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Computer-Aided Acquisition and Logistics Support (CALS)

Concept of Operations for Depot Maintenance

N. C. Bourgeois
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April 1993

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
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Richland, Washington 99352

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(b) Battelle, Dayton Operations.

ABSTRACT

This CALS Concept of Operations for Depot Maintenance provides the foundation strategy and the near term tactical plan for CALS implementation in the depot maintenance environment. The user requirements enumerated and the overarching architecture outlined serve as the primary framework for implementation planning. The seamless integration of depot maintenance business processes and supporting information systems with the emerging global CALS environment will be critical to the efficient realization of depot user's information requirements, and as such will be a fundamental theme in depot implementations.

SUMMARY

Pacific Northwest Laboratory (PNL) conducted this study for the Joint Logistics Systems Center (JLSC) of the U.S. Department of Defense (DOD). The purpose of the study was to outline in language and syntax that could be understood by managers unfamiliar with the program, the strategy and actions required to implement Computer-Aided Acquisitions and Logistics Support (CALS) capabilities in the DOD depot maintenance environment to better meet customer requirements and enable cost effective improvements to functional processes.

The JLSC is responsible for achieving DOD Corporate Information Management goals for the logistics business area. Simply stated, those goals are to reduce logistics costs by improving the business process, eliminating overlapping and duplicate business systems, many of which do not interface with each other, and provide a common business system which depots in all services could tailor to their specific needs and at the same time be used by managers at all levels, including DOD for business decisions. The JLSC Directorate for Depot Maintenance (JLSC/DM) is responsible for designing, developing and implementing the depot maintenance functional area of the integrated DOD logistics process and facilitating the development and implementation of improved business practices. Many of the initiatives being pursued under the aegis of CALS initiative are critical to the successful completion to the JLSC/DM goals. CALS is a program initiated by the DOD and industry to provide for the delivery of technical and logistics data in digital form, and to support a highly integrated and automated data base environment for weapon system acquisition and life cycle support.

The major conclusion of the study is that implementation of CALS within the depot maintenance community will establish an integrated information environment able to facilitate significant process, productivity, and cost reduction benefits. To analyze the employment of CALS in depot maintenance, the following elements were examined at their specific operational level:

- ☐ functions executed by depot maintenance personnel
- ☐ information requirements to support the functions (what)
- ☐ supporting the function through processing and application of information (why)
- ☐ process flow for the information (who)
- ☐ how information is ultimately provided to personnel (how)
- ☐ targets of opportunities for improvements using CALS with other capabilities.

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1.0 DM-CALS Concept of Operations Roadmap

The Joint Logistics Systems Center (JLSC) is responsible for achieving DoD Corporate Information Management (CIM) goals for the logistics business area. The Directorate for Depot Maintenance (JLSC/DM) is responsible for designing, developing and implementing the depot maintenance functional area of the integrated DoD logistics process, and facilitating the development and implementation of improved business practices. Many of the initiatives being pursued under the aegis of the Computer-Aided Acquisition and Logistics Support (CALS) initiative are critical to the successful accomplishment of JLSC/DM goals. CALS is a program initiated by the Department of Defense and industry to provide for the delivery of technical and logistic data in digital form, and to support a highly integrated and automated data base environment for weapons system acquisition and life cycle support. Implementation of CALS within the depot maintenance community will establish an integrated information environment able to facilitate significant process, productivity, and cost reduction benefits.

Given the range of data required by Depot Maintenance and the manner in which it is made available today (e.g., paper, aperture cards, numerous digital formats), how can the implementation of CALS make the data more accurate, available and timely? The mere employment of CALS data interchange standards will not provide the complete answer to this key question. Rather, there must be an examination of "how" CALS concepts, standards, technologies and DoD CALS Flagship Initiatives will be implemented in Depot Maintenance to meet customer requirements and enable cost-effective improvements to functional processes. This document, the JLSC/DM CALS Concept of Operations, codifies the strategy and actions required to implement CALS capabilities in the depot maintenance environment.

1.1 Functional Document Organization

1.1.1 Strategy Driven Approach

The functional structure of the Concept of Operations is based on initial planning efforts focused on the elements essential to development of DM-CALS Strategic Level Plans. Four Depot Maintenance strategies were developed to address CALS related issues:

1	Develop the Depot Maintenance Customer requirement for CALS

- Identify technical data used in the depots
- Model shop floor processes
- Understand the data requirements
  - What is the data
  - What is the data source
  - Which CALS program is applicable

2	**Contribute to an overall CALS architecture from a Depot Maintenance Perspective**

- Identify improvements to CALS programs from a depot maintenance perspective by identifying deficiencies and overlaps

3	**Understand the scope and mission of CALS programs**

- Identify the scope of joint and Service level CALS programs in regards to: Standards, Applications, Processes

4	**Define the organizational roles and responsibilities regarding CALS**

- Identify improvements to CALS programs from a depot maintenance perspective by identifying deficiencies and overlaps

1.1.2 Document Contents

The main sections of the document correlate with the previously stated strategy statements, and the appendices provide additional supporting details to the discussion in the main sections.

In Section 2.0, "DM-CALS Concept of Operations Summary", the case for CALS in Depot Maintenance is presented along with the coupling of CALS strategies and supporting near-term actions. Also, the principal aspects of the planning methodology for DM-CALS implementation are introduced.

Section 3.0, "DM Customer Requirements for CALS", corresponds to the first strategy statement concerning the development of Depot Maintenance Requirements for CALS. A consolidated view of information flows and requirements are presented along with Service-specific considerations. This section represents the initial results of a greater more comprehensive effort that will address all operational levels, personnel and functional areas from enterprise maintenance management to operations on the shop floor. This first effort focused on customer requirements for operational personnel for physical (shop floor) production and supporting production/design engineering activities.

Section 4.0, "CALS Architecture - DM Perspective", corresponds to the second strategy statement concerning the contribution to an overall CALS architecture from a Depot Maintenance Perspective. This section begins with a review of the DoD CALS vision, guiding principles and implementation framework. Subsequently, this DoD global view of CALS is applied to Depot Maintenance and a JLSC/DM CALS Implementation Model emerges. This introductory material supports an approach illustrated in Section 4.2, "DM-CALS Operating Environment" for assessing how CALS concepts, standards, technologies and initiatives can assist legacy systems in streamlining data flow and eliminating redundancies, and how to integrate CALS Flagship programs with legacy and migration systems.

Section 5.0, "CALS Initiatives", corresponds to the third strategy statement concerning the understanding of the scope and mission of CALS programs. This section will provide a tutorial on CALS, and introduce information on specific CALS initiatives.

Section 6.0, "JLSC/DM CALS Organizational Roles and Responsibilities", corresponds to the fourth strategy statement concerning the definition of the organizational roles and responsibilities related to CALS. This section recaps the JLSC Command CALS Mission with specifics related to the Depot Maintenance functional area resulting from the 30 October 1992 Plan for the Transition of CALS Logistics Functions and programs/systems from the Defense CALS Executive to the Joint Logistics Systems Center. Also, CALS primary points of Contact are provided.

Appendix-A, "Acronyms and Definitions" provides a central place to provide standardized definitions for acronyms and other CALS and DM related terms.

Appendix-B, "Depot Capabilities Profile", summarizes information about depot maintenance capabilities which could lead to the identification of common information elements across all the DoD Depots.

Appendix-C, "CALS-Related Systems", summarizes a combined listing of Depot Maintenance related systems and CALS initiatives to facilitate defining the scope of JLSC/DM implementation oversight for CALS-related matters.

Appendix-D, "Proposed DM-CALS Implementation Projects", presents recommended projects to support CALS implementation in DM.

Appendix-E, "JLSC/DM CALS Project, Planning Model", provides process model for management of CALS implementation in Depot Maintenance. The approach modeled is comprehensive in scope and include activities requiring coordinated action and joint participation with other directorates in JLSC and the Services.

1.2 Document Guide

The elements of CALS are comprehensive in nature and paint a complex picture with many interdependences. A single table of contents only provides one of many views of the material being presented. The following Table 1-1, presents other "user-views" or paths through the material base on a series of topic areas that are representative of individual or "bundled" areas of interest. Also, additional description information is provided to assist the reader in locating specific subject matter throughout the document.

Table 1.1 Document Guide for JLSC/DM CALS Concept of Operations

TOPIC AREAS	LOCATION OF MATERIAL
Assessment of Systems for Overlaps, Gaps, and Redundancies of CALS Related Functionality	- For discussion of approach, see Section 4.2 - For Candidate Systems for Assessment, see Appendix-C
Information Requirements, DM Customer/User	- For global DM information requirements, see Section 2.2 - For Service-specific requirements, see Section 3.3
Organizational Responsibilities, JLSC/DM CALS	- For JLSC CALS Points of Contacts, See Section 6.4
Planning Methodology, Development of CALS in DM	- For summary discussion see Section 2.3.4 - For detailed planning model see Appendix E
Strategy, Mission and Objectives, JLSC/DM CALS	- For DM strategies for CALS and related near term actions, see Section 2.1 - For DM Mission statements and objectives in CALS, see Sections 6.2 and 6.3

[Table 1-1 will be expanded in the next version of this document]

2.0 DM-CALS Concept of Operations Summary

The CALS initiative originally grew from industry advances in the use of digital data and the need for the government and industry to work together on the implementation of those advances. The formal definition of CALS is:

"Computer-aided Acquisition and Logistic Support (CALS) is a DoD and Industry strategy to enable, and to accelerate, the integration of digital technical information for weapon system acquisition, design, manufacture, and support. CALS will provide for an effective transition from current paper-intensive weapon system life cycle processes to the efficient use of digital information technology. The purposes of CALS is to improve industry and DoD productivity and quality, and thus improve supportability, military readiness, and combat effectiveness." *Source: MIL-HDBK-59A, Military Handbook, Computer-aided Acquisition and Logistic Support (CALS) Program Implementation Guide.*

2.1 Making the Case for CALS in Depot Maintenance

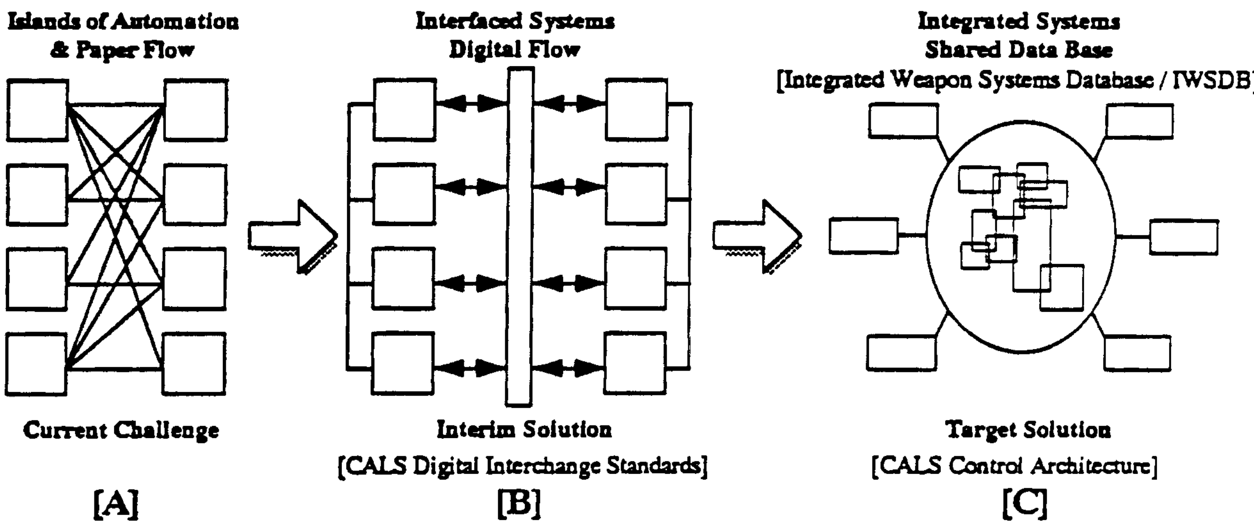


Figure 2-1 CALS Migration Path

Figure 2-1 depicts the transition of CALS from current paper-intensive weapon system life cycle processes to the CALS Vision of an integrated system and shared information environment, referred to as the Integrated Weapon Systems Data Base (IWSDB).

Technical Information (TI) is the lifeblood of logistic support including depot maintenance. TI is delivered during item acquisition (e.g., weapon system, assemblies and components) and maintained during the life cycle of that item. In the current environment represented by Figure 2-1[A], engineering and related logistic support data are delivered to DoD from an unified set, but is then separated and maintained by different organizations employing different systems and procedures. The blocks in this figure represent individual processes supported by stand-alone or "stovepipe" systems and the lines connecting the blocks represent data flows that often require conversion, manual processing or conversion from paper due to the inability to digitally interchange technical information between systems.

The CALS "Interim Solution", as shown in Figure 2-1[B], is enabled through the implementation of data interchange standards that establish consistent interfaces to pass technical information digitally between organizations and supporting information systems. The CALS data interchange standards are summarized in Table 2-1 and discussed in further detail in Section 4.1.

TABLE 2-1 Summary of DoD CALS Standards

DoD CALS STANDARD	INDUSTRY STANDARD	APPLICATION
MIL-STD-1840B	—	Data Interchange & File Management
MIL-D-28000A AMEND 1	IGES	CAD, Vector Graphics - Technical Manual Illustrations - Engineering Drawings - Electronic Information - NC Information - Piping Information
MIL-M-28001B	SGML	Automated Publishing - Technical Manuals
MIL-R-28002B	CCITT GRP 4	Raster Graphics - Engineering Drawings - Illustrations
MIL-D-28003A	CGM	Vector Graphics - Technical Manual Illustrations
MIL-STD-CITIS	—	Contractor Integrated Technical Information Services
MIL-SPECS-IETM	—	Interactive Electronic Technical Manuals - Data Base - Quality Assurance - User Interaction Requirements

The CALS interim solution will enable digital flow between interfacing systems, but there still remains other areas that must be addressed to achieve effective process integration. The current environment, where engineering and related logistic support data are delivered from an unified set and maintained separately during the operational lifecycle phases, is further detailed in Figure 2-2. Product definition data, related support data and TI products are accepted during the item acquisition phase via a contractually specified technical information transfer function. In the contractors data bases, the product definition data base is coupled to support products, and thus the configuration management of the physical end-item is closely linked to that of the supporting technical information In the current environment these two tightly coupled technical information streams are often separated upon acceptance and maintained by separate processes. The integrated process requirements for depot maintenance often require that these data streams be consolidated again. Because of different data conventions, process and procedures employed in the maintenance of this life cycle information, the task of integrating the full range of technical information required to support all Depot Maintenance functions is often a "Herculean" task. The goal of an integrated Depot Maintenance database is to provide a compatible structure that will facilitate the coupling between product definition data and logistic support products in such a manner that the DM business processes are effectively supported.

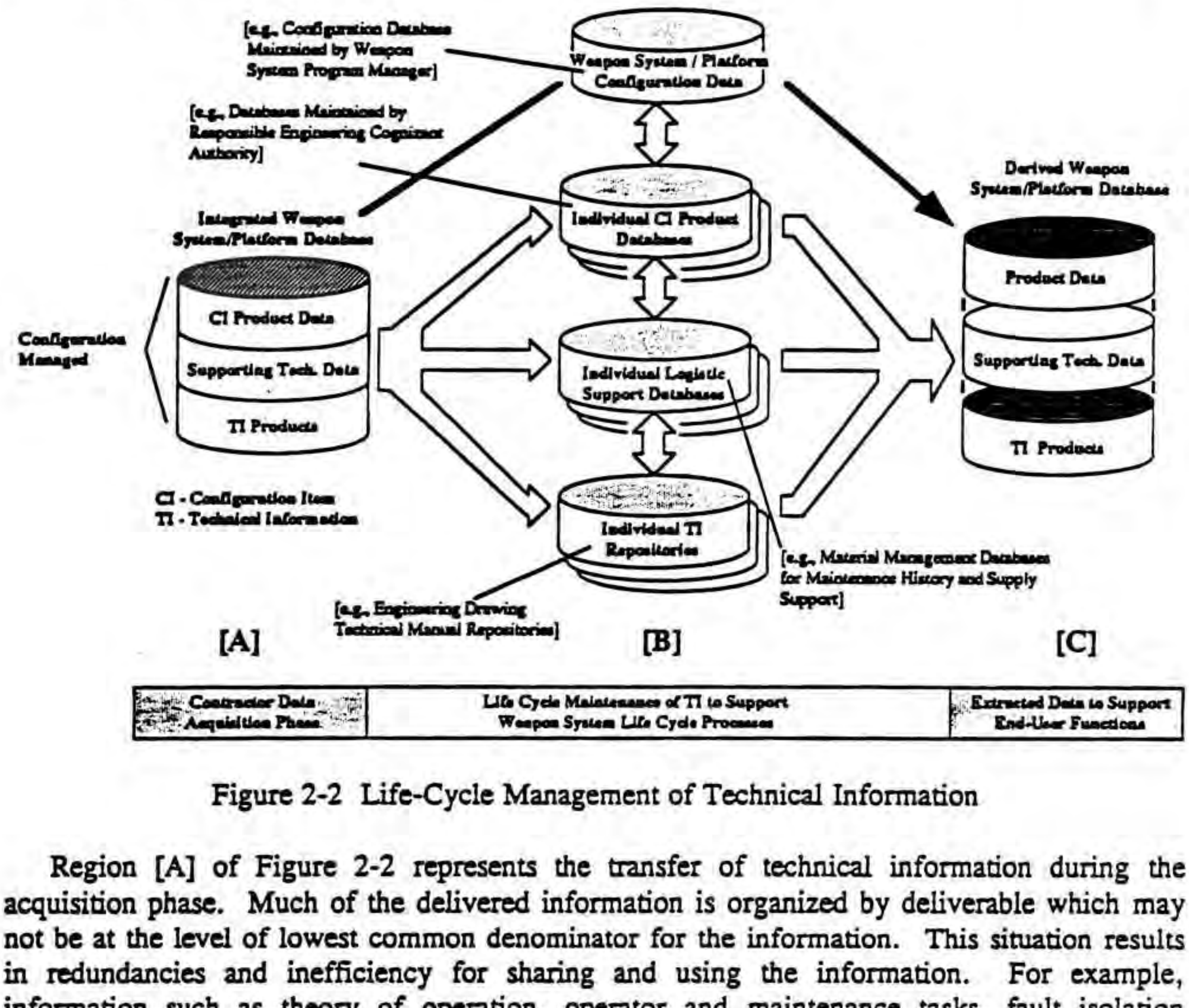


Figure 2-2 Life-Cycle Management of Technical Information

Region [A] of Figure 2-2 represents the transfer of technical information during the acquisition phase. Much of the delivered information is organized by deliverable which may not be at the level of lowest common denominator for the information. This situation results in redundancies and inefficiency for sharing and using the information. For example, information such as theory of operation, operator and maintenance tasks, fault isolation information, parts breakdown, illustrations are redundantly provided in Logistic Support Analysis Records (LSAR), Technical Publications, and Training deliverables.

The inefficiencies and problems occur when these deliverables are then managed during the operational lifecyle at the deliverable level, instead of managing the content based source information that was used to produce those deliverables. This results in multiple copies of the same information being managed in separate deliverables in separate organizations in separate systems and databases as illustrated in region [B] of Figure 2-2. When configuration changes occur it is difficult to ensure that all impacted deliverables are consistently updated.

Further complications occur when striving to support end-user requirements for tailored information. To conduct a specific maintenance task the mechanic may not need the complete technical document, but only specific sections of it. That same mechanic may also need other specific supplemental information related to the job at hand. The end-user will be best supported by being provided the right information at the right time which includes only that needed to accomplish the job, no more and no less. In today's environment data is aggregated and duplicated in multiple deliverables, maintained through the life cycle at the deliverable level, and subsequently extracted and broken down to sub-elements for use in other end-user information products. This situation exasperates an already challenging environment for achieving effective configuration management of technical information.

Depot Maintenance when compared with other logistic support process has leading requirements for integrated technical information, and therefore a driving force in formulating improved technical information management requirements. A depot may be called upon to engineer and install significant modernizations, re-manufacture, refurbish, repair, isolate faults, procure, etc.. in support of their maintenance functions. Region [C] of Figure 2-2 represents the need of the Depots to pull back together separately managed information to support user requirements.

Implementation of CALS in Depot Maintenance will abet the larger logistics support community in coming to grips with the manner in which technical information is acquired, created, managed, stored and provided to customers. Information needs to be managed at lowest common denominator that provides the highest efficiency for sharing. In this manner the "content" will managed singularly with tailored end-user technical information products being produced from the same version of source data.

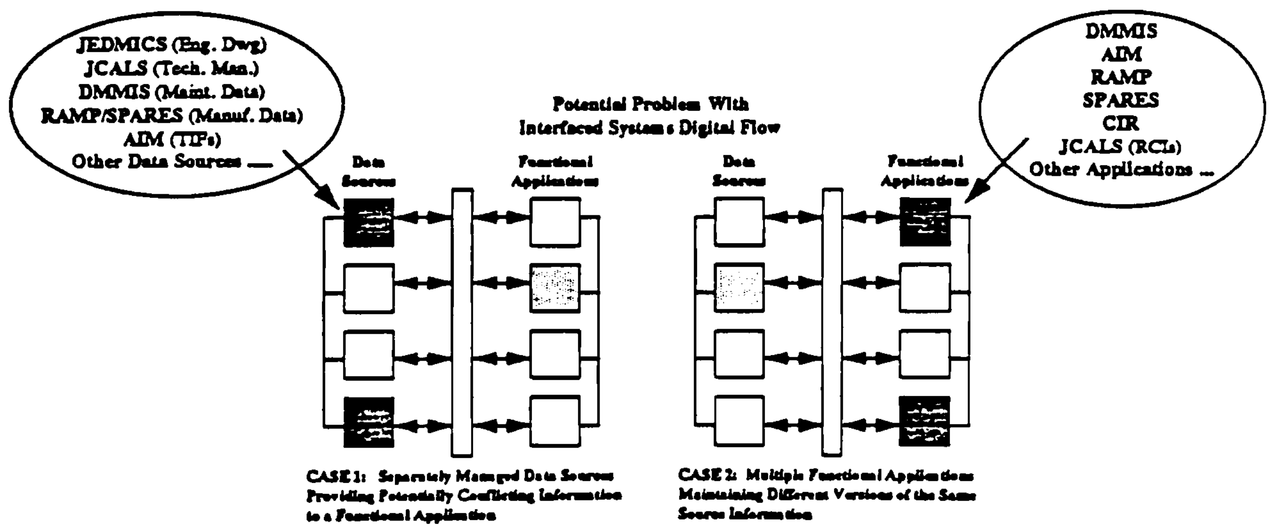


Figure 2-3 Interfaced Systems Digital Flow, Potential Problems

Due to the range of separately managed information sources that are provided to a depot, it is possible to get conflicting information (see Case-1 of Figure 2-3). When on examines the range of Depot Maintenance systems with dedicated databases, independent data processing capabilities supporting functions from enterprise maintenance management activities to specific operations and industrial processes, it is not unreasonable to expect that different depot maintenance processes could be working with different versions of what should be the same information (See Case-2 of Figure 2-2). Also, the maintenance of configuration links across separate unrelated copies of the same information in this type of environment becomes a nearly unreachable goal.

