NOT MEASUREMENT
SENSITIVE

MIL-HDBK-59B
10 June 1994

SUPERSEDING
MIL-HDBK-59A
28 September 1990

MILITARY HANDBOOK

CONTINUOUS ACQUISITION and LIFE-CYCLE SUPPORT (CALS)
IMPLEMENTATION GUIDE

AMSC N/A AREA ILSS
DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

FOREWORD

1. This military handbook was developed by the Department of Defense with the assistance of the military departments, federal agencies, and industry and is approved for use by all Departments and Agencies of the Department of Defense.

2. This military handbook provides information and guidance for applying the CALS strategy to the acquisition, management and use of digital data in support of defense weapon systems and equipment, hereafter referred to as defense systems. Specific attention is given to the detailed planning and contractual implementation of CALS requirements.

3. Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be of use in improving this document should be addressed to: CALS and EDI Office, Policy and Planning Division, 5203 Leesburg Pike, Suite 1609, Falls Church, VA 22041-3401 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

CONTENTS

PARAGRAPH **PAGE**

FIGURE **PAGE**

CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

1. INTRODUCTION

Continuous Acquisition and Life-Cycle Support (CALS) is a Department of Defense (DoD) and industry strategy to enable more effective generation, exchange, management, and use of digital data supporting defense systems. The primary goal of the CALS strategy is to migrate from manual, paper-intensive defense system operations to integrated, highly automated acquisition and support processes.

1.1 **Scope**. This handbook provides information and guidance for applying the CALS strategy to the acquisition, management, and use of digital data in accordance with (IAW) DoD Instruction (DoDI) 5000.2. The primary focus of this handbook is the acquisition of digital data products and information services in support of defense systems. It addresses:

a. CALS strategy;

b. CALS policy;

c. Acquisition process guidance;

d. Special considerations for existing defense systems; and

e. DoD infrastructure modernization-Joint CALS (JCALS).

1.2 **Applicability**. The primary audience for this handbook is DoD defense system acquisition managers and support personnel. Additionally, Automated Data Processing (ADP) system managers should be well versed with its contents, specifically those sections that relate to infrastructure requirements.

1.3 **How this handbook is structured**. This handbook provides a structured approach to implementing CALS requirements, data interchange standards, and data format specifications. Figure 1 shows the structure of this handbook and how it relates to other CALS reference documents (see 4.3.2).

Sections 2 and 3 provide guidance to acquisition managers on the CALS strategy and CALS policy. Section 4 provides an overview for applying the CALS strategy to the acquisition process, including development of Request for Proposal (RFP) and Statement of Work (SOW) language, detailed planning guidance for development of the CALS Government Concept of Operations (GCO), and the Contractor's Approach to CALS (CAC). Special considerations for applying CALS to existing defense systems can be found in section 5. Infrastructure consideration issues are addressed where applicable throughout, while section 6 provides an overview of infrastructure modernization through JCALS.

Appendix D provides decision templates for acquisition of digital data deliverables. Appendix E contains guidance for developing a GCO, and appendix F provides a sample GCO questionnaire. Appendix G is a Government CALS point of contact list.

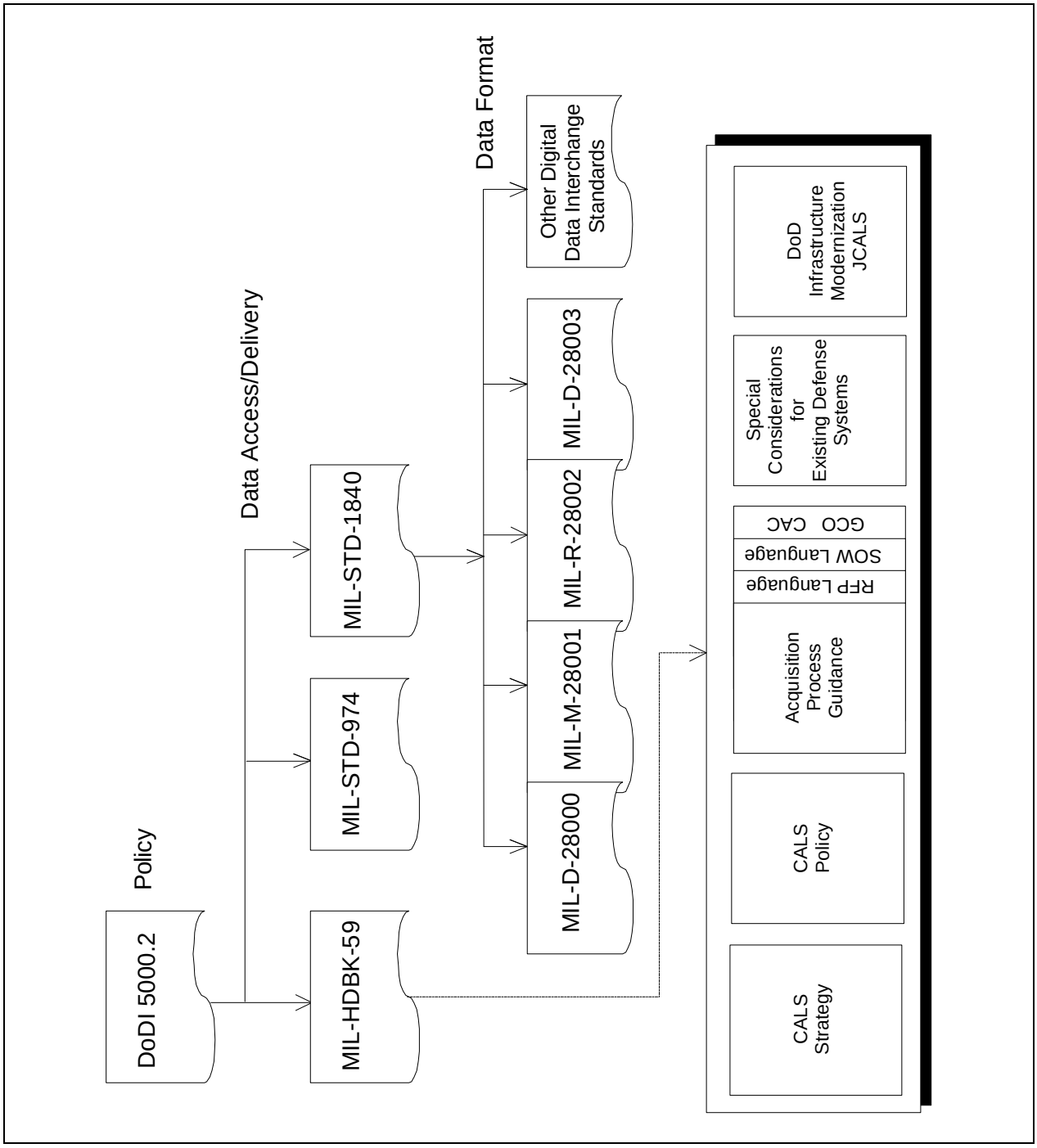

FIGURE 1. CALS reference documents and structure of the handbook.

1.4 **Applicable documents**. A listing of applicable documents may be found in appendix A.

1.5 **Acronyms and definitions**. A listing of acronyms may be found in appendix B. A listing for definitions of terms used in this handbook may be found in appendix C.

2. CALS STRATEGY

The primary goal of the CALS strategy is to migrate from manual, paper-intensive defense system operations to integrated, highly automated acquisition and support processes. A target of these automated and integrated processes will be the Integrated Weapon Systems Database (IWSDB). The IWSDB concept integrates shared data into a single logical database; it is currently under development. Automation and integration of design, manufacturing, and support processes will streamline these processes and increase the reliability and quality of defense systems, while reducing life-cycle costs.

Figure 2 depicts a structured approach to CALS implementation and an association between the iterative processes of infrastructure modernization, process improvement, and digital data acquisition. Effective implementation of the CALS strategy is achieved by addressing the following four elements throughout the life of a defense system.

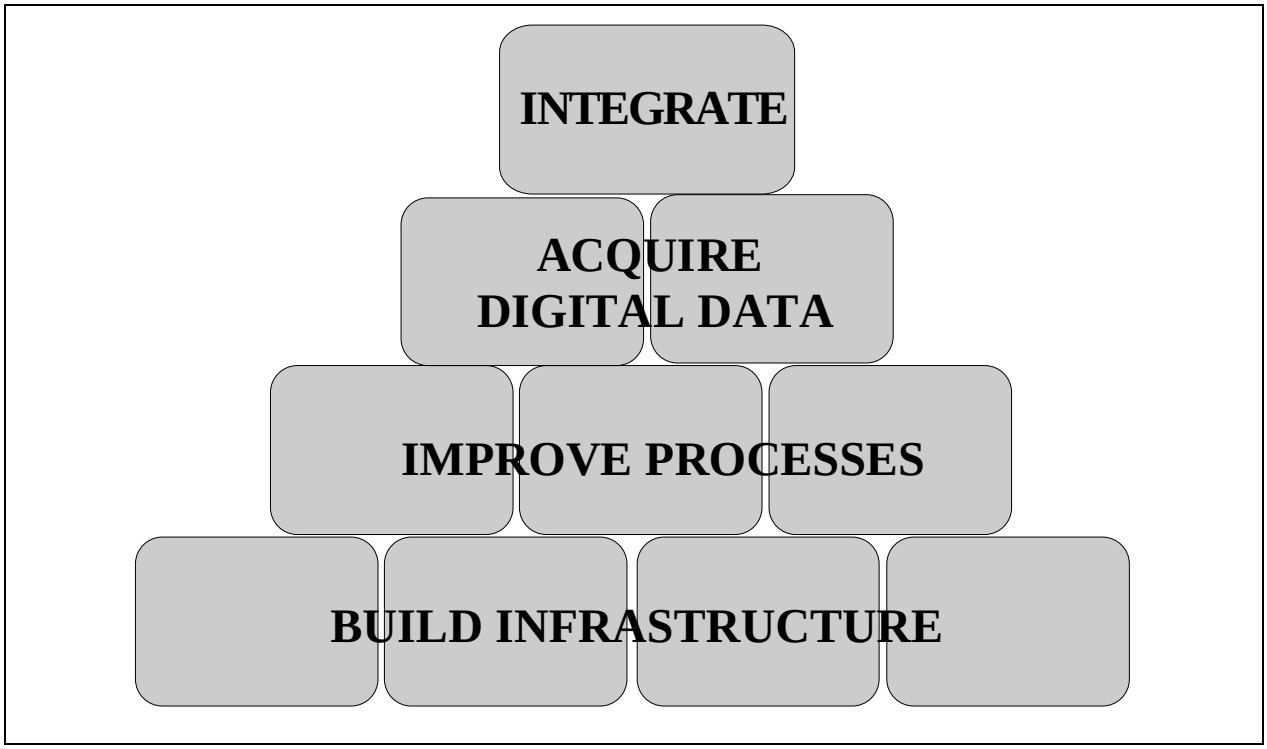

FIGURE 2. Foundation for creation, management, and use of digital data.

2.1 **Infrastructure modernization**. Infrastructure for paper-based processes includes typewriters, copy machines, mail-handlers, mail trucks, etc. The infrastructure for digital-based processes includes computer hardware, software, and communication network capabilities. The strategy to create, manage, use, and exchange digital products may require an associated infrastructure modernization (see 4.3.6.2 and 6).

2.2 **Process improvement**. The infrastructure for use of digital data offers opportunities that enable process improvements in design, manufacturing, and life-cycle support of defense systems. These re-engineered business processes may also result in further infrastructure modernization. There are a

number of process-level guidance documents, such as MIL-STD-881 and MIL-STD-499, that provide a useful body of reference information and implementation direction when addressing change at the process level. Examples of process improvements and benefits resulting from implementation of the CALS strategy include:

a. Improved information quality for acquisition, management, support planning, re-procurement and maintenance, reliability and maintainability, and equipment designs through direct coupling of design processes and integrated databases;

b. Reduced acquisition and support costs through elimination of duplicative, manual, error-prone processes;

c. Reduced space, weight, and storage requirements for digital data media in comparison with paper media and microfiche;

d. Increased opportunities for automated processes such as electronic ordering, electronic contracting, and electronic payments; and

e. Increased responsiveness to industrial base through development of integrated design and manufacturing capabilities and industry teaming arrangements to build and support hardware based on digital product descriptions.

2.3 **Digital data acquisition**. Implementing the CALS strategy requires shifting from acquiring paper-based data to acquiring digital data. To help effect sharing and exchange of information across dissimilar computer systems, a number of CALS standards and specifications have been developed. These CALS standards and specifications (see 4.3.2) provide the common interfaces and neutral file formats necessary for the effective access, interchange, and use of digital data.

2.4 **Integration**. The CALS objective for a standardized approach to integrating technical data for use within weapon systems requires a logical data structure to control and coordinate all technical information used to support a weapon throughout its life-cycle. The concept of a data structure to provide for the logical collection of shared data to support all technical information system users is referred to as the CALS IWSDB. This database concept will provide the basis for Government and industry to participate in an effective shared environment.

3. CALS POLICY

DoD Directive (DoDD) 5000.1 establishes acquisition policy which includes CALS. Its companion DoD Instruction, DoDI 5000.2, advocates the application of CALS to new defense system acquisitions and also provides a basis for applying CALS to existing defense systems. Implementing CALS policy requires new acquisition strategy approaches in the planning and contracting for defense systems. CALS requirements should be incorporated in defense system program plans and in the appropriate sections of the RFP and subsequent contract. CALS implementation also requires a significant upgrade in the DoD infrastructure. DoD components are building appropriate infrastructures for acquisition and use of digital data deliverables and will continue to expand their ability to receive, store, and distribute digitized technical data.

3.1 **Planning**. Defense Federal Acquisition Regulation Supplement (DFARS) Part 207.105 requires acquisition managers to describe the extent of CALS implementation in their acquisition plan. This planning activity sets the framework for effective implementation of the CALS strategy by helping to ensure the harmonization of all program plans, and by providing the basis for funding at the front end of the program for infrastructure modernization.

