IWSDB will combine simple information entities into complex information products such as operating and maintenance procedures, manufacturing specifications, etc.

3. IWSDB Environment. The DON CALS IWSDB cannot be quite as informal, ambiguous, or vast in scope as the English language. Fortunately, it has a narrower focus: integration of technical information that is useful for supporting acquisition and logistics processes. Using Einstein's complexity structuring principle, an IWSDB will have the capability to:

(1) Distribute reusable information entities to many different users simultaneously.

(2) Create reusable digital entities of information that support the acquisition and logistics processes for each weapon system.

(3) Add, delete, modify, name, index, and integrate information entities from many different sources.

(4) Use information entities in various combinations to support DON fleet and shore establishment functions and user requirements.

(5) Accomplish the above in an affordable manner, regardless of the geographic location of the reusable information entities, or the organizational affiliations of the information users.

4. IWSDB Information Entities and Processes

a. CALS IWSDB information entities include: textual descriptions of maintenance procedures, warnings, cautions, product model structures, engineering drawings, lists of equipment, Integrated Logistics Support (ILS) data, management information on IWSDB usage to analyze where improvements can be made, etc. Effectively, they are reusable "chunks" (packets) of technical information that are created and stored once, then used many times. Each has the ability to be published, retrieved, or used on demand in any one of a variety of required forms. For example, information entities for engineering data, stored in a linked product model structure, could be represented once in a three dimensional model, then be published either as a solid model, a wire frame drawing, a parts list, or a technical illustration. ILS data associated with a specific part could be retrieved immediately because the data would be linked to the individual part in the three dimensional model.

b. These integral data packets, when stored in the IWSDB, will take the form of component entities of information extensively cross-linked and cross-referenced to each other. They may include new forms of data such as audio and video. Figure 2-1 presents a conceptual view inside the logical structure of the IWSDB, showing how information entities may be linked for both reuse as is and for further integration. Traditional data forms such as technical manuals will still be able to be published on demand, but will not exist in that form in the IWSDB.

c. Integrated weapon system technical information that is accurate, current, and readily accessible is the key to improving acquisition and logistics support processes. Automated and integrated digital data management is the mechanism that will enable significant process improvements to be made. Ease of access to the technical information provided by the IWSDB will permit sailors and marines to complete their tasks safely and efficiently.

5. User's View of the DON CALS Vision. Many process innovations and improvements will be needed to provide integrated technical information to different Navy and Marine Corps users. User capabilities and productivity will be enhanced significantly, resulting in increased efficiency. The following examples from various acquisition and logistics support processes better illustrate these future user capabilities. These examples represent only a fraction of the improvements that will result from implementing the DON CALS vision and are meant to illustrate the process improvements that will benefit the Navy and Marine Corps.

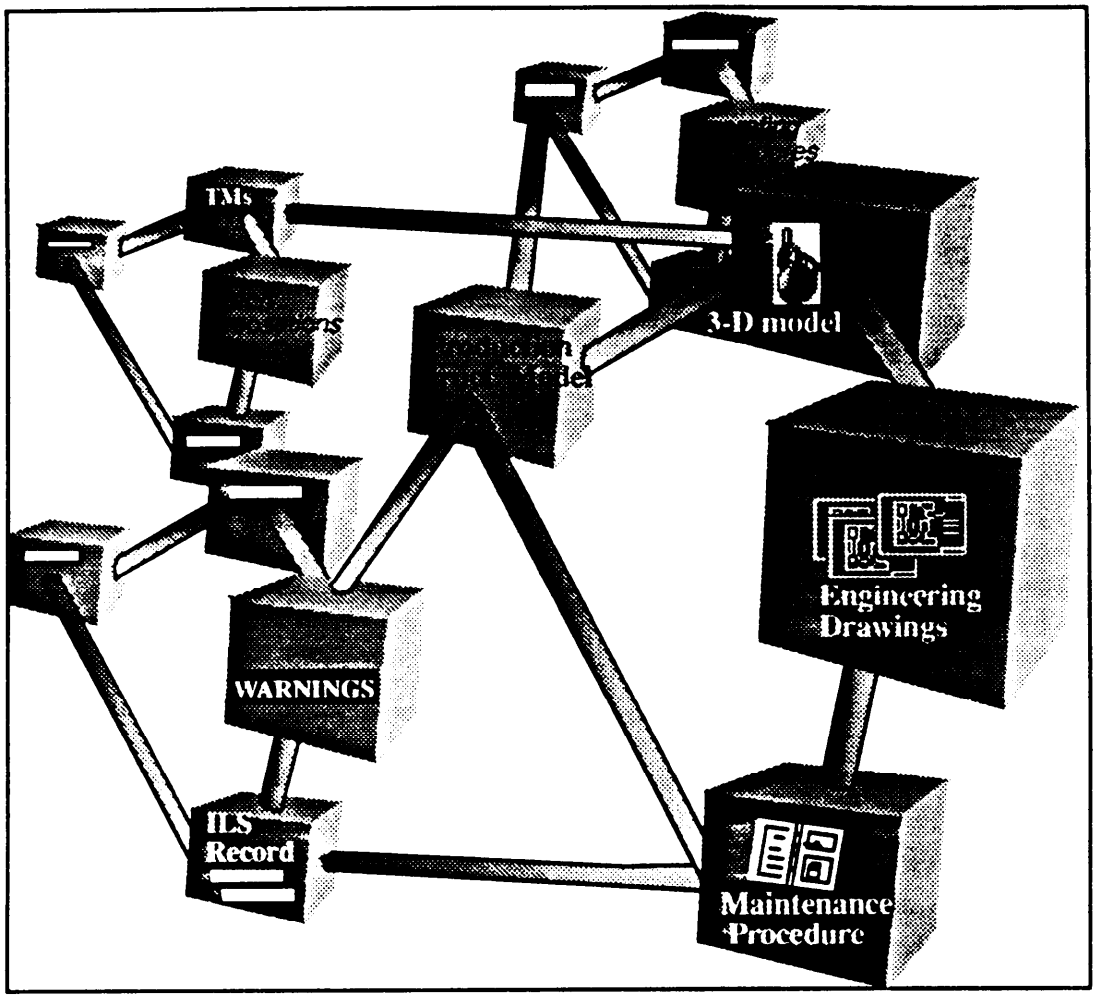

Figure 2-1. Integration of Information Entities Within The IWSDB

(1) Acquisition. The IWSDB will significantly improve the acquisition of new systems and the modernization of existing systems. Integrated digital data repositories, electronic networks, automated or automation-assisted verification, validation, and annotation capabilities will streamline system acquisitions and improve the quality of acquired systems.

The CALS IWSDB will enable process improvements such as integrated development of digital bid packages, electronic bids and orders, electronic transmittal of bid package documents, automation-assisted bid evaluations, and source selections to reduce administrative lead times for procurement processing. Contractor design and support information will be accessed or acquired digitally. Automation-assisted systems will verify that the data conforms to standards and contractual requirements, and will help in evaluating and validating data completeness, consistency, and contents.

(2) Design/Engineering. The CALS IWSDB will enable Concurrent Engineering and Computer-aided Design processes to support a variety of powerful tools and data compatibilities using their logically integrated databases and standards.

This will enable more complex and demanding weapon systems to be designed more efficiently.

Concurrent Engineering analysis and design will use advanced product models and automated 3-D design, engineering, and logistics support analysis tools operating on the same information base. These will increase component reusability, speed up the design iteration and integration process, improve overall product fitness and quality, and ensure product manufacturability, maintainability, modifiability, and reliability.

(3) Manufacturing. Local (and often rapid) manufacturing of components and assemblies is necessary to repair ships, planes, tanks, and various other systems and equipment. Rapid availability of the correct engineering data (e.g., digital part and assembly descriptions, specifications, etc.) from the IWSDB will facilitate such manufacturing.

Manufacturing processes will access the technical information in the IWSDB, and then use it to develop process plans to specify the tooling and sequencing of various processing operations. Digital technical information will allow the manufacturer to control tooling more efficiently during fabrication, test the manufactured components, and support multiple work orders and job requirements.

(4) Maintenance. The IWSDB will significantly improve the form, completeness, accuracy, and currency of technical information. Such quality technical information will improve maintenance at the organizational, intermediate, and depot levels. Better maintenance will improve weapon system availability and reduce life cycle support costs.

Maintenance operations will be supported with "smart" diagnostics and repair databases integrating and sequencing all procedures for a specific repair. Integrated product databases will increase the speed and thoroughness with which modifications are evaluated, designed, and incorporated. Linking related graphical, textual, and tabular files, and diagnostic routines into an Interactive Electronic Technical Manual (IETM), and integrating packages that concisely fit the task at hand will become a normal practice.

(5) Logistics Support. The IWSDB will allow logistics support to be acquired and provided in a near-paperless environment. It will integrate repair diagnostics, feedback data from field usage, engineering data, and logistics supportability data; this will result in improved design and performance.

(6) Material Management and Provisioning. The IWSDB will provide updated logistics supportability data to enable tighter and more accurate inventory management. For example, fault and reliability information will be captured, analyzed, and used to establish replenishment factors.

Supply support efficiency will be improved through adopting advanced inventory management practices. These practices will deliver provisions and parts when required, reduce equipment downtime, and systematically lower the on-hand ship and shore inventory levels. For unavailable items, there will be an automated search for likely cannibalization sources, based on utilization and mission priorities. In addition,

the development of automated bid sets and accurate configuration control will result in supply and inventory management improvements.

(7) Training. The need for continuous training of personnel grows unabatedly as weapon systems become more complex and operational doctrines stress coordination, interoperability, and high levels of performance. The IWSDB will provide integrated and more accurate information to support development and operation of improved and novel training aids.

Skill training will improve through reliance on computer-based training (CBT) applications for sea, air, and shore operations. Standardized instructional materials, tailored to specific normal and emergency situations, tasks and equipment, will facilitate cross-training and improve trainee performance. Such aids will flatten the learning curve for personnel and enhance their safety and productivity.

CHAPTER 3

DON CALS POLICY

1. Overview. This chapter provides the policy and guidance needed to transition from the current environment to the IWSDB vision. Implementation of an IWSDB will provide an information management capability that spans the technical information life cycle from data acquisition through retirement. This chapter establishes the need for the functional requirements, which are described in detail in Chapter 4.

2. Using the Foundation: Issues and Challenges. Ongoing CALS initiatives will contribute to achieving the DON CALS vision. Although the year 2010 seems far off, elements of the goal are beginning to be realized. Today's core initiatives and programs are implementing functionality that will support the digital receipt, conversion, storage, and management of integrated technical data. However, having these efforts in place is not enough, since they are largely stand alone and not DON-wide. They must be coordinated, integrated, and managed in such a way that the DON CALS environment can transition to its ultimate goal and also realize the maximum value added from each interim CALS program implementation. It is therefore imperative that the DON:

(1) Implement process innovations to maximize CALS benefits to technical information users. The DON CALS strategy encourages the innovation needed to support advanced operational capabilities.

(2) Base its CALS strategy on the required transition of functional requirements in terms of data, standards, and processes (Chapter 4). This defined functional transition should be the primary driver for DON CALS. Technology products, standards, and core programs and initiatives are merely enablers of that transition, and each can be changed to facilitate achievement of the vision.

(3) Use the more detailed follow-on definition of the required functional transition (Chapter 4) to evaluate the programs and develop implementation plans for FY 1992 and beyond.

(4) Continue coordinating core programs to ensure an integrated transition to the vision.

(5) Establish an open systems environment that provides connectivity and integration among the technologies and data types. Current core initiatives typically focus on one data type and will therefore cause the near-term environment to support only a loose confederation of data.

3. DON CALS Policy

a. To be effective in the next century, the DON must make a long-range commitment to technical information management improvement, prioritize the areas of maximum value, and support innovative opportunities. These changes will not occur all at once, and a prioritized transitional path must be established. To produce timely payoffs and reduce risk, the DON is adopting a phased implementation approach for

CALS, emphasizing near-term results on a pay-as-you-go basis. The DON is in a unique position to implement the CALS vision. The number of DON core initiatives and programs already underway provide a solid foundation for developing an integrated technical information management environment. DON CALS implementation efforts will capitalize on past efforts and investments in technologies, standards, and systems. Implementation efforts will:

(1) Fully support the requirements of DOD 5000.2, Part 6, Section N of 23 February 1991 (NOTAL).

(2) Take full advantage of joint projects to increase commonality, facilitate training requirements, and reduce costs.

(3) Promote process improvement prior to or as an integral part of promoting automation.

(4) Establish an open system environment that will provide connectivity and integration among technologies and data types.

b. Functional requirements for technical information, standards, process improvements, and training underlie the DON CALS strategy. It is important to understand how these primary factors work together. One way is to view technical information as the asset the DON must manage; standards as enablers of automation, management, and control of the technical information; functional process improvements as the means of enhancing the overall productivity of the applications that use the technical information; and training as the enabler for the user to take advantage of new CALS enhancements.

The detailed policy guidance for the three CALS implementation phases, CALS technical information, standards, process improvements, education/training, and CALS investment strategy follows.

4. Phased Transition Policy. Recognizing that the full implementation of the DON CALS vision is a long-term commitment that must transition from the current environment with programs and systems already in place, the DON CALS strategy has been structured into three time frames: Current Phase (FY 1992-FY 1996); Transition Phase (FY 1996-FY 2000); and Target Phase (FY 2000-FY 2010). This policy conforms to DOD CALS policy.

(1) Current Phase Policy (FY 1992-FY 1996). Current modernization efforts required to acquire, receive, store, manage, distribute, and use digital technical information will continue. Basic capabilities in data, standards, and processes will be consolidated and integrated, by adapting current DON and joint CALS initiatives. Development and implementation of applicable standards will continue. All new initiatives will implement acquisition guidance and standards according to DOD 5000.2 (NOTAL) and MIL-HDBK-59A (NOTAL).

(2) Transition Phase Policy (FY 1996-FY 2000). The transition phase will focus on the development of an exchange environment for all technical information processes. This environment will transition the data to the IWSDB. During this phase customized user data sets will be established and interim standards for the final integrated environment will be developed. All acquisitions will implement acquisition guidance and standards for a digital distributed information exchange environment.

(3) Target Phase Policy (FY 2000-FY 2010). The transition from an exchange environment to an integrated environment will be completed for selected weapon system data. Additional enhanced functionality throughout this phase will depend on technical and economic feasibility. All acquisitions will implement acquisition guidance and standards for an integrated information environment. CALS and open system environment standards will be routinely implemented in acquisition contracts, conversion efforts, and modernization projects.

Figure 3-1, illustrates the functional transition from the Current phase to the Target phase.