The ultimate solution to this problem is shown in the "Target Solution" of Figure 2-1[C], and that depicts all applications working from the same logical data source. One possible vision of this target solution in a Depot Maintenance environment is shown in Figure 2-4. A Depot Maintenance Infrastructure enabled by the CALS initiatives (i.e., JCALS, IDS, CAD2) would provide the key elements for connectivity between source data from Data Management sources with the User applications executing Depot Maintenance functions. This same infrastructure will support the current management of legacy data while providing a transition path to support future information management at the "lowest common denominator".

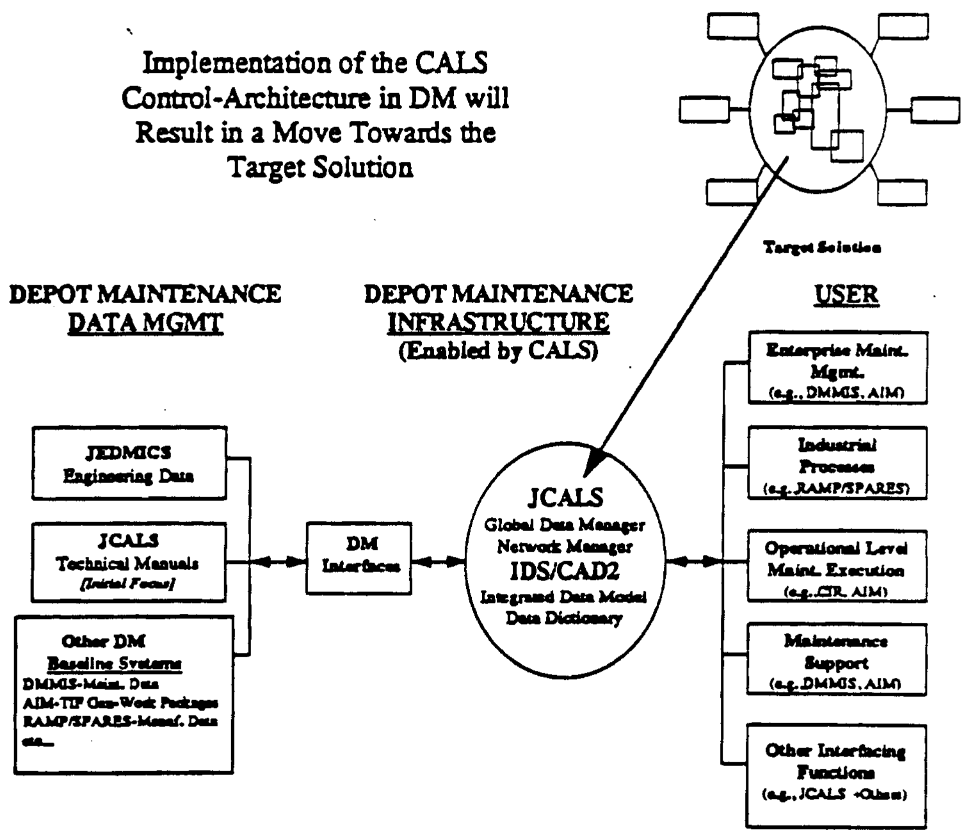


Figure 2-4 Target Solution

Appendix - D contains proposals for CALS Implementation Projects. One of these projects deals with developed of an Integrated - Product Data Control Model that is fundamental to establishing a supporting infrastructure for Depot Maintenance. This same implementation project would also have far-reaching benefits to the rest of the Logisitics Community.

From an examination of Figures 2-2 and 2-4 three principle functions for the lifecycle management of technical information begin to emerge, and they are "Create", "Manage", and "Use". Upon first examination, the conclusion could be drawn that Depot Maintenance only Uses technical information, and the functions of Create and Manage are handled by external activities. A picture is starting to emerge that shows that Depot Maintenance is a strong "partner" in the "Create" and "Manage" functions and directly provides much of tailored information to execute depot functions.

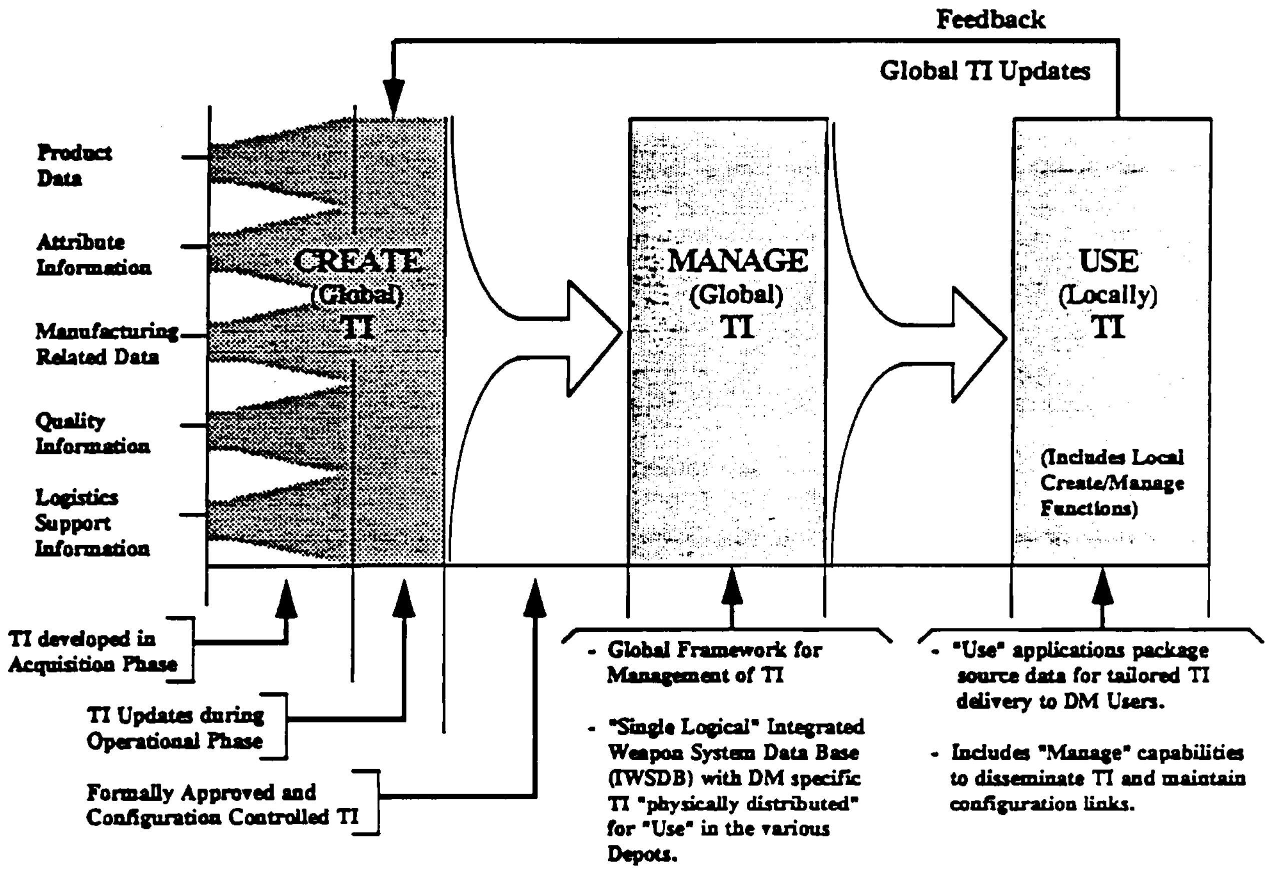


Figure 2-5 Technical Information Life Cycle - Supporting Depot Maintenance

2.2 JLSC/DM CALS Strategy and Tactical Actions

This document, the JLSC/DM CALS Concept of Operations, codifies the strategy and actions required to implement CALS capabilities in the depot maintenance environment and thereby meet customer requirements and enable cost-effective improvements to functional processes.

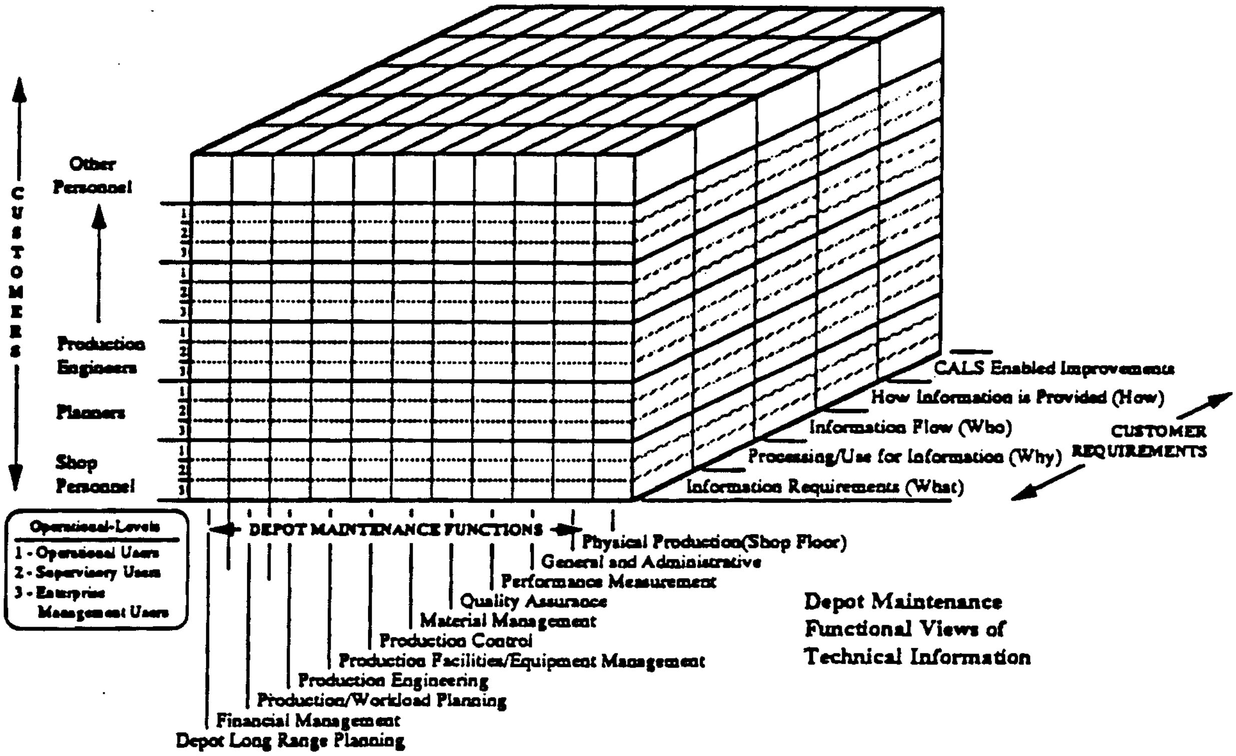


Figure 2-6 Analysis Matrix for Employing CALS in Depot Maintenance

The JLSC/DM CALS initiative provides an information-driven approach to enterprise integration that establishes the infrastructure to ensure that information or knowledge-driven end-user activities are fully supported across the full spectrum of Depot Maintenance functions. The Information-Integrated Enterprise (I^2E) approach for depot maintenance is not limited to the information system alone, but also includes the links between supporting information systems and the environment for end-users and industrial processes. Therefore, the JLSC/DM CALS strategy focuses on delivery of benefits to the ultimate customer. The economic justification for CALS investment is related to both the linkage that exists between the overall DM business strategy and CALS, and their mutual impact on depot operation costs and efficiency. Figure 2-6 depicts an approach for analyzing the employment of CALS in depot maintenance. The following elements are examined at their specific operational level:

- ❑ Functions executed by depot maintenance personnel
- ❑ Information requirements to support the functions *(What)*
- ❑ Supporting of function through processing and application of information *(Why)*
- ❑ Process flow for the information *(Who)*
- ❑ How information is ultimately provided to the personnel *(How)*
- ❑ Targets of opportunities for improvements using CALS with other capabilities

This first version of the JLSC/DM CALS Concept of Operations presents the JLSC/DM **Strategy**, and identifies supporting near term or **Tactical Actions**. It focuses on Operational

Users executing Physical Production (Shop Floor) and supporting Production & Design Engineering functions. The JLSC/DM CALS Concept of Operations characterizes the target depot maintenance operating environment enabled by the application of CALS and identifies tactical steps to achieve that target/strategic vision.

Four Depot Maintenance strategies were developed to address CALS related issues, and the following table identifies, within the scope of the CALS Strategies key actions necessary to address CALS related issues.

1	Develop the Depot Maintenance Customer requirement for CALS
Actions	**Issues**
■ Identify the requirements of the shop floor customer as they relate to CALS ■ Expose customer requirements to CALS programs ■ Understand and articulate the requirements for legacy data conversion and for CALS program interoperability	■ Need to expand the CALS customer focus to include Depot Maintenance as well as Acquisition ■ Need a formal mechanism to feed Depot Maintenance requirements to CALS programs.

2	Understand the scope and mission of CALS programs
Actions	**Issues**
■ Build a CALS knowledge base - Identify the scope of CALS programs and their mission - Obtain CALS IDEF models - Understand CALS standards ■ Formally contact CALS programs and participate in the CALS Expo ■ Identify NTI opportunities within the CALS programs ■ Develop an approach for handling legacy data	■ Need to identify and understand the comprehensive CALS mission ■ We need to identify all the CALS programs which may contribute to Depot Maintenance ■ Need to identify the scope of the CALS programs - What are the holes - Where are the overlaps

3	Contribute to an overall CALS architecture from a Depot Maintenance Perspective
Actions	**Issues**
■ Develop an approach which will improve the overall architecture of CALS programs and the way they work in concert for depot maintenance - Ensure JLSC/DM Corporate Near Term Initiatives are compatible with CALS philosophies for formats and processes ■ Develop a JLSC review process for CALS programs: - Functional - Technical	■ Need to ensure that the CALS architecture serving Depot Maintenance will support the Corporate and Service local distribution of data ■ CALS standards are not mature. This is critical for interoperability, but requires a voluntary DoD/Industry joint effort ■ Need to ensure that JLSC initiatives conform to CALS standards

4	Define the organizational roles and responsibilities regarding CALS
Actions	**Issues**
■ Define the Depot Maintenance Directorate and JLSC responsibilities regarding CALS	■ Need to identify responsibilities between JLSC and CALS programs and document CALS responsibilities within the JLSC

2.4 Planning Methodology

The DM-CALS initiative is an important joint DoD effort to promote increased availability and shared use of digital technical information in support of the full spectrum of DM activities. CALS within the depot maintenance environment is driving towards "just-in-time" information that is current, accurate, technically complete and in the form (e.g., media and content structure) and format (digital structure) required by the user. CALS will enable DM to capture data at its source and provide it where needed to support all functional aspects of DM. All of these benefits will be realized through implementation of a shared data environment across functional processes, which is called the Integrated Weapon System Data Base (IWSDB).

2.4.1 CALS Implementation Elements

The implementation approach depicted in Figure 2-7 for CALS-Enabled Integrated DM Processes results from the unification of three principal elements: (1) CALS Technologies, (2) CALS Support Infrastructure, and (3) CALS Standards.

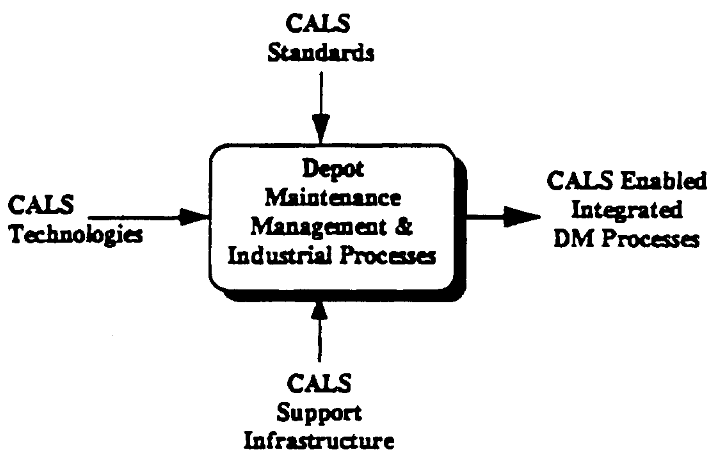


Figure 2-7 CALS Implementation Elements

These three principal thrusts for CALS support the founding objectives and will effectively position depot maintenance to fully exploit new opportunities as CALS evolves into the future. The ultimate goal is to cost-effectively field CALS enabled integrated depot maintenance processes that adeptly meet customer needs. The leading message from Figure 2-7 is that the consolidated application of CALS (Standards, Technologies, and Support Infrastructure) is critical to achieving integrated maintenance management and industrial processes for Depot Maintenance. The relationship between these three principal elements are fundamental to:

- Data interchange (Standards)
- Management of data and delivery to the user (Support Infrastructure)
- Effective user interface,display, and application of that data by the customer (Technology)
- Open System Environment/OSE (Proper application of Standards and Technology in the Support Infrastructure)

2.4.2 CALS Migration Approach

Figure 2-8 summarizes the application of CALS in migrating systems supporting the DM business area. A key first step in this approach is to define aspects of CALS that:

- ☐ Satisfy components' DM requirements
- ☐ Provide the basis to identify and evaluate improvement mechanisms
- ☐ Place DM implementation squarely on the path to achieve continuous process improvement

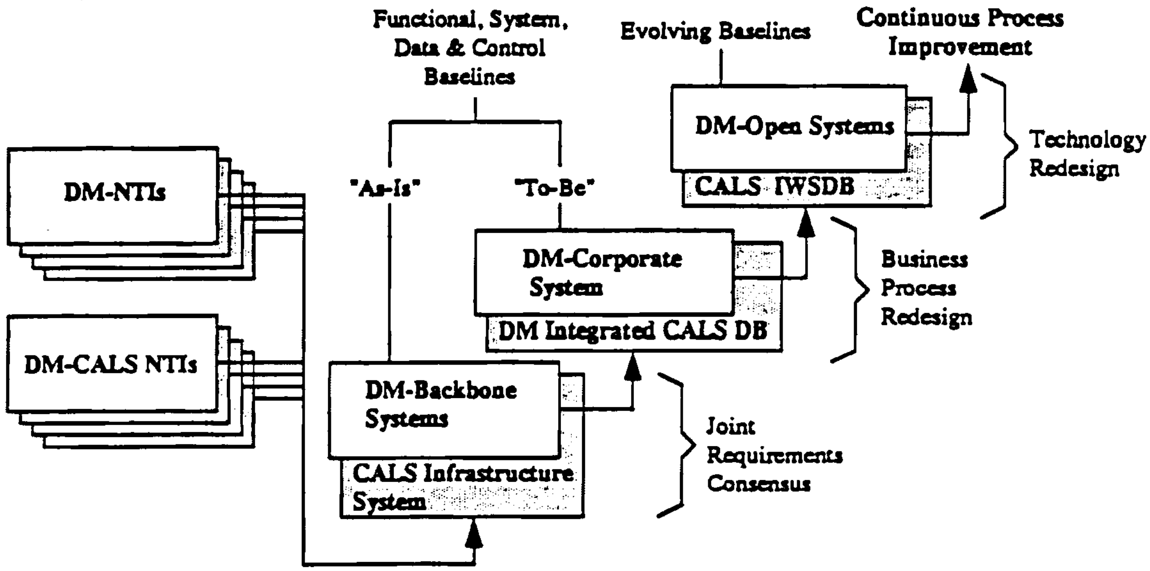


Figure 2-8 DM-CALS Migration Approach

An important aspect of CALS implementation support to migrate DM-Backbone Systems is the establishment of a "Control" baseline, which is in addition to the Functional, Systems, and Data baselines. The control baseline will define the family of requirements (standards, methods, tools) needed to direct the consolidated migration of DM processes to an open systems and shared information environment.

2.4.3 CALS Framework

Current DM activities across the services are inundated with technical information supporting DM functions, which comprise of both hardcopy and incompatible digital formats. The volume of technical information (TI) (e.g., engineering drawings, technical orders, and other technical documentation) is staggering. The increasing complexity of technology will escalate the volume of TI used to support a weapon system throughout its life cycle. Another enabling key to the migration of DM-Backbone Systems is a robust supporting infrastructure that meets the scope of information requirements of a multi-organization structure ranging from DM managers to the mechanic on the shop floor.

A DM-CALS Framework will be developed, that will define a cohesive infrastructure to incrementally achieve the target integrated technical information environment. A total coordinated effort across DM functional areas to modernized and integrate DM support systems through implementation of CALS will bring about an accelerated achievement of productivity and cost reduction benefits. This same framework will provide the logical structure to relate current, emerging and future information system architectures in the CALS functional areas supporting DM functions. The results from these efforts will be key to the joint establishment of the "roadmap" (CALS Implementation Plan) to achieve the DM-CALS Strategic Vision.

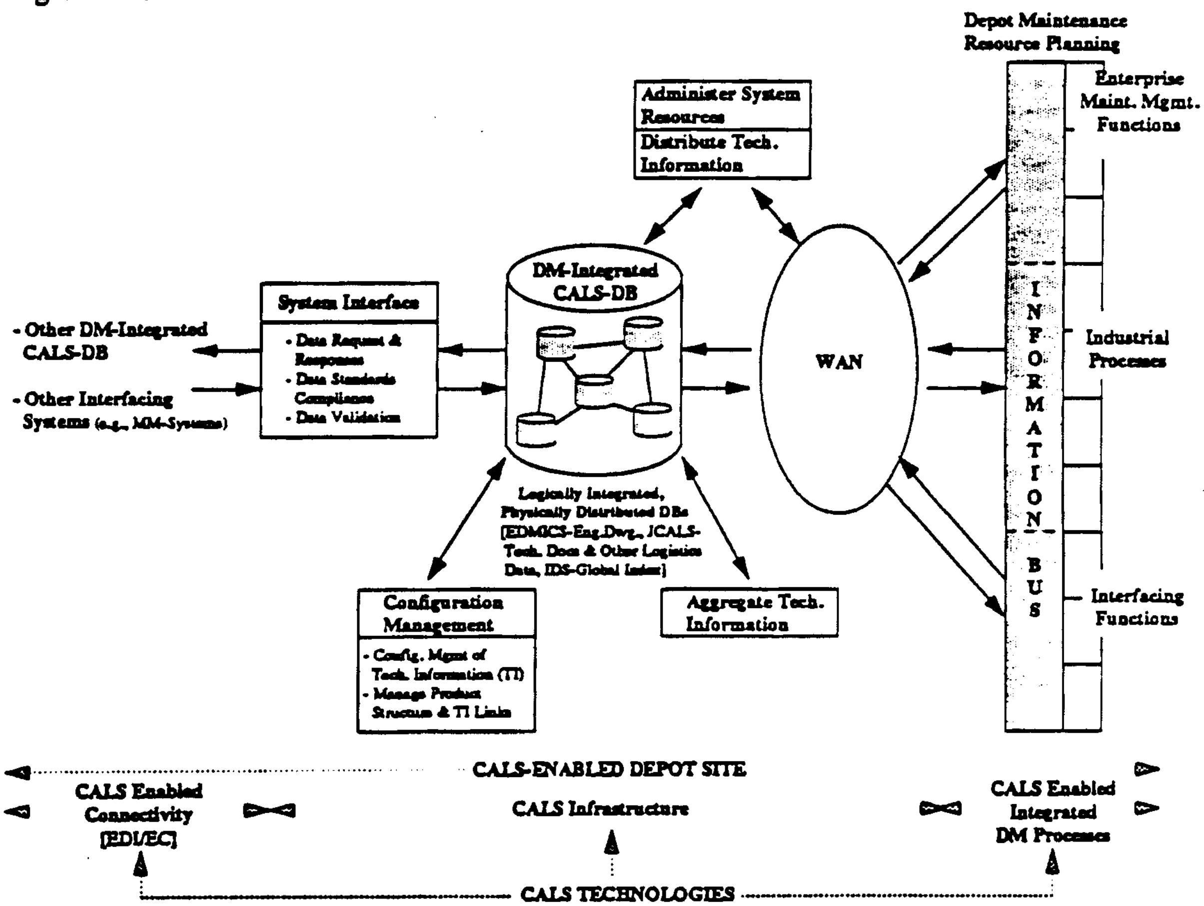


Figure 2-9 CALS Enabled Depot Maintenance System

The DM-CALS functional framework encompasses the infrastructure support processes required to provide CALS compliant technical information throughout the full range of DM functions. The DM-CALS functional framework would be implemented in the CALS Infrastructure system as shown in Figure 2-9. When fully developed, this framework will delineate how the *Management* of information in the CALS Infrastructure links the *Creation* and *Use* of information in depot maintenance and interfacing processes reflecting current capabilities as well as achievable near-term integration and process improvements. It will serve as the DM-CALS functional framework upon which to build the roadmap for migrating from the current environment to the ultimate integrated CALS environment.