3.2 **Solicitations**. DoDI 5000.2 establishes a core of fundamental policies and procedures for implementing various engineering, manufacturing, and support disciplines. DoDI 5000.2, Part 6, Section N, states that preference shall be given to the acquisition of contractor information services instead of data deliverables. Where data delivery is required, preference shall be given to delivery in machine-readable form rather than paper. The Instruction also states that all DoD acquisition plans and solicitations must address the following:

a. Integration of contractor technical information systems and processes for engineering, manufacturing, and logistic support;

b. Authorized Government access to contractor databases; and

c. Delivery of technical information in digital form using CALS standards referenced in MIL-STD-1840.

Section 4 of this handbook provides specific guidance on how to plan and contract for CALS implementation on a defense system acquisition.

3.3 **Infrastructure**. Effective acquisition of digital data can only be done with full consideration of the ability of Government activities to access, receive, store, distribute, and use the digital data that complies with the CALS standards. In response to DoDI 5000.2, DoD components are incrementally upgrading the infrastructure towards a comprehensive technical information management architecture through joint service programs. Joint DoD CALS infrastructure initiatives such as Joint CALS (JCALS) and Joint Engineering Data Management and Information Control System (JEDMICS), and applications initiatives such as Computer-Aided Design, Second Acquisition (CAD2) tools provide specific capabilities within the CALS strategy. The main thrusts for these and other infrastructure systems include handling of Technical Data Packages (TDP), technical publications, Logistic Support Analysis Records (LSAR), data for parts on demand, engineering

analysis data for acquisition and support, and conversion processes for legacy data products. Additionally, the preparation, review and comment, and distribution of the solicitation package should evolve using the infrastructure system.

DoDI 5000.2, Part 9, Section B, states that the program office will ensure that authorized recipients of digital data have the capability to receive, store, and maintain the data. The evolution of this required infrastructure is a key consideration in implementing the CALS strategy on any given acquisition. Deficiencies in the Government's infrastructure may require investments by the acquisition management team to effectively implement the CALS strategy. The Federal Acquisition Regulation, Federal Information Resource Management Regulation, and the Brooks Act require approvals or proper exemptions on each acquisition for computers (hardware and software) and related services. This adds leadtime to each acquisition which should be considered in the planning process.

3.4 **CALS implementation on existing defense systems**. DoDI 5000.2 requires that existing defense systems exploit opportunities to obtain cost savings by retrofitting digital information technology into their programs. Program phase, type, size, and duration are influencing factors on CALS implementation for these defense systems. Infrastructure modernization and other process improvement programs may offer the most promising opportunity for retrofitting digital information technology to existing programs. In order to take advantage of digital information technology on existing programs, legacy data conversion, re-acquisition of technical data in digital formats, and re-authoring data into processable data files may be required. Section 5 of this handbook offers an approach for evaluating opportunities for CALS implementation on existing programs.

3.5 **Reviews and audits**. The Defense Acquisition Board (DAB), Logistic Review Groups (LRG), Major Automated Information System Review Council (MAISRC), and other oversight activities will review and audit defense system acquisitions for adherence to DoD and DoD component CALS policy.

4. ACQUISITION PROCESS GUIDANCE

Implementation of CALS influences the planning, acquisition, and execution of defense system contracts. Figure 3 shows a high level view of the various activities performed during the defense system acquisition process. This model is segmented into three primary activities. Each of these activities, including the inputs, outputs, constraints, and resources, is discussed in detail in this section. (Application of the CALS strategy to existing defense systems is discussed in section 5.) Detailed relationships between the process activities are provided in figures 4 through 6.

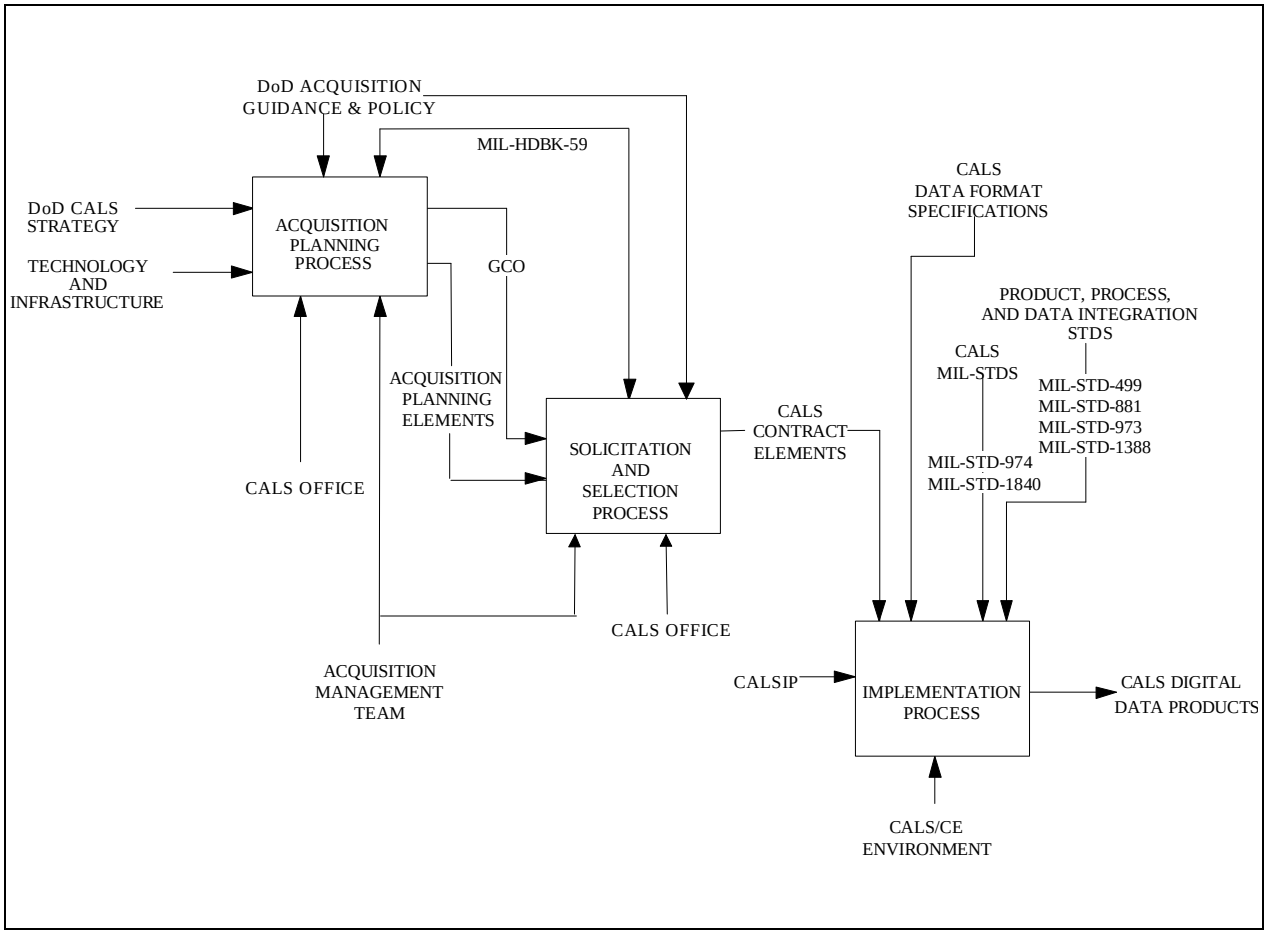

FIGURE 3. CALS and the acquisition process.

4.1 **Acquisition planning process**. Acquisition plans prepared pursuant to DFARS Part 207.105 must include CALS life-cycle considerations. The DoD CALS strategy described in section 2 provides the conceptual framework for implementing CALS in the DoD. The CALS elements of an acquisition plan are determined by evaluating how digital data will be applied in all phases of a program. This evaluation should also consider present and future technology and infrastructure capabilities.

4.1.1 **CALS acquisition planning elements**. The acquisition plan should describe the program's strategy for the creation, management (including acceptance, see 4.2.3.1), and use of digital

data products. This strategy, an integral part of the program acquisition strategy, should address the infrastructure for generating and managing digital data elements. In addition, the strategy should address concurrent access to multiple functional users, data management responsibilities, data flow among Government sites, identification of data integration between disciplines, and methods to be used to exchange data among the Government and contractor teams. The information requirements for each defense system program are unique and the opportunities for cost-effective application vary among contractors and Government activities.

4.1.2 **Technology and infrastructure capability**. Defense systems managers should conduct an assessment of the current technology base for information systems and information technology. Defense systems acquisition managers will consider the existing and planned infrastructures for both Government and contractor facilities, available CALS data interchange standards, and the various digital data delivery and acceptance options in terms of delivery media, format, and access.

Documentation of this assessment will take the form of a GCO. The assessment should include:

a. The identification of current, near, and mid-term infrastructure plans;

b. The ability for peer-to-peer communication;

c. The throughput capability to support movement of data electronically using the installed telecommunications infrastructure;

d. The personnel and their disciplines at all locations that are members of the acquisition management team;

e. The digital data resources (libraries of historical data, standards, and specifications) available to support program acquisition and logistic processes; and

f. The data acceptance requirements in terms of the type of data, format and content of data, and the delivery of or access to the data.

Provisioning for end user hardware and software requirements to support a fielded defense system are normally under the funding discretion of the acquisition manager and should be considered during the acquisition planning process.

4.1.3 **CALS office**. The Deputy Secretary of Defense established a CALS Policy Office within the Office of the Under Secretary of Defense (Acquisition and Technology) (OUSD (A&T)) to develop policy and plans for CALS implementation, develop standards and corporate architecture elements, and facilitate accelerated implementation within industry. The CALS Policy Office receives technical support from the National Institute for Standards and Technology (NIST) of the Department of Commerce in CALS standards, specifications, and conformance test development. The CALS Test Network (CTN) is in place to test, evaluate, and demonstrate the interchange and functional use of digital technical information using CALS standards. The Services and Defense Logistics Agency (DLA) have also designated CALS offices to meet the CALS objectives.

Due to the impact of CALS, most major commands, headquarters activities, and supporting field activities have established a CALS Office, or CALS advocate, to provide support to program personnel and to ensure that a common and consistent approach is applied to implementing the CALS strategy. This office may be contacted to obtain the most recent supporting acquisition and infrastructure modernization guidance. A CALS point of contact list is provided in appendix G.

4.1.4 **Acquisition management team**. The acquisition management team typically includes program managers (PMs), engineers, logisticians, and business managers responsible for cost, schedule, performance, and support of defense systems. With the implementation of the CALS strategy, the acquisition team may find it advantageous to expand the team to include personnel dedicated to the management and implementation of the digital data strategy and the required infrastructure. These information managers can help ensure that the correct data types, formats, infrastructure, and internal procedures for delivery, acceptance, and management are applied; and that all supporting Government activities are involved in the planning process for CALS. It is important for these supporting activities to be involved in the planning process because they routinely have life-cycle management responsibilities.

4.1.5 **CALS Government Concept of Operations (GCO)**. The GCO planning process should start as early in the acquisition process as possible. The GCO is a Government document that is prepared during the acquisition planning for each procurement. It is used to provide information to potential offerors about the Government infrastructure and CALS implementation strategy for defense systems. Development of a GCO will help ensure that the Government can access or receive the correct version and formats of digital data products needed to acquire and support a defense system.

The GCO can assist the acquisition manager in determining:

a. Hardware and software systems the Government has, or is developing, to manage and use the data;

b. Data users, types of data, frequency of use, and timeliness of data access or delivery to each user;

c. Data use and the review/approval processes to support life-cycle functions;

d. User locations and their primary functions in support of the defense system;

e. Data interchange requirements including format, media, applicable standards, and existing telecommunications capabilities;

f. Access authorizations and restrictions; and

g. Data acceptance requirements including data format and content of data and the Government processes for accepting product data, processable data, or Contractor Integrated Technical Information Service (CITIS) data.

The GCO is developed by the Government acquisition team with input from other supporting Government activities involved in the life-cycle support of the defense system. Figure 4 depicts the GCO process. The GCO should be included in the RFP (section J) as Government Furnished Information (GFI). Guidance for developing a GCO is provided in appendix E. A questionnaire-type form is provided in appendix F for gathering information for the GCO.

4.1.5.1 **Identify data type deliverables**. Data type deliverables are the data requirements specified on the Contract Data Requirements List (CDRL), DD Form 1423, for a typical program, categorized by program function. A survey of supporting defense system activities during the data call process outlined in DoDI 5000.2, Part 9, Section B, will establish data requirements. Sample data types to be digitally developed, accessed or delivered, and maintained are listed in table I. Note, table I. is not intended to be all inclusive.