5. CALS Technical Information Policy. CALS requirements will be implemented in all new procurements or major modification programs, subject to technical and economic considerations. Uniform, standard, integrated and tailored CALS acquisition guidance will be developed and implemented DON-wide. Concurrent Engineering principles will be emphasized in new acquisitions. Preference shall be given to contractor information services and on-line access instead of digital deliverables. Whenever feasible, if digital data is required, preference shall be given to delivery in machine-readable digital form rather than paper (DOD 5000.2, Part 6, Section N of 23 February 1991 [NOTAL]). CALS standards or DON approved interim standards will be implemented in acquisition programs.

6. CALS Standards Policy

a. The DON will (a) mandate and support the implementation of open systems environments for all systems, (b) adopt and conform to existing Department of Defense (DOD) standards wherever possible, and (c) develop interim DON standards and/or common implementation guidelines where necessary.

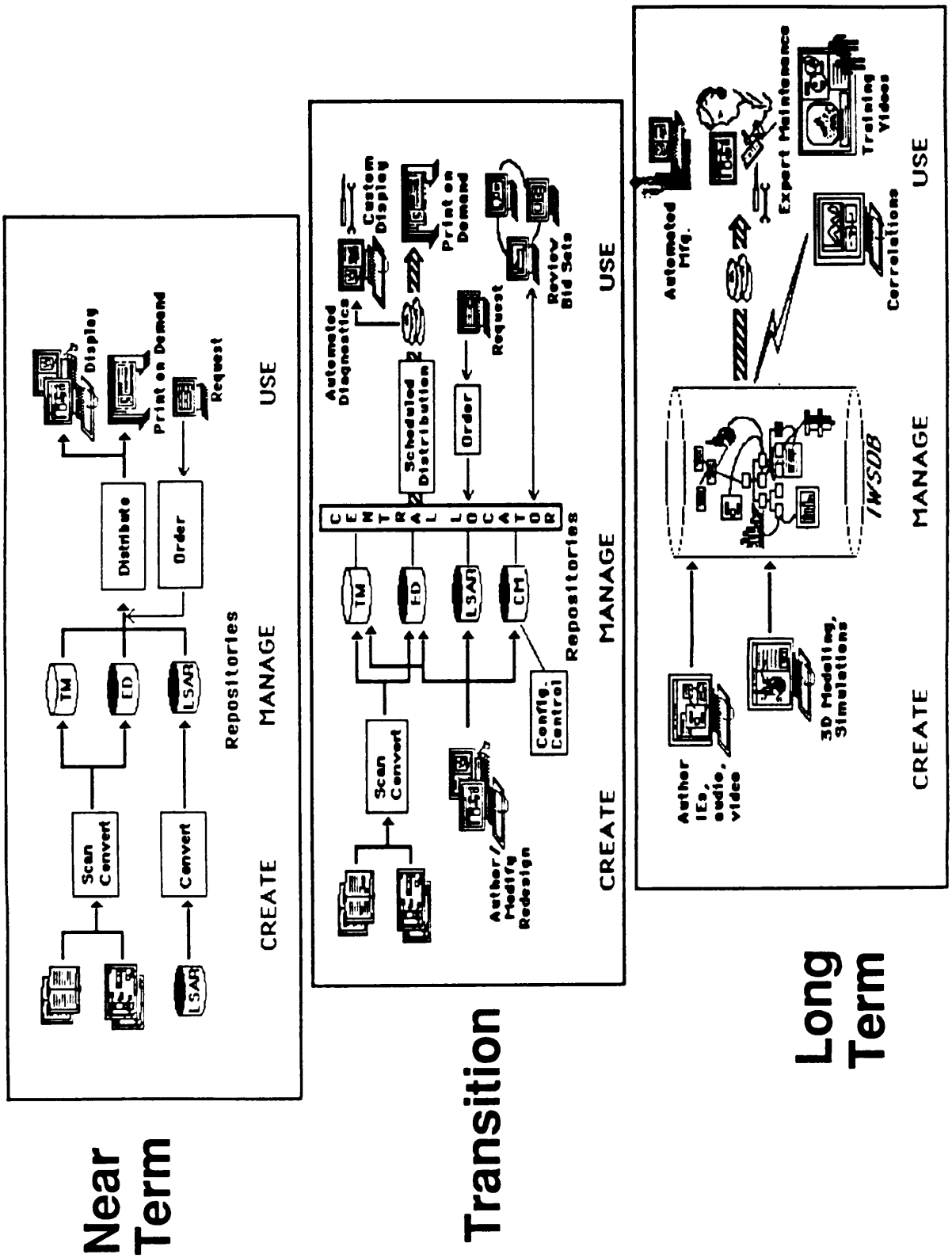

Figure 3-1. Functional Transition

b. A robust suite of effective CALS standards is vital if CALS objectives are to be successfully met. Current standards will be completed and improved as required. Standards scheduled for the transition phase must be aggressively developed and tested. Standards for the target phase integrated database environment will be developed. The DON will centrally coordinate requirements for CALS data standards and will actively monitor and support the development of new and emerging standards to support these requirements. The DON will support the development and use of DOD CALS standards but, given the length of time to establish DOD standards that meet mixed Service and industry requirements, will rely on interim DON approved standards to aggressively pursue its CALS strategic goals and achieve DON CALS implementation objectives. Interim DON standards will be coordinated with the applicable OSD policy offices.

7. Technical Information Infrastructure/Process Improvement Policy. The DON will continue to plan, develop, and deploy functional capabilities to receive, store, manage, distribute, and use digital technical information that meet fleet and fleet Marine Force requirements. Infrastructure modernization plans will reflect approved DOD and Navy/Marine Corps systems and programs and will be coordinated throughout the DON. The CALS process improvement strategy and methodology will be applied to all acquisition, engineering, and logistics support processes that create, manage, or use technical information. Process improvements and automation initiatives will be justified by cost/benefit analysis.

8. Education and Training Policy. As the DON progresses toward the IWSDB vision, it will incrementally change and improve processes using increasingly complex technologies. Given this incremental approach, there will be a continuous need for education and training. CALS education and training programs will be implemented across the DON, for civilian and military personnel in all DON organizations that utilize technical information. Computer-based training materials will be used to train CALS users along with maintenance and support personnel, to optimize the use of innovative CALS processes and technical information.

9. CALS Investment Policy

a. DON CALS investment decisions will be based upon the following principles:

(1) The user is the organization with business process authority and performance accountability.

(2) The user will define system requirements, manage implementation, and measure results.

(3) Process improvements will be made incrementally to reduce risk, enhance progress, and provide a modular implementation methodology.

b. These principles will determine how responsibilities for defining CALS implementation requirements across the DON will be assigned. Investment decisions will be based upon user defined requirements, improved processes, a sound implementation strategy, user capability to implement and use the DOD/DON approved system (unless otherwise justified), and the availability of resources.

c. The ultimate technical objectives of DON CALS are vendor-independent systems, assembled from standard components, which are interoperable with single-point data entry, non-redundant databases. These systems must ultimately meet the user's needs and improve the overall efficiency of the DON acquisition and logistics processes.

CHAPTER 4

DON CALS FUNCTIONAL REQUIREMENTS

1. Overview. This chapter describes the DON CALS functional requirements for data, standards, and processes between FY 1992 and FY 2010. This time frame is partitioned into the Current phase (FY 1992-96), Transition phase (FY 1996-2000), and Target phase (FY 2000-2010). The functionality described in this chapter is a detailed description of the DON CALS vision discussed in Chapter 2.

2. Data, Standards, and Processes

a. Current DON technical information is principally in paper (or related) formats. The first step towards DON CALS implementation is to convert selected existing paper assets to digital format. This will result in improved data management, reduced warehousing costs for storing paper, and improved access to the data. By the end of the Transition phase, digitized data will be converted to data formats that are more flexible for automated processing and content modification. By the beginning of the Target phase in 2000, the data must begin its transformation to support an IWSDB.

b. To implement the IWSDB, multiple standards must be in place to facilitate data integration. Currently, the MIL-STD-1840 sets the stage for the Current phase capture of new digitized data. The standard also addresses how to define the more processable data forms of the Transition phase. Standards for the Target phase integrated database environment still need to be developed.

c. Finally, processes are used to describe the connected functionality at a high level. They are divided into the following functional areas:

(1) Authoring/Modification. Creation of new technical data by automated means; and modifications of that data.

(2) Conversion. Scan conversion of paper or nonstandard electronic data to standard digital form.

(3) Receipt/Review. Acceptance, verification, and review of acquired digital data sets.

(4) Storage/Data Management. Registration and storage of the accepted data in a repository, managed by a Central Locator/Central Index. This includes system administrative functions such as user access control, and system resource management. It also includes the processes that organize and rearrange the data for added value, i.e., categorization, cross-referencing, and customization.

(5) Configuration. Changes to data and to weapon system configurations. Includes management of product data models or family trees.

(6) Distribution. Transfer of requested data sets to the user community via electronic or paper delivery. Includes the printing and publishing function.

(7) Use. Actual use of digital technical data.

d. For each of the three time phases in this document, only the relevant functional areas are described. The Current phase of DON CALS focuses on the fundamental processes needed to achieve Conversion, Receipt/Review, Storage/Management, Distribution, and Use. New systems during this phase will author data in accordance with CALS standards. In the Transition phase, Authoring/Modification and Configuration begin to play major roles, and System Administration becomes organized as the repositories are more logically integrated. By the Target phase, all functional areas are fully operational.

e. Required functionality for the Current phase is summarized in Chapter 5.5, the Transition phase in Chapter 5.6, and Target phase in Chapter 5.7. The principal factors that influence overall functionality (data, standards and processes) are each considered in the context of the technical issues and trade-offs that are key to each time frame.

5. Current Phase (FY 1992-96)

a. The functional goals of the Current phase CALS environment are to acquire and store a significant amount of data in digital format and to distribute that data to the fleet and other DON activities. Given the amount of existing paper-based data, a large percentage of the paper data needs to be converted. Although the DON CALS environment will eventually manage all DON technical information, it is unrealistic to assume that the entire inventory of technical information can be digitized within this short time period. Another consideration is that much of this legacy technical information relates to older weapon systems that will be phased out by the end of this decade. The functionality described here assumes a limited, but ever increasing volume of digital information available to be managed.

b. The available functionality in the Current phase is defined to a large extent by the existing or planned functionality of current DON CALS core initiatives. Core initiatives are systems that automate the technical information management infrastructure. Examples of core initiatives are: Advanced Industrial Management (AIM), Advanced Technical Information Support (ATIS), Automated Document Management and Publishing System (ADMAPS), Computer Aided Design (CAD-2), Engineering Data Management Information Control System (EDMICS), Integrated Logistics Support Information System (ILSIS), Navy Engineering Drawing Asset Locator System (NEDALS), and Technical Manual Print on Demand System (TMPODS). Other initiatives are considered and cited when relevant.

Figure 4-1 and Table 4-1 illustrate the envisioned functionality of the Current phase environment. An overview of Current phase data, standards, and processes follows. Since capitalizing on existing initiatives is key to the success of DON CALS, these discussions are supported by references to existing CALS initiatives and any transitioning considerations.

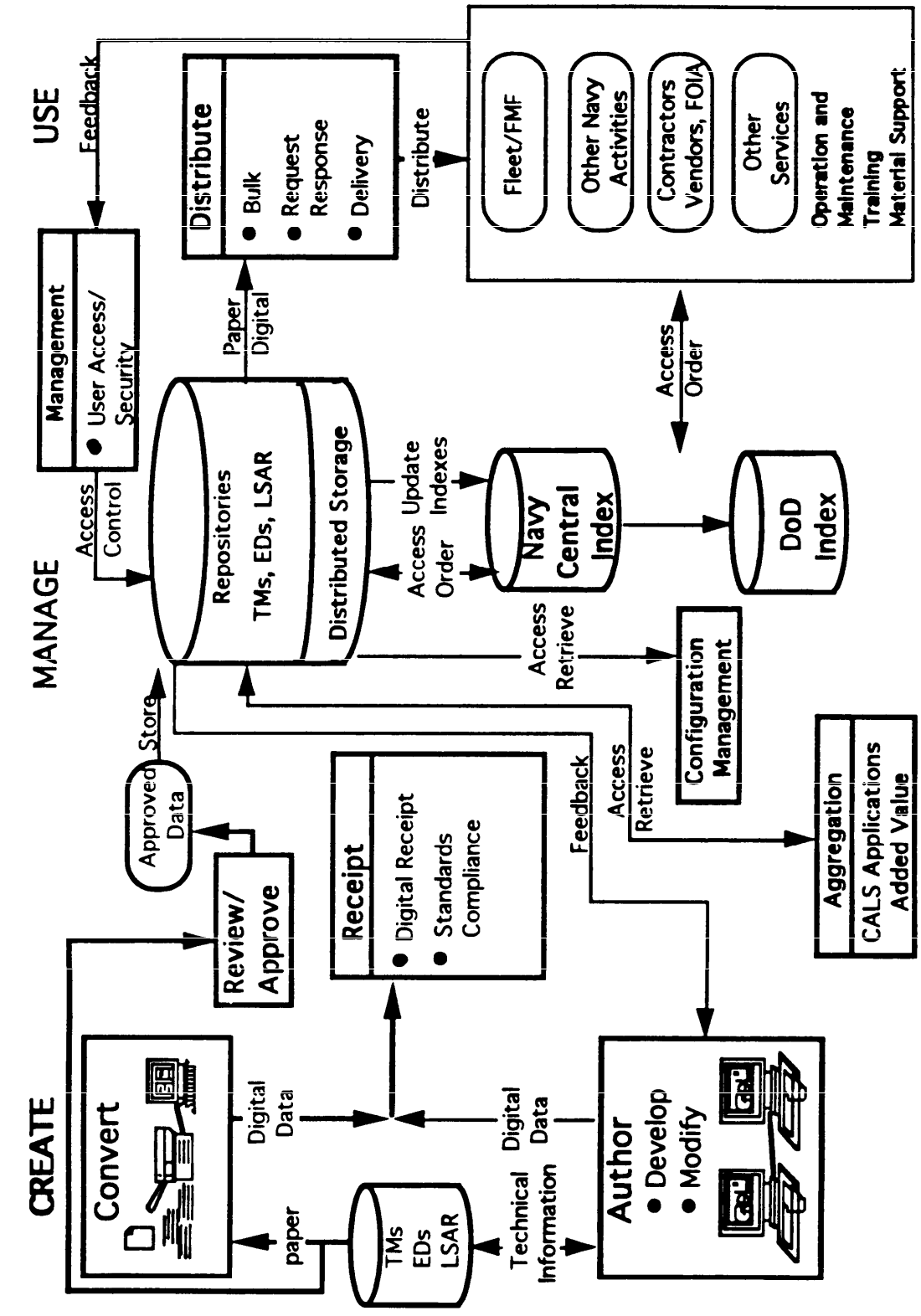

Figure 4-1. Envisioned Current Phase Environment Top Level Functionality

Table 4-2. Summary of Current Phase Functionality

- Independent major technical data repositories: TMs, engineering data, LSAR.
- Repositories networked, but are logically distinct.
- Central Locator begins to identify locations of major technical data assets on the network.
- Central Locator manages paper assets as well as digital data.
- Central Index begins to identify and catalog major technical data assets.
- Independent data management of each repository includes backup, access control, and database administration.
- CALS standards established and utilized to verify format of acquired data.
- Conversion of selected legacy data from paper to digital (mostly raster format).
- Limited authoring capabilities for CAD/CAM and technical documents.
- Digital data received, verified for compliance to standards, and stored in individual repositories.
- Selective on-line inspection of digitized pages for content, accuracy, and completeness.
- Distribution of tech data sets by specific request from operating command ("pull method").
- Added value to data via specialized CALS applications.
- Some storage and retrieval of weapon system configuration management data.
- User systems in position to receive delivered data in page-oriented format.

c. **Data.** The majority of the digital data in the Current phase CALS repositories will be in raster format since that is the primary format supported by such existing initiatives as TMPODS and EDMICS. Raster format stores an image of a page of text or graphics as a map of bits; rather than as elements of an editable format, such as characters, vectors, etc. Technical manuals, engineering drawings, and logistic support analysis (LSA) documentation will largely be stored in raster format while logistic support analysis records (LSAR) will be stored in a relational database. Other types of data applicable to the Current phase and stored in the repositories include digital specifications and standards, bid sets (solicitation packages), and configuration management data.