2.4.4 Planning Approach

The key thrusts driving initial CALS planning are centered around the following areas:

- ❑ Identify the Depot Maintenance objectives as they relate to CALS programs
- ❑ Document the scope of CALS applicability for Depot Maintenance
- ❑ Identify the issues that need to be addressed in order to fully exploit CALS opportunities for the Depot Maintenance environment
- ❑ Identify/Target the Depot Maintenance Strategies that will address CALS related issues, or that will best benefit (be enabled by) CALS.
- ❑ Identify a preliminary action list to carry out JLSC/DM CALS Strategies.

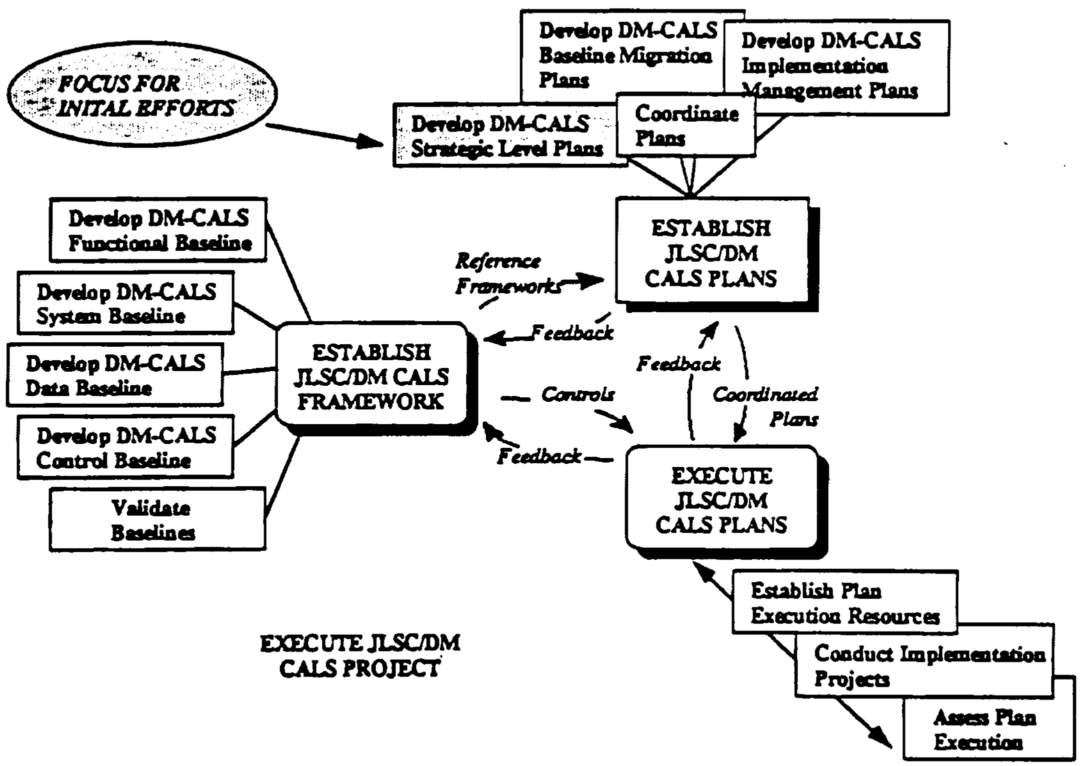


Figure 2-10 CALS Project Execution Process

The CALS planning approach fits within the larger context for executing the JLSC/DM CALS project. The total process encompasses the three key functions and supporting activities.

- ☐ Establish JLSC/DM CALS Framework
  - Develop DM-CALS Functional, System, Data, and Control Baselines
- ☐ Establish JLSC/DM CALS Plans
  - Develop DM-CALS Strategic Level Plans, Baseline Migration Plans, and Implementation Management Plans
  - Coordinate Plans
- ☐ Execute JLSC/DM CALS Plans
  - Establish Plan Execution Resources
  - Conduct Implementation Projects
  - Assess Plan Execution

Near term focus is centered on development of strategic level plans, and gathering information essential to establishing CALS Framework and subsequent development of integrated migration and implementation plans. It should be noted that the concept of a Control Baseline is being introduced as part of the CALS Framework. The addresses the key set of standards (e.g., functional, data, and technical) that are essential to establishing a shared data and open systems environment. This planning approach has been documented in an IDEF0 activity model that is further explained in Appendix-E.

3.0 DM Customer Requirements for CALS

3.1 Analysis Matrix for Employing CALS in DM

The Concept of Operations addresses the migration of the current environment matched to JLSC/DM CALS strategic goals. Information populating the analysis matrix for employing CALS in depot maintenance will be presented. Specifically, this first version of the Concept of Operations focuses on Operational User Level executing Physical Production (Shop Floor) functions along with the supporting Production and Design Engineering activities across the Services (See Figure 3-1) below.

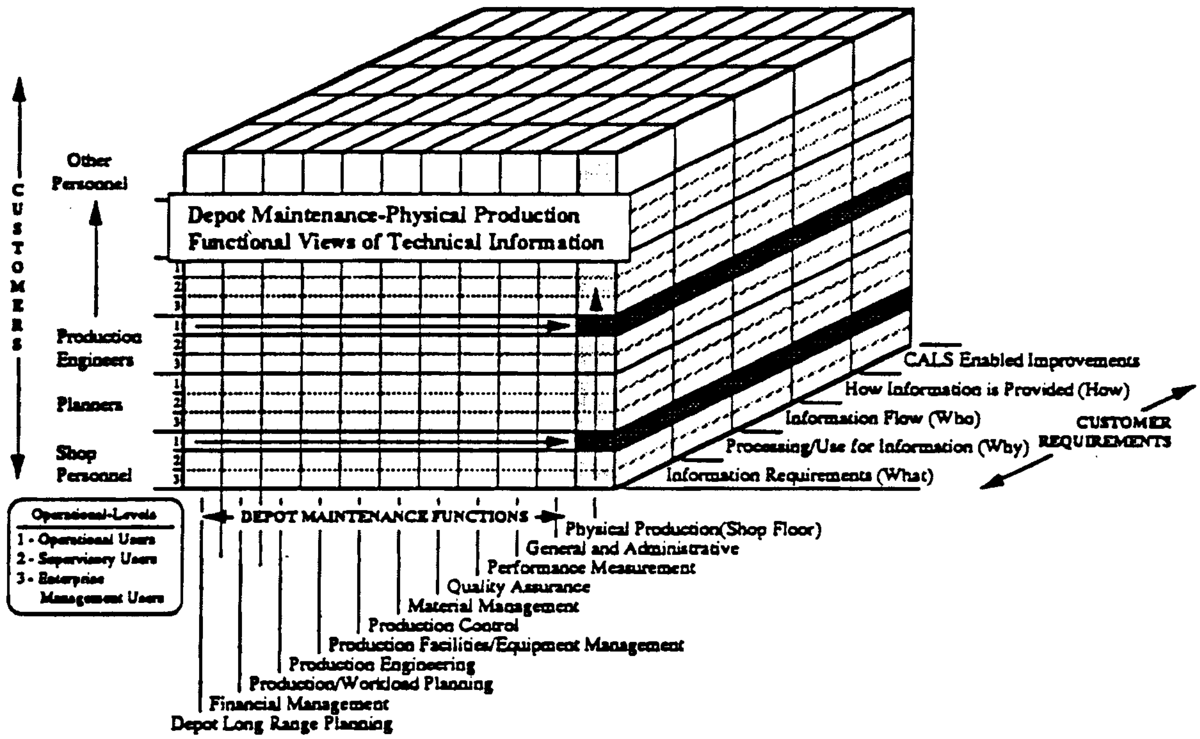


Figure 3-1 Physical Production Analysis Matrix for Employing CALS in Depot Maintenance

3.2 Prototypal TI Data Flow for DM - Consolidated View

3.2.1 What Information is Required

In considering the kinds of technical information (TI) required during depot maintenance processes, several general categories present themselves. The categories are not always distinct; there is overlap in many cases. In the discussion that follows, a definition of terms is warranted. The terms *component* and *part* are used interchangeably. A part is a homogeneous item which has no parts list. It is therefore not assembled, but rather fabricated from a raw material. An *assembly* is comprised of *parts*. By itself, and assembly has no generally useful purpose. A *system* is comprised of *parts* and *assemblies* and yields some useful function. The term *item* is used to generically refer to any one of the three main entities.

1. Product Data encompasses all information required to describe the item fully and completely. Geometric description information and engineering process specifications are the main examples of the information you would find here. CAD system models and other engineering design information such as form features, tolerances, and engineering analyses would fall into this category.

2. Attribute information required to describe the parts and materials used in an item. Quantity and quality type information is included in this category as well. Bills of Materials are a prime example of this kind of information.

3. Manufacturing-related information includes such things as process sequencing, post manufacturing heat treatment and/or corrosion prevention. Work cell locations, equipment and tooling information, even scheduling information is pertinent to this area.

4. Quality information covers inspection requirements, material property requirements, dimensional tolerances, and analyses. Before an can undergo a repair, an assessment needs to be made about whether or not the item can even be repaired or not, and if so, the nature of the repair. The quality category covers all information required to make that assessment.

5. Logistics support information includes such information as repair actions, failure data and other statistical information, and even inventory information. Technical Orders would fall into this category, for instance.

Information needs encompass the wide range of requirements supporting the application of diverse technologies in different combinations of commodities, processes, and products at work across all the DoD Depots. Even with all this diversity, there are many common information elements, and all depots will benefit from the ability to share information. **Appendix-B** provides tables display the technological capabilities of the depots arrayed against Commodities, Processes, Products, and Technologies. The core of this technology based information is comparable across depots, commodities and related products and only differ in the details of their specific application. The ability to leverage this shared information resource will not only support depot maintenance operational functions but benefit other areas such as trades skill training, and new technology introduction.

3.2.2 Rational (Why) - TI Lifecycle Steps

This kind of logical organization of information becomes obvious when one considers the natural progression of an *item* throughout its life cycle.

When an item is conceived, the documentation of that conception typically takes the form of engineering information in either digital or more historically, paper format. Pictures must be drawn, analyses must be done, and testing performed. The pictures are usually engineering drawings. At this point, these are the only physical manifestations of the item. Within the Depot Maintenance Environment, an item is usually created out of an unforeseen repair requirement. As existing weapon systems lives are extended, the need to accomplish this *creation* activity will become more predominant.

As the design matures, the next step is the creation of lists of the parts and materials and their required quantities in the *item*. These lists, although their format varies widely, are called Bills of Materials (BOM). At this point, someone must assess the BOM and determine what materials are already on hand in sufficient quantities, and what needs to be ordered. Some of the parts in the item may be able to be purchased, others need to be manufactured. This assessment *uses* existing information such as the BOM and inventory information, *manages* the information by comparing the BOM against the inventory, and then updating the inventory information after withdrawing the necessary parts and materials required by the BOM, and then *creates* new information in the form of orders, schedules, cost reports, and other management information.

The manufacture of the item from the resources identified in the BOM begins with a planning process. The design data and materials are analyzed to determine the proper machines, tools, facilities, and other resources required to accomplish the manufacture. These data are *used* to *create* new information such as process plans which define the sequence of operations involved. If a particular machine is down, facilities information is *managed* to update the status of that resource. Usually, the engineering information must be converted into instructions that the manufacturing equipment needs to fabricate the part. This is another example of the *creation* of technical information within the depot environment. Frequently, the same parts are re manufactured. The machine instruction information must then be *managed* to ensure that it is always consistent with the latest engineering information, and if not, must be updated.

After the item is created, a check must be made to ensure that it is consistent with engineering requirements. The information used to accomplish this is generally a reduction of the engineering information. As an example of how this is applied, consider the fabrication of a very large part from a very costly raw material. Occasionally, a manufacturing defect will result even after the most careful precautions. In these cases, a quality check may indicate that although the part does not meet the original specifications verbatim, it is still suitable for use perhaps with restrictions. This causes an *exception report* or *waiver* to be generated, authorizing the part to be installed in spite of the defect. The waiver must be approved by engineering of course, and perhaps by more senior management depending on the application.

After a weapon system grows older, certain repair problems begin to surface which are not anticipated. As another example of the need for *quality* information, consider the case of cracks discovered by field inspection personnel in the wing root structure of a fleet of aircraft. It would be very costly to replace all the wings, and even if you did, there is no guarantee that the same defect would not occur again. Therefore, a determination is made by *cognizant technical authority* as to how severe a crack may be before the wing is considered unserviceable. This newly created technical information is then published, carefully managed, and distributed to the units responsible for inspecting and repairing the structure.

Throughout the life cycle of the item, information is collected about its performance, failure history, cost, and much, much more. The repair information that was originally supplied with the item must be changed and supplemented with new information. These logistics support data therefore embody all three aspects of the *create*, *manage*, and *use* paradigm. The statistical information must be analyzed and the results fed back into the system so that the item can be effectively maintained.

3.2.3 WHO is Involved

The *creation* and subsequent *flow* of information can involve a wide variety of people. There are probably more different kinds of people involved than there are kinds of data.

Product data required for the acquisition of new weapons systems or other items are usually created by engineering or technicians such as draftsmen or other design-related disciplines. The flow of product data extends like a web into all facets of the item life cycle. Initially, the flow proceeds to the people involved in creating the attribute information. It also extends to those responsible for generating logistics support information such as Technical Orders. Procurement personnel require product data to send to vendors for bids. Manufacturing personnel obviously require product data from which to fabricate parts. Quality people require product data for inspection purposes.

Attribute information is created by different kinds of people depending on the organization and local policy. It may be assembled by engineering or an engineering services group. It may also be assembled by production planners in some cases. Once attribute information is created, it must be provided to those responsible for planning and managing resources. Exactly who those people are or what they are called varies, but in all cases someone must assess what is on hand versus what is required. Also, a *Costed Bill of Materials* must be *created* so that program management personnel can assess that information against budgetary constraints.

Manufacturing information is used and managed by a smaller group of people. Production engineering and production control people are usually the first ones to receive the product data and begin creating manufacturing specific information from it. Whereas production control is more concerned with ensuring that required resources will be available when required, production engineering generally concerns itself with information associated directly with the manufacturing processes. Creating Numerical Control (NC) code, laying out fabrication sequences (process plans), post manufacture treatments, etc., are all the domain of production engineering. The information created by production engineering during this phase must then be communicated back to production control so that scheduling can be coordinated with other projects.

To determine what people use quality information, it is necessary to examine some examples of what quality information means. On one hand, quality is everyone's job. This would imply that everyone requires quality information, whatever that is. In the context of this report, quality information is defined to mean a specific kind of information that is a blend of product (engineering) data, and logistics support data. as previously discussed, it is designed to provide an inspector or other maintenance personnel with the information required to determine the need for a repair. In the event a repair is indicated, the quality information also provides a basis for determining the extent and nature of the repair. Usually, people in Quality Control (QC) and Quality Assurance (QA) are the main people involved in *using* and *managing* quality information. The QA function also involves the *creation* of such information hand-in-hand with engineering.

Logistics support information is a massive category which involves just about every discipline supporting a system. Everyone from the engineering who created the item on down to the field maintenance personnel who see to the routine service and repair of the item are involved in *creating*, *managing*, and *using* logistics support information. Engineering creates the basis for much of this information through engineering drawings and process specifications. In many instances, engineering also creates BOMs and other material lists used later in logistics support. Since engineering can many times predict high-maintenance items within a design, they also can also provide an input to the spare parts re procurement functions. Procurement personnel compile cost information and identify cost-effective channels for obtaining required materials and parts. This information is submitted to management for review and action. Production planning personnel review procurement schedules, facility and other manufacturing resource availability information, priorities, and design a plan for the accomplishment of a repair, rework, or manufacture. Maintenance and inspection personnel compile information about typical failure modes and rates, and submit this information to management for analysis. Based on this, predictions can be made about the need for certain parts, or the requirement for a new repair identified.

3.2.4 HOW Information is Disseminated

Currently, the vast majority of information is disseminated via some sort of paper media. Digital transmission of information is on the rise with the advent of new cost-effective technology such as high-speed modems and faxes, and electronic mail (EMail). Additionally, network technology has radically improved its speed, capacity, and reliability in just the last two years. In spite of these, paper remains the biggest part of our informational lives.

The paper trail begins even before the drawings for a project are created. In fact, it is difficult to pinpoint just where the spring that originates the paper river begins. Some argue that it begins with the Statement of Need (SON) for a system within the acquisition system. Some say it begins even before that with feasibility studies, research and development. No matter. The point is, paper is the genesis of every system. The reasons for this stem from the simple fact that the lack of technology in the past made paper the viable means of communicating ideas accurately. Having established a foothold, the paper process frequently became an end in itself. Even after other means of communication proved viable, paper is often *required by regulation* for no identifiable reason.

Take the example of engineering drawings. Even though it is entirely feasible today to generate and transmit engineering information digitally, in many environments we have *legislated* ourselves to create a paper copy for archive or approval purposes, or to send to some regulatory agency like the Federal Aviation Administration (FAA) for review. To be fair, there may be practical reasons for this in some cases, such as the lack of compatible equipment to interpret the digital information.

Hardcopy printouts of information within a system are frequently used as a middle step to transferring information into another system, with the aid of human intervention. More often than we like to admit, we have situations where someone must re enter information into a system that already exists in another. In these situations, the information is usually printed out, and sections or all of it entered manually into the second system from the paper copy.

Technical Orders and other maintenance directive information is distributed today via a massive publication system. Since the information in these types of documents is subject to frequent change, particularly on new systems, the burden of keeping up to date is overwhelming. The distribution system is dependent on people at the receiving end who are not a normal part of the information management system to effect the changes to existing documentation. Configuration control is thus a major problem. The information actually carried to the work site is sometimes extracted and consolidated sub-elements from other documents. In some cases, *work cards* or some similar device are generated from the information contained in T.O.'s, and control of these lies with the local site. Simply knowing *what* information is required can be a major problem when maintaining older systems in a paper environment.

3.2.5 A Paper-Based TI Scenario

To illustrate, consider the case of a repair action on piece of airframe support structure. What follows is not an unusual scenario. It demonstrates typical problems encountered as information is transferred during the accomplishment of a specific repair. This particular piece of structure was not anticipated to require repair by the designers during a "normal" life cycle. However, budget constraints mandated an extended life for this item, and as a result, a repair was required. Due to depot overload and aircraft priority, the repair must be undertaken at a field facility. The repair facility spends an entire day researching available repair literature on the system in an attempt to identify a repair. Not only could a listed repair not be found, no parts lists were available which identified this part. Cognizant technical authority was contacted at this point to describe the problem, but without a part number, only a verbal description of the part and its location on the aircraft can be relayed. Finally, pertinent drawings are located and forwarded to the repair facility via next day mail. Repair personnel review the drawings and assess specific parts requiring replacement. The supply system cannot provide these parts since they were never expected to break to start with, so the vendor is contacted. Vendor says they no longer stock the parts, and tooling required to make them has long since been disposed of or otherwise unavailable. New tooling will have to be created at great expense and unacceptable schedule. The decision is made to proceed with local manufacture of the required parts. Facilities and resources were adequate, and top-level drawings of the affected items were now on hand. Upon closer inspection of the drawings, it became apparent that there were subcomponents which would also require manufacture so drawings of them also had to be requested. There were also manufacturing process specifications referenced on the drawings which were not available locally, and had to be sent for. After receiving all the required information, certain aspects of the repair had to be "invented". These deviations had to be documented in the form of sketches and text, and forwarded to cognizant technical authority for approval. The time required to transfer technical information back and forth between the repair facility and the cognizant technical authority caused significant delays initiating the actual repair.

Within an organization, the likelihood is high that with just a little standardization a paperless flow of information can be created in most cases. The biggest obstacle today to digital information transfer is hardware and software incompatibilities. Steps have been made to overcome these problems, there is still a long way to go. The most common approach to transferring digital information among dissimilar systems is by means of some *neutral format*.

Within engineering for example, the most mature of these formats is the International Graphics Exchange Standard (IGES). Most CAD systems today know how to read and write their graphic and textual information in a format defined by this standard. So why is there a problem? The saying "something gets lost in the translation" is very much true when it comes to neutral format data exchange. In many cases, CAD systems have features which offer them a competitive advantage in the marketplace. Unfortunately, the IGES standard cannot even begin to embrace the plethora of features supported by all the CAD systems out there. As a result, when a CAD system is asked to write its information in an IGES format, it must make some concessions and attempt to redefine its special features in terms IGES can understand. This is not always possible, and some information is either omitted entirely, or incorrectly represented in the IGES file. Also, IGES makes no attempt to any type of data other than geometric data.

Another widely recognized neutral format for digital data exchange is ASCII. This format is for the exchange of textual information only. Practically all word processors and editors in use today on a wide variety of hardware platforms can read and write ASCII text. Again, certain features of the text get lost when going through this translation. Formatting information such as margins, and paragraphing, text enhancements such as font type and size, bold, italics, and underlining are all lost through an ASCII transfer. Another choice for digital text transfer is the Rich Text Format (RTF), which allows the retention of most formatting and text enhancements to a new environment. Most major word processors and publishing packages can read and write RTF. CALS is providing a standardized solution to this problem with ASCII text document style specification using SGML (Standardized Generalized Markup Language).

It would be unrealistic to expect that a *paperless* information age can be achieved overnight, or even in the next several years. Still, the inefficiencies and expense of paper dissemination, not to mention the environmental implications, compel us to seek more suitable solutions to the problems of providing the right people with the right information at the right time.

3.2.6 CALS Enabled Solutions

CALS is much more than the application of new technologies or standards to the *creation* and *management* of information. CALS also embraces the *use* of information as well. In fact, it is in this area that CALS yields the biggest benefits.

3.2.6.1 Information Creation in the Future

Much emphasis is placed on CALS implications on the creation of information. True, this is where most CALS programs and efforts have focused so far. As discussed previously, the biggest hurdles in effective information transfer revolve around dissimilar data formats. For this reason, CALS has formulated comprehensive standards defining how information should be stored. This does not mean that we will soon see the day when proprietary formats no longer exist. The marketing reasons discussed above imply that we will always have unique features and formats from vendor to vendor. This in turn implies that it will always be possible to *use* a system in such a way that data interchange will be difficult or impossible. To reiterate, the reality of digital information creation is this: *If you intend to exchange digital information, you must forego using certain unique features of your system.* This will always be true. There is nothing CALS can do to prevent vendors from building in non-portable features into their systems and data formats, nor can it prevent you from using them. What CALS standards *can* do for us is provide a robust, well-defined *alternative* to the proprietary format for those environments dictating a need for data exchange between systems.