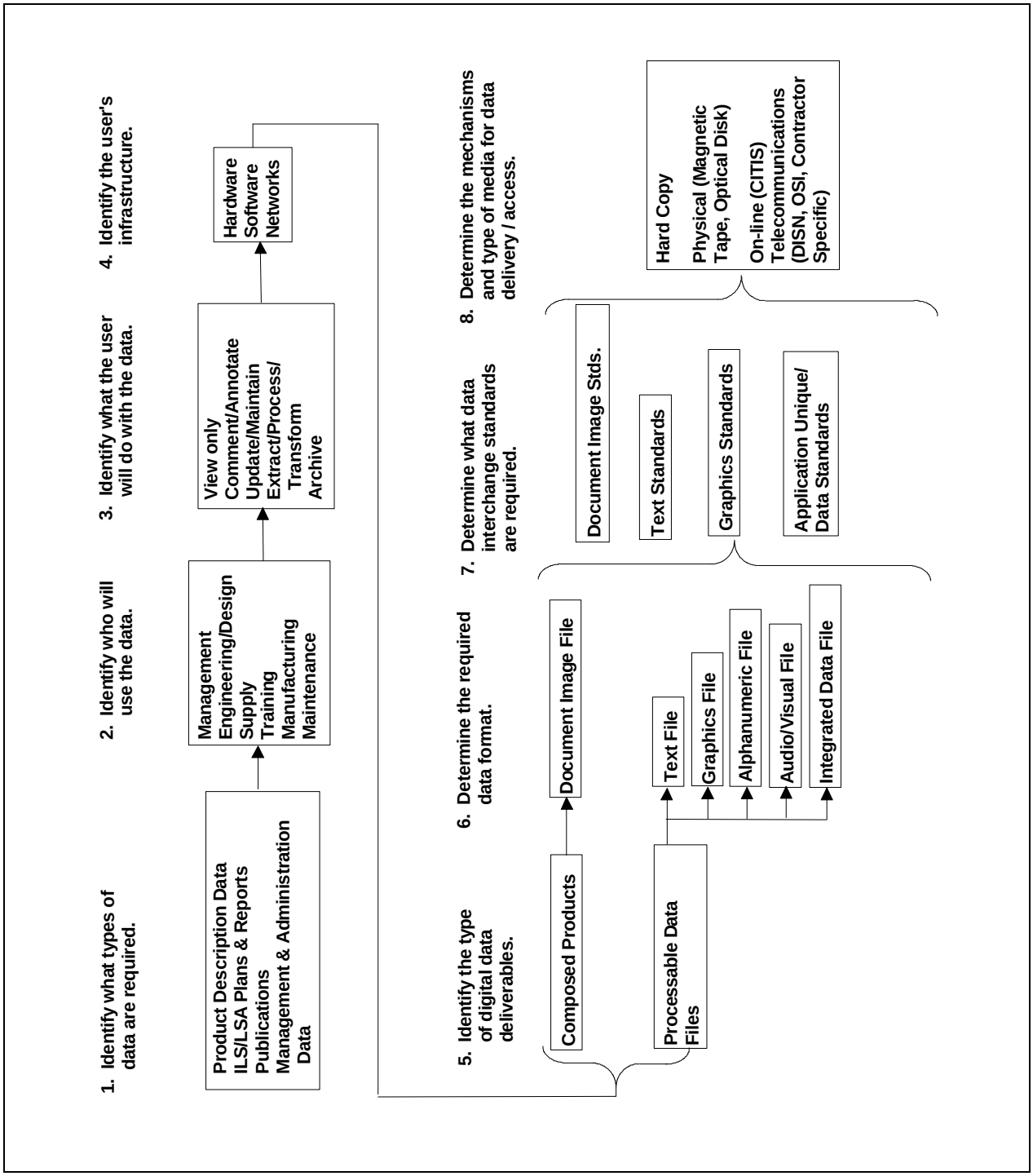

FIGURE 4. CALS considerations for existing defense systems.

TABLE I. Typical data type deliverables.

MANAGEMENT AND ADMINISTRATION DATA
Program Plans
Program Schedules/Master Schedule
Engineering Support Plans
Progress and Status Reports
Contractual Vehicles
Conference Agendas/Minutes
Reviews and Audits Documents
Technical Data Identification Checklists
Standardization Program Plan
Contract Work Breakdown Structure (WBS)
Cost Performance Report
Management Information System (MIS) Plan
Config. Audit Plan/Status Accounting Report
Data Accession List
Configuration Management Plan
System Engineering Management Plan (SEMP)
CALS Implementation Plan (CALSIP)
PRODUCT DESCRIPTION DATA
Technical Data Package
System Specifications
Engineering Drawings and Associated Lists
Analysis Data
Simulation Data
Test Data
ECP, RFW, and RFD
Product Specification
Software Development Plan
Software Test Plan/Description/Report
System Specification Report

PRODUCT DESCRIPTION DATA (Continued)
System Engineering Analysis Report
Engineering Data
ILS/LSA PLANS AND REPORTS
Integrated Logistics Support Plan (ILSP)
Logistics Support Analysis Plan (LSAP)
Logistics Support Analysis Record (LSAR)
Safety Assessment Reports
Reliability Assessment Reports
Maintainability Reports
Hazardous Materials/Process Reports
LSA Tasks (MIL-STD-1388-1)
Maintenance Plan/Reliability Plan
Maintainability Plan
Level of Repair Analysis (LORA)
Test and Evaluation Master Plan
Test Reports
Life-Cycle Cost Estimates
Manufacturing Plan
Environmental Impact Report
Technical Report-Study Services
Quality Program Plan
Computer Resources Integrated Support Document
Design to Cost Plan
PUBLICATIONS
Technical Publications
Technical Manuals
User's Manuals
Operations Manuals

4.1.5.2 **Identify data users**. The data users, as shown in appendix E, table E-I, are the functional organizations that will require access to the program data. These organizational areas include as a minimum: management, engineering/design, supply, training, manufacturing, and maintenance. In addition to their functional responsibilities, these organizations are defined by their location and the specific disciplines involved.

4.1.5.3 **Identify data use/processing**. The data use requirements are the ways in which the chosen data types can be processed. The acquisition manager will need to identify the use of the data types by the support organizations chosen for the program. The five defined methods of data processing typical of most defense systems are described below:

a. View Only - the ability to examine a data file without the ability to change it. This includes viewing selected portions of one or several documents as well as side-by-side comparisons of documents.

b. Comment/Annotate - the ability to evaluate and highlight for future reference or to make annotations, approvals, and comments without the ability to change the original file. Annotations are associated with a specific item or location within a document such that the annotations are displayed whenever that point or area of the document is displayed.

c. Update/Maintain - the ability to change data either directly or through controlling software in the active files on the host computer.

d. Extract/Process/Transform - the ability to extract and modify the format, composition, and structure of the data into another usable form.

e. Archive - the placing of data into a repository to preserve it for future use.

4.1.5.4 **Identify data user infrastructure**. The availability of digital data processing and telecommunications technology and approved standards for creation, storage, transmission, protection, and integrity of data at the time of delivery or access are important criteria for acquisition decisions. The current and projected capabilities of both the contractor and DoD components (military services and DLA) should be assessed with respect to program needs and schedules. For example, available systems may not provide adequate safeguards to allow processing of classified data formats. The GCO is an excellent vehicle for making these determinations. Acquisition managers should plan to access or acquire digital data products rather than hard copy, unless a clear case can be made that the costs will outweigh the life-cycle benefits.

The data user infrastructure is the computing environment available to a particular user. This environment establishes the data processing capabilities of that user. The following areas identify a user's infrastructure:

a. Hardware - determine the current and planned hardware available to support the defense system program.

b. Software - this is the most critical element. Interoperability will normally be achieved through the use of software. Again, determine both present and future software applications and availability.

c. Networks - determine the local- and wide-area networking capabilities.

d. Computer support personnel - consider the skills and expertise required to establish, operate, and maintain a functional and reliable computing environment.

e. Communications - determine data communication capabilities.

4.1.5.5 **Identify data delivery/type**. Following are types of digital deliverables supported by delivery and access methods specified by acquisition managers. Detailed information to assist in developing CDRL specifications for these deliverables is provided in appendix D.

a. Composed products - human interpretable documents in digital image format. These items are not normally further processed since they are complete, published entities. Examples of data products that could be delivered or accessed in this format include legacy engineering drawings, technical reports, and test plans.

b. Processable data files - machine readable dynamic information that includes revisable source data for multiple data applications, thus enabling standard and custom documents to be generated and the source data to be manipulated. Examples of processable files are LSAR files, files extracted as subsets of CAD files, and technical manual text files delivered in Standard Generalized Markup Language (SGML) format.

4.1.5.6 **Determine data format**. The following data formats are the forms in which each of the delivery/types can be procured. Refer to figure 4 for their relationships to the delivery/types.

a. Document image file.

b. Text file.

c. Graphics file.

d. Alphanumeric file.

e. Audio/visual file.

f. Integrated data file.

4.1.5.7 **Determine data interchange standards**. In order to ensure the proper sharing and exchanging of information across dissimilar systems, the acquisition manager should consider the possible loss of intelligence when translating information from one data format to another (whether the format is standard or not). The following types of interchange standards are used with data formats listed in figure 4:

a. Document image standards.

b. Text standards.

c. Graphics standards.

d. Application-unique data standards.

4.1.5.8 **Determine mechanisms and type of media for data delivery/access**. The two options that an acquisition manager may use to support digital delivery requirements are physical delivery and on-line delivery via telecommunications. Digital delivery and access requirements are specified through the SOW, the CDRL, and specific Data Item Descriptions (DIDs).

4.1.5.8.1 **Physical delivery**. Physical delivery includes delivery of magnetic tape, magnetic disk, or optical disk used to transfer CDRL items to a Government site. Magnetic tape is a mature, stable technology that is able to handle the large volumes of data typically associated with a major defense system acquisition. Magnetic tape standards are well defined and little additional investment cost will be involved. However, other media may be more efficient, and therefore, preferred.

Magnetic disk is also widely implemented on personal computers and work stations, and may be the physical medium of choice for small business contractors. Several primary de facto magnetic disk formats are available, but no official standard has been approved.

Optical media is used here as a generic term to include compact disk-read only memory (CD-ROM), write once read many (WORM), and rewritable disk or write many read mostly (WMRM). These media are ideal for mass distribution and archival purposes for large volumes of data.

4.1.5.8.2 **On-line access/delivery**. On-line delivery may be achieved via two methods: 1) delivery of CDRL items from a contractor sending system to a Government receiving system via telecommunications download; or 2) in-place delivery, which allows data items to be stored and maintained at a contractor's site for retrieval and display via telecommunications using a Government terminal, personal computer, or workstation. On-line access, as distinguished from on-line delivery, refers to the situation in which an organization accesses data items through CITIS services, or other similar information management services, as negotiated in the contract.

Secure on-line transmission of the full volume of data for defense systems is technically feasible, but severely taxes current telecommunication networks in DoD and industry. In the near term, telecommunications may be limited to electronic mail exchange of high priority technical data, or other clearly defined uses such as CITIS access. On-line interactive access provides immediate and timely data access for custom report generation, document generation, and on-line request of information transmitted as composed products and processable data files. Acquisition managers should give preference to use of CITIS for performing the functions of updating, storing, controlling, reproducing, and distributing data items. MIL-STD-974 provides information concerning core CITIS functions and tailorable CITIS functions which should be specified in the SOW and listed as contract line items. In the long term, cost effectiveness will be essential for successful implementation of a totally integrated defense system database.

Telecommunication networks provide an excellent opportunity to exchange and establish common practices for business type data using Federal Information Processing Standards (FIPS) Publication (PUB) 161 for Electronic Data Interchange (EDI) standards. FIPS PUB 161 summarizes the adoption of the families of interrelated software standards known as ASC X12 and Electronic Data Interchange for Administration, Commerce, and Transport (EDIFACT) for electronic transmission of such data. The acquisition manager should consider taking advantage of this opportunity for program administration process improvements.

4.2 **Solicitation and source selection process**. Upon completion of the GCO, the acquisition management team will be prepared to enter the solicitation and source selection process with a firm CALS implementation strategy and knowledge of the needs and capabilities for acquiring and using digital data. This section of the handbook is designed to help acquisition managers incorporate their CALS strategy into an RFP based on the information gathered through the CALS GCO process. This section takes a detailed look at each applicable section of an RFP, offers discussion of the types of requirements that can be included in that RFP section, and provides sample RFP language.

The RFP defines the scope of work, schedule, conditions, clauses, instructions, evaluation criteria, and deliverables to be provided in implementing CALS for the program. The requirements for electronic (on-line) services, digital data delivery, and functional integration should be addressed by the CALS RFP elements. Figure 5 illustrates this solicitation and selection process.

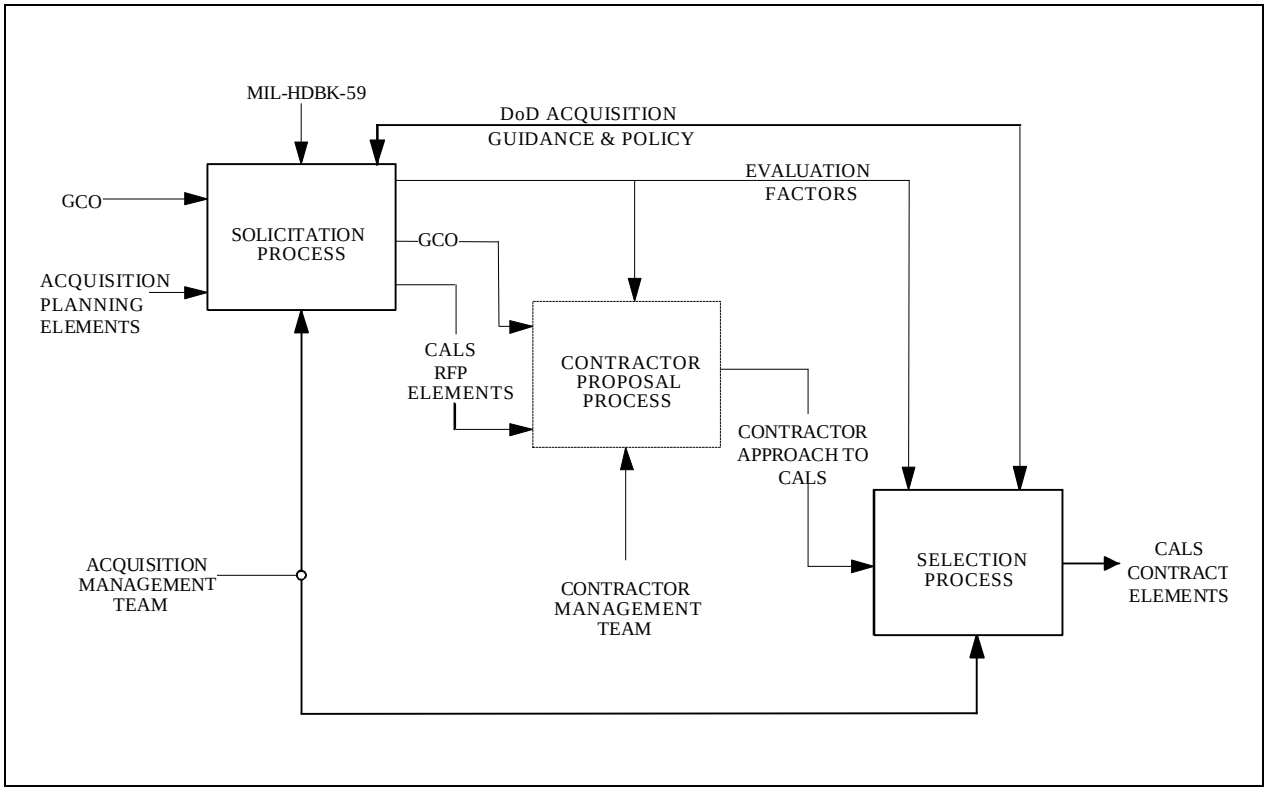

FIGURE 5. Solicitation and selection process.