Electronic transmission of technical data is not practical for distributing the volume of technical information that must be made available to field activities at widely dispersed locations in the near-term, even if the raster data is compressed to decrease its volume, . Therefore, the primary media for data delivered to users in the Current phase will be paper, optical, and magnetic.

d. **Standards.** MIL-STD-1840 is the overall CALS standard. It includes several specifications in the 28000 series defining various formats for technical documents and engineering data. It also specifies physical media characteristics for data delivered to the government.

Major standards applicable to the Current phase include:

(1) MIL-D-28000 Initial Graphics Exchange Specification (IGES) for engineering data.

(2) NIRS/NIFF Navy Implementation of Raster Scanning/Navy Image File format.

(3) MIL-M-28001 Standard Generalized Markup Language (SGML).

(4) MIL-R-28002 CCITT Group IV Raster.

(5) MIL-D-28003 Computer Graphics Metafile (CGM) for technical documents.

(6) MIL-STD-1388-2B LSAR relational database format.

(7) MIL-M-29532 (EC) Master Library Index

e. **Processes.** The processes making up the Current phase functionality are broken down into the functional areas of Conversion, Receipt/Review, Storage/Data Management, Distribution, and Use. Although some authoring of new technical data will occur in the Current phase, authoring functionality will play an increasingly significant role in later phases. Their initial operational capabilities include:

(1) Conversion. Scan conversion of existing paper data principally to raster format for technical documents and engineering drawings; some digital-to-digital conversion. Conversion of 80 character record LSAR to relational database tables.

(2) Receipt/Review. Data acceptance, receipt tracking of deliverable items, quality checks and interchange standards checks on incoming data using digitized specifications and standards and on-line content review. Maintenance of a database of information about each acquired data set allows acquisition managers to query the status of arriving data for a given weapon system.

(3) Storage/Data Management. Storage of the technical data in separate repositories for each data type. Each repository type may include multiple physical repositories geographically distributed at different sites. Each repository type has its own access control, resource management facilities, and locator/index facility that acts as a single distribution request servicing point for data of that type independent of where it is physically located. It will track locations of paper as well as digital data.

(4) Distribution. Centrally controlled distribution and delivery of data from the repositories to the fleet and other DON activities and contractors. Data will be delivered primarily as magnetic and optical media and demand-printed paper in accordance with existing distribution lists and in response to specific user requests. Requests, initially processed by individual repositories, will eventually be processed by a DON-wide, Central Locator/Central Index. Some minimal electronic distribution for certain data types will be available.

(5) Use. Applications supported by CALS technical information will include the purchasing, management, and manufacture of spare parts; provisioning of weapon systems at Initial Operational Capability (IOC); design and work packaging during construction, maintenance, and overhaul operations; technical publication authoring, distribution, and updating; procurement and inventorying of material; local management and use of engineering drawings; and technical training.

f. **Summary.** The Current phase CALS environment will be able to accept, verify, and store digital data according to CALS-compliant formats at various, physically separated, repository locations. The repositories will contain weapon system data converted to digital form, as well as newly acquired weapon system data. Access control will be tailored to each separate data type environment.

The total environment will support on-line requests for technical documents or engineering drawings by National Stock Number (NSN) or drawing number, and requests for LSAR database reports. These requests will be made from workstations connected to a central document locator. Paper copies, magnetic media, or optical media containing the requested data, including appropriate change packages, will be delivered to the user site under control of the central distribution facility. On-line queries will be available for certain kinds of data only, and only from workstations connected to the particular system handling that type of data; for example, EDMICS for engineering drawings, AIM for work packages, and ILSIS for LSAR data.

6. Transition Phase (FY 1996-2000)

a. The Transition phase will be characterized by the delivery and acceptance of data in editable forms and by digital modifications to the data and all of the functionality that supports change. During this phase the all important transition of the data to an information entity compatible format will take place.

Figure 4-2 and Table 4-2 illustrate the envisioned functionality of the Transition phase environment. An overview of Transition data, standards, and processes follows.

b. **Data**. Data will be a mix of paper, raster digital, and ever increasing volumes of editable, digital data. Linkages among technical documents, engineering data, and LSA data will be established to lay the groundwork for the IWSDB.

New data types will emerge to add value to the entire environment, and to support the new processes. Weapon system physical configuration data, change proposal and modification data, and user feedback data will be major new data types. Inventory and spares databases and other operational logistics databases will be linked into the main environment via the Central Locator. To support bulk distribution, site and user profiles need to be created, stored, and maintained.

Information contained in the Central Index is more extensive and is organized by a system-wide data dictionary. Weapon system catalogs will map data by weapon system and a master catalog maps weapon system data to commodity data. New standards must be developed to support new data types and processes.

c. **Standards**. Major standards applicable to the Transition phase include the basic set of standards identified in Chapter 5d. Other needed but undefined standards include those for: (a) User digital delivery format for technical documents, engineering drawings, and LSAR; (b) Data dictionary/directory; (c) User feedback data (e.g. Reliability/Maintainability); (d) Change Control; (e) Revision/Version Control.

Government standards currently under development in the areas of networking and data dictionaries should be monitored and supported. The PDES/STEP (Product Data Exchange Specification/Standard for the Exchange of Product Model Data) standard (MIL-R-28004 DRAFT), the key to storing engineering vector data and implementing product models, need to be finalized by the end of this time frame.

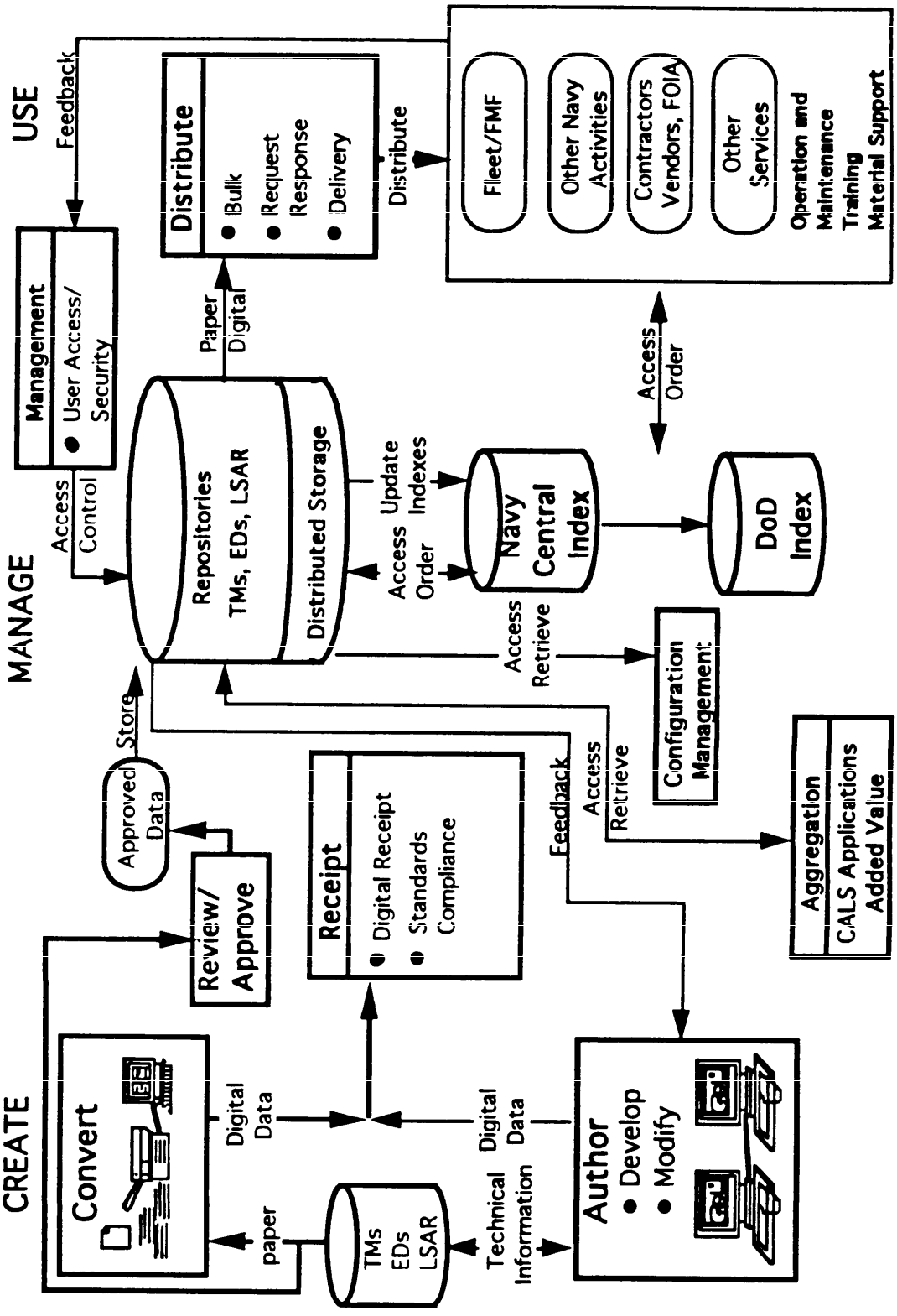

Figure 4-2. Envisioned Transition Phase Environment Top Level Functionality

Table 4-2. Summary of Envisioned Transition Functionality

- Partially integrated major technical data: TMs, engineering data, and LSAR.
- Enhancement of Central Locator to support some distributed repositories.
- Central Index identifies all major technical data assets.
- Standards for data storage formats start laying the ground work for the Phase III IWSDB.
- More centralized access control, backup, archiving, resource management, and database administration for all types of data.
- Conversion of selected paper and raster data to editable CALS formats and data linkage.
- Authoring tools to support creation of data in editable CALS formats.
- LSAR data acquired and developed in relational form.
- Validation of incoming data includes automated completeness checks.
- Additional data types supporting change tracking, configuration management, and bulk distribution.
- On-line review capabilities allow viewing and navigation through partially integrated data.
- Storage, management, and modification of weapon system physical configurations.
- Linkages between technical data and configuration data beginning to formalize.
- Electronic change proposals, automated change routing, and tracking.
- Bulk distribution of technical data sets ("push" method).
- Capture, administration, and catologing of user feedback data.
- Customized data aggregation formalized.
- Categorization of data includes assigning attributes for customization.
- Standard user delivery formats established and implemented.
- User systems in position to receive delivered data in standard user delivery formats.

d. **Processes.** Enhancements of processes introduced into the functional areas during the Transition phase time frame include:

(1) Authoring/Modification. Authoring and change control systems to support editable data types (SGML, IGES, PDES/STEP). Capability to change editable data, eliminating the need for change page sets on some data.

(2) Conversion. Conversion to editable data forms will be more automated and will include automated tag insertion for SGML and raster-to-vector conversion into IGES and PDES/STEP data formats.

(3) Receipt/Review. More automated data checks and data content validation.

(4) Storage/Data Management. A Central Locator capability will track the location of all types of data. Indexed access to weapon system and commodity data will be provided by Master and Weapon System Catalogs and the Central Index. Linkages among different data types and indexing within a dataset will be implemented. System-wide administration/security procedures will be consistently applied across all data types. User feedback data will be stored and managed.

(5) Configuration. Weapon system physical configuration management data will be logically tied into the Central Locator and linked to technical data. Storage and tracking of changes to data, change requests, and Engineering Change Proposals (ECPs); version control; linkage of modification data to change requests, ECPs, and master technical data will be functional.

(6) Distribution. Time-based, bulk distribution of customized technical data sets using digital media as well as paper.

(7) Use. Increased use of expert systems.

e. **Summary.** The Transition phase will be characterized by the logical integration of data, location and indexing, delivery of digital editable data, and by authoring, control, and management of changes to technical and configuration data. Customized datasets will primarily be distributed automatically, with individual requests still serviced for emergencies and other special cases. The data itself will migrate toward a much more integrated, logically linked form.

7. Target Phase (FY 2000-2010)

a. The centerpiece of the envisioned Target phase will be the IWSDB. Stored data will take the form of component "information entities" extensively cross-linked and cross-referenced to each other. Information entities are meaningful packets of data that are stored once and used many times. They have the capability to "publish themselves" on demand in any one of a variety of required forms. Information entities could include textual descriptions of maintenance procedures, warnings, cautions, lists of equipment, LSAR records, etc. Information entities for engineering data will be stored in a linked product model structure. Although represented internally as a 3-D model, they can be published as a solid model, a wire frame drawing, a parts list, or a technical illustration. The LSA data associated with a particular part could be retrieved

immediately because the data would be linked to the individual part in the product model tree.

b. Traditional data forms of the Transition phase environment such as technical documents will be published on demand in the Target phase, but will not exist in that form in the IWSDB. There are several advantages to storing and structuring data this way:

(1) A given piece of information is stored once, but used many times.

(2) When information changes, it can be modified in one place, then automatically propagated to all necessary output documents.

(3) Data can be retrieved by subject in smaller, more relevant pieces.

(4) Data can be more effectively targeted to the needs of the user.

(5) Navigation through the data is faster and easier.

Figure 4-3 and Table 4-3 illustrate the envisioned functionality of the Target phase environment. An overview of the Target phase data, standards, and processes follows.

c. **Data.** The most important impact on the data in the Target phase environment will be the restructuring of technical data into information entities and extensive cross-linking of the entities to each other and to other forms of data such as modification data, configurations, feedback. The Target phase database will also include:

(1) Product model structures.

(2) Commodity and weapon system data extensively cross-linked.

(3) Information on data usage to better analyze where improvements can be made.

(4) New forms of data such as audio and video.