3.2.6.2 Information Management

The best way to describe how CALS will benefit information management is with an example. Earlier we discussed how the IGES standard focused on the transfer of geometric information only. IGES thus provides no automated way to transfer other types of CAD information.

Today's CAD systems very easily and in some cases automatically generate and maintain BOM information. They know about material characteristics and quantities, and about the structure and organization of an assembly or system. They even provide analytical information such as centers of gravity, weight, dimensional tolerances, etc.. To address some of these new capabilities, a new exchange format is under development called Product Data Exchange Standard (PDES). Why not simply enhance the IGES standard? The structure of the IGES format is inherently limited and it was deemed more feasible to develop a new standard. PDES is still in very early development stages. Its viability throughout government and industry as a data exchange standard is still years away. Nonetheless, certain interim methods can provide an avenue for communicating information between some CAD systems and other enterprise management modules. For example, this could provide the capability for a CAD system to notify an inventory management module about required design parts and materials. The inventory module could then provide a planner with ordering information, or even generate the orders automatically subject to certain controls. Another example involves analyses. Currently, technical information regarding a structural model must be extracted from the CAD system manually via printed report, and then input along with other information into a structural analysis system. CALS can enable the digital transfer of that information, eliminating the labor involved in "rekeying" it.

In the discussion above, we covered the ASCII and RTF *neutral format* transfer of textual information. In reality, most documentation also includes some graphical information to illustrate discussions. CALS introduces the Standardized Graphic Markup Language (SGML) to address this need. SGML provides the standard required to allow the transfer of textual information with embedded graphics between systems. Although fairly mature as a standard, not many Commercial Off the Shelf (COTS) word processing packages provide the means to read and write SGML files, but there are several *publishing* packages available which directly support SGML. There are commercial conversion packages which can read many commercial word processor formats and write SGML files.

3.2.6.3 Using CALS-Provided Information

Merely putting data transfer technologies in place will not produce major improvements in productivity. Changes to the *culture* with regard to information creation, management, and use are required to fully realize CALS benefits. In fact, without proper modifications to information management policies and processes, CALS technologies can actually be counterproductive. It is not popular to tell a CAD user to deliberately avoid using the full capability of his system because the resulting data will not port to another system. If the issue is forced, the reluctant user will not help facilitate further data exchange efforts. The need for effective data exchange is clear to some members of an organization, but not so clear to those whose job does not benefit from the ability to exchange digital information. Successful data exchange is a cooperative effort in which everyone can win.

The biggest benefit of being able to transfer information between systems is being able to *use* it once it's there. For example, with any hardcopy information, researching and analyzing the information must obviously be done manually. Finding the information you need is a laborious, time-consuming process, and error-prone as well. With digital information, you can use the features of the software to assist with some of the work involved with reducing volumes of data into something digestible. For instance, the search function found in most word processors can be a tremendous aid to locating specific information within a document.

[Next update will address issues surrounding Rasterization of Paper Data and Raster to Vector Conversion]

3.3 Depot Environments

3.3.1 Army Depots

The Army's major command for depot maintenance is the US Army Materiel Command (AMC), Alexandria, Virginia. Management of specific commodities is performed by Major Subordinate Commands (MSCs), under HQ AMC.

The MSCs are:

- Armament Munitions and Chemical Command (AMCCOM)
- Aviation Systems Command (AVSCOM)
- Communications-Electronics Command (CECOM)
- Missile Command (MICOM)
- Tank Automotive Command (TACOM)
- Troop Support Command (TROSCOM)

The US Army Depot System Command (HQ DESCOM) manages the Army's organic depots and is the central source of data for the entire depot level maintenance program. Each MSC translates its financial resources and operational requirements into maintenance programs and submits these programs to HQ DESCOM. Close coordination between HQ DESCOM and the other MSCs is required to accomplish the planning, budgeting, and execution of the maintenance program.

HQ DESCOM is located at Letterkenny Army Depot, Chambersburg, Pennsylvania. The maintenance depots have a primary responsibility for the maintenance, overhaul, and repair of all major Army weapon systems including: tanks, howitzers, aircraft, tactical/support vehicles, missiles and ammunition. The depots extend these services to the field by deploying field teams who furnish on the spot technical assistance to Army units when and where it is needed.

A prime depot is designated for every item requiring maintenance. These assignments are made to reduce the redundant capabilities that could otherwise occur within the DESCOM system. Hence, the eight major maintenance depots and one depot maintenance activity (DMA) under DESCOM have each developed specialized capabilities as listed below.

- Anniston Army Depot (ANAD) assignments:
  - Overhaul and depot rebuild of combat vehicles, missiles, small arms, munitions;
  - Supply storage and worldwide distribution of combat vehicles, small arms, and associated spare parts and sub-assemblies
  - Storage and maintenance of conventional and chemical munitions and missiles
- Corpus Christi Army Depot (CCAD) assignments:
- Letterkenny Army Depot (LEAD) assignments:
- Lexington-Blue Grass Army Depot (LBAD) assignments:
- Red River Army Depot (RRAD) assignments:
- Sacramento Army Depot (SAAD) assignments:

- Tobyhanna Army Depot (TOAD) assignments:
- Tooele Army Depot (TEAD) assignments:
- Pueblo Depot Activity (PUDA) assignments:

3.3.2 Navy Depots

Under the Chief of Naval Operations (CNO), who is responsible for commanding the operating forces of the Navy and developing requirements to maintain the readiness of those forces, is supported by five System Commands (SYSCOMS) responsible for meeting the total system and materiel support needs of the Navy operating forces. These support needs can be grouped under the broad categories of weapons and weapons systems, equipment, materiels, supplies, facilities, maintenance, and supporting services.

Three of the SYSCOMS, Naval Air Systems Command (NAVAIR), Naval Sea Systems Command (NAVSEA), and the Space and Naval Warfare Systems Command (SPAWAR) are the Navy's hardware managers. The Naval Supply Systems Command (NAVSUP) is responsible for supply support and related policy implementation for secondary items. The Naval Facilities Engineering Command (NAVFAC) is responsible for Navy facilities. Field activities under the command of the hardware SYSCOMs perform the depot level maintenance, while the depot maintenance on NAVSUP managed inventories is accomplished under the direction of the appropriate hardware SYSCOM at their assigned depots.

3.3.2.1 Navy - Aviation Depots

The NAVAIR depot maintenance facilities are used primarily to rework and repair weapons systems, such as aircraft, engines, and components, and provide fleet support services needed to sustain an effective Navy air capability, such as modification, calibration, support equipment rework, automatic test equipment and maintenance, engineering assistance, repair of catapults, arresting gear, and landing aids. NAVAIR depot maintenance facilities include six Naval Aviation Depots (NADEPs) and the Naval Avionics Center (NAC).

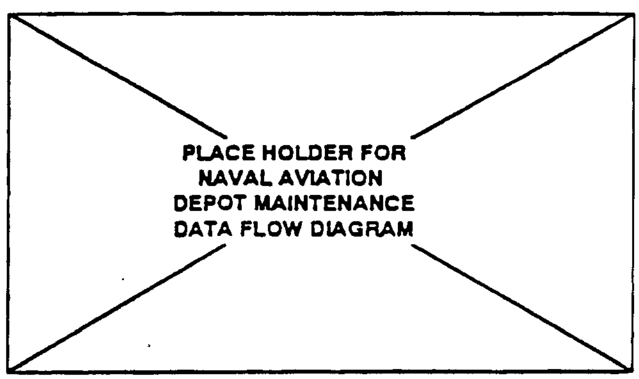


Figure 3-2 Naval Aviation Depot - Core Information Flows

3.3.2.2 Navy - Shipyards

The Naval Shipyards under the headquarters command of the NAVSEA provides the organic industrial base to the Navy for the repair, overhaul, alteration, and modernization of surface ships and submarines. The shipyards overhaul vessels on a scheduled availability basis established by the Chief of Naval Operations (CNO) to ensure that the highest state of capability and readiness is maintained. Additionally, the naval shipyards perform depot repairable work and serve as engineering planning yards for applicable ship classes.

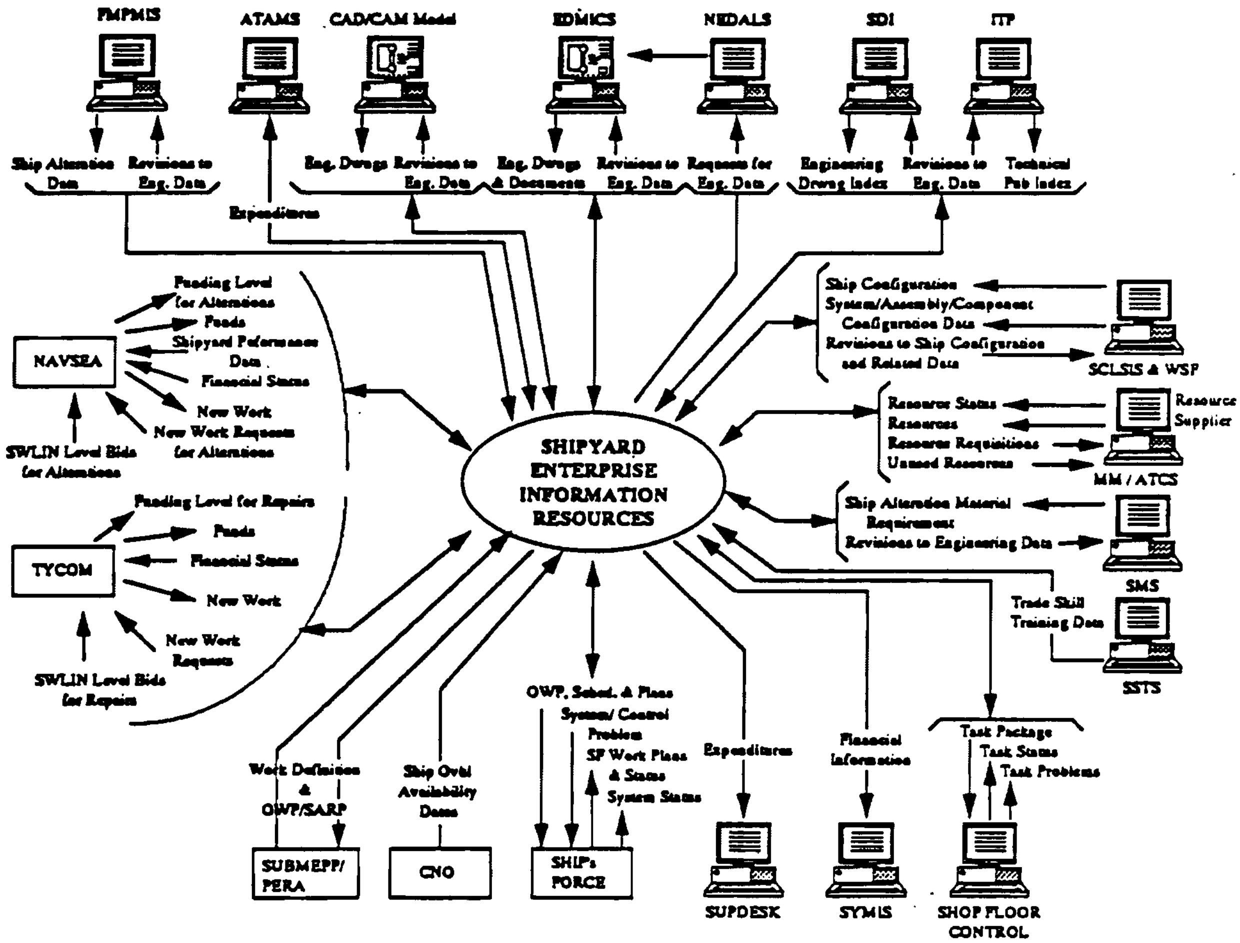


Figure 3-3 Shipyard Information Resources

3.3.2.3 Navy - Ordnance Activities

[To be included in next draft]

3.3.2.4 Navy - Electronic Systems Maintenance Depots

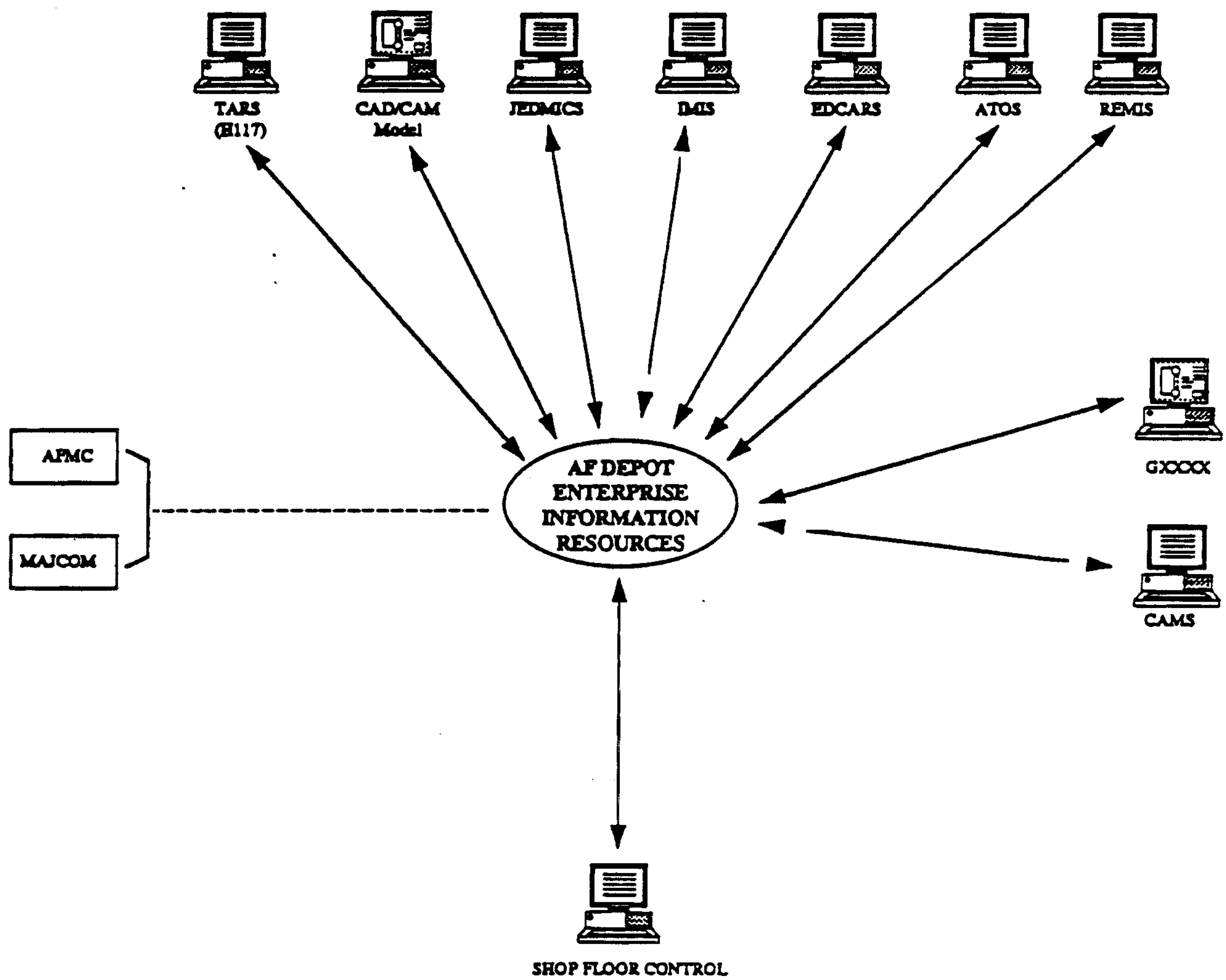
[To be included in next draft]

3.3.3 Marine Corps Depots

[To be included in next draft]

3.3.4 Air Force Depots

This section addresses the Air Force Depot environment specific issues surrounding Technical Information creation, management, and use. The picture of today's technical information environment is one of relative consistency among the depots. Technical information is generally stored at each depot in a central Technical Order (T.O.) Library. This library serves as the focal point for information dissemination to, and within, the depot. Changes are distributed to the library, and then from the library to all points within the depot owning copies of affected documentation. There are usually two other main repositories of technical information within the depot: the Engineering Support and Production Engineering units.



The primary source of technical information is the Technical Order (T.O.). In a missile support environment, the information is commonly referred to as (Universal?) Technical Manuals UTM's. In this context, the term T.O. will be used generically to refer to this type of information. T.O.'s are normally procured at system acquisition from contractors. The guidance on the structure and content of T.O.'s provides for flexibility, and contractors' format is generally acceptable. Product quality is generally good, but this situation does promote some lack of consistency throughout T.O. documentation. Other sources of technical information include MIL SPECS and MIL STDS, and engineering drawings. These are of particular interest in the engineering area.

Unanticipated repairs on occasion precipitate a need for information not documented in the T.O.'s. When this happens, several mechanisms exist for obtaining the requisite information. In the early stages of weapon systems support, there are frequently on-site technical support contractors who can provide the information. Typically, this on-site support is discontinued later in the life cycle. Subsequent requests for information are then put to the Item Manager, Program Manager, or System Manager at AFMC to use contractual channels to obtain required information. This can often have drawbacks in terms of timeliness. In most cases, information is received in some paper format. Configuration control of received information is effected through the depot technical library. A T.O. number is assigned by the library and the information is treated as a formally controlled T.O. from that point forward.

In the case of airborne systems documentation, the need to create new information rarely arises, but in the case of automated test equipment or ground support equipment, this is frequently the case. Looking toward the future as airborne systems become older, the need to create new information to support extended life cycles will become more and more common. When new technical information is created within the depot, engineering will document the information for inclusion into the appropriate T.O., and submit it with an AFTO form 22 to the technical library. An AF Form 252 is issued to other depots or field sites requiring the new information. The 252 publishes any changes or new T.O. information in the interim until the T.O. is re published. In certain cases, a Process Order may be issued by the Cognizant Technical Authority describing and authorizing special repair work in advance of a form 252.

3.4 Operational Level User Requirements

The Customers or End-Users are those individuals in the depot organizations who create, modify and use technical information to execute their assigned responsibilities. End-Users perform a wide spectrum of functional activities within the depots and cover a wide-range of sophistication in their application of computer systems and other technology. This effort is just the starting point for collecting of information requirements from this diverse group. As this activity matures, many more viewpoints will be solicited and systematically added to the current base of information.

3.4.1 Physical Production (Shop Floor)

Shop floor requirements for technical information in a manufacturing environment fall mainly into the categories of engineering drawings and process plans (routings). There is a wealth of "behind the scenes" information that must be available to operate and service the machinery and equipment to manufacture the parts, of course.

In a repair environment, drawings and T.O.'s are the primary sources of information required to identify disassembly, inspection, and repair procedures. T.O.'s are maintained

Shop floor control in either environment is generally facilitated by application-specific software developed locally. Rarely is there a direct digital interface between shop floor control and enterprise management systems. Data extracted from the shop floor control system is often reported upstream by manual input to enterprise systems.

3.4.1.1 Physical Production - Joint Requirements

[To be included in next draft]

3.4.1.2 Physical Production Service Unique Requirements

[To be included in next draft]

3.4.2 Production & Design Engineering

Design engineering information is typically new or revised information. In the design engineering environment within a depot maintenance context, the needs for technical information center around the requirement for innovative solutions to repair problems. This implies a need to access to all manner of information about failure modes and frequencies, and the conditions that precipitated the failure. This may take the form of statistical information from maintenance databases, inspection or accident reports, or any other source that would provide a clue as to the nature and severity of the problem. If repair cost is the problem, then cost data is required to narrow down the search for specific areas of improvement in the repair design.

Once all available problem-related information is assembled, the need for information turns to such things as geometric descriptions, specifications, system design data, engineering analyses, material characteristics, projected life cycles, and perhaps even cost constraints. Technical information from vendors is also required to incorporate any off-the-shelf hardware into the repair. Armed with information about the problem and potential solutions, the engineer can derive a suitable design to effect a cost-effective repair.

A production engineering environment needs access to all engineering data required to produce parts. This includes not only material requirements and geometric descriptions, but also dimensional tolerancing information and post-fabrication treatments such as heat treatment and corrosion prevention. Material characteristics and raw material size and shape are also critical to designing a successful manufacturing process plan.

3.3.2.1 Production & Design Engineering - Joint Requirements

[To be included in next draft]

3.3.2.2 Production & Design Engineering - Service Unique Requirements

[To be included in next draft]

4.0 CALS Architecture - DM Perspective

4.1 JLSC/DM CALS Implementation Model

.... ***DoD CALS Vision***

CALS is a joint Department of Defense (DoD) and industry initiative to improve weapons system quality, reduce development cycle time, and avoid cost through the use of digital technology in the generation, access, management, maintenance, distribution, and use of technical information. The CALS Vision is to provide affordable, ready access to up-to-date business and technical data and information associated with weapon systems and weapon systems support. Standard digital data will be provided throughout the life cycle for all authorized users.

CALS is embodied in the a collection of related technologies, infrastructure and standards which enable a logical Integrated Weapons System Data Base (IWSDB) environment for DoD weapon systems and subsystems. Data will be developed and acquired once and used many times. Selected weapon systems data bases, connecting and communicating equipment and workstations will be compatible and meet DoD Corporate Information Management (CIM) "open systems architecture" requirements.

.... ***DoD CALS Guiding Principles***

CALS is not a computer system, but rather the standards, technology and techniques applied in a sound infrastructure for integration and sharing of information among cross-functional users. The following are guiding principles for the Implementation of CALS DoD-wide:

- ❑ Continue to meet the needs of the users of DoD information systems, at accelerated information availability rates and at lower costs. Open systems architecture in system design is a key element in CALS implementation to cost effectively achieve this objective.

- ❑ Eliminate redundancy in information systems or processes and migrate towards CALS flagship programs. As processes are improved, the support for required functionality will be implemented in flagship programs.

- ❑ Improve or streamline the number of processes while consolidating and inserting technological capabilities, and use business methods for process development.

- ❑ Use established policy and procedures to create DoD-wide accepted definitions and standards for data.

- ❑ Ensure CALS concepts and initiatives are an integral part of weapon system development from concept definition through the end of the life cycle.

- ❑ Work toward government, commercial, and international standardization of information processing and real time access to the proper information by the correct individual.

.... *DoD CALS Implementation Framework*

The DoD CALS Architecture presents the logical depiction of CALS and provides the framework for managing and implementing CALS within DoD. This implementation framework includes the following key elements: functional processes and requirements, standards (functional, technical, and data), security, policies, data models, organizations and computer systems. These elements are depicted in CALS Architecture Model in Figure 4-1 which consists of three principal components: The Information Architecture, the Control Architecture, and the Computer Systems Architecture.