4.2.1 **Section B, supplies or services and prices/costs**. If a CITIS has been selected for implementation, the creation of a separate CITIS Contract Line Item Number (CLIN) should be established. This enables the cost of CITIS implementation and operation to be accumulated against this line item allowing cost benefit evaluation and consideration of CITIS options or alternatives. The establishment of the CITIS CLIN also recognizes that the CITIS period of performance may be different from the period of performance for the contract. Specific CITIS requirements are to be included in section C of the RFP.

The CITIS CLIN should require that the cost of the service be subdivided into its component elements for pricing and evaluation purposes. These elements include service establishment, telecommunications, access/connect time, security, equipment lease/purchase, storage capacity usage, application development, contractor infrastructure, and maintenance.

4.2.2 **Section C, description/specification/work statement**. The SOW requirements for CALS implementation will generally fall into three areas: digital delivery of data on media, on-line remote access to CITIS via telecommunications software or a CITIS environment, and post-contract award CALS planning.

4.2.2.1 **Digital delivery of data**. As discussed in the GCO section, the spectrum of delivery options of data deliverables ranges from paper to magnetic tape to optical disk. Standards used in the information exchange may be the CALS exchange standards or mutually agreed-to proprietary product standards or a combination of both. Generally these requirements will be included in block 16 of the CDRL (see 4.2.5); however, some delivery requirements for data still should be listed in the SOW. For example:

a. Technical data package - SOW may list the tape header requirements or that classified drawings are to be delivered on aperture cards while unclassified drawings are to be delivered on tape.

b. Technical publications - SOW may express a rank-ordered list of format preference for technical publications data. Computer Graphics Metafile (CGM) is preferred for illustrations. Raster graphics should be limited to existing art in paper form or photographs requiring conversion (see 4.3.3.9).

c. Other CDRL items - SOW language may be used to clarify data requirements that feed a Government receiving system.

d. Data acceptance - SOW should define the CALS format and content acceptance criteria, as well as document acceptance procedures for both media and CITIS delivery.

It is in these instances when additional SOW language may be necessary to properly define digital delivery requirements.

4.2.2.2. **On-line, remote access to data via CITIS**. The definition of basic CITIS access to data is established in accordance with MIL-STD-974. Data to be accessed is identified by annotation of

the appropriate CDRL item to which CITIS access is desired. This standard should be tailored, as required, to include the given core CITIS functions and any tailorable CITIS functions. Tailorable options may be requested to be priced as alternatives to allow cost/benefit assessment.

The SOW should identify CITIS implementation requirements that are not specified in MIL-STD-974. These include the number of current users to be served, hours of operation, system response requirements, special security requirements, selection of Defense Information Systems Network (DISN) or third party leases for communications, and the period of performance that includes each location where CITIS is provided.

Sample language may include:

- The (program) CITIS shall be provided at (number) sites at the following locations:...
- The availability of the (program) CITIS shall be between the hours of (time/time zone) to (time/time zone) for (number) concurrent users.
- The (program) CITIS shall provide response to (CDRL data item) inquiries in (time) or less.
- The CITIS shall be capable of handling data of no less than (specify) classification. Special CITIS security requirements are: (specify)
- The (program) CITIS period of performance shall start (date/time) and continue until (date/time) at (all, specified) locations.
- The CITIS shall be capable of being accessed using Government receiving systems composed of (list).
- The contractor shall install a leased line(s) capable of handling (number) concurrent user sessions between the CITIS and the following Government site(s) (list).

Tailorable CITIS options that include access to contractor computer assets and software will require development of specific RFP requirements. These requirements need to include a detailed description of the type of use supported and the frequency of use. Access to software tools may be addressed by annotation of the appropriate CDRL(s) that deal with the creation of the data that the program wishes to process.

4.2.2.3 **Post-contract award CALS planning**. Some acquisition managers may choose to have the contractor team continue to do CALS planning after contract award if the information in the CAC is insufficient for life-cycle CALS planning. This CALS activity may be in the form of a study to continually explore opportunities that can be summarized in a CALSIP for cost-reducing process improvements. This may be an especially effective strategy for managers of existing defense systems to apply CALS to their programs. Process improvements that weren't practical or possible at contract award, may make very good business sense as technology and infrastructure evolve over time. The

CALSIP can be used to summarize the results of this post-award CALS planning/study process. (See 4.2.2.3.1 and DID DI-IPSC-81353.)

It should be noted that these same opportunities for process improvements may be identified via the Value Engineering Change Proposal (VECP) process, through unsolicited proposals, through use of a technology refreshment clause (see 4.2.4), or by in-house Government personnel.

4.2.2.3.1 **CALS implementation plan**. The CALSIP is characterized by changing content over contract or order life. Thus, each CALSIP document deliverable only records CALSIP content at a fixed date (periodic submissions) or viewing time (aperiodic submissions). The CDRL should identify each required CALSIP deliverable (MIL-STD-1806 marking requirements inclusive), its associated requirements(s) for "preliminary draft" approval (if required), its associated requirement(s) for inspection and acceptance, and the method(s) of delivery required. Aperiodic document submissions are generally used by the Government for review purposes and require an accompanying hard copy periodic document submission if content recall or traceability is required. Example method(s) might include one or more of the following:

a. Live, on-line interactive, digital interchange contractor computer to Government computer and vice versa, aperiodic CALSIP documents, and specified periodic electronic media CALSIP documents in a mutually agreeable word processing/desktop publishing application file format. These periodic documents serve the Government as a cumulative chronicle of the CALSIP and satisfy CDRL-approved deliverable requirements.

b. Live, on-line interactive, digital interchange contractor computer to Government computer and vice versa, aperiodic CALSIP documents, and specified periodic hard copy CALSIP documents printed on 8-1/2 x 11 inch white bond paper. These periodic documents serve the Government as a cumulative chronicle of the CALSIP and satisfy CDRL-approved deliverable requirements.

The information in the CALSIP is important throughout contract or order life. Typically, contract (or order) support CALS activity occurs within both Government and contractor's facilities. Contractor-supplied service(s) will be complementary to and usable by the Government CALS capacity established to support the contract or order and its underlying acquisition program as required by DoDI 5000.2 Part 6, Section N. Government usability of contractor-supplied CALS service(s) is assured, in part, by Government exercise of approval authority (CDRL block 8) on the initial and revised periodic CALSIP document deliverable(s).

The CALSIP should not be a static document, but should be revised to reflect the reality of changing requirements, technology, and improved processes. To promote timely updates, it is intended that the Government program manager and the contractor program manager or their respective designees have authority to mutually agree to changes of the CALSIP. The Government may, for a particular program, approve the CALSIP prior to or concurrent with the issuance of follow-on contracts or orders. Revision(s) to the CALSIP pursuant to block 8 of the CDRL, may be made by mutual agreement between the respective Government and contractor program managers.

4.2.3 **Section E, inspection and acceptance**. The acceptance of CALS digital data products, either delivered on physical media or by CITIS, is different from the acceptance of comparable paper data products in several ways. The following paragraphs provide details on the acceptance of digital data products and information services.

4.2.3.1 **Digital data acceptance**. The unique aspect of CALS digital data deliverables is that they will be subject to inspection and acceptance on several levels. The most important level of acceptance is the data content and format. Because the delivery must adhere to requirements in the SOW for data format and media, these must be verified prior to the inspection of the data content.

The first level of acceptance is to the physical media. This acceptance will ensure that the delivery media was in accordance with delivery specifications. This level of inspection will not be used if data has been formally delivered via CITIS.

The second level of acceptance is applied to the MIL-STD-1840 digital data format if it has been specified. This level of acceptance may be aided by automated tools obtained, if available, from the CALS Test Network or each Service component CALS office. The next level of acceptance is adherence to the specified CALS data exchange format(s). Again, automated tools may be used to verify compliance.

The last level of acceptance is the data content and format. This acceptance will be performed either manually or through the use of computer-assisted tools. Pre-acceptance of any and all levels of acceptance may be performed at the contractor's facility and final acceptance shall always be performed at a Government facility.

4.2.3.2 **CITIS acceptance**. CITIS requires additional acceptance requirements to be applied. Acceptance of the service and the CITIS CLIN, if utilized, is a verification that the contractor has provided the service as specified. The CITIS functional requirements are defined by MIL-STD-974 and the particular statement of work. A checklist of CITIS functional requirements may be prepared to assist in tracking contractor compliance. These functional requirements may include service availability, maintenance response, provision for core CITIS functions, and provision for tailorable CITIS functions.

Assurances of adequate acceptance testing for CITIS should be obtained via contractor demonstration of the service. The test should include demonstration of functional capabilities and verification that the CITIS will handle data required to be formally delivered through CITIS without alteration of the data product. Such a test is not required for each delivery but should be rerun if major maintenance has been performed or if the sending or receiving systems have been changed enough to warrant an additional test. If specific test data is deemed necessary for adequate testing of a CITIS, that test data should be provided and results reviewed at a customer facility. On-line access service should be accepted when it is demonstrated that a person with proper authorization can perform the contractually required core and tailorable CITIS functions from a terminal or workstation at the customer's facility or as otherwise agreed.

Electronic data transfer service acceptance should occur when a single instance of transfer of the specific deliverable type can be achieved, including successful download and retrieval of data into the

customer's system when contractually required. This data may be real product data or test data, as appropriate.

4.2.4 **Section H, special contract requirements**. The primary emphasis for any special contract provision is the ability to refresh or upgrade the technology baseline applied at contract award. Acquisition managers should look for every opportunity for technology insertion advantages in an evolving CALS environment. The use of VECPs and related incentive mechanisms can be applied to offer the contractor team opportunities to improve the CALS solutions initiated at contract award.

4.2.5 **Section J, attachments**. The CDRL requirements in section J of the RFP provide the contractual means by which defense system data, in digital formats or otherwise, are delivered to the Government. To receive technical information in CALS standard digital formats, the CDRL has to clearly identify the appropriate CALS requirements documents for content, structure, and format compliance as referenced in MIL-STD-1840. MIL-STD-974 is used to identify on-line access and delivery requirements. The GCO is included in this section as GFI.

4.2.6 **Section L, Instructions To Offerors (ITO)**. Section L should be used for instructing potential bidders to prepare and submit a comprehensive CAC that describes contractor capability and experience in the area of CALS. Note that the CAC is different from the CALSIP described in 4.2.2.3, as a CALSIP requires a CDRL and a DID. Section L can also be used to offer potential bidders the opportunity to propose alternative forms of delivery of digital data products and information services.

4.2.6.1 **Contractor's Approach to CALS (CAC)**. The CAC is a description of the contractor's approach, experiences, and successes in the creation, management, use, and exchange of digital information. This information is generally only important to an acquisition manager during the source selection process. Information in the CAC is used to gauge the risk associated with the contractor's ability to provide the digital data products and services required by the RFP.

The acquisition manager should instruct the offeror to include the following information in the CAC:

a. The contractor's approach and experiences in the management, use, and exchange of digital information. This description should include a discussion of the generation, storage, indexing, distribution, and delivery of digital data products.

b. The contractor's approach and experience in integrating applications and databases for engineering, manufacturing, logistic support, and program management processes so as to facilitate the transfer and sharing of information among functional areas.

c. The CITIS (when required in section C, SOW), to include the general procedures, specifications, software applications, and database services utilized by the CITIS. Describe how the CITIS will take advantage of the existing Government infrastructure (provided in the GCO) for connection, presentation, and access to CITIS data, and the submission, acceptance, and approval procedures that will be employed for CDRL data within the CITIS environment.

d. Introduction and responsibilities, including a statement of the plan's purpose and scope. CALS support hardware and software architecture, reference documents and definitions, and Government, industry, and contractor points of contact.

e. CALS program management, including program objectives and strategy, program management responsibilities, and program management approach.

f. CITIS (if required in RFP) system test and evaluation, including test management concept, pilot demonstration, and inspection and acceptance of CITIS.

g. Information system description, including source and destination systems, and relationship with Government receiving systems as depicted in the CALS GCO.

h. Data protection and integrity, including risk assessment and system security certification.

4.2.6.2 **Alternative proposals**. In section L of the RFP, offerors should be encouraged to review the GCO and the RFP data requirements and propose alternative delivery methods that reduce life-cycle costs and improve processes. Estimated costs and benefits should be documented to reflect all significant investments, transition, and operating expenses associated with the various alternative digital delivery methods (Government and offeror expenses and benefits). Selected alternatives will be incorporated into the contract.

Alternative proposals are a significant potential cost-reducer because optimum CALS implementation is achieved through the most effective combination of Government and contractor infrastructure (hardware, software, and communications). Each offerors' infrastructure will be different and a program can potentially achieve greater benefit and reduced cost through alternative standard digital delivery methods.

4.2.7 **Section M, evaluation factors**. Section M is the driver for the information asked for in section L. Section M describes how each area of the proposal will be evaluated and the relative value of each area. The source selection evaluation team will review proposals for responsiveness to the RFP and to evaluate the degree of risk associated with the contractors' approach to meeting the CALS requirements. General evaluation criteria for CALS and specific evaluation criteria for CITIS follow.

4.2.7.1 **General evaluation criteria**. These criteria are used to evaluate the contractor's compliance with CALS sections of the RFP with respect to CALS implementation.