Users will be able to enter data relating to their task, such as logging a maintenance procedure as completed. The information will then be automatically propagated to all relevant databases; such as parts and inventories, reliability/maintainability, training. More sophisticated queries, correlations, trends, analyses will be possible with the high percentage of extensively linked on-line data. Concurrent engineering will be supported by links between manufacturing and engineering data and between user feedback data and technical product data.

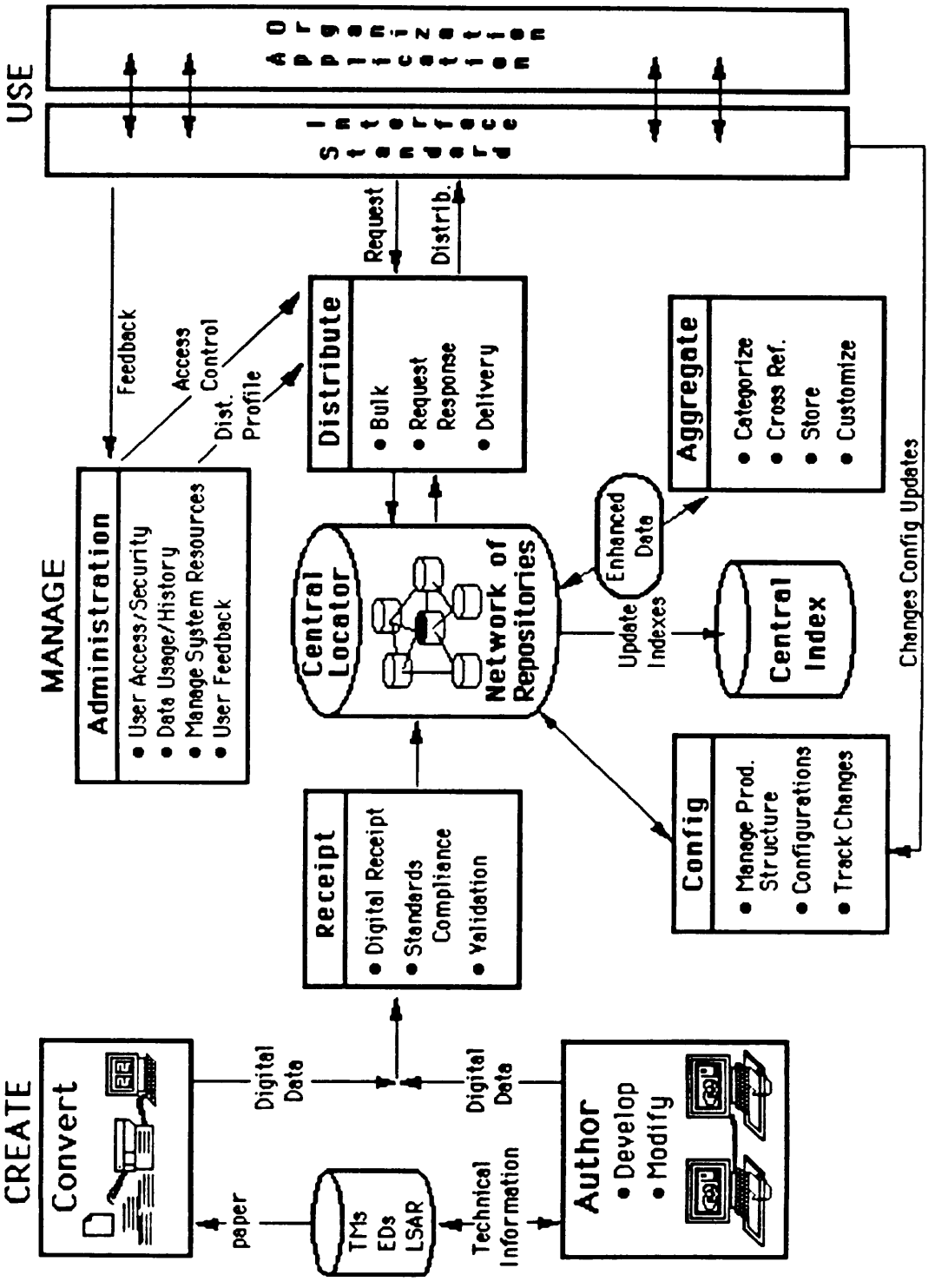

Figure 4-3. Envisioned Transition Phase Environment Top Level Functionality

Table 4-3. Summary of Envisioned Target Phase Functionality

- Evolution to highly-integrated major technical data assets.
- Progression from page orientation to single-source, content-based data elements.
- Data elements extensively cross-referenced and linked for navigation.
- Central Locator fully supports distributed repositories and new data forms (e.g., audio, video).
- Broad-based, highly interactive on-line access to data.
- Data validation now automated and includes full linkage and correlation checks.
- Standards implemented for product modeling and storage of highly-integrated data.
- Product models allow storage and management of product structures including linkages to technical and physical configuration data.
- Full support for all phases of configuration management and change management. Parts/inventory databases linked to physical configuration data.
- More sophisticated queries, correlations, trends, and analyses possible with CALS software.
- Customized data aggregates include review packages.
- Higher percentage of the data delivered via high-speed direct transmission utilizing contemporary, very dense media formats.
- Usage database and software provide a base for optimization of system and data usage.
- Concurrent engineering supported by links between manufacturing and engineering data and between user feedback (e.g. R&M data) and technical product data.
- Customized delivery of technical data by user profile matched to content, rather than by page.
- Standards developed and implemented for delivery of highly-integrated data.
- User systems in position to receive highly-integrated data in standard user delivery format(s).
- Advanced user interfaces support display and manipulation of new data.

d. **Standards.** The standards needed for the Target phase environment will evolve from existing standards such as PDES/STEP and, in some cases, from new standards. The current development of PDES/STEP will incorporate or at least be compatible with the information entity concept. There is work in progress even today on concepts such as active documents, information refineries, hypermedia systems, and object-oriented systems that have a role in developing the needed standards for the IWSDB.

e. **Processes.** The major new processes and enhancements introduced into the familiar functional areas during the Target phase time frame will include:

(1) Authoring/Modification. Sophisticated authoring tools for entering and manipulating the information entities and for controlling single source point changes. Multiple-author, and simultaneous electronic reviews will be functional.

(2) Conversion. Conversion mechanisms for translating traditional data to information entities and for conversion of IGES to PDES/STEP.

(3) Receipt/Review. More automated data content validation based on expert systems, validation of data linkages, and navigational paths.

(4) Storage/Data Management. Distributed data management administered by the Central Locator. Storage/Data Management of linked, knowledge-based information entities, and other types of data. Tight linkage between the LSAR and the operational logistics databases. Support for new data forms such as audio, video, animation.

(5) Configuration. Organization of the data on a product model (family tree) basis. Physical weapon system configurations linked to product models. Support for all aspects of configuration management.

(6) Distribution. Support for on-line access to required data for all DON personnel and widely available electronic on-line distribution. Bulk distribution using new forms of bulk electronic media, not available today.

(7) Use. Continuing enhancement of expert systems capability and implementation of newly developed human interface technology.

f. **Summary.** The Target phase DON CALS environment will provide timely, customized access to relevant data for the user. Some of this data will be presented in forms unknown or in limited use today, such as animated maintenance procedures; or by using new human interface techniques such as voice and eye motion. The data may be delivered on tiny cartridges that snap into a miniature computer worn by the user. All of this is possible if the appropriate coordination and effort are applied to the conversion, capture, management, and distribution of the DON's technical information.

CHAPTER 5

DON CALS STRATEGIC PLAN

1. Purpose. This chapter defines the DON CALS Strategic Plan. This plan provides guidance for a coordinated transition from the current environment to the CALS information management concept (vision) of the future for all types of technical information. The plan will be used to coordinate CALS policies and implementations throughout the DON.

2. Scope. Corresponding to the DOD CALS architecture, this plan has been structured into three time frames: (a) Current Phase: FY92-96; (b) Transition Phase: FY96-2000, and (c) Target Phase: FY2000-2010.

3. Key Success Factor

a. The strategic plan's policy goals and objectives define what needs to be achieved and by when. Given this policy road map and the increasing levels of technical data integration and process interoperability that will be realized as the evolutionary transition proceeds, the pace of achievement becomes the key success factor and must be coordinated to:

(1) Adequately support DON operations throughout the entire FY92-2010 implementation period.

(2) Provide DON users with operationally useful increments in new CALS capabilities.

(3) Achieve the DON CALS vision.

It is therefore imperative that the Navy and United States Marine Corps (USMC) implementations support the planned pace of functional achievement.

b. Figure 5-1 illustrates a preliminary high-level estimate of the evolutionary transition pace of this functionality. The shaded horizontal bars show what proportion of the final functionality in each CALS functional area (as measured by the total bar) will be operational by the end of each planning phase.

c. Navy and USMC implementation planning for DON CALS goals and objectives will enable development of a refined evolutionary transition to full functionality.

4. Policy Goals and Objectives

a. The entries in Table 5-1 summarize the policy goals that define the transition to the DON CALS vision; these goals are grouped by CALS functional area for consistency with Figure 5-1 and Chapter 4. Table 5-1 also shows the fiscal years the policy goals are to be achieved. Since each policy goal is multidimensional in scope some of its supporting policy objectives will be completed earlier.

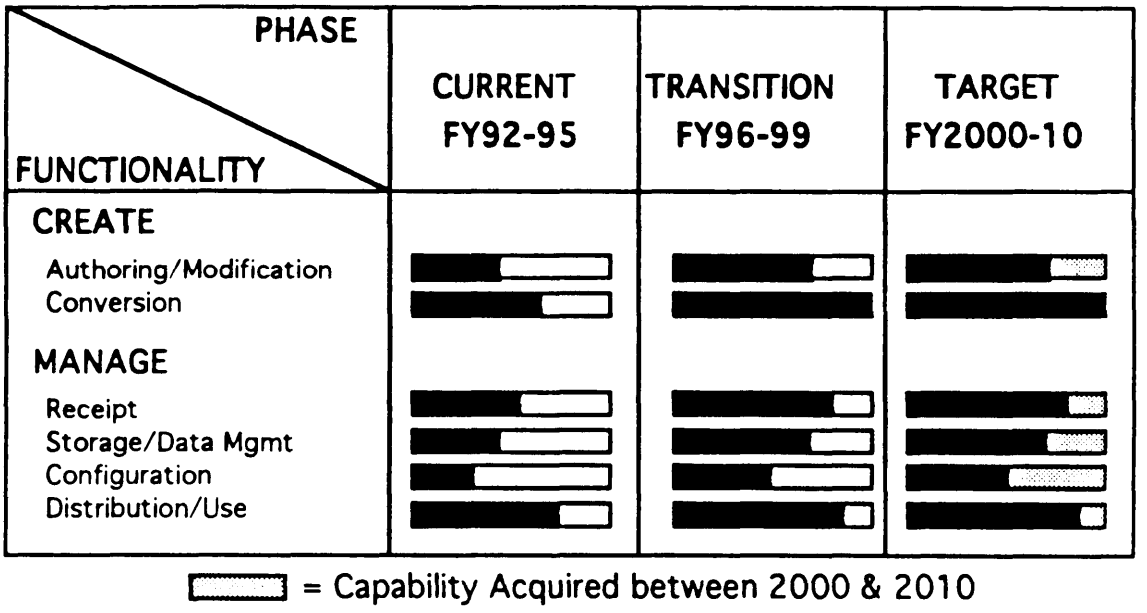

Figure 5-1. Transition of the Functionality on the Road to Achieving the IWSDB DON CALS Vision

b. To achieve the final IWSDB vision, the functional areas will be coordinated and integrated. Constant coordination and integration are required throughout the goals and time phases. One goal in each of the functional areas is shaded to show the major integration goal within that functional area. These major integration goals occur toward the end of the Transition phase to facilitate the realization of fully functional and integrated technical information.

c. The sections following elaborate these table entries with a rationale and supporting objectives for each policy goal.

Table 5-1. FY92-2010 DON CALS Phased Goals

AUTHORING/MODIFICATION POLICY GOALS	FISCAL YEAR								
	CURRENT				TRANSITION				TARGET
	92	93	94	95	96	97	98	99	2000-2010
Define preliminary authoring standards for editable digital technical information (TI). Para. 5b(1).		O							
Establish standards-conforming processes for creation and quality assurance of digital TI. Para. 5b(2).				O					
Identify new technical data types beyond technical manuals (TMs), engineering drawings and data (EDs), and logistics support analysis (LSA) records and reports, and develop authoring/modification standards for them. Para. 5b(3).				O					
Define comprehensive authoring standards making appropriate policy changes for editable digital TI. Para. 5c(1).					O				
Enhance DON-wide CALS processes to modify digital technical data contents, update indexes, and to support the change management process. Para. 5c(2).						O			
Establish enhanced DON-wide change procedures and standards for controlling and propagating changes to IWSDB-integrated TI. Para. 5d(1).									O
Establish standard IWSDB environment to author, modify and link integrated TI. Para. 5d(2).									O

Table 5-1. FY92-2010 DON CALS Phased Goals

CONVERSION POLICY GOALS	FISCAL YEAR								
	CURRENT				TRANSITION				TARGET
	92	93	94	95	96	97	98	99	2000-2010
Define TI conversion criteria for use by DON Program Managers. Para. 6b(1).		O							
Coordinate and consolidate current DON conversion efforts to contain costs, avoid duplicated effort, and support TI use. Para. 6b(2).			O						
Convert existing TI to digital using criteria and capabilities for the conversion of data to acceptable digital form. Para. 6b(3).				O					
Identify and plan critical TI for migration from raster or nonstandard digital formats to editable digital formats during the Transition phase. Para. 6b(4).				O					
Selectively Migrate digital technical data coordinating and executing the planned transition to editable and more value-added digital formats. Para. 6c(1).					O				
Establish migration/conversion techniques and standards for integrated TI that translate existing digital data to modifiable IWSDB information entities. Para. 6c(2)						O			
Migrate/convert TI to IWSDB information entities formats to the maximum extent that is feasible and cost-effective. Para. .6d(1).									O

Table 5-1. FY92-2010 DON CALS Phased Goals

RECEIPT POLICY GOALS	FISCAL YEAR								
	CURRENT				TRANSITION				TARGET
	92	93	94	95	96	97	98	99	2000-2010
Establish preliminary guidelines to govern acceptance testing of digital technical data. Para. 7b(1).		O							
Implement existing CALS data interchange standards that support data receipt objectives in the Current phase. Para. 7b(2).			O						
Establish a complete baseline of DON standards to enable CALS integration of any future data types. Para. 7b(3).				O					
Define access to contractor-managed TI and data services including functional capabilities, standards, and guidance needed for use of CITIS. Para. 7b(4).				O					
Refine TI acquisition guidance defining quality assurance requirements for acceptance of TI. Para. 7c(1).					O				
Establish acceptance testing for all newly acquired TI ensuring it complies with appropriate standards and relevant contract specifications. Para. 7c(2).						O			
Maintain and use the baseline of CALS receipt standards. Para. 7c(3).								O	
Establish automated validation capabilities to assure the quality, accuracy, and consistency of newly acquired TI. Para. 7c(4).								O	
Establish integrated acceptance processing for all received TI. Para. 7d(2).									O
Establish compliance checking capabilities for contractor managed technical data and services. Para. 7d(3).									O