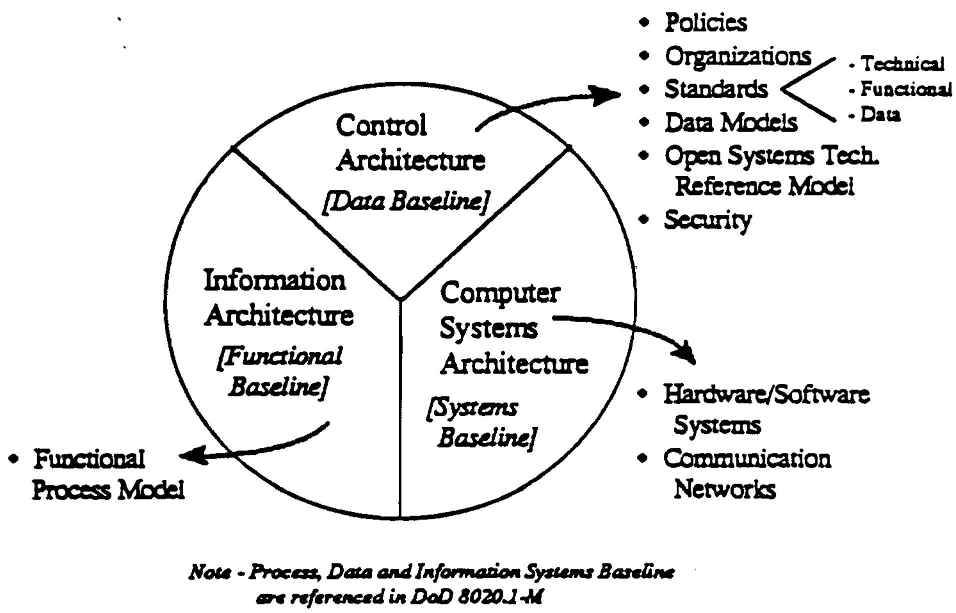


Figure 4-1 DoD CALS Architecture Model

This three components of the CALS Architecture model is based on the application of the ANSI Three-Schema Architecture which defines three different integrated views (or schemas) for information:

- ❑ **External View** - user (or application) view of information

- ❑ **Conceptual View** - logical representation of data and data relationships

- ❑ **Internal View** - actual physical design required by a database management system

These fundamental concepts have been applied as follows:

- The External View has been expanded into an **Information Architecture** that includes activity models to fully describe the user information requirements. The Information Architecture reflects the user's view of CALS processes. It defines the relationships among the functional activities performed by users, and includes the process models that describe what the users do.

- The Conceptual View has been expanded into the **Control Architecture** to establish the management and control mechanism for integrated CALS development and implementation. Therefore, the Control Architecture provides the implementation structure for DoD management of CALS. It is the management view of CALS that links and regulates the supply of information and related technologies provided by the Computer Systems Architecture with the demand for information as expressed in the Information Architecture. The Control Architecture addresses the organizational structure that manages CALS, the business processes that justifies the investments required, and the CALS plans, policies, and standards which enable uniform implementation.

- The Internal View has been expanded into the **Computer Systems Architecture** to encompass system software, hardware and communication facilities. The Computer Systems Architecture defines the relationship between hardware and software components needed to implement the Information Architecture processes, while being consistent with the Control Architecture. It represents where and how data is Created(e.g., authored, modified, acquired), Managed (e.g., stored, administered, accessed, distributed), and ultimately Used (e.g., applied or processed) by the end-user in the DoD infrastructure employing diverse technologies.

Also note in Figure B-1, that the Process, Data and Information Systems Baseline referred to in the DoD Manual for Functional Process Improvement (DoD 8020.1-M) can also be mapped to the CALS three part architecture.

Inherent in the "Three-Architecture" approach is the foundation for flexibility, adaptability, and cost-effective transition for CALS. CALS development and implementation should be based upon its most stable aspect. In the dynamic development environment of depot maintenance, the conceptual view of data and data relationships is more stable than the evolving processes and implementation of technologies in computer systems. The "data-driven" Control Architecture interposed between the functional definition in the Information Architecture and the technology implemented in Computer Systems ensures a stable development environment that also fosters flexibility for cost-effective "adaptation" of improved business practices and new technology.

The DoD CALS Architecture provides the data-driven framework and stable development environment for the Depot Maintenance Information-Integrated Enterprise (I^2E) approach to CALS implementation. The key contribution that CALS can make to the development and implementation of improved depot maintenance processes is through establishment of an integrating infrastructure. The concentric rings shown in Figure 4-2 depicts the infrastructure support that provides a "single-logical" source (e.g., Integrated DM Product Data Base) supporting the concurrent end-use of information depicted by the various process radiating outward from the center of the diagram. It is essential that all concurrent processes operating on common data are utilizing the same version, making information configuration management a critical concern. The information can still be physically-distributed, but through the logical integration, data is extracted from one controlled and configuration managed source.

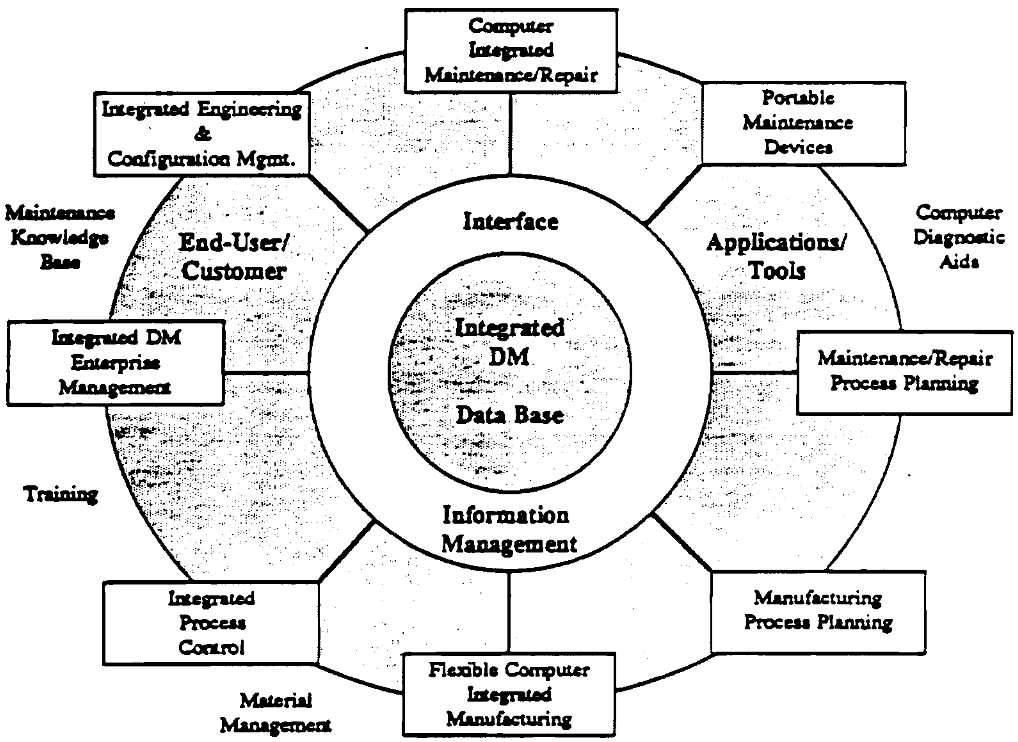


Figure 4-2 Information-Integrated Enterprise Concept

Information and the knowledge derived from information are the lifeblood of the depot maintenance enterprise, and which drives functions that can extend beyond the confines of an information system. An exact understanding of how information in the end-users "hands" is employed, is fundamental to the determination of what data, at what level, needs to be managed in the DM Integrated Product Data Base.

Information or knowledge gained from information can be applied directly to propel the execution of operational personnel functions. Examples of this are the Technical Information Packages (TIFs) used to communicate task-level work instructions to a mechanic in a shipyard environment, or Technical Orders/Process Orders/Work Cards utilized in an aviation depot environment. Information can be aggregated from various formats and media and passed on to other devices such as portable maintenance devices or diagnostic aids for final display and interface to the user. Sometimes the ultimate use can be derived from transformation of information, such as the translation and downloading of machine tool instructions to formats required by machine controllers in manufacturing.

The wide range of information use often requires sources to be maintained at various levels. For example, TIFs and T.O.s and their derivatives are often built from sub-sets of traditional information products, sometimes referred to as "atomic-level" data. A TIF can be comprised of illustrations "cut" from a portion of a engineering drawing, excerpts from specific sections of a technical manual or other source documents, configuration data from weapon systems databases, and information from reference libraries (e.g., requirements and specifications). The definition of what is included at the "atomic-level" and corresponding maintenance of the configuration links are key to achieving information-integrated processes across the enterprise and properly supporting end-users. A comprehensive approach to the implementation of CALS will enable the achievement of an information-integrated enterprise. The DoD Flagship CALS Initiatives can provide the mechanism to implement the integrating infrastructure that will also facilitate the cost-effective migration of the Depot Maintenance Systems Baseline. A robust, open-systems environment for implementation of the DM Integrated Depot Maintenance Product Data Base will provide connectivity to current information management systems and interoperability between end-use applications and tools (See Figure 4-3).

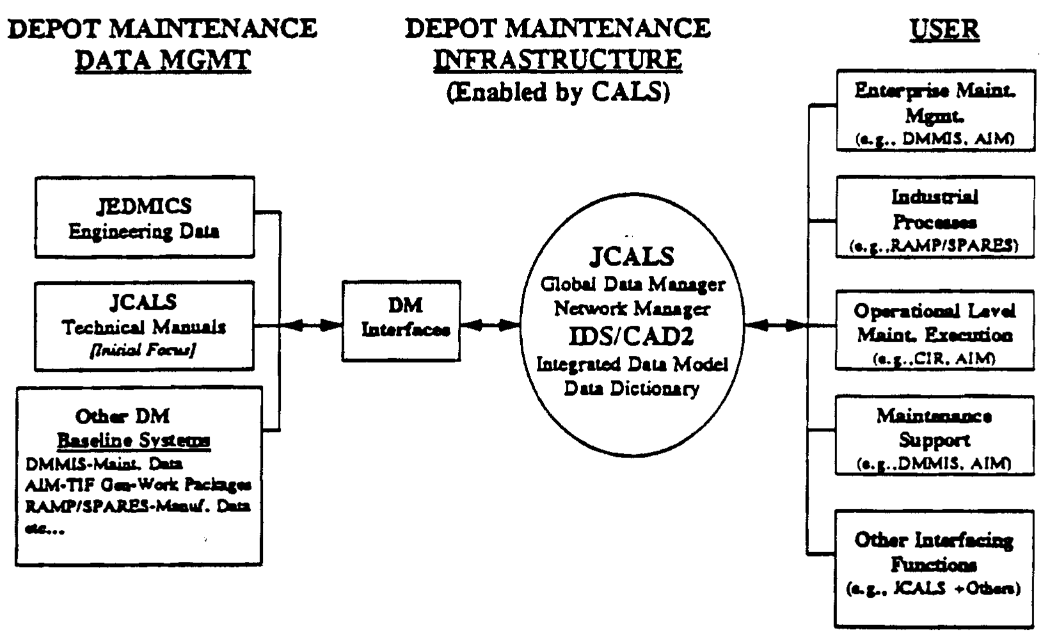
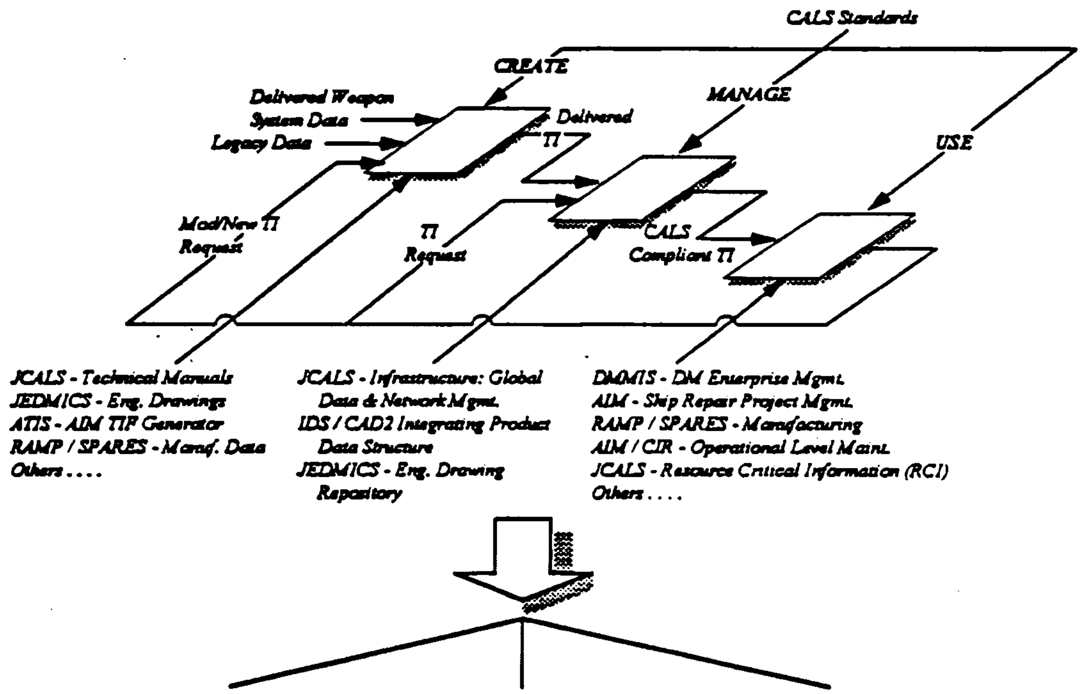


Figure 4-3 CALS Enabled Depot Maintenance Infrastructure

The next step is to introduce and discuss the "CREATE-MANAGE-USE" paradigm and then bring all the pieces together to depict the CALS development/implementation model for the depot maintenance community. - This same approach is equally valid in other functional areas and could be applied to ensure seamless interfaces with other logistics support communities (e.g., material management) This will be provided in the next draft of this document.



CREATE

- The process of acquiring, authoring, modifying, and converting Technical Information (TI)

MANAGE

- Infrastructure support for Information-Integrated DM Enterprise
- Includes: management, administration, loading, control, tracking, packaging, and distribution of TI

USE

- Customer functions supported by CALS enabled integrated data environment and by application of CALS technologies

Figure 4-4 DM-CALS Create-Manage-Use Paradigm

4.2 DM-CALS Operating Environment

Two major points covered in the JLSC/DM CALS fundamental objectives address the need to: assess how CALS standards can assist legacy systems in streamlining data flow and eliminating redundancies, and to integrate CALS flagship programs with legacy and migration systems. The following table conceptualizes how the assessment of systems, supporting functions, and CALS might be accomplished.

First systems are listed against broad functional categories supporting or interfacing with Depot Maintenance. The following represents a starting set of system categories:

- ❑ CALS Infrastructure Systems
- ❑ Enterprise Maintenance Management
- ❑ Industrial Support Processes
- ❑ Maintenance Support Processes
- ❑ Interfacing Systems

Next these systems are arrayed against Depot Maintenance functions to identify the potential areas where gaps and overlaps exist, thus helping to focus attention where more detailed analysis is required.

The information arrayed in this table can also be used to formulate strategies. A case is made using the information presented in this table for a proposed CALS Implementation Project (CALS-IP) addressing global data management issues critical to achieving a shared data environment supporting Depot Maintenance processes. The proposed Implementation Project involves the establishment of an Integrated Product Data Control Model (PDCM) building off the foundation work accomplished in the IDS and CAD2 programs and examining implementation within JCALS. The results of this effort would provide the basis for building a common infrastructure supporting DM processes across the components. The three programs that comprise this CALS-IP would address weapon system life cycle support across the Air Force, Army, Navy/Marine Corps and would examine platforms from aircraft to ships and submarines.

The development of a common data structure as proposed in the Integrated-PDCM CALS-IP will:

- ❑ Provide the foundation to build upon to achieve continuous process improvements
- ❑ Facilitate consolidation of Depot Maintenance applications
- ❑ Be key to effective migration of Depot Maintenance Systems
- ❑ Provide important linkages to interfacing functions and will become exceedingly important to achieving cross-functional integration

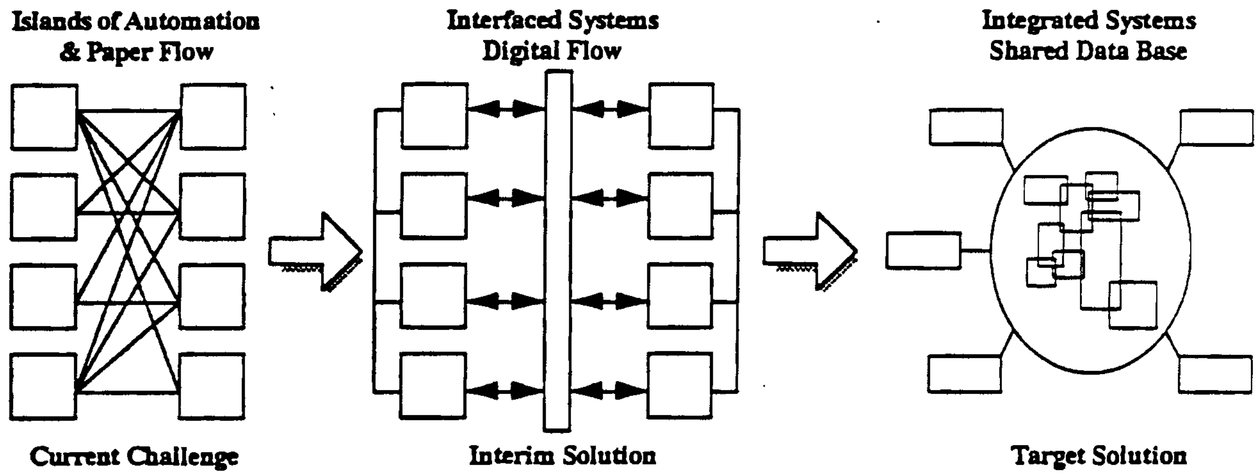
		DEPOT MAINTENANCE GLOBAL FUNCTIONS														
		Enterprise Maint. Management					DM Support	Interface Support	Industrial Support Processes		CALS-Related Processes					
System Category	System Name	Manage General Activities	Manage Quality	Manage Production	Manage Material	Execute Production	Engineering Support	Material Mgmt.	Manuf. Support	Diagnostics Support	Global Data Mgmt.	Eng. Dwng Mgmt	Tech. Document Mgmt	TI Authoring/ Conversion	TI Retrieval Display	TI Distribution
CALS Infrastructure Systems	JCALS										●	◎	●	◎	◎	◎
	IDS						○				●	◎	○	◎	◎	○
	JEDMICS						●				○	●	○	○	○	○
	DGAINS												◎	◎	○	●
Enterprise Maintenance Management	DMMIS	◎	○	◎	◎	◎	○	○								
	AIM	◎	◎	◎	◎	◎	◎	○			○	○	○	○	○	○
Industrial Support Systems	SPARES						◎		◎							
	RAMP						○		◎							
	IMIS									◎						
DM Maint. Support Systems	CADII						●				◎	◎	○	◎	◎	○
DM Interfacing Systems	CLIP							◎			○					

● - All Aspects Supported ○ - Key Aspects Supported ◎ - Some Aspects Supported (or Interfaces Supported)

5.0 CALS Initiatives

The CALS initiative originally grew from industry advances in the use of digital data and the need for the government and industry to work together on the implementation of those advances. The formal definition of CALS is:

"Computer-aided Acquisition and Logistic Support (CALS) is a DoD and Industry strategy to enable, and to accelerate, the integration of digital technical information for weapon system acquisition, design, manufacture, and support. CALS will provide for an effective transition from current paper-intensive weapon system life cycle processes to the efficient use of digital information technology. The purposes of CALS is to improve industry and DoD productivity and quality, and thus improve supportability, military readiness, and combat effectiveness." **Source:** *MIL-HDBK-59A, Military Handbook, Computer-aided Acquisition and Logistic Support (CALS) Program Implementation Guide.*



[This section will provide a tutorial on CALS, and introduce information on specific CALS initiatives. More to be provided in next draft]

6.0 JLSC/DM CALS Organizational Roles & Responsibilities

6.1 Defense CALS Executive

The 30 October 1992 Plan for the Transition of CALS Logistics Functions from the Defense CALS Executive to the Joint Logistics Systems Center defines the transition of logistics functions and programs/systems from the Defense CALS Executive/CALS Evaluation and Integration Office (DCE/CEIO) to the Joint Logistics Systems Center (JLSC) for continued implementation. The DCE/CEIO serves as the office of primary responsibility for the DoD-wide oversight and management of CALS, with a focus on insertion of CALS concepts early in the acquisition life cycle. The principal DCE/CEIO responsibilities include: develop, implement, and monitor policies, procedures, and guidance within DoD which further the CALS goals; monitor and support the insertion of CALS technologies into selected information and weapon systems; develop and implement advanced CALS standards; ensure the integration of CALS concepts, to include EC/EDI, across functional areas; maintain interface with organizations external to DoD including Congress, industry, and other nations; interface with JLSC on CALS logistics issues, initiatives, and implementation; and facilitate process improvements in the weapons system life cycle using CALS methodologies.

6.2 JLSC Command CALS Mission

The Joint Logistics Systems Center (JLSC) is responsible for achieving DoD Corporate Information Management (CIM) goals for the logistics business area. Within the JLSC, the CALS objective will be to incorporate the capability to use standardized digital data which support functional processes in DoD logistics systems. The intent is for programs/systems to loose their "CALS" identity as this integration occurs. They will be incorporated into the standard systems and supporting logistics processes which are being developed and implemented. These projects will be evaluated on their contribution to improved business practices, increased efficiency or enhanced logistics capabilities. Within the JLSC, projects will acquire a functional proponent (i.e., Depot Maintenance, Materiel Management, and ED/EDI) and will be managed as any other initiative being implemented within the Center.

The JLSC CALS mission includes the following: serves as the CALS focal point for the logistic business area; maintains interface with the DCE/CEIO on industry interfaces, EC/EDI advances, emerging standards development, acquisition initiatives, and other CALS efforts; manages the implementation of DoD CALS logistics applications and determines, through functional and technical analysis, CALS opportunities and economic benefits of application within DoD logistics processes; and evaluates and approves CALS Functional Economic Analyses and recommends the expenditure of funds for CALS activities for assigned logistics programs; and ensures that CALS FEAs comply with guidance from the Director of Defense Information.

The CALS related programs/systems designated as acquisition will fall under DCE/CEIO purview, and those CALS related programs/systems designated as logistics will fall under the JLSC purview. The key criteria for determining acquisition or logistics designations will be based on the predominate user of the information provided by the programs/systems.

6.3 Depot Maintenance CALS Mission and Fundamental Objectives

The Directorate for Depot Maintenance (JLSC/DM) is responsible for designing, developing and implementing the depot maintenance functional area of the integrated DoD logistics process, and facilitating the development and implementation of improved business practices. JLSC/DM supports the JLSC command CALS mission by providing the focal point for depot maintenance business area in determining through functional and technical analysis, CALS opportunities and the economic benefits for improving DoD depot maintenance processes. Associated CALS responsibilities will encompass the following key activities:

- ☐ Introduce key enabling CALS technologies for integrating and improving Depot Maintenance processes.

- ☐ Ensure that emerging depot maintenance standard systems are compatible with DoD CALS standards, policies, procedures, and open systems architecture.

- ☐ Establish the supporting CALS infrastructure and shared data environment to receive, manage, and provide integrated technical information essential to the effective execution of Depot Maintenance operations from the enterprise-level to shop-floor processes.

- ☐ Prototype selected CALS related applications, and coordinate activities with other appropriate functional directorates within the JLSC and the Components.

- ☐ Maintain vital interfaces with Components, and ensure CALS implementation supports their essential requirements. For the Depot Maintenance functional area act as a coordinating/liaison organization with DoD CALS Executive Office for industry interface, exploitation of CALS advances, and compliance to emerging DoD/Industry standards and acquisition initiatives.

- ☐ Assess potential of initiatives for multi-component savings, and evaluate CALS/DM FEAs to ensure DDI standards are met.