Value for "CALS Implementation" shows up in a number of different areas. Offerors' proposals for digital delivery of CDRL items will be evaluated by the area requiring them, e.g., Technical Publications personnel will evaluate the Technical Publications part of proposals. Their evaluation will include assessment of value for delivery of CDRL items in the required CALS formats. Overall, the value of applying the CALS strategy should be a lower life-cycle cost and higher quality product.

4.2.7.2 **CITIS evaluation criteria**. The source selection evaluation team should have a high confidence in the proposed offeror's ability to meet the following requirements:

a. Data acceptance and CITIS functionality (see 4.2.3.1 and 4.2.3.2);

b. System and administrative security capabilities (consult MIL-STD-1785, applicable FIPS Pubs, and other DoD directives accommodating classified and sensitive unclassified information). Exchange of data in a digital environment may warrant encryption and decryption capabilities;

c. Interchange requirements, e.g., speeds, capacity, compatibility, etc.;

d. System configuration controls and procedures;

e. Proposed transmission methodology; and

f. Capabilities of database management and retrieval application (digital data products needed to acquire and support a defense system in a CALS environment).

4.3 **Implementation processes**. CALS may be implemented using a three-part approach: on-line services; digital data delivery; and integration of product, process, and data. Figure 6 illustrates the CALS contract elements, the CALS/Concurrent Engineering (CALS/CE) environment, and the military standardization documents that enable a CALS digital data product. This CALS/CE environment is best described by functionally integrated Government/industry teams working with shared and integrated product and process data to enhance design, development, manufacturing, and support activities (see 4.3.6).

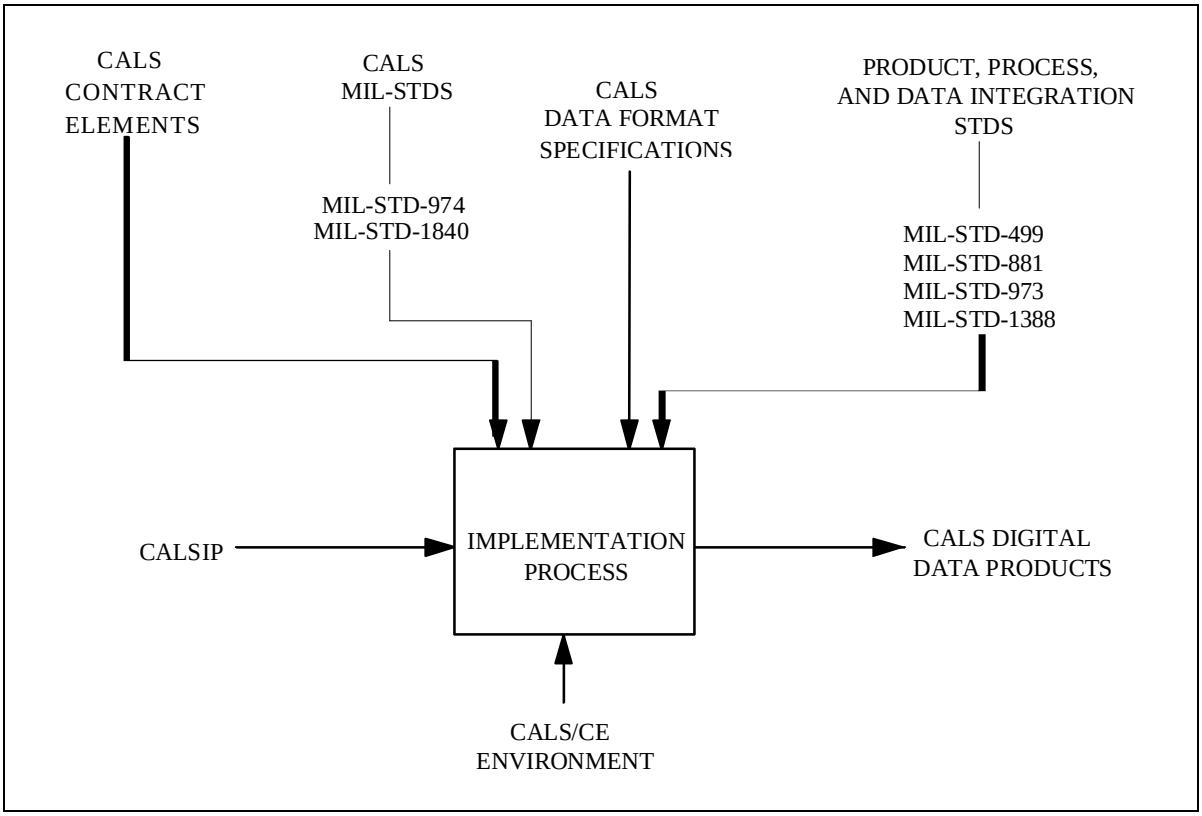

FIGURE 6. Implementation process.

4.3.1 **CALS contract elements**. CALS RFP elements, the GCO, the CAC submittal during source selection evaluation, the CALSIP (if required), and other specific evaluation criteria will lead to a definitive set of CALS requirements in the contract. These elements are the basis for a successful CALS implementation.

4.3.2 **CALS standards**. CALS standards and specifications are geared toward technical data interchange requirements. These documents serve as controls to ensure that information systems are hardware platform and proprietary data format independent.

4.3.2.1 **MIL-STD-974 - Contractor Integrated Technical Information Service**. This standard defines the scope of on-line services to provide access and delivery of digital data to the Government. Such contractor provided on-line services are known as the CITIS. The acquisition manager should review this standard for core and tailorable CITIS functions to perform the functions of updating, storing, controlling, reproducing, and distributing digital data. This standard is contractually invoked as referenced within the SOW and properly applied to the CDRL.

4.3.2.2 **MIL-STD-1840 - Automated Interchange of Technical Information**. This standard defines the exchange formats for digital data to support the CALS environment. This standard should be contractually invoked by being referenced within the SOW and being properly applied to the CDRL. This standard provides an overall instructional approach to the use of the CALS specifications. Also, MIL-STD-1840 addresses the interface of computer technologies that are automating the creation, storage, retrieval, and delivery of technical manuals, engineering drawings, and other digital data. MIL-STD-1840 addresses standard file sets and formats, data file representation standards, file naming conventions for the transfer of digital data, and shows how to map indexing information in Hollerith data to header records.

4.3.3 **CALS data format specifications**. These are the data format specifications that establish the requirements for delivery of digital data to the Government. These specifications control the SGML tagging conventions for processable text data files, the format for raster image data, vector graphics, graphics meta files, and the conventions for engineering design and product data. These standards are contractually invoked as referenced within the SOW and properly applied to the CDRL.

4.3.3.1 **MIL-D-28000 - Digital Representation for Communications of Product Data: IGES Application Subsets and IGES Application Protocols**. This specification defines a standard for product definition data formats. Product definition data consists of the elements required to define a product. It includes geometry, topology, relationships, tolerances, attributes, and features necessary to define a component part or assembly of parts for the purpose of design, analysis, manufacture, test, and inspection. MIL-D-28000 identifies the requirements to be met when technical data is delivered in the digital format of the Initial Graphics Exchange Specification (IGES) as specified by the American Society of Mechanical Engineers (ASME) standard ASME Y14.26M. Discrete subsets or application protocols of the ASME Y14.26M entities are identified by class according to the application for which the digital data is prepared. MIL-D-28000 addresses five classes with the possibility that additional classes will be added as soon as the technical work codifies their requirements and validates fitness for use. The five existing classes are:

a. Class I - Technical Illustration Subset;

b. Class II - Engineering Drawing Subset;

c. Class III - Electrical/Electronic Applications Subset (Note: Class III is not commercially supported and should therefore not be placed on contract);

d. Class IV - Geometry for Numerical Control (NC) Manufacturing Subset; and

e. Class V - Three-dimensional (3D) Piping Application Protocol.

4.3.3.2 **MIL-M-28001 - Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text**. This specification defines a standard for preparation of textual technical information using the SGML. Data prepared in conformance to these requirements will facilitate the automated storage, retrieval, interchange, processing, and presentation of technical information from heterogeneous data sources.

4.3.3.3 **MIL-R-28002 - Raster Graphics Representation in Binary Format**. This specification identifies the requirements to be met when raster graphics data represented in digital, binary form are delivered to the Government. This specification may be used to digitally capture data for purposes of automating presentation, storage, retrieval, and print-on-demand functions.

4.3.3.4 **MIL-D-28003 - Digital Representation for Communication of Illustration Data: CGM Application Profile**. This specification defines requirements to be met when two-dimensional picture descriptions or vector-oriented illustration data is delivered in digital format. This format is known as CGM and is suited for illustrations often found in training, maintenance, and technical manuals.

4.3.4 **Other digital data interchange standards**. Other industry standards developed for data interchange may be useful in exchanging specific types of data in digital format. Known as CALS building blocks, the following data formats provide the opportunity for acquiring intelligent data necessary to support specific applications for defense systems. Use of these standards will be by mutual consent.

4.3.4.1 **Very High Speed Integrated Circuit (VHSIC) Hardware Description Language (VHDL)**. The VHDL, ANSI/IEEE 1076, is a formal notation intended for use in all phases of the creation of electronic systems. Because it is both machine and human readable, it supports the development, verification, synthesis, and testing of hardware designs, the communication of hardware design data, and the maintenance, modification, and procurement of hardware. VHDL is typically used for top down system design, full custom chip design, application specific integrated circuit (ASIC) library development, validation of designs before and after synthesis, and development and debugging of model code. NIST adopted the ANSI/IEEE 1076-1987 VHDL Standard as a FIPS PUB 172, 29 June 1992. Additionally, MIL-STD-454N, Standards General Requirements for Electronic Equipment, and Requirement 64, Microelectronics Devices Requirements for Electronic Equipment, specify the use of ANSI/IEEE 1076 for device design and documentation.

4.3.4.2 **Electronic Design Interchange Format (EDIF)**. The EDIF standard (ANSI/EIA 548-1988) was developed by the Electronic Industries Association (EIA) to address the exchange of electronics product data between diverse CAD hardware and software. EDIF features and keywords support both design and manufacture of electronic systems. EDIF was designed to address all concerns shared by the electronic design community, including simulation models, schematics, and integrated circuit layouts.

4.3.4.3 **IPC-D-350 - Printed Board Description In Digital Form**. This industry standard from the Institute for Interconnecting and Packaging Electronic Circuits (IPC), specifies 80 character, fixed-length record formats used to describe printed-circuit board products with detail sufficient for tooling, manufacturing, and testing requirements. These formats may be used for transmitting information in digital form between design and manufacturing facilities. IPC-D-350 records are also useful when the manufacturing cycle includes computer-aided processes and numerically controlled machines.

4.3.5 **Product, process, data integration standards**. CALS implementation in the acquisition process should establish, either through competition or by incentives, an integrated design, development and manufacturing environment that demonstrates functionally integrated teams working with shared data. Acquisition managers should address these CALS integration requirements: product integration, process integration, and data integration.

4.3.5.1 **MIL-STD-499 - Engineering Management**. This standard assists in defining, performing, managing, and evaluating the systems engineering process efforts in defense systems acquisitions and technology developments. This standard implements the technical essence of concurrent engineering and supports integrated product and process development by requiring the simultaneous development of system products and life-cycle processes to satisfy user needs, the utilization of a multi-disciplinary approach, and a systems engineering methodology.

4.3.5.2 **MIL-STD-881 - Work Breakdown Structure for Defense Materiel Items**. This standard establishes criteria governing the preparation and employment of WBS for use during the acquisition of designated defense materiel items. The uniformity in definitions and approach for developing the upper three levels of the WBS established by this standard is expected to promote compatibility of multiple-data requirements.

4.3.5.3 **MIL-STD-973 - Configuration Management (CM)**. Sets forth CM practices which are to be tailored to specific programs and implemented by the contract SOW language. Applies technical and administrative direction over the life-cycle of configuration items, and describes in technical documentation the functional and physical characteristics of existing or planned hardware and software to meet product development and mission needs.

4.3.5.4 **MIL-STD-1388 - Logistic Support Analysis**. MIL-STD-1388-1 provides general requirements and task descriptions governing performance of logistic support analysis during the life-cycle of systems and equipment. The goal of this standard is a single, uniform approach by the military services for conducting those activities necessary to (a) cause supportability requirements to be an integral part of system requirements and design, (b) define support requirements that are optimally related to the design and to each other, (c) define the required support during the operational phase,

and (d) prepare attendant data products. MIL-STD-1388-2 prescribes the data element definitions, data field lengths, and formats for LSAR data. It identifies the LSAR reports that are generated from the LSAR data and identifies the LSAR relational tables and ADP specifications for transmittal and delivery of automated LSAR data. This standard allows for delivery of LSAR data in manual or automated mode and on-line access to LSAR data as specified by the requiring authority.

4.3.6 **CALS/CE environment**. Product, process, and data integration enhance a design, development, manufacturing, and support environment that demonstrates functionally integrated Government/industry teams working with shared data. This environment, variously known as concurrent engineering, simultaneous engineering, or integrated product development (IPD), is espoused in CALS policy.

4.3.6.1 **Government and contractor teamwork**. All parties to the contract need to work as a team to ensure effective post-award implementation of the CALS strategy. Teaming should ensure that implementation remains a low risk venture and that continuous process improvements can be implemented as technology advances.

4.3.6.2 **Infrastructure modernization**. The goal of DoD infrastructure modernization is to employ a standards-driven, open-system architecture that supports uniform integrated and interrelated functional processes among all services and the DLA (see 6). A migration towards achieving this goal is being accomplished by two means:

a. Development of a Joint Service system that embodies the target system design and functional attributes and provides a fully encompassing infrastructure for evolving complementary systems; and

b. Modification of existing and near-term planned systems for evolution towards CALS requirements and the target system concept.

Joint DoD CALS infrastructure initiatives such as JCALS and JEDMICS, and applications initiatives such as CAD2 tools, provide specific capabilities within the CALS strategy. The capabilities provided by each of these specialized systems will migrate towards a cohesive information management system. Other considerations include data conversion and data requirements for parts on demand infrastructures such as Rapid Acquisition of Manufactured Parts (RAMP) and Flexible Computer Integrated Manufacturing (FCIM).