Table 5-1. FY92-2010 DON CALS Phased Goals

STORAGE/DATA MANAGEMENT POLICY GOALS	FISCAL YEAR								
	CURRENT				TRANSITION				TARGET
	92	93	94	95	96	97	98	99	2000-2010
Define a storage concept that can evolve to the future IWSDB. Para. 8b(1).		O							
Develop an inclusive indexing and cataloging mechanism for technical data. Para. 8b(2).			O						
Establish initial TI repository capability supporting multiple technical data types, technical data integration, diverse users, and central administration. Para. 8b(3).				O					
Standardize repository capabilities across organic and non-organic sites. Para. 8b(4).				O					
Develop a technical data dictionary by defining, prototyping, and establishing a migration process for a standard data dictionary consistent with the government IRDS standard and the evolving IWSDB information entities data element standards. Para. 8c(1).					O				
Develop user-support standards for preparation and storage of customized data packaging. Para. 8.c(2).					O				
Apply standard DON indexing scheme to all data types in DON repositories to initiate TI integration among repositories. Para. 8c(3).						O			
Enhance central TI administration policy to coordinate the administration and management of distributed technical data repositories. Para. 8c(4).						O			
Implement suitable TI repository security by defining and standardizing security administration of all TI repositories and obtaining security accreditation (as needed). Para. 8c(5).							O		
Verify DON IWSDB Conceptual Design. Para. 8c(6)								O	
Develop and deploy a fully functional IWSDB to all sites. Para. 8d(1)									O
Develop, aggregate, and update customized data packages for users to support distribution/use. Para. 8d(3).									O
Enhance administrative processes to ensure IWSDB performance, data integrity, and data security within repositories. Para. 8d(4).									O

Table 5-1. FY92-2010 DON CALS Phased Goals

CONFIGURATION POLICY GOALS	FISCAL YEAR								
	CURRENT				TRANSITION				TARGET
	92	93	94	95	96	97	98	99	2000-2010
Establish preliminary configuration management (CM) procedures DON-wide for digital TI. Para. 9b(1)				O					
Establish an integrated change tracking process for the various forms of TI. Para. .9c(1).					O				
Establish automated linkages between usage and operational technical data to drive a coordinated TI change process. Para. 9c(2)							O		
Integrate weapon system configuration changes into a global configuration change process. Para. 9c(3).								O	
Establish weapon system product structures and models to support versioning of TI. Para. 9d(1).									O
Establish embedded relationships connecting different versions of digital data to the corresponding physical system items. Para. 9d(2).									O

Table 5-1. FY92-2010 DON CALS Phased Goals

DISTRIBUTION/USE POLICY GOALS	FISCAL YEAR								
	CURRENT				TRANSITION				TARGET
	92	93	94	95	96	97	98	99	2000-2010
Establish a standard user display and system platform policy and develop a presentation capability to enable the user to view and use CALS integrated technical information. Para. 10b(2).		O							
Implement "pull" distribution for DON CALS via central ordering. Para. 10b(2).			O						
Prepare for "push" distribution and TI user support as the primary Transition phase distribution process and standardize user presentation formats and user interfaces for digital TI use across DON. Para. 10b(3).				O					
Establish TI distribution security policies for data access control and security issues associated with digital distribution of TI to users. Para. 10b(4).				O					
Develop a database of distribution metrics to support planning and design decisions for further transitioning of the distribution process. Para. 10c(1).					O				
Devise a "push" distribution process including TI indexing/ordering. Para. 10c.(2).						O			
Transition the distribution process from relying largely on paper-based "pull" to using bulk delivery and digital-based "push". Para. 10c(3).							O		
Plan for customized distribution of information entities. Para. 10c(4)..								O	
Transition the distribution process from using bulk media to delivery via telecommunications. Para. 10d(1).									O
Expand coverage and service quality of "push" distribution to users through enhanced profiles and distribution metrics evaluation. Para. 10d(2).									O
Distribute customized databases with appropriate tool sets to enhance the value and usability of the data in user systems. Para. 10d(3).									O

5. Authoring/Modification

a. Definition. The Authoring/Modification functional area encompasses automated and standardized support for the creation, tagging, linking, and subsequent modification of new, digitally editable technical information (TI).

b. Phase I Current Goals: FY92-96

(1) FY93 Goal: Define preliminary DON authoring standards for editable digital technical information.

(a) Rationale. Digital authoring and modification of new data will begin to occur in the near-term DON CALS environment. Digital authored data will initially represent only a small percentage of the total volume of data stored in DON repositories. The majority of the Current phase repository data will consist of converted forms of existing paper data. To support the evolution of digital authoring, preliminary authoring and data format standards for editable data need to be developed by FY93.

(b) Objectives. The preliminary authoring standard will require:

1. Evaluation of existing authoring/modification environments within the DON. Characteristics and limitations of the CALS data interchange standards should be evaluated to determine whether standards should be modified to better meet DON requirements.

2. Evaluations of industry authoring/modification prototype environments available in pre-release form.

3. Development of preliminary digital authoring standards to satisfy DON CALS authoring/modification requirements in the Current phase for editable data.

4. Measurement of preliminary authoring/modification impact on technical data.

(2) FY95 Goal: Establish standards-conforming processes for creation (acquisition, authoring/origination, modification) and quality assurance of digital TI.

(a) Rationale: Authoring procedures, computer systems, and software tools will vary depending on the type of digital data being created. For example, authoring of product data will be embedded in the actual engineering design process, typically an end-product from a CAD environment. Technical manuals and other technical publications will be authored using SGML-based authoring tools. LSAR will usually be authored in the contractor environment and will often represent a view of the contractors design/development database.

Similarly, data content modification procedures will also be influenced by the type of data that needs to be modified. Managing changes to a single passage that occurs in multiple documents is particularly critical. Documents and drawings may be modified by multiple authors, complicating control even further. Control and tracking of changes to the data will be a critical requirement.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define and establish conforming CALS processes to support creation and quality assurance of editable digital technical data.

2. Develop enhanced authoring/modification inputs to technical data acquisition guidance; and use this guidance as a basis for quality assurance.

(3) FY95 Goal: Identify new technical data types beyond technical manuals (TMs), engineering drawings and data (EDs), and logistics support analysis (LSA) records and reports, and develop authoring/modification standards for them.

(a) Rationale. The IWSDB will be comprised of editable digital data packaged as reusable information entities. Audio, video, and other multimedia formats will become important to some DON CALS users. Other new data types and new relationships among data types will emerge as the needs of all users are addressed. New types of output products such as Interactive Electronic Technical Manuals (IETMs) will require new authoring tools and methods. Thus, standards and capabilities for authoring, modifying, and integrating such new data types must be established.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Solicit TI users input to identify new TI types and automation needs.

2. Evaluate available technologies and tools to support these new data types.

3. Develop plans for digital authoring, modification, and integration of these new data types which enable their use in the IWSDB.

4. Develop needed authoring/modification standards, policy changes, and inputs to acquisition guidance for program managers.

c. Phase II Transition Goals: FY96-2000

(1) FY96 Goal: Define comprehensive DON authoring standards, making appropriate policy changes for editable digital TI.

(a) Rationale. A large quantity of newly authored, SGML and IGES/PDES/STEP conforming technical data will be created during the Transition phase. Therefore, quality authoring tools are critical to enhance authoring productivity, conformance to standards, and technical data utility.

Since many of the authoring/modification tools used by the DON during the Current phase will be relatively new, and since the tools and platforms will vary across different DON activities, the Current phase environment will provide a laboratory for research and data collection on the authoring/modification process. This evaluation of DON experience and technological progress will provide a basis for establishing comprehensive DON-wide authoring and modification standards for editable digital data by FY96.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Evaluate tools for authoring technical publications (primarily SGML-oriented tools) with respect to productivity levels, cost, and potential to support required IWSDB enhancements.

2. Evaluate CAD environments/PDES/STEP authoring tools that integrate various aspects of a product's design/engineering information set.

3. Develop authoring tools and techniques that will support advanced change control mechanisms.

4. Refine comprehensive authoring standards, policies, and acquisition guidance for editable technical data.

(2) FY97 Goal: Enhance DON-wide CALS processes to modify digital TI contents, update indexes, and support the change management process.

(a) Rationale. CALS processes must be enhanced to support the comprehensive authoring/modification standards and policies. These enhancements will facilitate increased integration and enable a DON-wide focus for change management and data use. For example, they will facilitate establishing a DON-wide change tracking system in the Transition phase, and standardized procedures to internally change digital documents and digital drawings. This standardization is needed to control, track, and propagate data changes.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Review existing commercial practices and DON initiatives that modify and control changes to digital technical data and that support technical document authoring and the engineering/design process. Specify modification and change control requirements.

2. Develop processes and procedures to modify digital technical data. These should address such issues as electronic review/approval, and acceleration of the change cycle for safety/health considerations, etc.

3. Define authoring-related requirements for change control tools to support a standardized modification process. These tools need to be compatible with the authoring environments and with the change tracking and version control management processes.

d. Phase III Target Goals: FY2000-10.

(1) FY2002 Goal: Establish enhanced DON-wide change procedures and standards for controlling and propagating changes to IWSDB-integrated TI.

(a) Rationale. Change implementation and change tracking techniques in the Transition phase were oriented toward raster and editable data. While many of the Transition phase change control mechanisms will still apply in the Target phase, enhancements will be required to support modification to information entities, change propagation, and support for changes to integrating data linkages.

Another data change issue relates to innovation in the modification review process. Technology for interactive editing and computer conferencing will be mature enough to enable on-line interactive reviewing of data modifications, contracts, and other items by a designated group of remotely-located reviewers. In addition, innovative forms of data, new integration requirements, and other IWSDB characteristics may require further enhancements in the Target phase change control process. DON procedures and standards need to be in place to support these IWSDB-related enhancements.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Determine DON requirements for modifying and integrating IWSDB data.

2. Develop corresponding procedures and standards.

(2) FY2003 Goal: Establish a standard IWSDB environment to author, modify, and link integrated TI.

(a) Rationale. From the IWSDB data definitions developed during the Transition phase goals, the DON should develop corresponding authoring standards and environments in the early stages of the Target phase. Without these standards in place, future data management and conversion burdens are anticipated because of the larger volume of non-standard data forms in conjunction with other newer and increasingly complex data forms that will be authored and acquired.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define DON-wide IWSDB authoring standards and tool requirements. Use lessons learned in the Transition phase from evaluating available authoring tools and surveying experience from the various DON activities.

2. Define a standard environment with required functionality.

6. Conversion

a. Definition. The Conversion functional area includes the scanning conversion of paper documents and drawings to non-editable (i.e. raster) or editable digital forms and automated translation (i.e. migration) of non-standard digital technical data to standard editable or IWSDB digital forms. Migration may prove inadequate for some types of digital technical data, and will need to be supplemented with human and tool-assisted conversion.

b. Phase I Current Goals: FY92-96

(1) FY93 Goal: Define TI conversion criteria for use by DON Program Managers.

(a) Rationale. Program Managers (PMs) are justifiably concerned with the immediate problems and goals affecting their own programs and associated technical data. By establishing policies early that take anticipated DON CALS architectural and transitional strategy considerations into account, PMs can incorporate these policies into their decision making.

Even though multiple published guidelines for acquisition (including MIL-HDBK-59A (NOTAL), DOD Acquisition Guidance, etc.) already exist, a single DON document is needed to integrate, focus and simplify the guidance needed for conversion of technical data.

(b) Objective. The following objective needs to be addressed to achieve this goal: develop a DON CALS TI plan of conversion criteria (by technical data type) that provides specific conversion guidance to acquisition and logistics managers concerned with technical data conversion.

(2) FY94 Goal: Coordinate and consolidate current DON conversion efforts to contain costs, avoid duplicated effort, and support TI use.

(a) Rationale. At present, many different approaches to conversion of existing data to digital formats are being pursued. Current major conversion programs support individual data type repositories and distribution/on-line retrieval centers. Some also produce customized, packaged data. Thus, they vary depending on the DON conversion program and even by geographical site within a program.

In addition, numerous implementation issues need to be resolved consistently across the DON. For more involved conversions to editable digital forms, a determination needs to be made on the location of conversion services. Options include co-locating this conversion service with the more basic raster conversions for the same data type, or establishing physically separate operations. It is difficult for Product Managers (PMs) to know which conversion services are available, which technical data should be converted, and into which digital forms. By centralizing and standardizing these services and output products, these decisions are simplified. Coordination and centralization will enable the DON to determine the technical data that needs to be converted and when it needs to be converted. This coordination will provide more uniform conversion quality, and allow the DON to realize cost savings through increased conversion efficiency and elimination of potential duplication of conversion efforts.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Evaluate all existing conversion initiatives, coordinating and consolidating them as appropriate.

2. Evaluate conversion requirements for all types of data to determine how and where they should be converted.

3. Define preferred conversion strategy, incorporating new service concepts and data products.

4. Establish metrics for evaluating the effectiveness of the new conversion strategy, determining shortfalls, and making conversion implementation corrections.

(3) FY95 Goal: Convert existing TI to digital using criteria and capabilities for the conversion of data to acceptable digital form.

(a) Rationale. Because achieving CALS benefits requires technical data in digital form, existing technical data must be converted as soon as practical. In the

Current phase, the bulk of this conversion will be to raster form suitable for near term digital storage, management and distribution. However, some technical data may need to be converted to nonstandard editable digital forms to support DON operations and plans requiring modifiable or processable data content.

(b) Objective. The following objective needs to be addressed to achieve this goal: plan and convert existing technical data per consolidated conversion strategy and conversion acquisition guidance.

(4) FY95 Goal: Identify and plan critical TI for migration from raster or nonstandard digital formats to editable digital formats during the Transition phase.

(a) Rationale. Digital data in a raster format is, for practical purposes, non editable. Much of the benefit and cost saving associated with digital data is lost if it is in a format that cannot be edited. To achieve data base integration, technical data must be in formats that can be automatically processed. Processing includes modifying technical data content for change implementation, or cross-referencing (e.g., between LSAR and TM data), categorizing, and customizing technical data for providing added value to users. Therefore, conversion to raster formats needs to be an interim step to attainment of editable and processable data during the Transition phase.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define a set of practical, usable DON standards for editable data while continuing to monitor and support the refinement of the CALS standards. Examine Target phase functional requirements with respect to their effect on data format, e.g., hypertext links, attributes, etc. Facilitate and participate in industry efforts for subsetting CALS editable data standards.