It is essential that the CALS approach for depot maintenance takes an effective first step on the path leading to a robust environment that supports continuous process improvement. The following fundamental objectives are focused on taking that appropriate first step:

- ☐ To make Depot Maintenance requirements known to CALS programs and to direct some of the CALS program focus towards the Depot Maintenance customer

- To ensure that new JLSC/DM initiatives and current migration systems conform to CALS guidelines and specification where applicable

- To make technical data accessible to the user on the shop floor in conjunction with Maintenance Management data in a transparent fashion

- To assess how CALS standards can assist legacy systems in streamlining data flow and eliminating redundancies

- To integrate CALS flagship programs like JCALS, JEDMICS, etc. with legacy and migration systems.

6.4 JLSC CALS Points of Contact

The CALS Primary Points of Contact in JLSC are as follows:

	DMI - Industrial Processes Division	Phone #
Col John Pavlovsky	Division Chief	50428
Jerry Franklin	Deputy Division Chief	50428
Mike Ahearn	FCIM/CALS Manager	50428
James Eccleston	DM CALS Implementation	50405
	DMO - Business Operations Division	
Delma Worth	Chief	50513
Jerry Willoughby	CALS Financial Tracking	50430
	CX - Electronic Commerce	
Steve Fisher	Division Chief	50700
LTC Sam Evans	JLSC CALS Liaison	50705
Gerald Tritle	CALS Business Case Analyses and Functional Support for Logistics and Finance	50700
	CI - Corporate Integration	
Jeff Vineyard	Director, CI and CALS POC	50705
Doug Moll	Chief, CI Division	50705
	TI - Technical Integration Management	
Gerald Patterson	CALS Evaluation for DISA	58120
	RM - Resource Management	
MAJ Brian Marshall	JLSC Liaison to Functional Requirements Management Activity (FRMA)	50348
Sandy Nichols	RM Focal Point for CALS Financial Tracking	50350
	MM - Material Management	
CDR Mike Bachmann	CALS Focal Point for Interface to Material Management	50472
Thad Cates	Chief, Material Management Planning Division	50472

Phone Extensions - (513) 255 - XXXX

APPENDIX - A

ACRONYMS
and
DEFINITIONS

Depot
Maintenance
CALS
Concept of
Operations

CAD	Computer-Aided Design
CAE	Computer-Aided Engineering
CALS	Computer-Aided Acquisition and Logistics Support
CALSIP	CALS Implementation Plan
CAM	Computer-Aided Manufacturing
CCDM	CALS Compliant Digital Media
CCITT	International Consultive Committee on Telegraphy and Telephony
CDRL	Contract Data Requirements List
CE	Concurrent Engineering
CITIS	Contractor Integrated Technical Information Service
CGM	Computer Graphics Metafile
CM	Configuration Management
CMP	Configuration Management Plan
DDN	Defense Data Network
DID	Data Item Description
DM	Data Management
DoDISS	Department of Defense Index of Standards and Specifications
ECP	Engineering Change Proposal
EDIF	Electronic Design Interchange Format
FIPS	Federal Information Processing Standard
GOSIP	Government Open System Interconnect Profile
IETM	Interactive Electronic Technical Manuals
IPC	Institute for Interconnecting and Packaging Electronic Circuits
IGES	Initial Graphics Exchange Specification
IWSDB	Integrated Weapon System Database
LSA	Logistics Support Analysis
LSAR	Logistics Support Analysis Record
PDES/STEP	Product Data Exchange Specification / Standard for the Exchange of Product Data]
RFP	Request for Proposal
SGML	Standard Generalized Markup Language
SQL	Structured Query Language
VHDL	VHSIC (Very High Speed Integrated Circuit) Hardware Description Language

APPENDIX - B

DEPOT CAPABILITIES PROFILE

Depot Maintenance CALS Concept of Operations

The following listings were obtained from the 1992 version of the Depot Profiles that were prepared by the Joint Depot Maintenance Analysis Group, Technology Assessment Division. The Depot Profiles contains information about Army, Navy, Air Force and Marine Corps depot maintenance capabilities. It identifies technological capabilities, functions, and equipment across a spectrum of depot activities.

End-User needs encompass the wide range of information requirements supporting the application of diverse technologies in different combinations of commodities, processes, and products at work across all the DoD Depots. Even with all this diversity, there are many common information elements, and all depots will benefit from the ability to share information. The tables that follow display the technological capabilities of the depots arrayed against Commodities, Processes, Products, and Technologies.

Technology related information can provide a common shared resource that can benefit all depots across diverse products, processes and commodities. For example: the Laser Measuring, Spectrographic Analysis, Ultrasonic, and Radiography technologies are applied in the Test and Inspection process for an extensive range of products across the various commodities and depot sites. The ability to share this sort of information across the depots will boost the introduction of new technologies, assist training, and provide a mechanism to share technology application innovations.

COMMODITIES

Aircraft	General Support Equipment
Automotive Equipment	Missile
Combat Vechicles	Ordnance
Communications/Electronics	Ships
Construction	

PROCESSES

Cleaning	Other
Disassembly	Repair
Fabrication	Test and Inspection

PRODUCTS

Acc & Comp Airframe	Guidance System
Acc & Comp Engine	Machine Tools
Acc & Comp Hull and Chassis	Mechanical
Acc & Comp Missile	Metal Airframe
Acc & Comp Power Plant	Metal Hull and Chassis
Acc & Comp Propulsion	Metal Missile Frame
Acc & Comp Shelter / Housing	Metal Shelter / Housing
Armament	Non-Electronic Support Equipment
Avionics	Non-Electronic Surface Cmd and Control
Carrier Hull	Non-Metal Airframe
Communications	Non-Metal Hull and Chassis
Communications Electronics	Non-Metal Shelter / Housing
Conventional Arms and Explosives	Payload System
Electronic Support Equipment	Recip Engine
Electronic Surface Cmd and Control	Recip Power Plant
Electronics Test Equipment	Shelf-Propelled Guns and Artillery
Electronics	Small Arms
Fire Control	Solid Propulsion
General Purpose	Sub-Surface Hull
Generator Set	Support and Launch
GTE Engine	Surface Hull
GTE Power Plant	Towed Guns and Artillery
GTE Propulsion	Troop Support Equipment

Technologies Listing begins on next page.

TECHNOLOGIES

Abradable Rubber Repair	Automated Bonding Test
Abrasive Flow	Automated Disassembly
ADAS	Automated Disk Deblading
Advanced Components	Automated Final Test
Advanced Composite	Automated Florescent Penatrant Inspect
AEPS	Automated Materials Handling
Agricultural Media Blast	Automated Ultrasonic
Air Comprs Analyzer/Test Facility	Automated Weight Sorter
Air Conditioning (Freon)	Automatic Test Equipment
Air Conditioning (Lithium Bromide)	Aviation Support Equip
Air Flow	Baking Oven
Air / Fuel Flow	Barge Design
Aircraft Ditmco	Bearing Process System
Aircraft Rigging	Bearing Testing
All Elec Testing	Bonding
All Electric Foundry w/Auto Sand System	Bonding Composites
All Up Round Bit	Bonding Metal
Altimeter Testing, Auto	Bonding Non-Metal
Analog Components Testing, Auto	Cable Assembly
Anechoic Antenna Test Chamber	Cable Fabrication
Antenna and Rotary Ground Repair	Cable Test - Ditmco 9100
Antenna Restoration	CAD/CAM
Antenna Test Range	CAD/CAM Armament
Antenna Test Range Facility	CAD/CAM Artwork - Flat Wire Cables
Auto Analog / Digital - GR1796	CAD/CAM Artwork - Printed Circuit Board
Auto Cable Test Ditmco 9100	CAD/CAM Auto Drafting
Auto Chassis Dynamometer	CAD/CAM Auto Drilling
Auto Comsec STE-51/52	CAD/CAM Auto Prop Machining
Auto Dynamometer	CAD/CAM Automated Measuring System
Auto Gyro Testing	CAD/CAM Building Layout
Auto Laster Cutting	CAD/CAM CAE - e.g., Finite Elements
Auto Oxyfuel Cutting	CAD/CAM CAE - ECP
Auto Plasma Cutting	CAD/CAM Capacity Analysis
Auto Spot Welding	CAD/CAM CNC
Auto Wire Guided Vehicle	CAD/CAM CNC & NC Programming
Autoclave	CAD/CAM CNC Controlled Propulsn Shaft
Autoclave Large (over 20 feet)	CAD/CAM CNC Plate Cutter
Autoclave Small (20 feet and under)	CAD/CAM CNC Vertical Internal Grinder

TECHNOLOGIES (Cont'd)

CAD/CAM Design Drawings	CAD/CAM Project Design
CAD/CAM Design R&D	CAD/CAM Punch
CAD/CAM Design/Drafting/CNC Tapes	CAD/CAM Punch, Lathe, Milling
CAD/CAM Design/NC Program/Layout	CAD/CAM Sheet Metal
CAD/CAM Drafting	CAD/CAM Sheetmetal Fabrication
CAD/CAM Drafting Support	CAD/CAM Shelter Layout
CAD/CAM Drawing Layout	CAD/CAM Ship Design Including Detail
CAD/CAM Drawings	CAD/CAM Structural Analysis
CAD/CAM Electrical Schematics	CAD/CAM Structural Steel / Boiler
CAD/CAM Engineering Analysis	CAD/CAM System Design
CAD/CAM Engineering Design	CAD/CAM Technical Documents
CAD/CAM Engineering Drawings	CAD/CAM Tool Design
CAD/CAM Equipment Design	CAD/CAM Wiring Diagrams
CAD/CAM Fabrication	Calibration Lab
CAD/CAM Facility Layout	Ceramics
CAD/CAM Fleet Issue Unit Loads	Certified Soldering
CAD/CAM Inventory Control	Chemical Analysis
CAD/CAM Lathe	Chemical Clothing Maint Facility
CAD/CAM Machining	Chemical Laboratory
CAD/CAM Machining Center Program	Chemical Machining
CAD/CAM Manuf. Numerical Control	Class 100,000 Clean Room
CAD/CAM Mechanical Design	Clean Room
CAD/CAM Metal Fabrication	CNC Machining - Forming
CAD/CAM Milling	CNC Machining - Milling
CAD/CAM Missile Containers	CNC Machining - Shear
CAD/CAM Multiclass/Multigroup	CNC Machining - Welding
CAD/CAM NC & CNC	CNC Punch Press & Plasma Arc
CAD/CAM NC Machine Tools	CO2 Blast
CAD/CAM NC Programming	Cold Proof
CAD/CAM PC Design	Communications Command and Control
CAD/CAM Parts Inspection	Communications Systems
CAD/CAM Parts Replication	Component Screening
CAD/CAM Plate Cutting	Coordinate Measuring
CAD/CAM Portable Handling Equipment	Cordage Manufacturing
CAD/CAM Portable ORO Handling	Corrosion Control
CAD/CAM Printed Ciruit Board	Cryptographic
CAD/CAM Process Management	Dabber Tig Welding
CAD/CAM Programming	Deactivation

TECHNOLOGIES (Cont'd)

Dedicated Valve Rework Facility	Epoxy Repair
Demilitarize Capability	EProm / Prom Programming
Destructive / Nondestructive	Explosive Forming and Cladding
Diesel Eng Analyzer / Test Facility	Failure Analsysis
Digital Components Testing, Auto	Fastener Verification Lab
Drop Hammer	Fiber Optic Cables
Drydocking	Field Test Unit
Dye Penetrant	Final Test, Engine Trans, Final Drive
Dye Penetrant System w/ Powder	Firing Cycle Measurement System
Dynamic Components, Auto	First Article Test
Dynamic Pressure Test Unit	Flame Spray
Dynamometer	Flash Paint Removal
EDC	Flex Cable
Eddy Current	Flex Printed Circuits and Cables
Electric Component Screening	Flexible Machining Cell
Electric Discharge Machining (EDC)	Floating Drydock Design
Electric Systems	Florescent Penetrant
Electrical / Electronic Apparatus	Flouride Ion
Electrical / Electronic Final Assembly	Forging
Electrical / Electronics	Forming
Electro Hydraulic Press	Foundry
Electro Magnetic Forming	Foundry Ferrous / Non Ferrous Capabilities
Electro Plating	Freon Reclamation
Electro-brushing for Decontamination	Gaging
Electromagnetic Interface Test	Gamma & X-Ray
Electron Microscope	Gas Powdered Vinyl Weldng Machine
Electronic ATE	General Watercraft Larc-60 & Lacv-30
Electronic Testing	Glass Media Blast
Electronic Warfare Systems	Governor Test Stand
Electrostatic Discharge Test	Grit Blast
Electrostatic Epoxy Spray	GRP Products
Elex Combat System	Gymnasticator
Encapsulation	Gyro Testing, Auto
Enclosed Blast and Paint Facility	Gyrocompass
Engine Test Cell	Heat Exhanger
Environmental Stress Screening	Heat Treating
Environmental Vibration	Heavy Radar
Enzyme (Tank)	Heavy Steel Structure

TECHNOLOGIES (Cont'd)

High Temperature	Layup Facility
High Voltage Power Supplies	Lead Yard DMP SSN 688
Honeycomb Profiler	Leak Test
Hush House	Lg Antenna Hydrostatic Test Tank
Hybrid Microciruit Repair	Life Boat Repair
Hydraulic	Liquid Chemicals
Hydraulic Component Augo	Liquid Penetrant
Hydroblast	Load Test
Hydrostatic	Machining
Hyperbaric Chamber	Magna Flux (MT)
I/R Calibration	Magnetic Particle
Indicator Panel	Main Load Bank
Indoor Antenna Pattern Test Range	Main Rotor Balancing, Auto
Indoor / Outdoor Antenna Range	Manual Disassembly
Induction Heating	Manual Final Test
Installation of Fixed Plant Equip	Manual Test
Integrated Blade / Vane System	Manual Test Set
Investment Casting	Manual Ultrasonic
Isostatic Press	Metal Finishing
ITA Design and Manufacturing	Metal Machining
Ivadizer	Metal Plating
Joiner Door Mfg	Metal Spray Facility
Kemen Test Cell	Metalizing
Laminar Flow Workbenches	Meterological Repair
Large Engine Shaft Lathe	MG Set Repair
Large Sheetmetal	Micro Blaster
Large Wiring Harness Manufacturing	Micro-mini Soldering
Laser Cutting	Microbalancing SSTG
Laser Deriviting	Microcircuit Repair PCB
Laser Deweld	Milling
Laser Hole Punch	Milling Machining and Forming Automated
Laser Marking	Milling Machining and Forming Chemical
Laser Measuring	Milling Machining and Forming
Laser Static Balance	Milling Machining Forming Horiz Ex/In
Laser Test Range	Milling Machining Forming Vertical Ex/In
Laser Tool Metal Cutting / Punch	Minor Components
Laser Vibration Inspection/Diagnosis	Missile Compartment Removal
Launching Equipment	Mission Avionics

Molded Rubber	Plastic / Composites
Molten Salt Furnace	Plastic Injection
Motor Controller	Plastic Inspection
Motor / MG Depot Repair / Test Facilities	Plastic Media Blast
Motors	Platemaker
MSI	Plating and Anodizing
Navigational Aids	Polaris Guidance
NC & CNC	Poseidan Guidance
NC & CNC Machine Tools	Potting
NC Machining	Powder Coating Electrostatic
NC Machining 3-, 4- & 5-Axis	Powder Metal Spray
NC Programming	Power Distribution
NC Punch Press	Power Generation/Control Components Auto
Neutron Beam	Power Trans Dynamomoter
Neutron Radiography	Precision Balancing
Newfield Antenna Pattern Test Range	Precision Grinding
Nicad & Silver Zinc Battery	Precision Measuring Lab
Non-Hazardous Chemicals	Printed Circuit Board Manufacturing
Numerically Controlled Machining	Printed Circuit Board Repair
OHE Prototypes	Propellant / Explosives
On-site Commo Repair Teams	Propeller Balancing, 100 K lbs Capacity
Operational Software	Prototype Army Vans / Shelters
Optical Laser	Prototype Maint., Trg, Test Vans
Optical Repair Facility	Prototype Secure Commo Facilities
Optics	Pump Test Facility
Paint Application	Radio Repair / Calibration
Paint Application Automated	Radio / Comm Installation
Pattern Making	Radiograph (RT)
Peculiar Test Equipment	Radiography
Penetrant (PT)	Real Time X-Ray
Periscope Refurbishment	Recorder Repair
Phosanodize	Refrigeration Analyzer / Test Facility
Photo Etching	Removers
Piping	Repair / Assembly
Planning Yard for SSN594 CL / 637 CL	Repairable Components
Plasma Arc Cutting	Retrieval Equipment
Plasma Cutting Machine	Rework & De-Mill
Plasma Spray	Rework Tracking System

TECHNOLOGIES (Cont'd)

Rigid Fiber	Special Hull Treatment
Robotic Auto Cleaning System	Spectrographic Analysis
Robotic Auto Wire Guided Vechicle	Spindle Finishing Machine
Robotic Blade Weight	Steam Generator Chemical
Robotic Blast Desealing	Steam Generator Inspection / Test
Robotic CARC Painting	Steam Rupture Tests
Robotic Desealing	Steam Test Facility 1500 psi
Robotic Disassembly	Steam Testing (600#)
Robotic Explosive Handling	Steel Grit Blasting
Robotic Fueling / Defueling	Steel Media Blast
Robotic Low Pressure Plasma Spray	Straylight
Robotic Metal Spray	Strayetching
Robotic Metalizing	Sub Hull / Bulkhead
Robotic Painting	Super Clean Room
Robotic Painting Missile Contatainers	Super Size CNC Milling Machine
Robotic Plasma Spray - Conventional	Survelance Test Range
Robotic Plasma Spray - Low Pressure	Synthetic Foam
Robotic Plating	Tactical Vechicle Inspection
Robotic Sand Blast	Tanks Non-Hazardous Cleaner
Robotic Welding	Technical Repair Stds.
RR Hump Test	Telecommunications
Rubber Products	Temperature
Sand Blasting	Tempest Test
Seeker / Gyro Repair	Test Adaptors ITA
Selective Plating	Test Cell Helo
Semi-Automatic Tig Welding	Test Program Set Development
Shaft Repair	Test Program Sets
Shaft Welding Machine	Test Sets
Sheetmetal	Test Stand
Shelter Systems	Test Tank Facility
Shelters, Vans, Tactical	Test Track
Ship Design	Test / Repair CO2 Inflat. Lifeboats
Shipping Covers	Thermal Spray
Shot Blast	Thermal Wave NDE
SHT	Tin / Lead Plating
Simulators	TMDE
Software Design and Manufacturing	Tool and Die
Solvent Recovery Sludge Dewatering	Toxic Chem Maint - Disasbly, Test, Reasbly

TECHNOLOGIES (Cont'd)

TPS Program Development	Water Jet Cutting
Tansducer	Water Jet Cleaning
Transducer / Hydrophone Refurb	Wave Guide
Transmission Test	Waveguide Apparatus
Tubing / Cable	Welding Arc
Type II Standard Lab	Welding Certified Ballistic
Ultrasonic (UT)	Welding Electron Beam
Ultrasonic Debonding	Welding Laser
Universal Radar Ground Repair	Welding Plasma
Vacuum Oven	Welding TIG, MIG, Conventional Electric
Vacuum Pressure Impregnator (VPI)	Wet Catapult Accumulator
Van / Shelter Honeycomb Panel	Winch and Ram Test Facility
Van / Shelter Repair	Winch Test Facility
Vapor Degreasor	Wire Braiding
Vibration Spectrum Analysis	Wire Electrical Discharge Machine
Vibratory Finishing	Wirerope / Cable Tension 200 K lbs
Vibratory Processing	Wiring Harness
Video Inspection Probe	Wood Mill
Video Mapping Equip	X-Ray
VSCF, Auto	3D Radar
Walleye Guidance & Control	8-Axis Tool Grinder
Warhead Manufacturing	

DOD DEPOT SITES

ARMY DEPOTS:

- Anniston Army Depot
- Corpus Christi Army Depot
- Letterkenny Army Depot
- Lexington-Blue Grass Army Depot
- Red River Army Depot
- Sacramento Army Depot
- Tobyhanna Army Depot
- Tooele Army Depot
- Pueblo Depot Activity

NAVY DEPOTS:

Naval Aviation Depots:

- Naval Aviation Depot Alameda
- Naval Aviation Depot Cherry Point
- Naval Aviation Depot Jacksonville
- Naval Aviation Depot Norfolk
- Naval Aviation Depot North Island
- Naval Aviation Depot Pensacola
- Naval Aviation Depot Indianapolis

Naval Shipyards:

- Charleston Naval Shipyard
- Long Beach Naval Shipyard
- Mare Island Naval Shipyard
- Norfolk Naval Shipyard
- Pearl Harbor Naval Shipyards
- Philadelphia Naval Shipyard
- Portsmouth Naval Shipyard
- Puget Sound Naval Shipyard

Naval Ordnance Activities:

- Naval Ordnance Station Indian Head
- Naval Ordnance Station Louisville
- Naval Undersea Warfare Engineering Station Keyport
- Naval Weapons Station Charleston
- Naval Weapons Station Concord
- Naval Weapons Support Center Crane
- Naval Weapons Station Earle
- Naval Weapons Station Seal Beach
- Naval Weapons Station Yorktown

Space And Naval Warfare Command Maintenance Depots:

- Naval Electronics Systems Engineering Center Portsmouth
- Naval Electronics Systems Engineering Center San Diego

MARINE CORPS DEPOTS:

- Marine Corps Logistics Base Albany
- Marine Corps Logistics Base Barstow

AIR FORCE DEPOTS:

- Aerospace Guidance And Metrology Center
- Aerospace Maintenance & Regeneration Center
- Ogden Air Logistics Center
- Oklahoma City Air Logistics Center
- Sacramento Air Logistics Center
- San Antonio Air Logistics Center
- Warner Robins Air Logistics Center

APPENDIX -C

CALS
RELATED SYSTEMS

Appendix-C, "CALS-Related Systems", summarizes a combined listing of Depot Maintenance related systems and CALS initiatives to facilitate defining the scope of JLSC/DM implementation oversight for CALS-related matters. In the next version of the Concept of Operations this section will include system summaries and other descriptive information.