A very important goal of joint DoD systems is the need to achieve interoperability with those in industry who are providing CITIS to DoD defense systems managers. As DoD components and industry evolve towards interoperable systems, common and consistent applications of CITIS will also evolve (see 6.2).

4.3.7 **CALS digital data products**. The results of applying CALS during the acquisition process are standard digital data products. These products, received into an integrated information management system, foster greater product, process, and data integration - enabling the Government to reduce its life-cycle cost for managing higher quality data.

5. SPECIAL CONSIDERATIONS FOR EXISTING DEFENSE SYSTEMS

CALS implementation should be considered for existing defense systems, spares re-procurement, product improvements, non-developmental items (NDI), and commercial off-the-shelf (COTS) items. Opportunities to improve processes, accelerate schedules, or reduce costs using the CALS strategy should also be considered for all contract modifications and life-cycle phase transitions.

5.1 **Considerations**. Considerations for applying CALS to new defense system acquisitions provide the basis for CALS implementation on existing defense systems.

Applying CALS to existing defense systems will vary depending on program phase, type, size, and duration. Two approaches to CALS implementation on existing programs are contract modifications or incentive programs that encourage the contractor and their subcontractors to undertake modernization projects. Acquisition managers may choose to conduct a study to explore opportunities that can be summarized in a CALSIP.

The CALS considerations for existing defense systems processes, shown in figure 7, can aid in documenting the results of the investigation. The following sections provide further clarification of the checklist factors.

5.1.1 **Examine opportunities**. Programs that require large quantities of paper deliverables are burdened by costs associated with the printing, management, storage, shipping, and volume of data required in hard copy format. In order to implement a successful CALS approach each of the various data categories listed below should be investigated for applicability:

a. Management and administrative data;

b. Product description data;

c. Integrated Logistic Support (ILS)/LSA plans and reports; and

d. Publications.

5.1.2 **Investigate data key points**. Within each type of data and CDRL item it is necessary to investigate the key points that will impact the cost and resources of implementing CALS. The following key points need to be considered during the decision making process:

a. Data availability - the availability of data and how it is to be handled must be considered. Also, consider how the data is going to be used, particularly if the data must be digitized into a processable data format or converted to another digital format for the end user. Data availability may be impacted by the limited/restricted rights status associated with each CDRL-identified data deliverable.

b. Data accuracy - it may be necessary to institute an elaborate quality assurance process to validate the accuracy of the existing data, especially older data, when making necessary conversions to digital form.

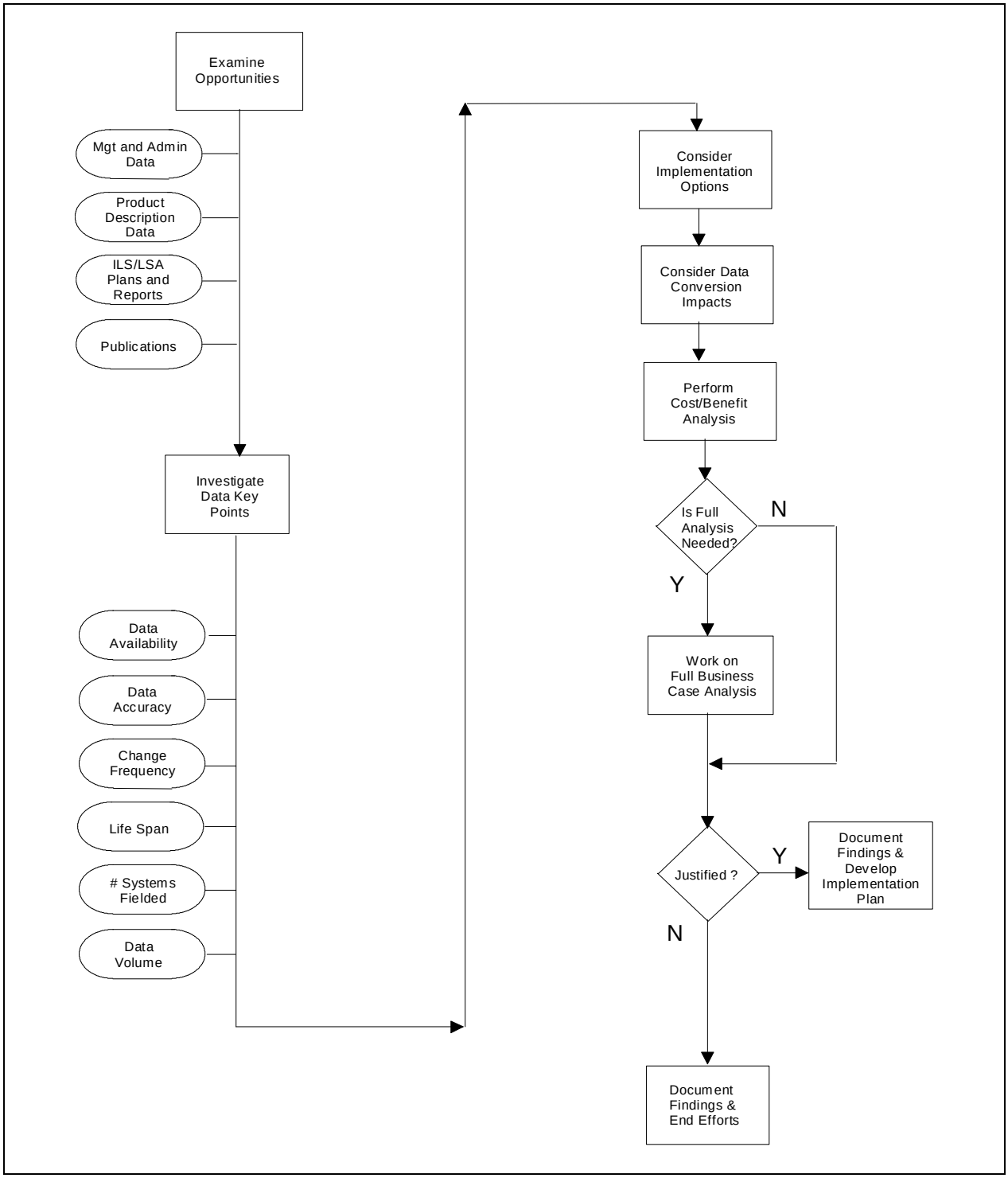

FIGURE 7. CALS considerations for existing defense systems.

c. Change frequency - how often the data changes or the potential for data obsolescence is another key consideration. The acquisition manager may determine that the required frequency for change strongly influences the cost effectiveness of implementing CALS.

d. Life span - the life span of the defense system may be a key factor in determining if it is practical to convert data into digital form. If the life span is long, even small short term gains from applying CALS may be appreciable over the program life-cycle.

e. Number systems fielded - the number of systems that have been fielded and that are planned to be fielded should be taken into consideration. It may be impractical to acquire digital data if there are few fielded systems requiring support.

f. Data volume - the amount of data that is to be acquired, converted, stored, or processed should be considered in the decision process. The justification of savings brought about by eliminating the hard copies is an important aspect in determining the effect of data conversion for a program.

5.1.3 **Consider implementation options**. Consider the many different options prior to making a decision about applying CALS to existing defense systems. The following implementation options should be considered:

a. Task/contract change proposals - descriptions of the proposed changes should include documentation to describe the change in sufficient detail to support formal change approval and contractual authorization.

b. Engineering Change Proposals (ECPs) - ECPs offer to change the specifications and will include descriptions of the proposed change, including documentation by which the change is described to support formal change approval and contractual authorization.

c. Incentive programs - incentive programs such as the VECP, the Manufacturing Technology (MANTECH) Program, and any other cost/benefit sharing programs offered by the Government, are intended to encourage industry to undertake modernization activities that would not otherwise be included in their operating plan.

5.2 **Consider data conversion impacts**. Data models used to support older military products will require reconfiguration to allow valid execution of the application programs. Data size (megabytes), transaction rates, data sensitivity, "as is" versus "to be" operating systems, simplification and standardization of data formats, existing DoD infrastructure capabilities, and protocol converters will have to be taken into account.

5.3 **Perform cost/benefit analysis**. A cost/benefit analysis is required to support major investments made under the Corporate Information Management (CIM) process. Two of the four elements for the implementation of CALS (establishment of an infrastructure and business process improvements) may require a business case to be developed. The element that is within the discretion

of the defense system acquisition manager is the development of requirements for digital data products and information services. Normally, a cost/benefit analysis provides an adequate level of support to the acquisition manager's decision-making process. However, under some circumstances (e.g., meeting Defense Management Review Decisions (DMRD) or deploying information technology that are substantial infrastructure investments) an acquisition manager may be required to develop a full business case. This is also known as a Functional Economic Analysis (FEA), and includes the activities briefly described below. For a detailed explanation of the FEA see "The Corporate Information Management Functional Economic Analysis Guidebook".

a. Defining the scope of the business case analysis. The scope of the analysis corresponds to the functional activities that CALS would support.

b. Determining the cost drivers of the activities and the required performance metrics. The cost drivers point toward those activities that are subject to computerization.

Typical non-recurring costs are:

1. Computer hardware;

2. System development and installation;

3. Software interfaces;

4. Data configuration;

5. Network installation and protocols;

6. Enhancements and upgrades; and

7. Data conversion.

Recurring costs include:

1. System maintenance;

2. Digital data creation, use, and maintenance;

3. Data storage, delivery, transmission, and distribution; and

4. Training.

c. Create an "as is" and "to be" activity resource technology matrix. In this step, determine which resources (time, personnel, money, and technology) are required to perform the functional activities. The objective is to set-up a cost matrix to determine the cost savings between the "as is" approach and the "to be" (CALS implementation) approach.

d. Document the "as is" organizational state and the "to be" organizational action/transition plan. Estimate the transition costs. In this step, the focus is on estimating and tracking how the organizational requirements, including infrastructure, will change over the time frame of the analysis, and how CALS implementation costs would be priced and measured across that same time frame. In this step, estimate the costs of digital data format and media format validation, personnel training, and other transition costs.

e. Perform decision/trade study analysis. Invariably there will be many choices, options, schedules, architectures and technologies that are competing for the investment dollar.

6. DoD INFRASTRUCTURE MODERNIZATION-JCALS

The goal of Government infrastructure systems modernization is to migrate toward a DoD target system design concept. The target system concept employs a standards-driven, scalable, open-system architecture which supports uniform integrated and interrelated functional processes among all services and the DLA. This migration is being approached by: 1) development of a DoD CALS system which embodies all the target system design and functional attributes, and whose infrastructure will serve as the integrating agent for evolving complementary infrastructure systems; and 2) upgrade of existing and near-term planned systems for progression towards CALS compliancy and target system concepts. Therefore, the overall infrastructure modernization will be a combination of top-down and bottom-up approaches which will provide a cost-effective CALS solution for acquiring and managing information.

6.1 **JCALS design**. The DoD CALS infrastructure program, presently known as JCALS, provides an Information Management System (IMS) that is evolving to support uniform logistic, acquisition, engineering, manufacturing, configuration management, materiel management, and other life-cycle functional processes. This will be facilitated through the use of its multi-weapon system IWSDB, Global Data Dictionary and Directory (GDD/D) services, extensive networked telecommunications, and its strict adherence to CALS and CIM Technical Reference Model (TRM) standards. Data residing in the JCALS system, or in any system to which JCALS will interface (including JEDMICS), will be transparently available to any user with a need-to-know and proper access privileges. The system will provide uniform applications and services to implement joint functional processes through the use of the JCALS Workbench. This workbench will provide a uniform human-user interface (HUI) and will give transparent access to all data, applications, and software tools available throughout the architecture. The system, through the workbench, will provide a flexible work-flow management capability which will be tailorable to suit the organizational structure of the service, command, or workplace while ensuring that future changes can be accommodated easily.

The JCALS open-system architecture will implement a communications and computing infrastructure based on the TRM standards. The architecture will be scalable such that it will allow growth in scope, size, functionality, and processing speed without the necessity for major re-engineering. This will be accomplished via adherence to open systems architecture standards, and through modular hardware and data-driven modular software design. Future CALS implementers, including those responsible for systems being developed, should adhere to the TRM standards and to JCALS implementation direction to ensure interoperability and to avoid costly bridging efforts.

6.1.1 **Integrated Weapon Systems Database (IWSDB)**. The JCALS IWSDB will provide a multi-weapon system repository that services multiple acquisition and logistic functions. IWSDB will read, write, modify, delete, and grant application-usage permission on a need-to-know basis. Enforcement will be by a multi-level secure (MLS) trusted computing base (TCB) rated initially at a B1 level of trust and progressing to a B3 level. JCALS will provide transparent access to technical information regardless of where it resides within the IWSDB's distributed databases. All technical information will be strictly configuration managed. Configuration impacts due to changes will be identified by JCALS object-oriented data management service.

6.1.2 **Global Data Management System (GDMS)**. The JCALS GDMS will provide the services required to access and manage the distributed data of the IWSDB. The GDMS will respond to requests from applications or requests stored internally to JCALS to access, store, and manage data. One example of responding to requests stored internally is the production of summary data from an existing system to be stored on-line for access by system users.

The GDMS will store data in the IWSDB in a physically distributed manner. Data may be stored where the data was created, where the data will be used most frequently, or in an existing system which already contains this type of data. This will involve managing physically distributed data that may not reside in the same location as the owner/proponent of the data.

The GDMS will ensure the correctness of the user and application views and maintains the integrity of data accessed and modified. The GDD/D database will serve as a repository of data management policy and data integrity requirements for data stored in the IWSDB. Existing systems will retain control and integrity responsibilities for their own data. The GDMS will ensure that access of existing systems data does not violate the official ownership or integrity rules of that system. The execution of an existing system's programs will be directly under the control of the existing system.