2. Identify and plan critical TI for migration from raster or nonstandard digital formats to editable digital formats during the Transition phase.

3. Where necessary, re-acquire from contractors selected data in its original electronic form for conversion to one of a set of acceptable formats.

4. Sponsor raster-to-vector pilot conversion efforts and monitor technology developments.

c. Phase II Transition Goals: FY96-2000

(1) FY97 Goal: Selectively migrate digital technical data, coordinating and executing the planned transition to editable and more value-added digital formats.

(a) Rationale. By FY96, experience will have been gained from converting and using raster data, and from converting and using relational LSAR data. Through lessons learned, the DON will be better able to assess the capabilities and benefits of raster, and determine whether or not to accelerate the transition to editable formats. The DON will also be able to decide whether or not to make improvements in the conversion and migration processes.

Based on this, conversion and migration of existing digital forms must be effected to achieve benefits arising from editable and integrated technical data management and

use.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Evaluate DON experience and alternative data migration/conversion options. Options should include intelligent raster, other information tagging schemes, and vectorized drawings.

2. Establish guidelines to migrate/convert existing digital and non-digital technical data to intelligent data forms. Integrate and consolidate DON migration/conversion process requirements and plans. Make adjustments to procedures, initiatives, and policies as necessary.

(2) FY98 Goal: Establish migration/conversion techniques and standards for integrated TI that translate existing digital data to modifiable IWSDB information entities.

(a) Rationale. The IWSDB is based on the premise that storage of single, reusable information entities, extensively linked together, provides maximum flexibility and added value to users. Additional benefits for operations and support can be realized by sharing technical data across weapon systems, new and old. These benefits can only be realized if a sufficiently large body of related data is linked together. Participating weapon system data in older data forms needs to be migrated or converted so that the DON can take full advantage of the IWSDB technology.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Prototype the conversion of selected technical data from all data types to editable, linked information entity forms.

2. Define migration/conversion techniques, standards, and conversion acquisition guidance to support this data transition to IWSDB information entity forms.

d. Phase III Target Goals: FY2000-10

(1) FY2007 Goal: Migrate/convert TI to IWSDB information entity formats to the maximum extent that is feasible and cost-effective.

(a) Rationale. It is currently difficult to accurately estimate the benefits and costs of migrating/converting technical data from various Transition phase digital forms to IWSDB forms and structures because of the current lack of standards and supporting tools for authoring IWSDB data. IGES-to-PDES/STEP translators and advanced raster-to-vector converters likely to be available by the Target phase will aid engineering data conversion.

By the beginning of the Target phase, significant experience relating to IWSDB issues will have been accumulated from multiple laboratory, field activity, and SYSCOM sources for information entity studies and experiments. This experience should provide a basis to establish the necessary managerial, planning, and technical criteria for migrating/converting technical data, and also for developing supporting automated tools to facilitate the data transition.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Determine technical data migration/conversion candidates based on assessing weapon system operational needs and transition suitability of the data.

2. Plan the migration/conversion to IWSDB information entities consistent with the transition of CALS to IWSDB repository capabilities.

7. Receipt

a. Definition. The Receipt functional area includes the acceptance, verification, and validation/review of acquired technical data sets, including checks for contract deliverables and data standards compliance. It also includes developing, maintaining, and extending a complete baseline of standards to enable the transition to the DON CALS vision, as well as to support various technical data types and contractor-managed technical data services.

b. Phase I Current Goals: FY92-96

(1) FY93 Goal: Establish preliminary guidelines to govern acceptance testing of digital technical data.

(a) Rationale. In many instances, there are incompatibilities or inconsistencies in defining digital data standards. As technical data is delivered or transferred, information may be illegible, indecipherable, non-compliant or missing. In the Current phase, if DON lacks the proprietary authoring environment used to develop the technical data, then digital information is totally unreadable even though the contractor has complied with the specified standards.

Emerging on-line data access and review capability of interim data products will provide government feedback to contractors. Identified problems can then be addressed under the existing contract, reducing cost to the DON and improving the quality of the acquired technical data. Of crucial importance to the developer/contractor, is the criteria used to evaluate the technical data for acceptance. The data needs to be evaluated in a consistent, reproducible manner. In addition, guidance and processing support is needed to perform acceptance testing adequately.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define acceptance testing criteria and procedural guidance for digital technical data of various types. These criteria should be consistent with the preliminary acquisition guidance given to DON acquisition managers.

2. Establish criteria to verify that proprietary formats are readable in the appropriate environment.

(2) FY94 Goal: Implement existing CALS data interchange standards that support data receipt objectives in the Current phase.

(a) Rationale. CALS data interchange standards have already been specified in some DON acquisition and data conversion contracts. The resulting

digital technical data will be delivered to DON during the Current phase. Therefore, DON must be capable of receiving and accepting it.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Review and analyze the technical data currently being acquired to see which formats are the most useful.

2. Establish digital data acceptance testing capabilities for each data type to support existing CALS data interchange standards consistent with the preliminary guidelines in the prior goal.

3. Use acquisition guidance to specify DON CALS requirements in all new TI acquisition or data conversion contracts.

(3) FY95 Goal: Establish a complete baseline of standards to enable CALS integration of any future data types.

(a) Rationale. A practical approach to implementing CALS must include standards for data exchange, acceptance processing, data integration, and data access. Use of effective standards makes CALS application processing and data integration independent of the hardware platforms, and enables servicing diverse DON users. A baseline of standards must be supported that can be extended and refined to enable the functionality in the DON CALS vision. Changes in this baseline should include developments, modifications and enhancements to existing CALS standards, and the development of new standards to enable CALS integration of any future data types. These standards must comply with DOD-wide standards development efforts.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop a media format implementation plan; data distribution indexing/ordering format implementation plan, technical data format implementation plan, internal document indexing scheme for TI, and telecommunications protocol for networking CALS components. These plans need to consider security/access issues.

2. Formally establish a CALS standards Proof of Concept (POC) for the DON interface with NIST and the OSD CALS office.

3. Support the national product definition data format development.

(4) FY95 Goal: Define access to contractor-managed TI and data services, including functional capabilities, standards, and guidance needed for use of CITIS.

(a) Rationale. Contractor-managed data services will become an option for DON CALS. Its integrated use affects many DON CALS processes and requires careful planning to achieve effective interoperability with organically stored technical data. Any apparent cost savings from such a concept will be only temporary if it is not effectively integrated with DON operations and technical data.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define the DON contractor-managed data service concept of

operations.

2. Identify the service coverage requirements (i.e., weapon systems, data types, user types and locations, etc.).

3. Prototype the concept in a major acquisition program.

4. Develop standards for contractor-managed data, cataloging/indexing/searching, packaging, accessing (days, times, controls), and usage.

c. Phase II Transition Goals: FY96-2000.

(1) FY96 Goal: Refine TI acquisition guidance, defining quality assurance requirements for acceptance of technical data.

(a) Rationale. The Transition phase will increasingly focus on incorporating new data types into CALS and integrating existing digital technical data types to support value-added functionality. The preliminary acquisition and acceptance guidelines will potentially be inadequate to support these new needs. In addition, the DON will have accumulated a considerable base of experience using the preliminary guidelines. Therefore, the preliminary acquisition guidance must be extended and refined to provide a more comprehensive baseline for use by acquisition managers.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Review evolving CALS technical data needs, data acquisition and acceptance testing experience.

2. Develop a comprehensive baseline of acquisition guidance for use by acquisition managers during the Transition phase.

3. Establish quality assurance requirements to support automated acceptance testing.

(2). FY97 Goal: Establish acceptance testing for all newly acquired TI ensuring it complies with appropriate standards and relevant contract specifications.

(a) Rationale. A minimal level of standards compliance will have been established during FY92-96, applying primarily to raster (image) data. During FY96-2000 more rigorous testing of tagging schemes and vectorization will need to be undertaken. Both newly acquired digital data and converted data (prior to acceptance into a repository) need to be tested for compliance. For example, conversion accuracy will need to be assessed when a raster image is converted to a vectorized depiction. In addition, it is expected that additional standards, variations/implementations, and DON-unique interim standards will emerge. This will result in the development of additional compliance assessment tools.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Review and analyze current standards compliance practices, improving coverage, automation, and assessment.

2. Review and analyze the digital technical data being acquired to

determine the formats that will need to be assessed for compliance. Take into consideration the formats specified in major DON acquisitions.

3. For emerging standards, develop automated logic routines that compare standard specifications to delivered technical data.

4. Prototype acceptance testing using selected acquisitions.

5. Enhance CALS receipt process to incorporate automated acceptance testing.

(3) FY99 Goal: Maintain and use the baseline of CALS receipt standards.

(a) Rationale. Increasingly sophisticated information technology (hardware and software) has been changing the form and nature of digital technical information. This trend is expected to continue.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Monitor and identify emerging nonstandard data forms and data that has potential acceptance problems or presents opportunities for improved efficiency. Determine the usefulness and acceptability of the emerging data form and establish interim standards.

2 Continue to define and develop applications using existing CALS 28000-series and other CALS baseline standards. Review current data standards (government and industry) and determine the standards or portions of standards that are appropriate for inclusion in a CALS data standard.

3. Update the baseline of standards and subsets used in CALS. Establish interim data standards to govern all data acquisition including data acquired through organic authoring. Incorporate reliance on standards into TI acquisition guidance for acquisition managers.

4. Ensure that standards apply to all new contracts.

(4) FY99 Goal: Establish automated validation capabilities to assure the quality, accuracy, and consistency of newly acquired TI.

(a) Rationale. Technical information represents a significant output of any weapon system acquisition. As the usage of information entities becomes more prevalent it is critical that newly acquired information entity data be validated according to these standards.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop automated data validation routines for various linked data types.

2. Prototype automated data validation routines for selected acquisitions.

3. Expand automated data validation routines to integrate logical inferences and consistency checks across functions, disciplines, and data types.

d. Phase III Target Goals: FY2000-10.

(1) FY2004 Goal: Establish integrated acceptance processing for all received TI.

(a) Rationale. Generically-stated contractual requirements still need to be checked to make the technical data useful. For example, the content, structure, linkage, and consistency of all technical information (including IWSDB information entities, complex data entities such as data base subsets, simulations and other models, voice audio, and video data) will need to be validated for acceptance prior to being integrated into the IWSDB.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Establish an automated and integrated capability to validate completeness, consistency, and accuracy of IWSDB information entities and application-specific databases for such areas as design, maintenance, or supply.

2. Establish the capability to evaluate the logic and accuracy of various simulations and models delivered to the DON. For example, interactive training or maintenance simulations will need to be examined from a variety of standpoints (e.g., accuracy, understandability, needed equipment, etc.) prior to their introduction as standard tools.

3. Enhance automated validation and verification capabilities for checking any residual non-IWSDB data forms for interoperability with the IWSDB environment.

4. Enhance CALS receipt processing to incorporate the automated and integrated acceptance processing.

5. Enhance CALS acquisition guidance to support this integrated acceptance processing.

(2) FY2006 Goal: Establish compliance checking capabilities for contractor-managed technical data and services.

(a) Rationale. In the future, storage and management of technical information will be accomplished organically and non-organically. The mix of technical data across these two modes will change over time according to government contracting trends and DON CALS user requirements. Contractor-managed data is also subject to periodic re competitions. Coordinated usage and re competition of such contractor-managed data services relies heavily on interchangeability assured by compliance to standards.

Non-organic storage and management of technical information is currently defined in the CITIS specification. Regardless of its future form or the availability of other contracting alternatives, the technical data and associated services (e.g., administration, modification, access and distribution to DON users) housed outside the DON repositories will need to be checked for compliance.

CITIS, or its successor, should be treated just like any product or service that the DON acquires and uses. DON requirements for contractor-managed CALS data therefore

need to be specified. Each data service can then be evaluated to verify that it meets the appropriate DON specification.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Establish and refresh DON CALS requirements and specifications for contractor-managed technical data and services.

2. Establish automation-assisted capability to verify and validate content, currency, and traceability of contractor-managed data bases.

3. Establish automation-assisted capability to verify and validate capabilities and performance of contractor-managed services.

4. Define contractor services and future data acquisition policies to accommodate contractor recompetes, and integrate non-organic data into the IWSDB environment.

8. Storage/Data Management

a. Definition. The Storage/Data Management functional area includes the specification of data meaning and relationships, the registration and storage of accepted technical data in designated DON data repositories, managed by a Central Locator/Central Index. It also includes: system administrative functions such as user access control and data security, system resource management, data usage requirements, management of data histories, user feedback data, and certain other support data; as well as other functions that organize, rearrange, and integrate the technical data for added usage value, such as categorization, cross-referencing, and customized packaging for use.

b. Phase I Current Goals: FY92-96

(1) FY93 Goal: Define a storage concept that can evolve to the future IWSDB.

(a) Rationale. Currently, multiple storage systems are being developed by several CALS initiatives. To realize maximum efficiency for user access and storage costs, coordination among initiatives is needed. A coordinated strategy for the location of information storage repositories and for the integration of data types needs to be developed.

The present definition of the IWSDB within the DON is insufficient in detail to allow an orderly transition from a series of current repositories to an IWSDB environment. The early definition of the IWSDB functionality and the implications of that definition for Current and Transition phase data, standards, process improvements, and innovations should influence the Current phase strategy for data storage.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop an initial conceptual design and technical definition of the envisioned IWSDB.

2. Develop a Current phase strategy for physical storage locations

and management of data types that allows evolution to the IWSDB.

(2) FY94 Goal: Develop an inclusive indexing and cataloging mechanism for DON technical data.

(a) Rationale. The DON needs to be able to locate technical data regardless of its physical storage location. Where data is replicated at more than one location, data modifications need to be propagated to all instances of the data. Data consistency and currency throughout the DON are essential to support improved acquisition and logistics practices. A global TI index and catalog will improve user access to technical data, and improve various logistics support activities.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop a central indexing and cataloging standard for the DON.

2. Develop DON data dictionary standards to support the storage strategy and cataloging/indexing standards.

(3) FY95 Goal: Establish initial TI repository capability supporting multiple technical data types, technical data integration, diverse users and central administration.

(a) Rationale. The DON is actively converting existing non-digital technical data and acquiring digitized technical information. These data are being stored in uncoordinated digital repositories. This uncoordinated approach can lead to unnecessary duplication of effort, inconsistencies among repositories, and will result in a series of standalone repositories unless a standardized and centralized approach to repository administration is followed. User access, data security, digital data labeling and control, technical information back-up, archiving, and actual data storage are all service areas that require standardization.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop a functional description of current repository environment and administration.

2. Identify and specify the local administrative services that should be provided by individual repositories and the services that should be centralized for DON-wide consistency and coordination.

3. Define standard operating procedures governing regular operations. Procedures should govern such requirements as back-up, archiving, facility and data security, disaster recovery, and communication/coordination among individual sites.