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JLSC DM SB*	OSD CALS CSA**	DM EA***	Designator	System Name	AF	N	MC	A	DLA
		X	ADS	Accident Data System					
		X	H075C	Accouting System for Industrial Fund Procurements (FORGFM)	X				
		X	J041	Acquisition and Due In System	X				
X	X		AIM-M	Advanced Industrial Management		X			
	X		AIMS	Advanced Information Management System					
	X		ATIS	Advanced Technical Information Support		X			
	X		ATS	Advanced Training System	X				
	X		AIM II	Aerospace Industrial Information Management System II	X				
X		X	D003B	Aerospace Maint. and Regeneration Center Cost and Billing System	X				
X		X	E046A	AFLC Labor Standard Data System (AFLCLSDS)	X				
X		X	E046B	AFLC Labor Standard Mechanization System/Maintenance (AFLCSMS/M)	X				
		X	H185	AFSC Programmed Flying System	X				
	X		AFEMS	Air Force Equipment Management System	X				
	X		AFIPS	Air Force Information Publishing System	X				
		X	D086	Air Force Logistics Command Mission Workload Assignment System	X				
		X	D220	Air Force Logistics Command Provisioning System	X				
		X	C001	Air Force Management System	X				
		X	A030	Air Force Material Command and Control System	X				
		X	ACPERS	Air Force Personnel Data System Civilian	X				
X		X	G043	Air Vehicle Performance System	X				
	X		ABDR	Aircraft Battle Damage Repair	X				
	X		AIRS	Aircraft Information Retrieval System	X				
X		X	G039	Aircraft Missile Maintenance Production Compression Report System	X				
	X		ASIMIS	Aircraft Structural Integrity Management Information System	X				
		X	AMIP	Alteration Material Identification Program					
		X	G068	Alternate Repair Source Analysis System	X				
X		X	AMCISS	AMC Installation Supply System				X	
	X		ACAPS	AMCCOM Computer Aided Publications System				X	
	X		AN/BSY-2	AN/BSY-2 Submarine Combat System Automated Technical Manual		X			
	X		ADVANCE	Army Data Validation and Netting Capability Establishment				X	
	X		AMTIS	Army Modernization Training Information System				X	
		X	ASMIS	Army Safety Management Information System				X	
	X		ATEDB	Army-Wide Test and Evaluation Database				X	
	X		AIM-T	Authoring Instructional Material		X			

* Initial Analysis for DM System Baseline

*** DM(EA) "As-Is" Hardware/Software Architecture Model (Sept 92)

** OSD CALS Computer Systems Architecture (May 92)

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
		X	AACS	Automated Access Control System					
X		X	ABM	Automated Budget Module System		X			
	X		ACPIN	Automated Computer Program Identification Number System	X				
		X	ACCS	Automated Customer Complaint System					
	X		ADACS	Automated Data Collection System				X	
	X		ADMAPS	Automated Document Management and Publishing System		X			
X		X	AFES	Automated Financial Entitlements System				X	
	X		AIMS	Automated Integrated Maintenance System for the F-22	X				
X		X	AIOB	Automated Internal Operating Budget				X	
	X		AII	Automated Item Identification					X
	X		ALPS	Automated Logistics Publishing System		X			
X		X	APS	Automated Planning Systems		X			
	X		APARS	Automated Printing and Retrieval System					
		X	APADE	Automated Procurement and Data Entry System					
X		X	APCS	Automated Production Control System ALQ-99		X			
	X		APPS	Automated Publications Production System					
	X		APXPS	Automated Publications; XEROX Publishing System				X	
X		X	ARCMIS/RADCON	Automated Radiological Control Mgmt. Info. Sys./Radiological Control		X			
	X		ASCC	Automated Software Control Center	X				
X		X	ASKARS	Automated Storage, Kitting and Retrieval System		X			
	X		ATDRS	Automated Technical Data Retrieval System		X			
	X	X	ATOS - R012	Automated Technical Order System	X				
	X		ATDT	Automated Testability Decision Tool	X				
X		X	ATAMS	Automated Time and Attendance Muster Sheet		X			
X		X	ATAAPS	Automated Time, Attendance, and Production System				X	
		X	ATCIS	Automated Tool Control and Inventory System (Army MMIS 6.7)					
X		X	ATCS	Automated Tool Control System		X			
		X	ATCIS	Automated Tool Crib Inventory System (Army MMIS 3.4)					
X		X	ASRS	Automatic Storage and Retrieval System				X	
	X		ADAM	Aviation Diagnostics and Maintenance		X			
	X		AMDAS	Avionics Maintenance Data Analysis System	X				
		X	BRIMS	Base Repairable Inventory Management System					
	X		BTS	Base Training System	X				
	X		BOIP	Basis of Issue Plan				X	

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
		X	REV	Document Revision Tracking					
	X		DWG-PROC	Drawing Procurement		X			
	X		EPS	Electronic Publishing System				X	
	X		ETMS	Electronic Technical Manual System		X	X		
	X		ETPS	Electronic Technical Publication System			X		
	X		ED/CMS	Engineering Data / Configuration Management System	X				
	X		EDCARS	Engineering Data Computer Assisted Retrieval System	X				
	X		EDPODS I	Engineering Drawing Print on Demand System Level I		X			
	X		EDPODS II	Engineering Drawing Print on Demand System Level II		X			
	X		EDPODS III	Engineering Drawing Print on Demand System Level III		X			
	X		ESTEPS	Enhanced Ships Technical Publication System		X			
	X		EIP	Enterprise Integration Program	X				
X		X	EMMS	Equipment Maintenance Management System		X			
	X		EOPDB	Equipment Oriented Publication Data Base				X	
	X		EPMS	Equipment Publication Management System				X	
	X		EPMS(E)	Equipment Publication Management System (Enhanced)				X	
X		X	G016	F-16 Falcon Trace	X				
X		X	G088	F-4 Phantom Trace	X				
X		X	G011	Facility Equipment Planning, Programming Control System (FEPPCS)	X				
X		X	FASS	Facility System Safety (Army)				X	
X		X	G090	Field Exchangeable Management System	X				
	X		FEDC	Field Exercise Data Collection				X	
	X		FVPDS	Fielded Vehicle Performance Data System				X	
X		X	FI/GCAS	Financial Inventory / General Fund and Cost Systems				X	
		X	FMPMIS	Fleet Modernization Program Management Information System					
		X	G023	Flexible Aircraft Scheduling Technique and Tracking System (FASTTS)	X				
	X		FCIM	Flexible Computer Integrated Manufacturing				X	
X		X	FASS	Fundamental Automated Scheduling System (Navy)		X			
		X	G009	Government Furnished Material Transaction Reporting System	X				
X		X	HMIS	Hazardous Material Information System				X	
	X		IPS	Image Processing System	X				
	X		ITDS	Improved Technical Data System	X				
X		X	ILSMIS	Industrial Logistics Support Management Information System		X			
	X		IICE	Information Integration for Concurrent Engineering	X				

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
	X		IPMIS	Initial Provisioning Management Information	X				
	X		ISOM	Initial Spares Optimization Model			X		
X		X	IEMS	Installation Equipment Management System				X	
X		X	IFS-M	Installation Facility System-Mini/Micro				X	
	X		ISD/LSAR	Instructional Systems Development, Logistics Support Analysis Record	X				
	X		IDS	Integrated Data Strategy	X				
	X		IDSE	Integrated Development Support Environment	X				
	X		IGS	Integrated Graphics System	X				
	X		IISS	Integrated Information Support System	X				
	X		IMIS	Integrated Maintenance Information System	X				
	X		IMDE	Integrated Model Development Environment	X				
	X		ITAP	Integrated Technical Applications Program					X
	X		ITIMS	Integrated Technical Information Management System	X				
	X		IETM-RCS	Interactive Electronic Tech. Man. for Radio Comm Systems on Aegis Ships		X			
X		X	D025	Interservice Material Accounting and Control System	X				
		X	G337	Inventory Tracking System	X				
		X	JML	JML-Nuclear Material Ordering					
X		X	G004L	Job Order Production Master System (JOPMS)	X				
	X		JCALS	Joint Computer-Aided Acquisition and Logistics Support				J	
X			JEDMICS	Joint Engineering Data Management Information Control System		J			
X		X	JHARS	Joint Hazard Retrieval System				X	
	X		JPAD	Joint STARS Paperless Automated Depot	X				
	X		LTDB	Lead Time Data Base	X				
	X		LSAR-ADP	Logistic Support Analysis Record				X	
	X		LSAR-2B/NS	Logistic Support Analysis Record Networking Initiative		X			
	X		LCOM	Logistics Composite Model	X				
	X		LIMSS	Logistics Information Management Support System	X				
		X	A067	Logistics Management Information System	X				
	X		LOGPARS	Logistics Planning and Requirements Simplification System				X	
	X		LSMIS	Logistics Support Management Information System	X				
X		X	MSTS	Machine Shop Tracking System		X			
X		X	G004H	Maintenance Actual Material Cost System (MAMCS)	X				
	X		MDMS	Maintenance Data Management System				X	
		X	G030	Maintenance Decision Support System	X				

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
	X		BOMDB	Bill of Material Data Base	X				
		X	G081J	C-5A Airframe Status Accounting System	X				
		X	G081C	C-5A Engine Management System	X				
		X	G081B	C-5A Improved Configuration Management System	X				
		X	G081H	C-5A Job Control	X				
		X	G081A	C-5A Maintenance Data Recorder Tape Analysis System	X				
X		X	G081I	C-5A Personnel Availability and Scheduling	X				
		X	G081D	C-5A Time Compliance Technical Order System	X				
X		X	CALMIS	Calibration Management Information System				X	
		X	CEDRS	Capability Engineering Data Requirements System					
X		X	CAPS	Capital Asset Planning System		X			
X		X	K045	CAPPS-Computer Assisted Process Planning System	X				
	X		CPS	Cataloging Provisioning System	X				
	X		CTOL	Cataloging Tools On-Line					X
		X	G035B	Central Management of Depot Level Maintenance System	X				
	X	X	CPAS - H103	Central Procurement Accounting System	X				
	X		CTF-AX	Central Tracking Facility for the AX Program		X			
		X	CMMS	Chemical Materials Management System					
X	X		CCSS	Commodity Command Standard System				X	
	X		CEMS	Comprehensive Engine Management System	X				
		X	CASS	Computer Assisted Scheduling System					
X	X	X	CIR - G007	Computer Integrated Repair	X				
	X		CREW CHIEF	Computer Model of Maintenance Technician	X				
	X		CAD 2	Computer-Aided Design 2		X			
	X		CADBIT	Computer-Aided Design Built-In Test	X				
	X		CADDS	Computer-Aided Design/Drafting System	X				
	X		CATIS	Computer-Aided Technical Information System		X			
	X		CATDS	Computer-Aided Training Development System	X				
	X		CTOS	Computerized Technical Order System	X				
X		X	CWPABS	Computerized Workload Planning and Budgeting System		X			
	X		CLIP	Configuration Logistics Information Program		J			
X		X	CSA-MIS	Configuration Status Accouting Management Information System		X			
X		X	G072D	Contract Depot Maintenance Production and Cost System	X				
	X	X	CDMS - J090	Contracting Data Management System	X				

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
	X	X	CAMS	Core Automated Maintenance System	X				
X		X	C/SCS	Cost / Schedule Control System		X			
X		X	G326C	Cost Accounting	X				
		X	CODS	Customer Order Documentation System					
		X	G024	D/M Management Job Order Number Information System (JON)	X				
	X		DRAMA	Data Review Analyses and Monitoring Aid					X
	X		DLIS	Defense Logistics Integrated System					X
	X		DAMIS	Depot Activation Maintenance Information System	X				
X		X	G072E	Depot Level Maintenance Requirements and Program Mgmt. System	X				
	X		DMAMTI	Depot Maintenance Automated Machinery Technology Initiative	X				
X		X	G402A	Depot Maintenance Exhangeable Production Systems (DMEPS)	X				
X	X	X	DMMIS - G402B	Depot Maintenance Management Information System	X				
X		X	DMMS	Depot Maintenance Management System			X		
X		X	G005M	Depot Maintenance Material Support System (DMMSS)	X				
X		X	G072A	Depot Maintenance Production Cost System (DMPCS)	X				
X		X	G037	Depot Maintenance Quality Information System	X				
X		X	G017	Depot Plant Equipment Program (DPEP)	X				
		X	NUWES-MCS	Depot Support Maintenance Support System-Management Control System					
		X	DDS	Design Data System					
	X		DEPTH	Design Evaluation for Personnel Training and Human Factors	X				
	X		DARS	Digital Archival Retrieval System				X	
	X		DSREDS	Digital Storage and Retrieval Engineering Data System				X	
X		X	G014	Directorate of Maintenance Remote Data Collection System (DMRDCS)	X				
X		X	H036A	DMIF Cost Accounting / Production Report (DMIF/CA/PR)	X				
X		X	DMMS(JOWF)	DMMS (Job Order Work File)			X		
X		X	DMMS(LBRDIS)	DMMS (Labor Distribution)			X		
X		X	DMMS(MRF)	DMMS (Master Reference File)			X		
X		X	DMMS(MWSF)	DMMS (Master Work Schedule File)			X		
X		X	DMMS(MIHF)	DMMS (Material Issue History File)			X		
X		X	DMMS(ML)	DMMS (Material Loop)			X		
X		X	DMMS(RCF)	DMMS (Receipts Control File)			X		
X		X	DMMS(STD)	DMMS (Standards File)			X		
X		X	DMMS(TARS_LD)	DMMS (Time and Attendance-Labor and Distribution)			X		
		X	REF	Document Cross Referencing					

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
X		X	G028	Maintenance Engineering Data Support Systems (MEDS)	X				
X		X	G004K	Maintenance Facility Master Plan (MFMP)	X				
X		X	G332	Maintenance Facility System	X				
X		X	MIDAS	Maintenance Inspection and Data Analysis System				X	
		X	G046	Maintenance Job Tracking System (MJTS)	X				
X		X	G037G	Maintenance Labor Distribution System (MLDS)	X				
X		X	G327	Maintenance Material Requirement and Cost System	X				
		X	MSFS	Maintenance Shop Floor System					
X		X	G324	Maintenance Work Load Control System (MWCS)	X				
X		X	G328	Maintenance Work Load System (MWLS)	X				
X		X	G336	Maintenance Workload Managment System	X				
X		X	MCS	Management Control System		X			
X		X	G325	Manhour Accounting and Distribution System (MADS)	X				
	X		MANPRINT	Manpower and Personnel Integration Database				X	
	X		MPT DSS	Manpower, Personnel & Training Decision Support System	X				
X		X	MCIFRS	Marine Corps Industrial Fund Reporting System			X		
	X		MCLORA	Marine Corps Level of Repair Analysis			X		
	X		MCPDS	Marine Corps Publications Distribution System			X		
		X	MCQDIS	Marine Corps Quality Deficiency Information System					
	X		MCSAMM	Marine Corps Systems Acquisition Management Model			X		
X		X	MUMMS	Marine Corps Unified Material Management System			X		
X		X	MCRC	Master Component Rework Control System		X			
		X	D043	Master Item Identification Control System	X				
		X	D043A	Master Item Identification Data Base System	X				
	X		MCIS	Material Change Information System				X	
X		X	D229	Material Inventory Tracking System	X				
		X	MM	Material Management Application					
X		X	MVIS	Material Visibility System		X			
X		X	G037E	MDS/Project Work Load Planning System (MDS/PWLPS)	X				
X		X	G037F	MDS/Work Load Analysis Planning Data Systems (MDS/WLAPDS)	X				
		X	J014	Mechanized Bidders List System	X				
X		X	G019C	Mgmt. of Items Subject to Repair Rqmts, Scheduling & Analysis Sys.(MISTR)	X				
	X		MEIDS	Militarized Electronic Information Delivery System				X	
	X		MEDALS	Military Engineering Data Asset Locator System					X

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
		X	MK86	MK86-Depot Maintenance Function					
	X		MPCASS	Modernized Parts Control Automated Support System					X
		X	D087L	Modification Management System	X				
		X	MP	MP-Accounts Payable Reconciliation					
		X	MR	MR-Shipyard MIS Material Requirements					
		X	NEUSS	NADEP Equipment Utilization Support System					
X		X	NIFMS	NAVAIR Industrial Financial Management System		X			
X		X	NIMMS	NAVAIR Industrial Material Management System		X			
	X		NALDA	Naval Aviation Logistics Data Analysis Program (NALDA)		X			
X		X	NALCCOIS	Naval Logistics Center Communications and Office Information System		X			
X		X	NOMIS	Naval Ordnance Management Information System		X			
		X	SUPDESK	Naval Shipyard Supervisor's Desk					
	X	X	NEDALS	NAVSEA Engineering Drawing Asset Locator System		X			
	X		NAILS	Navy Automated Integrated Logistics System		X			
	X		NPODS	Navy Publishing On Demand System		X			
	X		NUBS-NPFC	Navy Unique Batch System		X			
		X	NAC	Nuclear Accountability					
		X	NDR	Nuclear Deficiency Report					
		X	NDS	Nuclear Document Scheduling					
		X	NETS	Nuclear Engineering Training System					
		X	NPS	Nuclear Power Engineering Authorization System					
		X	TECHCARD	Nuclear Shop Stores					
	X		OMSDALS	Occupational Measurement Squadron Data Analysis and Logistics System	X				
	X		ORDB	Occupational Research Data Bank (ORDB)	X				
X		X	OSHRKS	Occupational Safety and Health Record Keeping System		X			
	X		OASIS	Operability Assessment System for Simultaneous Engineering	X				
X		X	WIS	ORD-NIF Workload Information System		X			
		X	D015	Pacer Impact Initiative Benefit Summary System					
	X		PLAD	Paperless LANTIRN Automated Depot (PLAD)	X				
X		X	G004I	Periodic Scheduling & Control Equipment & Personnel System (PSCCEPS)	X				
		X	PCWLF	Personal Computer Workload Forecasting					
		X	PRISM	Planning Requirements and Information Systems Management					
X		X	D038	PME Calibration Interval Analysis Program	X				
		X	J090B	PR MIPR and Non-Complex Contractual Document Subsystem	X				

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
				12/16/1992				Page-9	
X		X	PIERS	Production Industrial Engineering Resource System		X			
		X	K033	Program and Resource Management Application	X				
X		X	G004B	Project Order Number Control (POCS)	X				
	X		PRIDE	Provisioning Relational Integrated Distributed Electronic System	X				
	X		RAMP	Rapid Acquisition of Manufactured Parts		X			
X		X	D092	Raw Stock Material Control System	X				
	X		RIDB	Readiness Integrated Data Base				X	
X		X	G031	Receipt Certification Program	X				
		X	RRMS	Recycling Radioactive Material System					
	X	X	REMIS - G099	Reliability and Maintainability Information System	X				
	X		RCM	Reliability Centered Maintenance			X		
	X		RAMCAD	Reliability, Availability and Maintainability in CAD	X			X	
X		X	RMMS	Remote Meter Monitoring System		X			
		X	S090	Repair Process Enhancement System	X				
		X	D073	Repair Requirement Computation System	X				
	X		RAPID-WS	Requirements Analysis Process in Design for Weapon Systems	X				
	X	X	RDB - D200	Requirements Data Bank	X				
X		X	SITS	Safety Inspection Tracking System				X	
X		X	G326B	Sales and Billing Funding Control	X				
	X		SDC	Sample Data Collection				X	
	X		SEWS	Scientific / Engineering Work Station	X				
X		X	SDS(ADMINSUP)	SDS(Administrative Support Module)				X	
X		X	SDS(BOM)	SDS(BOM Module)				X	
X		X	SDS(CAPPLAN)	SDS(Capability Planning Module)				X	
X		X	SDS(CMPTRK)	SDS(Component Tracking Module)				X	
X		X	SDS(CAS)	SDS(Cost Accounting System)				X	
X		X	SDS(EIT)	SDS(End Item Tracking)				X	
X		X	SDS(INV)	SDS(Inventory Module)				X	
X		X	SDS(MPM)	SDS(Maintenance Program Management)				X	
X		X	SDS(MOBPLN)	SDS(Mobilization Planning Module)				X	
X		X	SDS(PGMMGT)	SDS(Program Managment Module)				X	
X		X	SDS(RPM)	SDS(Repair Parts Management Module)				X	
X		X	SDS(RPTPGMMGT)	SDS(Report Program Management Module)				X	
	X		SAMIS	Security Assistance Management Information System	X				

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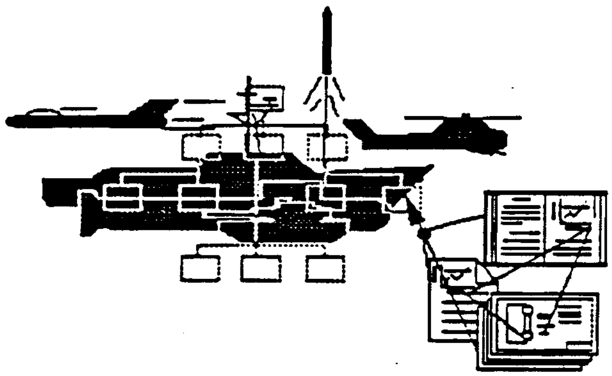
JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
		X	SMS	Ship Alteration Material System		X			
		X	SDI	Ship's Drawing Index		X			
	X		SNAP 3	Shipboard Non-Tactical ADP Program III		X			
X	X	X	SCLSIS	Ships Configuration & Logistics Support Information System		X			
X		X	SABRS	Shipyard Automated Budget Reporting System		X			
X		X	SLIMS	Shipyard Laboratory Information Management System		X			
X		X	SYMIS	Shipyard Management Information System		X			
X		X	SPITFIRE	Shipyard Physical Inventory Tool for Improving Industrial Readiness		X			
X		X	SSTS	Shipyard Skills Tracking System		X			
		X	SWIFTS	Shipyard Waterfront Information Fast Tracking System		X			
	X		SPA	Solicitation Package Automation		X			
	X		SPARES	Spare Parts Production and Reprocurement Support System	X				
		X	SAACONS	Standard Army Automated Contracting System				X	
	X		SAMS	Standard Army Maintenance Systems				X	
	X		SARSS	Standard Army Retail Supply System				X	
X	X	X	SDS	Standard Depot System				X	
X		X	B800	Station Availability Measurement Program	X				
	X		SC&D	Stock Control and Distribution System (SC&D)	X				
	X		SMART 1	Strategic Materials Analysis: Requirements & Technology I	X				
	X		SMART 2	Strategic Materials Analysis: Requirements & Technology II	X				
	X		SEAMS	Support Equipment Acquisition Management System	X				
X		X	SESS	Support Equipment Standardization System		X			
X		X	SYMIS(FA)	SYMIS(Cost Accounting Application)		X			
X		X	SYMIS(IDA-NIF)	SYMIS(Integrated Disbursing and Accounting System)		X			
X		X	SYMIS(MD)	SYMIS(Material Disbursing)		X			
X		X	SYMIS(MM)	SYMIS(Material Management)		X			
X		X	SYMIS(MR)	SYMIS(Material Requirements)		X			
X		X	SYMIS(PC)	SYMIS(Production Control)		X			
X		X	SYMIS(SSA)	SYMIS(Ship Stores Application)		X			
		X	G079	Systems and Equipment Modification-Maintenance Program	X				
	X		SLIC	Systems and Logistics Integration Capability	X				
	X		TDC/CMS	Technical Data Center / Configuration Management System	X	X	X	X	
	X		TMPODS	Technical Manual Print On Demand System		X			
X		X	TPL	Technical Publications Library Program		X			

JLSC DM SB	OSD CALS CSA	DM EA	Designator	System Name	AF	N	MC	A	DLA
X		X	H117	Time and Attendance Reporting System (TARS)	X				
	X		TDS	TRADOC Documentation System				X	
X		X	G035A	UCA Depot Maintenance Budget & Maintenance Cost System (DMBMCS)	X				
	X		ULLS	Unit Level Logistics System				X	
	X		UBRD	Usage Based Requirements Determination				X	
X		X	WCS(CWPABS)	WCS(Computerized Workload Planning and Budgeting)		X			
X		X	WCS(DM)	WCS(Depot Maintenance)		X			
X		X	WCS(FB)	WCS(Feedback)		X			
X		X	WCS(HIS)	WCS(History)		X			
X		X	WCS(MF)	WCS(Manage Facilities)		X			
X		X	WCS(MM)	WCS(Manage Manpower)		X			
X		X	WCS(MAN)	WCS(Manufacturing)		X			
X		X	WCS(MDR)	WCS(Master Data Record)		X			
X		X	WCS(MU)	WCS(Material Usage)		X			
X		X	WCS(OPSDOC)	WCS(Operations Documents)		X			
X		X	WCS(PS)	WCS(Production Status)		X			
X		X	WCS(QA)	WCS(Quality Assurance)		X			
X		X	WCS(SUM)	WCS(Summary)		X			
X		X	WCS(TD)	WCS(Technical Data)		X			
X		X	WCS(WIS)	WCS(Weekly Induction Schedule)		X			
		X	WSF	Weapon System File					
	X		WSMIS	Weapon System Management Information System	X				
	X		WSAMS	Weapon Systems Analysis and Management System				X	
		X	D035K	Wholesale and Retail Receiving and Shipping	X				
	X		WOLF	Work Order Logistics File				X	
X		X	G004C	Workload Programming, Planning, and Control (WPCC)	X				
X		X	WCS	Workload Control System		X			
		X	G004E	Workload, Budget, and Analysis Data Retrieval System (WOBARS)	X				

APPENDIX - D

PROPOSED DM-CALS IMPLEMENTATION PROJECTS



Joint Logistics System Center (JLSC)
Director for Depot Maintenance

Implementation Project for CALS

Integrated Product Data Control Model
(I-PDCM)

Objective

The objective of the proposed DM-CALS Implementation Project is to maximize the benefits of IDS, JCALS and CAD 2 to the DoD infrastructure modernization by establishment of a common integrating data structure. The key to achieving a shared data environment feeding integrated Depot Maintenance processes and supporting systems is the establishment of a common data framework. The purpose of the I-PDCM Implementation Project is to provide this important foundation to the DM-CALS infrastructure through a cooperative effort with the IDS, JCALS, and CAD 2 programs.