6.2 **Relationship of JCALS and CITIS**. The Government infrastructure being developed and the CITIS are viewed as complementary concepts. The JCALS system provides the preferred Government gateway to the contractor enterprise (see figure 8). The use of JCALS provides a known set of interface parameters (i.e., data elements, GDD/D, interface protocols, etc.). This will allow acquisition managers to easily construct GCOs for their programs that will provide consistent and cost-effective solutions over the defense system life-cycle.

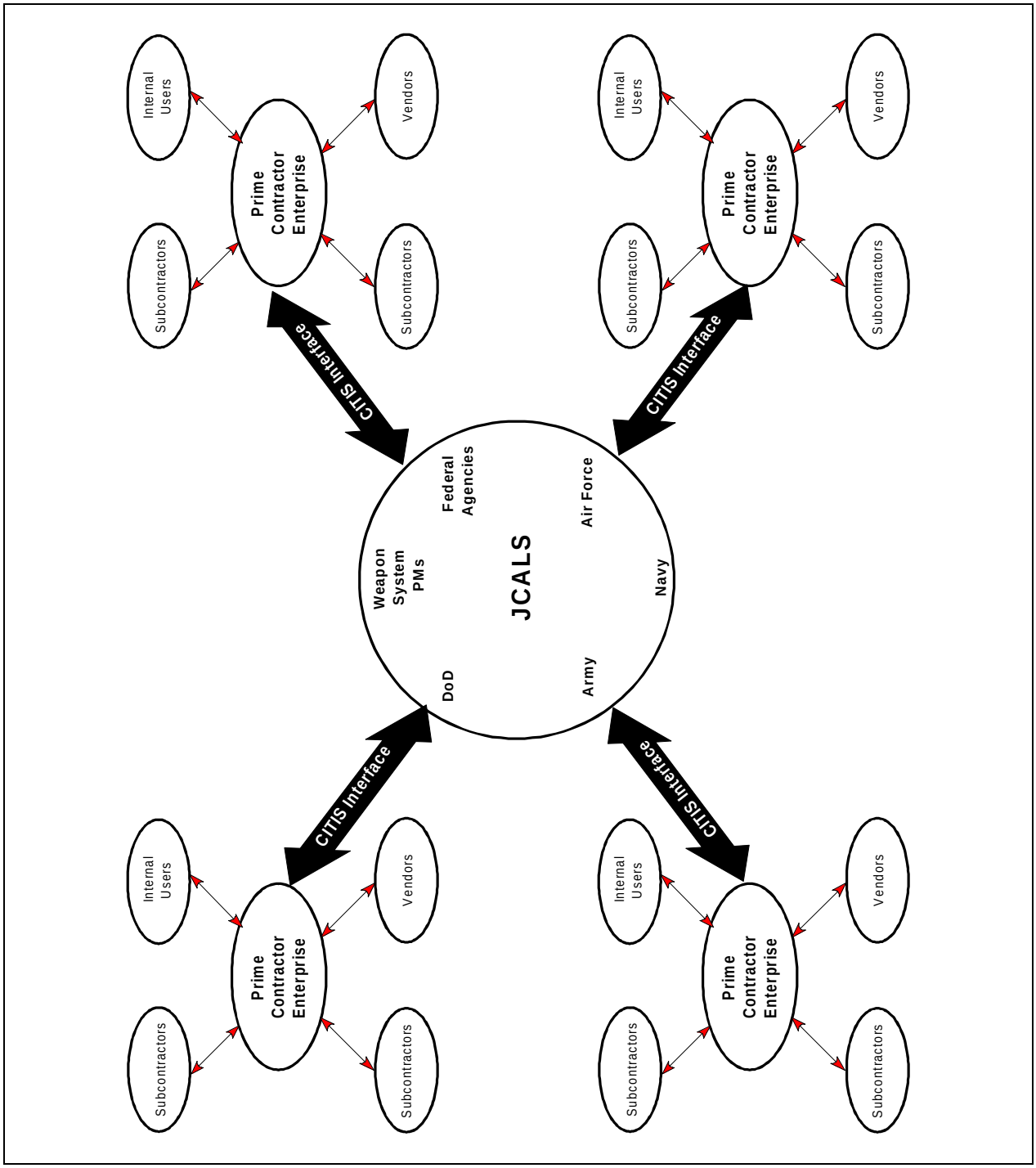

FIGURE 8. JCALS/industry interface.

JCALS system specifications indicate the following four options (which are not mutually exclusive) for bi-directional CITIS interface (see figure 9): 1) non-interactive data exchange using removable digital media (e.g., MIL-STD-1840 magnetic or optical media); 2) selected CITIS functions using dial-up or network access capabilities; 3) on-line interface where data dictionaries are mapped to each other for transparent, seamless access; and 4) fully integrated, JCALS site-type interface for which the contractor is furnished GDD/D services, software and, if required, equipment (dependent on the infrastructure already in place at the contractor's site).

As the JCALS system evolves, the acquisition manager should consider implementing the fourth option of JCALS/CITIS interface as the most assured methodology of achieving compatibility. However, if the cost-effectiveness of this strategy is prohibitive, then providing the contractor with compatibility guidance to achieve the third option of JCALS/CITIS interface is recommended. Either strategy will ensure that the interface is streamlined and standardized; minimize the problems incurred by an acquisition manager requiring access to multiple CITIS systems; provide for easier technical information download/transition to JCALS; and ensure that software tools are more uniform. The option 3 interface is achievable through adherence to the compatibility standards in appendix A which are based on the TRM and CALS standards. Most important of these standards are the data dictionary standards. JCALS is in the process of submitting data elements for standardization through its Functional Data Administrator (FDA) and Defense Information Systems Agency (DISA). These data elements will be documented in the JCALS data model and its Data Element Dictionary. Options 1 and 2 represent the least sophisticated types of CITIS connection, and have several inherent drawbacks (among them are potential delays in receiving timely technical information). Acquisition managers should determine which CITIS options will be implemented based on a business case analysis to be documented in the GCOs for their programs.

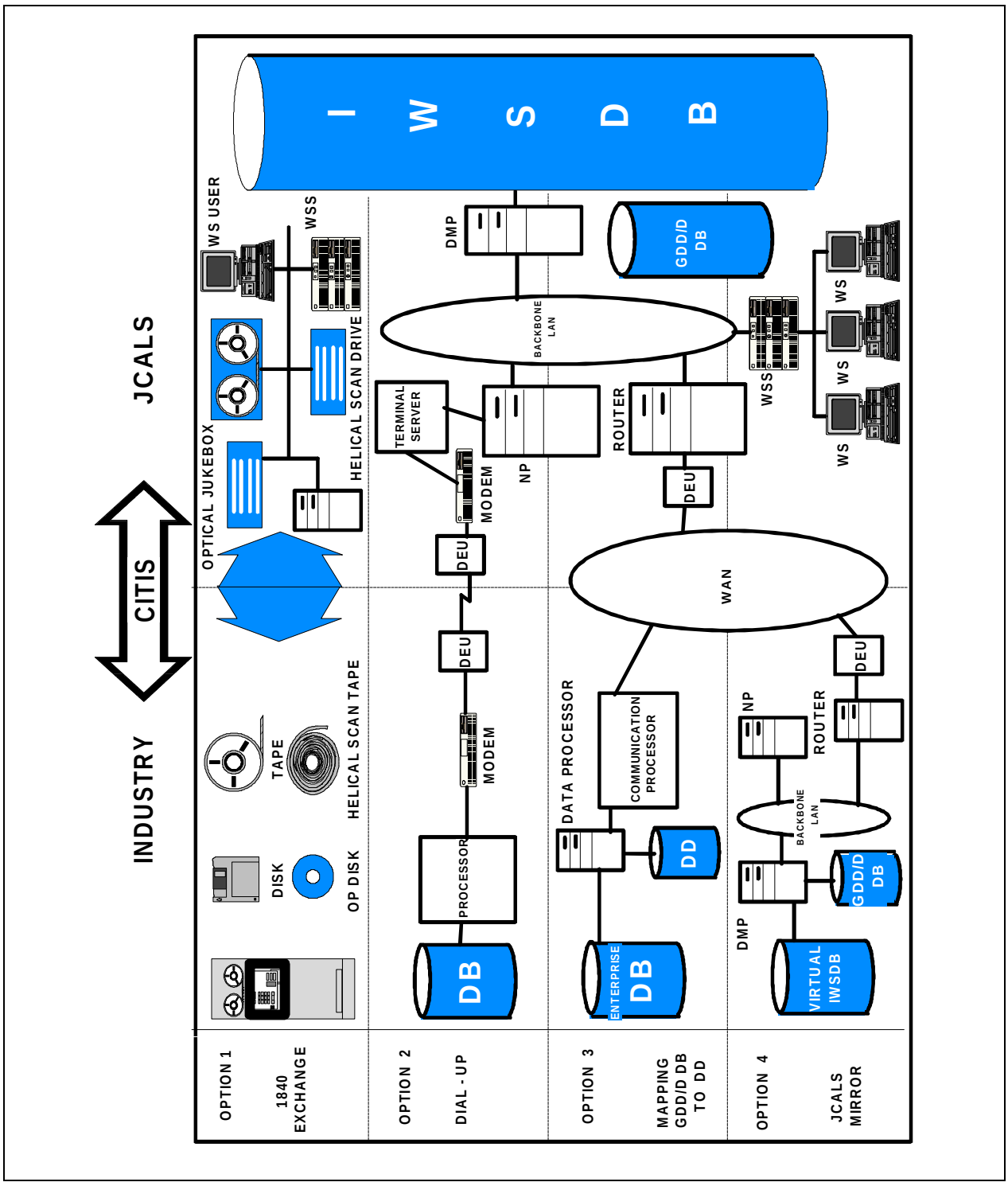

FIGURE 9. JCALS/CITIS interface levels.

6.3 **Responsibilities of the acquisition manager**. The acquisition manager is responsible for all expenses associated with establishing CITIS connections to industry via the four options described in section 6.2. These expenses may include hardware, software, and networking development/ enhancement costs, plus any labor required for proper data dictionary mapping efforts. The JCALS PM's role is generally limited to funding for the design, development, test, and installation of the JCALS system at designated sites. The JCALS PM also provides funds for establishing infrastructure connectivity to selected DoD existing IMSs as approved by OSD.

Those infrastructure requirements within the discretion of the acquisition manager should adhere to the design and functionality of the JCALS system. Existing and near-term infrastructures have to progressively evolve towards JCALS capabilities and functionality. Contact the JCALS point of contact, the Service point of contact, or your local CALS office for more information (see appendix G).

6.4 **Compatibility standards**. The JCALS design, functionality, and implementation are standards-driven. JCALS embodies the precepts of the DoD CALS Architecture (e.g., Information Architecture, Computer Systems Architecture, and Control Architecture) and adheres to or exceeds their requirements and the CIM TRM. The standards employed by JCALS can be categorized into two broad categories: information and architecture.

a. Information:

Data Dictionary -

- DoDD 8320.1 - DoD Data Administration
- DoD 8320.1M - DoD Data Element Standardization Procedures Manual
- DoD 8320.1-M-1 - Data Element Standardization Procedures
- IRDS - Information Resource Dictionary System
- MIL-STD-973 - Configuration Management

Data Format -

- MIL-D-28000 - Digital Representation for Communication of Product Data: IGES Application Subsets and IGES Application Protocols
- MIL-M-28001 - Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text
- MIL-R-28002 - RASTER Graphics Representation in Binary Format, Requirements for
- MIL-D-28003 - Digital Representation for Communication of Illustration Data: CGM Application Profile
- VHDL - VHSIC Hardware Description Language
- EDIF - Electronic Design Interchange Format
    - IPC-D-350 - Printed Board Description in Digital Form
- PDES/STEP - Product Data Exchange using STEP/Standard for Exchange of Product Model Data
- MIL-STD-1388-2 - DoD Requirements for a Logistic Support Analysis Record
- MIL-STD-100 - Engineering Drawing Practices
- ASCII - American Standard Code for Information Interchange

Interchange -

- MIL-STD-1840 - Automated Interchange of Technical Information

b. Architecture: CIM Technical Reference Model

Software -

- Application Portability Profile (APP)
- POSIX - Portable Operating System Interface
- MIL-STD-1815 - Ada Programming Language
- FIPS Pub 127.1 - Database Language SQL with Integrity Enhancement
- DoD-STD-2167 - Defense System Software Development
- MIL-STD-1472 - Human Engineering Design Critical for Military Systems Equipment and Facilities
- MIL-STD-1838 - Common Ada Programming Support Environment (APSE) Interface Set (CAIS)

Communications -

- FIPS PUB 146 - Government Open Systems Interconnection Profile (GOSIP)
- Transmission Control Protocol/Internet Protocol (TCP/IP)
- ANSI X.25 - Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks by Dedicated Circuit
- ANSI X.420 - Message Handling Systems - Interpersonal Messaging User Agent Layer
- IEEE 802.3 - Information Technology - Local and Metropolitan Area Network - Part 3: Carrier Sense Multiple Access with Collision Detectors (CSMA/CD) Access Method and Physical Layer Specifications
- IEEE 802.4 - Information Processing Systems - Local Area Networks - Part 4: Token-Passing Bus Access Method and Physical Layer Specifications
- FDDI - Fiber-Optic Distributed Data Interface
- ISDN - Integrated Services Digital Network
- ANSI X.400 - Message Handling Systems - System Model - Service Elements
- ANSI X.500 - The Directory - Overview of Concepts, Models and Services
- FTAM - File Transfer Access and Management
- ASC X12 Electronic Data Interchange (EDI)
- MIL-STD-1781 - Simple Mail Transfer Protocol

Security -

- DoD 5200.28-STD - DoD Trusted Computer System Evaluation Criteria Rainbow Series
- AR 380-19 - Information Security Systems
- DES - Data Encryption Standard
- Executive Order 12356 - National Security Information

Application Programming Interface -

- X-Windows
- Motif
- ANSI - American National Standards Institute
- PHIGS - Programmer's Hierarchical Interactive Graphics System
- GKS - Graphical Kernel System (ISO/Data Proc.)