4. Establish a standard distribution support process for DON users, multiple data formats/media. Analyze technical data distribution requirements for indexing/ordering TI, providing print-on-demand and digital output, and taking into account the efficiencies of centralized and decentralized distribution points.

5. Establish initial configuration management support.

6. Define repository functional description for transition environment and plan for the migration to the IWSDB.

(4) FY95 Goal: Standardize repository capabilities across organic and non-organic sites.

(a) Rationale. As the number of digital data types grows and IWSDB deployment continues, the population of repository sites will grow. While many of these sites will be organic, it is also likely that some percentage will be managed by contractors. Contractors may also provide selected services at organic repository sites. Given this participation by contractors, it is natural that variations in repository operating environments and capabilities would result.

Non-organic data needs to be interfaced with or even integrated into the IWSDB environment. Individual repository operating environments therefore need to be controlled by standardizing contractor and DON capabilities and interfaces. For contractor-managed data concepts (such as CITIS) to be effective for weapon system maintenance and support, as well as future acquisitions, they must be supported by links to established organic data. The IWSDB metadata (data dictionaries and mapping data structures) must also support non-organic data.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Standardize repository capabilities, services, data security, interfaces and user tools across organic and non-organic DON Sites.

2. Define appropriate metadata and standardize interfaces/interconnections and other links across organic and non-organic repository sites supporting the integration of non-organic data.

3. Establish administrative oversight controls over non-organic repository sites for standardization compliance and contract performance.

4. Define contractor services and future data acquisition policies to accommodate contractor recompetes, and integrate non-organic data into the IWSDB environment.

c. Phase II Transition Goals: FY96-2000

(1) FY96 Goal: Develop a technical data dictionary by defining, prototyping, and establishing a migration process for a standard data dictionary consistent with the government Information Resource Dictionary System (IRDS) standard and the evolving IWSDB information entity/data element standards.

(a) Rationale. A digital data dictionary stores and processes information on the meaning, structure, relationships, and usage of technical data. This information about the data, called "metadata," is itself usually stored in a database so it can be easily accessed and processed. During FY92-96, most metadata will be stored in separate data dictionaries for individual data sets. Since DON standards will be developed for a data dictionary, an indexing system, and a cataloging standard during FY92-96, there is an opportunity to integrate and consolidate these individual

dictionaries and establish a global data dictionary that will allow discrete databases established in the Current phase to be logically integrated.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop a DON prototype data dictionary for a future logically integrated environment applying the DOD data dictionary standard to support the DON storage strategy and cataloging/indexing standards.

2. Using a prototype subset, reconcile remaining conflicts in existing data element definitions and names.

3. Evaluate data dictionary prototype experience and incorporate lessons learned into various standards.

4. Migrate the prototype into an operational DON data dictionary.

(2) FY96 Goal: Develop user-support standards for the preparation and storage of customized data packaging.

(a) Rationale. The most frequently used method of distributing data in the Current phase is to send the user entire paper books. Typically, only a small section of a single manual or a few sections from multiple manuals are actually required to complete a job. With the evolution of authoring and storage technology in the Transition phase it will be possible to begin creating customized data sets that cut across multiple publications. These customized data packages can then be digitally stored and distributed quickly. Through indexing, cataloging, and cross-referencing, the storage function can utilize its existing data sets to create and store the customized packages, ready for distribution/use.

(b) Objective. The following objective needs to be addressed to achieve this goal: develop a standard for the identification, representation, and storage of customized data sets across the DON databases.

(3) FY97 Goal: Apply standard DON indexing scheme to all data types in DON repositories to initiate TI integration among repositories.

(a) Rationale. By the late 1990s, the operational CALS infrastructure will provide the DON with the opportunity to initiate technical data integration. Technical data during the Transition phase will be a mix of both converted (raster and editable) and newly authored data. Much of the recently authored data will be enhanced data that will need to be integrated with older, less sophisticated data forms. The complexity and uses of the technical data require that it be logically integrated.

The quantity of technical data and the dispersion of the DON user community preclude the total physical integration of technical information at one location. The various nodes of the integrated repository system, therefore, need to be populated with appropriate sets of technical data. Collection of data usage statistics becomes important to ensure that the right data is being acquired and supplied in the most usable forms for DON users.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Enhance the categorization and indexing capability to address information entities and other new forms of data. Develop standards for a DON-wide catalog for all major weapon systems and for indexing data within a dataset.

2. Initialize a preliminary integrated repository site, integrating received data with other data, attributes, and associated storage functionality, such as indexes, standard DON catalog, and data dictionary services.

(4) FY97 Goal: Enhance central TI administration policy to coordinate the administration and management of distributed technical data repositories.

(a) Rationale. The storage capability in the Current phase will consist of a set of decentralized data repositories. During the Transition phase, as storage capabilities evolve toward a more tightly integrated and centrally managed network, an enhanced DON-wide management standard will be needed to support the administration of the technical data. Uniform administration and security of the data, user services, troubleshooting, and system resources will become increasingly critical to ensure data integrity, currency, as well as responsive user services.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop and implement a standard for centralized data management and for the administration of the physically distributed repositories and their technical data.

2. Enhance this standard for the impact of distributed contractor-managed technical databases.

(5) FY98 Goal: Implement suitable TI repository security by defining and standardizing security administration of all TI repositories and obtaining security accreditation (as needed).

(a) Rationale. Data security considerations will grow in importance with increasing data linking, interoperability, and integration. Without proper security accreditation from appropriate organizations, affected DON or contractor-managed repositories will not be allowed to store, access, or otherwise utilize any classified or sensitive information; and such repositories may need to be isolated.

Protection and security of sensitive or classified data is an important concern for central administration. An overall operating concept will need to be developed to address security requirements during the Transition phase. The scope of this concept should include issues such as: control of user/site access to selected information to eliminate unauthorized disclosure of classified or sensitive information; and protecting the integrity of stored data from computer viruses or unauthorized changes. Once an integrated security operating concept has been developed, affected organizations and data repositories will need to obtain an appropriate level of security accreditation.

(b) Objective. The following objective need to be addressed to achieve this goal: develop and implement a practical and adaptable concept of secure operations for DON repositories and technical data.

(6) FY99 Goal: Verify DON IWSDB Conceptual Design

(a) Rationale. Several technical data repositories containing large quantities of digital information will become operational in the Transition phase. This data must be migrated to IWSDB form by the Target phase. Without a plan for data migration, a smooth transition will not occur. Conceptual design for the IWSDB needs to be verified before full scale development can take place.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop a prototype of the IWSDB architecture based on the Current phase IWSDB design concept and Transition phase CALS infrastructure for integration support.

2. Determine what role CITIS or other contractor-managed technical databases will play in the IWSDB solution.

3. Refine the functional definition and description of the envisioned IWSDB, and identify needed standards, acquisition and logistics process improvements, functionality innovations, and policy guidance and tracking needed to support the IWSDB.

4. Develop a transition plan that defines data migration among various nodes, the establishment of additional nodes, and the acquisition of repository functionality.

d. Phase III Target Goals: FY2000-10

(1) FY2010 Goal: Develop and deploy a fully functional IWSDB repository system.

(a) Rationale. The primary data storage/administration focus for the Target phase will be to transition into the IWSDB environment. There are two significant issues relating to this deployment. The small-scale prototype IWSDB concept used in the Transition phase to validate the IWSDB conceptual design will need to be detailed, expanded, developed, and deployed into a large-scale fully operational IWSDB repository system. In addition, the technical data will need to be restructured into information entities, extensively cross-linked to each other, and linked to other older forms of data.

Full scale development and deployment of the IWSDB will require the conceptual design and initial implementation plan developed in the Transition phase to be modified and expanded, and detailed plans developed and executed.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop, update and obtain consensus on IWSDB functional description (including conceptual schema, configuration control, versioning of products and technical information, indexing, and interface between organic and non-organic sites).

2. Define appropriate metadata (including data dictionaries and mapping data structures) required to support technical data integration, control data replication, and define required functional/process specification.

3. Adapt, expand, and refine the IWSDB design and implementation plans to support full scale development and deployment of the IWSDB, using lessons learned from Transition phase prototyping efforts as well as operating experience and innovations in DON initiatives.

4. Establish configuration control and other needed links and indexing mechanisms for all populated data elements, including any new data forms and information entities.

5. Establish and apply new standards to support product modeling and storage of highly integrated data, including linkages to technical, configuration, and user feedback data.

(2) FY2010 Goal: Develop, aggregate, and update customized data packages for users to support distribution/use.

(a) Rationale. Advances in authoring and storage technologies (along with linking extensions in indexing, cataloging, and cross-referencing) will present new opportunities to create, store, and distribute customized data packages. The new, modular organization of the technical data as reusable referenced information entities with behavioral traits, will enable advanced customized data packages to be created and distributed. Anticipated advancements in networking and data transmission technologies and standards will allow electronic access to or distribution of most customized data packages in the Target phase via the distribution/use process.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Apply enhanced standards for data storage so that it can be quickly and efficiently reorganized into customized data packages.

2. Integrate with distribution/use by defining data views that address specific user requirements and by enhancing stored user and site profiles. Establish appropriate relationships among the data to specify these logical views and create the technical data packages.

3. Establish the necessary organic and non-organic data repository interfaces to support the aggregation and preparation for distribution of customized technical data packages.

4. Define user system capabilities and tools needed to receive and process customized technical data packages at user sites, e.g., Integrated Electronic Technical Manuals (IETM).

(3) FY2010 Goal: Enhance administrative processes to ensure IWSDB performance, data integrity, and data security within DON repositories.

(a) Rationale. As the quantity of technical data captured in the DON repository system increases, the emphasis will need to shift from converting and capturing information in the repositories, to maintaining the accuracy and currency of the stored information and providing consistent IWSDB performance. In addition, with operations relying more on integrating digital TI, storing and protecting classified and sensitive information will be a key consideration.

A concerted effort to maintain the accuracy and currency of technical data, integrated

operational feedback and change data, and the various supporting data linkages is required. Unless administrative procedures and mechanisms are established to ensure continued data currency and proper protection, the data will become compromised or outdated.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop mechanisms to automatically collect, analyze, and summarize transaction information, user feedback, technical data problems, supporting linkage problems, etc.

2. Monitor how system resources and technical data are used, adjusting administrative procedures, repository balancing, and system enhancement investments as necessary.

3. Establish problem and disaster recovery procedures for various IWSDB failure modes.

4. Work with certification organizations in defining and developing secure, technically feasible innovations in mixed security environments.

5. Develop and deploy strategies to control data aggregation sensitivity (i.e., accumulating multiple pieces of non-sensitive data, which results in disclosure of sensitive information).

9. CONFIGURATION

a. Definition. The Configuration functional area includes the management of changes to technical data and to related weapon system configurations. It also includes management of product data models, or family trees.

b. Phase I Current Goals: FY92-96. FY95 Goal: Establish preliminary configuration management (CM) procedures DON-wide for digital TI.

(1) Rationale. Overall operational costs will be directly reduced by more effective repair and diagnostic procedures, and more accurate supply information. Availability of usage data and operational data will enable design process improvements, as well as provide actual information to substantiate projected support requirements for similar systems. These capabilities require an integrated DON-wide configuration management process, which needs to be established incrementally to coordinate with evolution of TI storage/data management. In the Current phase, a preliminary standardized CM must be developed to reflect the confederation of technical data repositories.

(2) Objectives. The following objectives need to be addressed to achieve this goal:

(a) Establish preliminary policies and procedures for a consistent and consolidated change management process.

(b) Define consistent change tracking requirements for each technical data type.

an interim step to automation of reliable and processable data during the transition

(c) Establish preliminary change management database(s) for management/tracking of changes to each type of technical data. Interface these databases with existing weapon system configuration databases, where feasible and cost-effective.

c. Phase II Transition Goals: FY96-2000

(1) FY97 Goal: Establish an integrated change tracking process for the various forms of TI.

(a) Rationale. The change tracking environment needs to support a mechanism for tracking TI changes for many different data types as well as linking weapon system modifications to corresponding technical data. Without this type of capability, multiple change orders could be executed by various organizations for the same change to a particular component. The DON needs to be able to consolidate and aggregate similar change requests across the DON and execute them in an integrated fashion.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define one integrated set of change tracking policies and procedures across the DON.

2. Enhance the change management database(s) that consolidates and stores change requests, ECPs, and other data related to the management and tracking of technical data changes.

3. Coordinate weapon system configuration changes into a global configuration change process.

(2) FY98 Goal: Establish automated linkages between usage (i.e. supply) and operational (i.e. 3M) technical data to establish a coordinated TI change process.

(a) Rationale. Inspection and maintenance cycles; operating, diagnostic, and repair procedures; and replacement part schedules are all subject to change due to operational experiences. This user experience can enhance the content, clarity, and effective use of operational data. Also, multiple branches of the DON may be using the same equipment but are unaware of experiences and lessons learned from other users. Such data sharing can be enabled by integrating operational experience with the change order process.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define the operational parameters that need to be integrated into the change control process.

2. Establish a mechanism for integrating operational experience with the change control process.

3. Develop an index scheme for accessing the operational data in conjunction with user feedback.

(3) FY99 Goal: Integrate weapon system configuration changes into a global

configuration change process.

(a) Rationale. A system's value is measured by the accuracy of its information. It is necessary to design an integrated process that creates a modification once and then applies it to all instances of the weapon system. This will support a single change/approval process and the creation and maintenance of one master modification data set.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Coordinate the design using a digitized and integrated work flow process for proposing, approving and implementing configuration changes.

2. Identify and normalize the data elements across the different weapon system configurations. Create an integrated configuration management data dictionary to support the IWSDB.

3. Develop a design for tracking common components within and across weapon systems.

4. Develop a method for linking configuration data to integrated technical data.

d. Phase III Target Goals: FY2000-10

(1) FY2002 Goal: Establish weapon system product structures and models to support versioning of TI.

(a) Rationale. Modern weapon system products are complex, integrated collections of hardware devices, software subsystems, training and operational procedures, and other associated technical data needed to manufacture and support the products. In time, some of these product components become tailored to specific tactical strategy changes or classes of missions or foreign military sales. Some get replaced or enhanced during scheduled upgrades. Older devices may get serviced using new commodity or old cannibalized parts. Different versions of each weapon system product will thus emerge naturally.

Configuration and control of technical data must support versioning and allow rapid tactical changes during emergencies. The resulting product structures should be capable of determining: how many versions of a weapon system exist, where they are being used, what is the technical data structure of each, which weapon system versions use a particular device, etc.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Develop standardized weapon system product structures using PDES/STEP and incorporating 3-D engineering models.

2. Develop supporting versioning structures or other representational models for technical data types or forms not adequately integrated into the prevailing PDES/STEP standard.

(2) FY2007 Goal: Establish embedded relationships connecting different

versions of digital data to the corresponding physical system items.

(a) Rationale. Design technical data may support numerous variants of physical devices; such physical variants may be introduced as manufacturing changes or later as field modifications during maintenance or operational use. Not all the design data is affected by such changes; and each physical variant will have its own unique impact on the technical data.