To accomplish this we will utilize IDS, CAD 2 and JCALS experts to establish a common data structure that has the flexibility to support logistics processes with initial focus on Depot Maintenance. The intent would be to develop and implement the Integrated-PDCM in IDS CAD 2 and in the JCALS design, and be ready to transition Integrated-PDCM managed data to JCALS when it becomes available for operation. JCALS features such as: workflow manager, extensive reference library capability, robust hardware, software, and network architecture that will provide enhanced support to end user functions. The I-PDCM will provide the backbone to integrate the Depot Maintenance infrastructure and the full range maintenance management and industrial processes, as well as properly positioning Depot Maintenance to migrate in step with evolving CALS standards such as Product Data Exchange using STEP (PDES) standard.

Pilot Application

The development of the I-PDCM Implementation Project would be done in conjunction with SM-ALC IDS/JCALS integration project and expand the scope to include Navy participation with the CAD 2 program. The results of this effort will provide the basis for building a common infrastructure for Depot Maintenance processes across the components. The three programs that comprise this DM-CALS Implementation Project would address weapon system life cycle support across the Air Force, Army, Navy/Marine Corps and would examine platforms from aircraft, ground vehicles to ships and submarines.

Joint Logistics System Center (JLSC) - Director for Depot Maintenance CALS Implementation Project

JCALS Rapid-Prototype of DM Functional Requirements (RAPID-FR)

Objective

The principal objective of this proposed CALS Implementation Project (CALS-IP) is to provide enhanced capability to rapidly develop, concurrent with the customer, tested and validated functional requirements. The title of the CALS-IP is "JCALS Rapid-Prototype of DM Functional Requirements (RAPID-FR). The RAPID-FR Implementation Project will support achievement of JLSC/DM responsibilities for integrating DoD Functional Requirements and managing the development, integration, implementation and maintenance of the Depot Maintenance processes to achieve those requirements. This Implementation Project builds upon the software and hardware capabilities, workflow processes and generic application tool-set available on the JCALS platform.

Rapid Development of Integrated Functional Requirements

Requirements-Prototyping, depicted in Figure-1, brings together the key elements for JLSC Corporate Integration in a dynamic environment for developing and validating Depot Maintenance functional requirements. It may also support developments in other areas. This approach will provide tools to both the "owners" and "executors" of functional processes which facilitate "hands-on" examination and incorporation of process improvements.

The key to achieving an effective rapid-prototyping environment for functional requirements (element-3 of Figure-1) is to establish a set of generic tools that possess the following capabilities:

- o User-defined work flow management facility that can be easily adapted to support modeled process functionality.
- o Facility to incorporate evolving information /data requirements.
- o Open systems environment to support interface to required analysis tools.

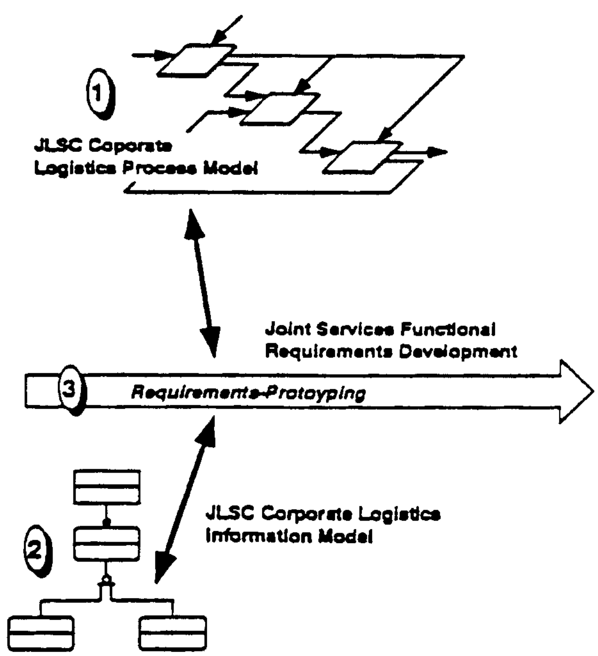


Figure-1 Rapid Prototyping of Functional Requirements

The JCALS project offers a critical opportunity for the employment of the aforementioned rapid prototyping of functional requirements. Using this approach, JLSC may be able to resolve existing JCALS joint service requirements issues.

Note: The numbered labels in both Figure-1 and 2 provide a mapping between the key elements supporting Corporate Integration.

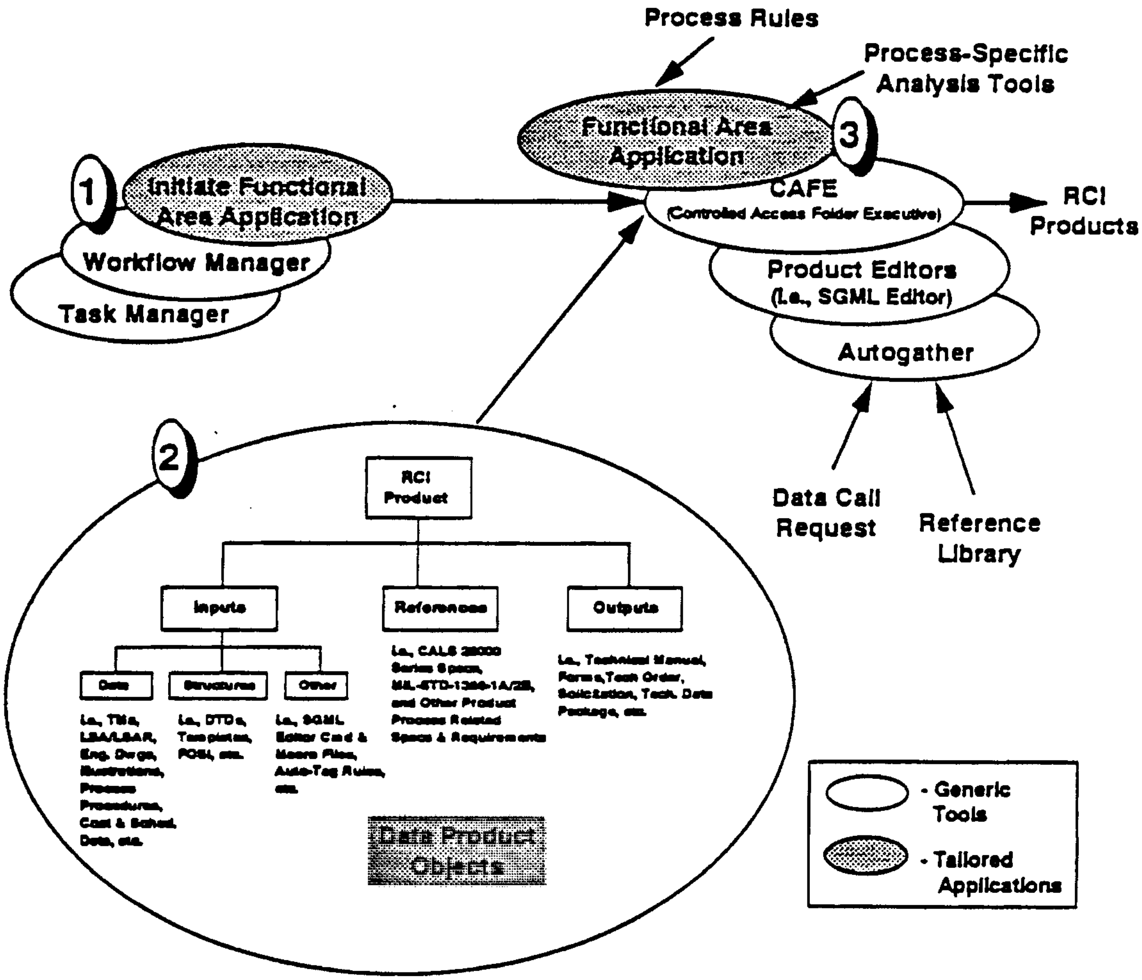


Figure-2 JCALS Data-Driven Approach, Accommodation and Rapid Prototyping of Functional Requirements

The unique data driven approach of the JCALS system, depicted in Figure-2, could serve as the Requirements-Prototyping platform. Element-1 of JCALS includes a Workflow and Task Manager that provides end-users with a capability to establish the process flow to generate information products, which are referred to as Resource Critical Information (RCI) products in the JCALS program. This JCALS capability can accommodate specific aspects of the Depot Maintenance Model along with those functional requirements related to controlling process execution and the flow of supporting technical information. Element-2 of JCALS along with the Global Data Management System accommodates the Corporate Information Model as wells as other standards and controls. In this element the RCIs that reflect the output products from the JLSC Depot Maintenance Model are defined. Element-3 of JCALS brings the first two elements together along with a common set of generic tools and any required analysis applications in an open systems environment to fully execute the prototyped functional requirements.

The definition of Element-2 requirements addresses data content, standards and packaging, which are often technical in nature more amenable to achieving joint consensus. Joint consensus on Element-1 requirements which define the "how" involved in managing and executing processes is often more difficult to achieve. A requirements development approach using JCALS would involve: identification of functional areas to be prototyped, definition of Element-1 requirements and identification of other analysis tools required to support selected functional processes. Element-3 could then be implemented allowing participants to tailor the work/task management process to examine various aspects of the Depot Maintenance Model and related functional requirements. In this manner the Requirements-Prototype would become a "discovery-tool" for defining depot maintenance process and related functional requirements in a joint environment along with providing the initial working models of these processes for implementation in JCALS and other JLSC Implementation Projects.

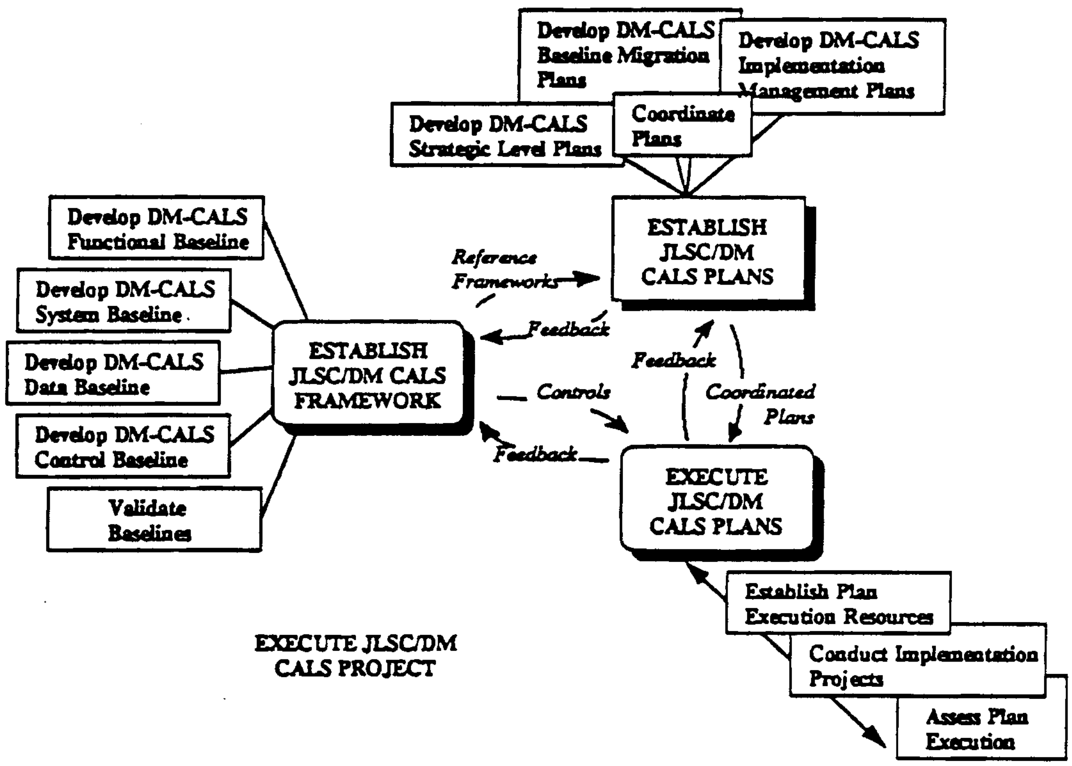
With such an approach, JLSC could expedite the development of consensus joint requirements for JCALS and the service components would enjoy a "preview" of the capability which JCALS will provide. The process could continue in an iterative fashion to fully develop JCALS capability.

APPENDIX - E

JLSC/DM CALS
PROJECT
PLANNING MODEL

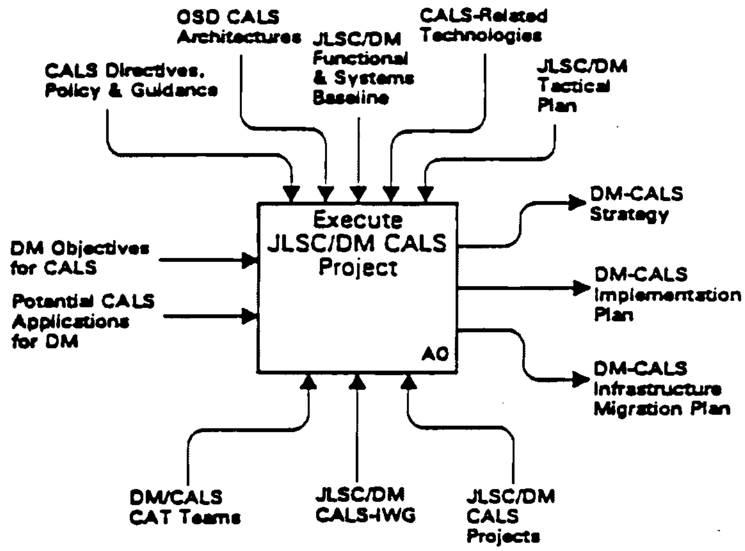
Depot Maintenance CALS Concept of Operations

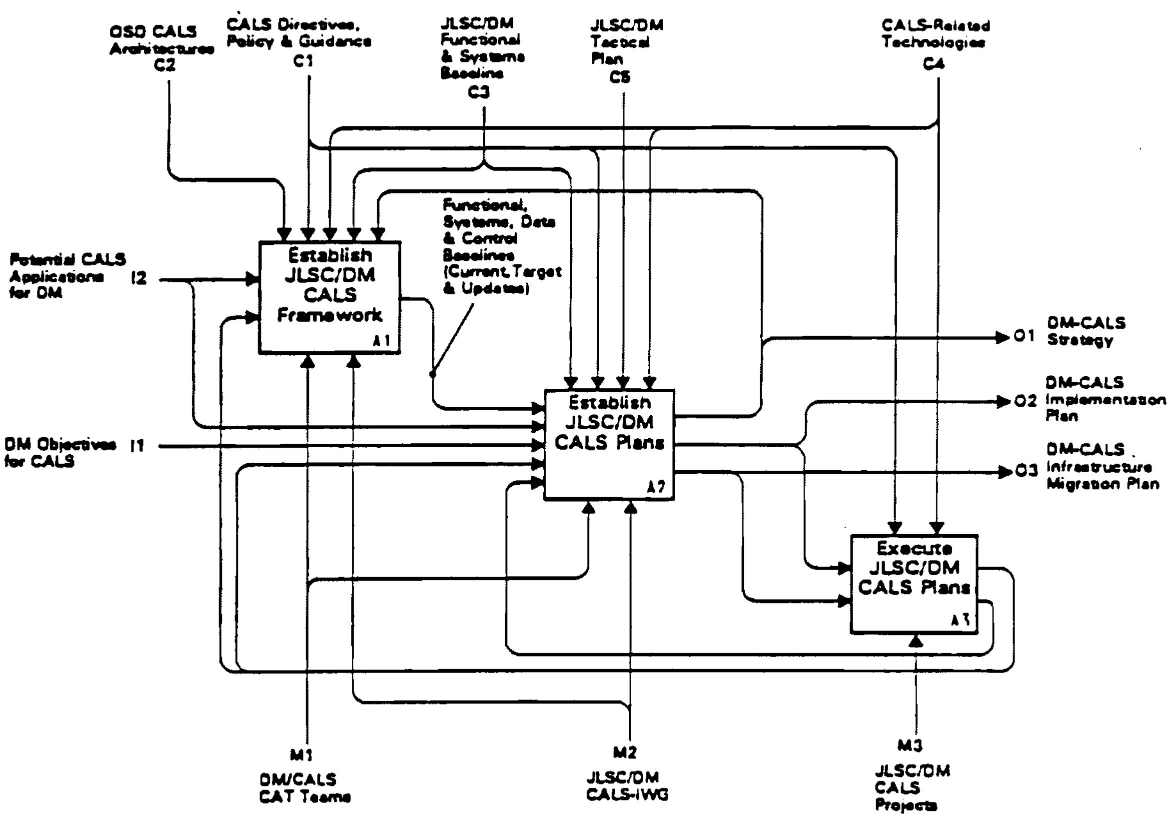
The CALS planning approach fits within the larger context for executing the JLSC/DM CALS project whic encompasses three key areas and supporting activities shown in the following figure.

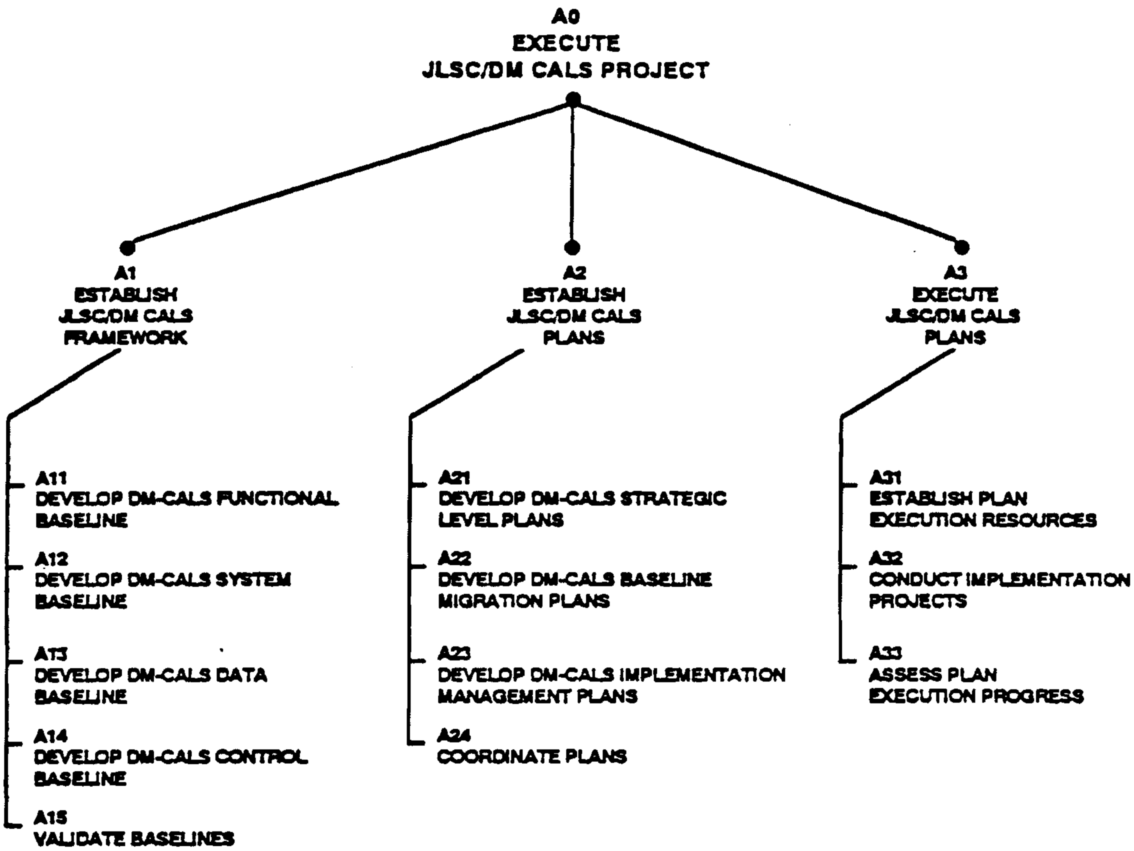


CALS Project Execution Process

These three areas include: Establishment fo JSLC/DM CALS Framework, Plans, and the execution of those plans. The following IDEF0 activity model details this process and a will provide the basis for the Work Breakdown Structure (WBS) used to manage the execution of the JLSC/DM CALS Project.


OSD CALS Architectures
JLSC/DM Functional & Systems Baseline
CALS-Related Technologies
CALS Directives, Policy & Guidance
JLSC/DM Tactical Plan
DM Objectives for CALS
Potential CALS Applications for DM
Execute JLSC/DM CALS Project
A0
DM-CALS Strategy
DM-CALS Implementation Plan
DM-CALS Infrastructure Migration Plan
DM/CALS CAT Teams
JLSC/DM CALS-IWG
JLSC/DM CALS Projects


OSD CALS Architectures C2
CALS Directives, Policy & Guidance C1
JLSC/DM Functional & Systems Baseline C3
JLSC/DM Tactical Plan C5
CALS-Related Technologies C4
Potential CALS Applications for DM I2
Establish JLSC/DM CALS Framework
A1
Functional, Systems, Data & Control Baselines (Current, Target & Updates)
DM Objectives for CALS I1
Establish JLSC/DM CALS Plans
A2
O1 DM-CALS Strategy
O2 DM-CALS Implementation Plan
O3 DM-CALS Infrastructure Migration Plan
Execute JLSC/DM CALS Plans
A3
M1 DM/CALS CAT Teams
M2 JLSC/DM CALS-IWG
M3 JLSC/DM CALS Projects


A0
EXECUTE
JLSC/DM CALS PROJECT
A1
ESTABLISH
JLSC/DM CALS
FRAMEWORK
A2
ESTABLISH
JLSC/DM CALS
PLANS
A3
EXECUTE
JLSC/DM CALS
PLANS
A11
DEVELOP DM-CALS FUNCTIONAL BASELINE
A12
DEVELOP DM-CALS SYSTEM BASELINE
A13
DEVELOP DM-CALS DATA BASELINE
A14
DEVELOP DM-CALS CONTROL BASELINE
A15
VALIDATE BASELINES
A21
DEVELOP DM-CALS STRATEGIC LEVEL PLANS
A22
DEVELOP DM-CALS BASELINE MIGRATION PLANS
A23
DEVELOP DM-CALS IMPLEMENTATION MANAGEMENT PLANS
A24
COORDINATE PLANS
A31
ESTABLISH PLAN EXECUTION RESOURCES
A32
CONDUCT IMPLEMENTATION PROJECTS
A33
ASSESS PLAN EXECUTION PROGRESS

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