Fully integrated configuration control and Concurrent Engineering practices require defining and maintaining the "as designed", "as built", and "as used" relationships. In an IWSDB environment, some of these relationships will need to be embedded with the technical data because of their connection to detailed data.

(b) Objectives The following objective need to be addressed to achieve this goal: define and establish standardized relationships between the "as designed", "as built", and "as used" technical data and physical devices for an IWSDB environment.

10. Distribution/Use

a. Definition. The Distribution/Use functional area includes preparation and transfer of requested technical data sets to the DON user community, via digital or paper delivery. Digital delivery may be on portable bulk media or using telecommunication networks. This area also includes the printing and publishing function, and standardized support of user digital technical data presentation/ application systems.

b. Phase I Current Goals: FY92-96

(1) FY93 Goal: Establish a standard user display and system platform policy and develop a presentation capability to enable the user to view and use CALS integrated technical information.

(a) Rationale. Usable electronic display of technical documents, engineering data, and other data requires suitable user computer equipment and software. Minimum specifications need to be established for various user classes and coordinated through with the Copernicus Architecture.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Evaluate operating DON end user display needs and hardware requirements for multiple types of data including work packages and specialized viewing requirements.

2. Develop and prototype an Interactive Electronic Technical Manuals (IETM) to optimize the end use of integrated technical data.

3. Review existing hardware platforms for applicable end user platforms. Identify new end user hardware requirements and develop supporting acquisition strategies.

(2) FY94 Goal: Implement "pull" distribution for DON CALS via central ordering.

(a) Rationale. Standards affecting data distribution are not yet resolved. Usable electronic display and local printing on demand of technical data, given its variety of font characteristics and graphical detail, requires suitable user computer equipment and software. These minimum requirements need to be established for various user classes and coordinated distribution with the Director of Space and Electronic Warfare (OP-094).

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Evaluate operating DON distribution plans to identify data distribution gaps and determine how to fill them.

2. Evaluate DON plans to identify Current phase technical data needs for all weapon systems. Prioritize the data loading and indexing needed to support the location and distribution of technical data.

3. Define and implement the best approach to interoperate DON CALS technical data distribution services with other DON programs.

4. Quickly evaluate and choose defacto interim standards needed to support technical data distribution. This will provide Current phase stability and time to evaluate and select improved standards for the Target phase.

(3) FY95 Goal: Prepare for "push" distribution and TI user support as the primary Transition phase distribution process (with "pull" used to service exceptions), and standardize user presentation formats and user interfaces for digital TI use across DON.

(a) Rationale. A "push" distribution process relies on regularly scheduled bulk distributions of digital data to users. The Transition phase environment should support "push" distribution using optical media to reduce the frequency and data volumes associated with ad hoc user requests for data. This will level data distribution loading requirements. "Push" distribution provides adequate distribution performance without building a costly distribution infrastructure to support peak demands. "Pull" distribution should be used to service ad hoc user request exceptions.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define DON CALS requirements needed to support a "push" data distribution process.

2. Define Transition phase goals for advanced DON distribution service.

3. Analyze and consolidate development of the standard user presentation software, and standard interfaces for user application systems and ensure functionality is reconciled with other automated systems such as SNAP III and NALCOMIS to provide "seamless use".

4. Develop and provide training to users on distribution/use procedures and technical data presentation systems.

5. Develop enhanced user feedback mechanisms for corrections, improvements, and reliability of TI support to DON users.

(3) FY95 Goal: Establish TI distribution security policies for data access control and security issues associated with implementing "push" digital distribution of TI to users.

(a) Rationale. During the Transition phase, as storage capabilities move toward a more tightly integrated and centrally managed CALS capability, and as some technical data may be accessed from contractor-managed data bases, TI security considerations will grow in importance with increasing levels of data linkage, interoperability, and integration. Therefore, the distribution/use process must not compromise the TI security achieved in storage/data management.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Evaluate methods to control access to sensitive digital data bases and to control distribution of sensitive data to cleared users.

2. Evaluate automated data processing security requirements of distribution/use systems.

3. Establish/reconcile the government's access/data rights to contractor data bases.

d. Phase II Transition Goals: FY96-2000

(1) FY96 Goal: Develop distribution metrics to support planning and design decisions for further transitionings of the distribution process.

(a) Rationale. It is difficult to accurately project user data type requirements, volume levels, frequency of updates, specialized printing requirements, and other distribution-influencing factors. It is particularly difficult to project these factors today, since data distribution is currently neither centralized nor digital. But without sufficient data on these metrics, a distribution strategy cannot be planned with confidence.

Two or three years of data collected from experience with both demand-driven ("pull") distribution as well as data collected from some limited push distribution using prototype push implementations will provide a valuable basis for devising an efficient push distribution strategy.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Identify likely distribution-influencing factors based on experience with pull distribution in the Current phase. The list should be subject to review by all program managers involved in the distribution and receipt of CALS data.

2. Revise the distribution metrics data to allow for lessons learned, newly discovered metrics, and/or technological and program advances.

3. Develop transition plan for distribution processes.

(2) FY97 Goal: Devise a "push" distribution process including TI indexing/ordering based.

(a) Rationale. To support the push data distribution strategy new functionalities and standards must be developed and integrated into the Transition phase functionality. The new distribution functionality should build on "lessons learned" in the Current phase and analysis of the Current phase and early Transition phase distribution metric data.

The "push" portion of the distribution process requires site and user profiles to manage the "push", and standardization of digital distribution media and technical data output formats. These profiles will be managed in a central administrative function.

Also, an ad hoc capability must be widely available to technical data users which allows them to research an index of available TI interactively and to order selected TI to be delivered in desired relationships, data formats and media. This capability will be the users' gateway to TI and eventually the user interface to the IWSDB.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Prototype the "push" distribution process using work flow modeling, decision support, and other relevant technologies.

2. Define alternative user distribution requirements and develop corresponding objectives.

3. Develop an implementation plan to operationally deploy a mature distribution process.

4. Identify required functionality and develop a system requirements plan for an indexing, browsing and ordering capability, including migration from independent TI indexes through integrated indexes to the IWSDB.

(3) FY98 Goal: Transition the distribution process from relying largely on paper-based "pull" to using bulk delivery and digital-based "push".

(a) Rationale. The distribution process needs to reflect technological advances in telecommunications and in deliverable portable media that may radically alter the anticipated balance of usage of the two technologies for digital distribution. Minimum requirements for the users' computer hardware and software resources needed to both receive and manage the distributed digital technical data must be reexamined and modified to adjust for new technologies and standards.

(b) Objectives

1. Enhance the distribution prototype mentioned in a previous goal to explore digital distribution issues.

2. Develop and execute a phased implementation plan to support the chosen transition strategy.

3. Coordinate the user system hardware and software requirements with the Copernicus Architecture to assure that user systems are in place to perform appropriate printing/publishing and local data management functions.

4. Develop/enhance and support the transition to IWSDB environment with on-line access to integrated TI indexes.

5. Develop a standard for the telecommunications functions.

(4) FY99 Goal: Plan for customized distribution of information entities.

(a) Rationale. The levels of integration and sophistication present in an IWSDB are significantly greater than those of the Transition phase DON CALS environment. Technical data will have evolved into technical information that can be processed directly by user's computer systems (e.g., engineering models in CAD/CAM environments). This environment is more dependent on automated processing, compliance with new standards, and automated administrative controls (e.g., enhanced distribution profiles). It will also require technical data translations, enhancements, or conversions to support the advanced functionality.

Development of these highly integrated distribution capabilities will be a primary focus of the Target phase, but preparation must begin earlier to ease the transition to such an environment. In addition, such capabilities will need to be coordinated with JCALS, which is scheduled to become operational in the latter part of the Transition phase. Prototyping and detailed planning will be required for successful IWSDB development and operational implementation.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Define the integrated concept of operations for the Target phase distribution process.

2. Define needed digital-to-digital technical data translations or migrations required to support chosen output data standards and selected users.

3. Define the functionality and process enhancements needed to support such an advanced distribution capability. Develop a phased implementation plan and transition strategy for implementation during the Target phase. The plan should include prototype developments to validate the concept and explore the risks.

d. Phase III Target Goals: FY2000-10

(1) FY2000 Goal: Transition the distribution process from using bulk media to delivery via telecommunications links.

(a) Rationale. As user application systems increasingly become more sophisticated and useful, they will become more dependent on both increased data integration and data timeliness/consistency across the CALS community. For such user applications, periodic physical delivery of digital data using bulk media will prove to be either inadequately responsive (if infrequent) or increasingly costly (if frequent).

Data accuracy and consistency within CALS is facilitated by the IWSDB environment and controlled change processing. In the short term, only a small subset of the technical data and its supporting linkages undergoes change processing. Data can therefore be refreshed for any user system by providing controlled access to changed data subsets.

• Selectively migrate digital technical data

In the Target phase, optically-based telecommunication links will economically provide adequate data bandwidths to service any DON user system via electronic digital data transfers. During the early years (FY2000-05) of the Target phase, telecommunications support needs to be expanded to connect all users to service time-compliant data requests, provide expanded access to contractor-managed data, and transition from bulk to electronic delivery for prioritized user applications.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Expand telecommunications access to DON users with adequate connectivity and data transfer bandwidths.

2. Provide standardized CALS support for this value-added electronic distribution. In addition, provide adequate access/data usage/security controls and accountability for the various classes and sources of distributable data.

3. Standardize integration of CALS distribution with contractor-managed data repositories to support contractor recompetition and any changes in usage of organic-versus-contractor data repositories.

4. Continue to provide distribution capabilities for handling non-electronic data delivery.

(2) FY2005 Goal: Expand coverage and service quality of the "push" distribution to users through enhanced profiles and distribution metrics evaluation.

(a) Rationale. Prescheduled "push" distribution service will be made available to different classes of users or user sites as their technical data becomes digitized, cataloged, indexed, and stored in a data repository, and as they acquire the equipment to accept data from DON CALS, process, display, and print it. In addition, as users become more dependent on this distribution process and their data needs change, they will require service changes and enhancements. User coverage and service quality must therefore expand.

A "push" distribution strategy is driven by pre-stored site and user profiles that specify who gets what data, when, and in what form. During the Transition phase, the initial profiles will be relatively straightforward. Such profiles will need enhancements to accommodate converted data, changes in data output standards, broadened data repository sources, new data usage requirements, improved data access and security controls, service to non-standard or fringe users, etc. As the provided distribution service becomes more sophisticated, the monitoring metrics data base must also be enhanced to provide continual feedback necessary to adapt and balance the service.

(a) Objectives. The following objectives need to be addressed to achieve this goal:

1. Enhance the distribution metrics to better capture, monitor, analyze, and plan CALS service quality in distributing the mixed inventory of technical data.

2. Enhance standard site and user profiles to expand and tailor digital "push" distribution to remaining classes of users and their equipment.

3. Refine and balance distribution service levels periodically based

on the metrics data.

(3) FY2010 Goal: Distribute customized data bases with appropriate tool sets to enhance the value and usability of the data in user systems.

(a) Rationale. Data will transition during the Target phase from predetermined page-oriented formats to more sophisticated forms in which users will determine customized use and output formats. Multiple formats will coexist. There will also be new advanced formats (multimedia audio, video, etc.).

Data relationships and links, and other supporting data (digital data dictionaries, coordinated software tools for accessing and processing, etc.) will become increasingly important for some distributed data since they will provide users advanced value added. An increasing amount of data will be integrated using information entities. In addition, more advanced user application systems will emerge.

(b) Objectives. The following objectives need to be addressed to achieve this goal:

1. Adapt or add profiles to specify approved and supported standardized customization requirements.

2. Enhance capabilities for better data integration within DON and for CALS-related DOD and contractor elements.

3. Support distribution of customized databases aggregated from IWSDB information entities.

4. Specify minimum user system capabilities (hardware and software) to process various customized databases.

CHAPTER 6

MANAGEMENT

1. Overview

The Secretary of the Navy, has assigned primary responsibility for coordinating the expeditious development of CALS to the Deputy Chief of Naval Operations (CNO) (Logistics) (N4). N4 has in turn designated the Assistant Deputy CNO for (Logistics) (N4B) as the DON CALS Advocate. The Assistant Secretary of the Navy (R, D & A) has directed all DON Systems Commands (SYSCOMS), Navy Program Executive Offices (PEOs), and Direct Reporting Program Managers (DRPMs) to comply with CALS implementation plans and policies established by N4.

2. Management Structure

The Navy organizations most closely concerned with CALS are the members of the Navy acquisition and logistics community; which include the Navy Systems Commands (SYSCOMs), the Marine Corps Systems Command (MARCORSYSCOM), the PEOs, and the Navy DRPMs. N4B has established a CALS management structure in the Systems Commands. The various officials and organizations that make up the DON CALS management structure are:

(1) Assistant Secretary of the Navy (ASN-(RD&A).) Ensures that DON CALS acquisition policies are consistent with Department of Defense (DoD) CALS policies and that SYSCOM/MARCORSYSCOM/PEO/DRPM acquisition activities are consistent with Navy CALS acquisition requirements.

(2) Deputy CNO For Logistics (N4). N4 has overall responsibility for the effective implementation of CALS in the DON. Coordinates the development of Navy CALS policies and strategic plans.

(3) Assistant Deputy CNO For Logistics (N4B). N4B has primary responsibility for CALS policy and implementation planning. N4B represents DON CALS policy and implementation positions to individuals and organizations outside the Navy Department.

(4) DON CALS Implementation Group (Principals). This flag level group is chaired by the Director of the Navy CALS Coordination Office and is comprised of Navy/Marine Corps Systems Command officials directly responsible for CALS implementation. The Group's primary responsibility is to ensure coordinated implementation of CALS across Navy. It advises N4B on CALS policy development and supervises CALS implementation. The Navy CALS Policy and Strategic Plan provides the fundamental planning guidance for CALS implementation. The Implementation Group is responsible for developing detailed implementation plans,

to achieve each policy goal in Chapter 5. The Implementation Group is also responsible for identifying the resources required to achieve the goals. The Navy CALS Implementation Group reviews and resolves issues related to CALS implementation plans and oversees the Navy CALS Coordination Office. In addition, the Implementation Group appoints working groups and system coordinators to serve as development agents for CALS functional areas.

(5) DON CALS Coordination Office. Organized within the Naval Supply Systems Command, this office is headed by a flag-level Director who is supported by an Executive Director and staff. This office coordinates CALS issues among the SYSCOMs, USMC, PEOs, and DRPMs and on behalf of these organizations and with their approval, accepts and responds to taskings from N4B. In support of the Navy CALS Implementation Group and N4, this office performs administrative functions; plans, programs, and budgets resources for non-programmatic CALS activities; and coordinates the CALS-related work of various Navy organizations. The office also coordinates Navy Research & Development (R&D) efforts for emerging CALS technology.