Hardware -

- Industry Standards

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

APPLICABLE DOCUMENTS

10. SCOPE

10.1 **Scope**. This appendix is not a mandatory part of the handbook. The information contained herein is for guidance only.

20. **Applicable documents**.

20.1 **Government documents**.

20.1.1 **Specifications, standards, and handbooks**. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto.

SPECIFICATIONS

MIL-D-28000	Digital Representation for Communication of Product Data: IGES Application Subsets and IGES Application Protocols
MIL-M-28001	Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text
MIL-R-28002	Raster Graphics Representation in Binary Format, Requirements For
MIL-D-28003	Digital Representation for Communication of Illustration Data: CGM Application Profile
MIL-T-31000	Technical Data Packages, General Specification For
MIL-M-38784	Manual, Technical, General Style and Format Requirements
MIL-M-87268	Manuals, Interactive Electronic Technical: General Context, Style, Format, and User-Interaction Requirements
MIL-D-87269	Data Base, Revisable: Interactive Electronic Technical Manuals, for the Support Of
MIL-Q-87270	Quality Assurance Program: Interactive Electronic Technical Manuals and Associated Technical Information; Requirements for

APPENDIX A

STANDARDS

MIL-STD-100	Engineering Drawing Practices
MIL-STD-499	Engineering Management
MIL-STD-881	Work Breakdown Structure for Defense Materiel Items
MIL-STD-973	Configuration Management
MIL-STD-974	Contractor Integrated Technical Information Service (CITIS)
MIL-STD-1379	Military Training Programs
MIL-STD-1388-1	Logistic Support Analysis
MIL-STD-1388-2	DoD Requirements for a Logistic Support Analysis Record
MIL-STD-1472	Human Engineering Design Critical for Military Systems Equipment and Facilities
MIL-STD-1777	Internet Protocol
MIL-STD-1778	Transmission Control Protocol
MIL-STD-1781	Simple Mail Transfer Protocol
MIL-STD-1806	Marking Technical Data Prepared by of for the Department of Defense
MIL-STD-1815	Ada Programming Language
MIL-STD-1838	Common Ada Programming Support Environment (APSE) Interface Set (CAIS)
MIL-STD-1840	Automated Interchange of Technical Information
DoD-STD-2167	Defense System Software Development

APPENDIX A

HANDBOOKS

MIL-HDBK-248 Acquisition Streamlining

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

20.1.2 **Other Government documents, drawings, and publications**. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein.

AR 380-19 Information Security Systems

DoDD 5000.1 Defense Acquisition

DoDI 5000.2 Defense Acquisition Management Policies and Procedures

DoDI 5000.2M Defense Acquisition Management Documentation and Reports

DoDD 8320.1 DoD Data Administration

DoD 8320.1-M-1 Data Element Standardization Procedures

DoDD 8320.1M DoD Data Element Standardization Procedures Manual

DoD 5200.28-STD DoD Trusted Computer System Evaluation Criteria

Executive Order 12356 National Security Information

(Application for copies should be made to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

20.2 **Non-Government publications**. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS.

FEDERAL INFORMATION PROCESSING STANDARDS (FIPS)

FIPS PUB 146 Government Open System Interconnect Profile (GOSIP)

FIPS PUB 151 Portable Operation Systems Interface (POSIX) for Computer Environments

APPENDIX A

FIPS PUB 161 Electronic Data Interchange (EDI)

(Copies of Federal Information Processing Standards (FIPS) are available to Department of Defense activities from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

IEEE 802.3 Carrier Sense Multiple Access-Collision Detection, 1985

IEEE 802.4 Token Passing Bus Access Method, 1985

(Application for copies should be addressed to the Electronic Industries Association, Standard Sales, 2001 I Street, NW, Washington, D.C. 20006.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI X.25 ANSI Wide Area Network Protocol

ANSI/IEEE 1076-1987 IEEE Standard VHDL Language Reference Manual

ANSI X.420 Message Handling System: Interpersonal Message User Agent Layer

ANSI X.12 Accredited Standard Committee Draft Standards for Trial Use of Electronic Data Interchange

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018-3308.)

INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS (IPC)

IPC-D-350 Printed Board Description in Digital Form

(Application for copies should be addressed to IPC, Inc., 7380 North Lincoln Avenue, Lincoln Wood, IL 60646-1776.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 10303 Industrial Automation Systems - Product Data Representation and Exchange

APPENDIX A

(Copies are available from the Standardization Document Order Disk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, for issue to DoD activities only. All other requestors must obtain documents from the American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.)

CORPORATE INFORMATION MANAGEMENT (CIM)

AD-A261-390 Functional Economic Analysis Guidebook, Version 1.1

(AD-A261-390 is the order number for Version 1.1 of the Functional Economic Analysis Guidebook. Version 1.1 was the latest version when this handbook was printed. The order number for the subsequent versions of this document is available by calling 1-800-835-5246.)

(DoD components and Government contractors may obtain copies of this document from the Defense Technical Information Center (DTIC), Building 5, Cameron Station, Alexandria, VA 22202-6145. The public may obtain copies of this document from the U.S. Department of Commerce, National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161.)

20.3 **Order of precedence**. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

APPENDIX A

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B
ACRONYMS

10. SCOPE

10.1 **Scope**. This appendix contains a list of the acronyms used throughout this handbook. It is not a mandatory part of the handbook and the information contained herein is intended for guidance only.

10.2 **Acronyms**. The acronyms used in this handbook are defined as follows:

ADP	Automated Data Processing
ANSI	American National Standards Institute
AP	Application Profile/Application Protocol
APP	Application Portability Profile
ASC	Accredited Standards Committee
ASCII	American Standard Code for Information Interchange
ASIC	Application Specific Integrated Circuit
ASME	American Society of Mechanical Engineers
CAC	Contractor's Approach to CALS
CAD	Computer-Aided Design
CAD2	Computer-Aided Design, Second Acquisition
CAE	Computer-Aided Engineering
CALS	Continuous Acquisition and Life-Cycle Support
CALSIP	CALS Implementation Plan
CAM	Computer-Aided Manufacturing
CCITT	Consultative Committee on International Telegraphy and Telephony
CDRL	Contract Data Requirements List
CD-ROM	Compact Disk - Read Only Memory
CE	Concurrent Engineering
CGM	Computer Graphics Metafile
CIM	Corporate Information Management/Computer Integrated Manufacturing
CITIS	Contractor Integrated Technical Information Service
CLIN	Contract Line Item Number
CM	Configuration Management
CMP	Configuration Management Plan
COTS	Commercial-Off-The-Shelf
CTN	CALS Test Network
DAB	Defense Acquisition Board
DAL	Data Accession List
DAP	Document Application Profile
DES	Data Encryption Standard
DFARS	Defense Federal Acquisition Regulation Supplement
DID	Data Item Description
DISA	Defense Information System Agency

APPENDIX B

DISN	Defense Information Systems Network
DLA	Defense Logistics Agency
DLSC	Defense Logistics Services Center
DMRD	Defense Management Review Decision
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DTIC	Defense Technical Information Center
ECP	Engineering Change Proposal
EDI	Electronic Data Interchange
EDIF	Electronic Design Interchange Format
EDIFACT	Electronic Data Interchange For Administration, Commerce, and Transport
EIA	Electronic Industries Association
FAR	Federal Acquisition Regulation
FCIM	Flexible Computer Integrated Manufacturing
FDA	Functional Data Administrator
FDDI	Fiber-Optic Distributed Data Interface
FEA	Functional Economic Analysis
FIPS	Federal Information Processing Standard
FMECA	Failure Modes, Effects, and Criticality Analysis
FOSI	Formatting Output Specification Instance
FTAM	File Transfer, Access, and Management
GCO	Government Concept of Operations
GDD/D	Global Data Dictionary and Directory
GDMS	Global Data Management System
GFI	Government Furnished Information
GKS	Graphical Kernel System
GOSIP	Government Open System Interconnect Profile
HUI	Human-User Interface
IAW	In Accordance With
IC	Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
IETM	Interactive Electronic Technical Manual
IGES	Initial Graphics Exchange Specification
ILS	Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
IMP	Infrastructure Modernization Programs
IMS	Information Management System
IP	Internet Protocol
IPC	Institute for Interconnecting and Packaging Electronic Circuits
IPD	Integrated Product Development
IRDS	Information Resource Dictionary System
ISD	Instructional Systems Development
ISDN	Integrated Services Digital Network

APPENDIX B

ITO	Instructions To Offerors
IWSDB	Integrated Weapon Systems Database
JCALS	Joint CALS
JEDMICS	Joint Engineering Data Management and Information Control System
LAN	Local Area Network
LCCE	Life-Cycle Cost Estimate
LORA	Level Of Repair Analysis
LRG	Logistics Review Group
LSA	Logistics Support Analysis
LSAP	Logistics Support Analysis Plan
LSAR	Logistics Support Analysis Record
MACS	Mutually Agreeable Commercial Software
MAISRC	Major Automated Information System Review Council
MANTECH	Manufacturing Technology
MIS	Management Information System
MLS	Multi-Level Secure
NC	Numerical Control
NDI	Non-Developmental Item
NIST	National Institute for Standards and Technology
ODA	Office Document Architecture
OSD	Office of the Secretary of Defense
OSI	Open Systems Interconnection
OUSD (A&T)	Office of Under Secretary of Defense (Acquisition and Technology)
PDES/STEP	Product Data Exchange Using STEP/Standard for the Exchange of Product Model Data
PDL	Page Description Language
PHIGS	Programmer's Hierarchical Interactive Graphics System
PM	Program Manager
POSIX	Portable Operating System Interface
QA	Quality Assurance
QE	Quality Engineering
RAMP	Rapid Acquisition of Manufactured Parts
R&M	Reliability and Maintainability
RFD	Request for Deviation
RFP	Request For Proposal
RFW	Request for Waiver
SEMP	System Engineering Management Plan
SGML	Standard Generalized Markup Language
SIE	Special Inspection Equipment
SOW	Statement Of Work
SPA	Solicitation Package Automation
SQL	Structured Query Language
SRL	SGML Reuse Library
T&E	Test and Evaluation

APPENDIX B

TCB	Trusted Computing Base
TCP	Transmission Control Protocol
TDP	Technical Data Package
TEMP	Test and Evaluation Master Plan
TRM	Technical Reference Model
3D	Three-Dimensional
VECP	Value Engineering Change Proposal
VHDL	VHSIC Hardware Description Language
VHSIC	Very High Speed Integrated Circuit
WAN	Wide Area Network
WBS	Work Breakdown Structure
WMRM	Write Many Read Mostly
WORM	Write Once Read Many

APPENDIX C

DEFINITIONS

1. **Acceptance Testing**. The testing performed by a user to determine that an automated system (equipment or software) for a specific task or environment performs according to specification.

2. **Acceptance**. Acknowledgment by an authorized representative of the Government that a product, data, or service conforms with contract content and quality requirements. Acceptance may occur before, at, or after delivery.

3. **Acquisition Manager**. The system/equipment program manager, the program manager's staff, and other DoD officials responsible for determining contract requirements for the generation, acquisition, and use of defense system/equipment data, and having acquisition authority for defense systems and equipment.

4. **Alphanumeric File**. A data file containing structured numeric or alphanumeric fields. Database files are alphanumeric files.

5. **Application-Unique Data Standards**. A specific set of data entities, relationships among data entities, and their attributes, often expressed in the form of a data dictionary and a set of rules that govern data definition, data integrity, and data consistency.

6. **Audio/Visual File**. Files containing digitally formatted video or video and audio information products for use along with or in place of paper-based operations and training.

7. **Continuous Acquisition and Life-Cycle Support (CALS)**. A DoD and industry strategy intended to enable more effective generation, exchange, management, and use of digital data supporting defense systems.

8. **CALS Compliant**. Conforming to currently available CALS specifications, standards, and guidance for the type of digital data employed.

9. **CALS Control Architecture**. The Control Architecture provides the implementation structure for DoD management view of CALS that regulates the supply of information and related technologies provided by the Computer Systems Architecture. It contains data models developed in conjunction with the process models in the Information Architecture, data definitions and standards, technical and functional standards, and policies required to ensure that information resources support required functions. It also addresses the organizational structure that manages CALS, the business process that justifies it, and the strategic plan that directs the implementation.

10. **CALS Computer Systems Architecture**. The Computer Systems Architecture defines the relationship between software and hardware components needed to implement the Information Architecture processes, while being consistent with the Control Architecture. It represents how and where data is stored, managed, accessed, and delivered to the end user in the DoD infrastructure using

different technologies (e.g., databases, operating systems, application and system utilities, communication networks, and storage media).

11. **CALS Information Architecture**. The Information Architecture reflects the user's or DoD's professional view of CALS processes. It defines the relationships among the functional activities performed by the users, and includes the process models that describe what users do.

12. **CALS Implementation Plan**. A description of the way the contractor will apply CALS techniques throughout the life of the contract in order to satisfy service, infrastructure, media, and format requirements stated in the contract.

13. **Computer Graphics Metafile (CGM)**. Vector or mixed vector and raster description of two-dimensional pictures or illustrations.

14. **Concurrent Engineering**. A systematic approach to the integrated, concurrent design of products and their related processes, including manufacturing and support. This approach is intended to cause the developers, from the outset, to consider all elements of the product life-cycle from conception through disposal, including quality, cost, schedule, and user requirements.

15. **Contractor Integrated Technical Information Service (CITIS)**. CITIS is a contractor developed service which provides electronic access to or delivery of contractually required CDRL data to users. CITIS, and consequently the contract provisions for CITIS, does not include the databases to which access is granted, or the database process, or the format of data to be accessed through CITIS.

16. **Data Format**. The data formats are the forms in which each of the delivery/access methods can be procured. Data format is addressed in the CALS standardization documents.

17. **Data**. Recorded information, regardless of form or method of recording.

18. **Destination System**. The computer hardware, software, and network receiving transferred data.

19. **Document Image File**. A digital data file representation of a human interpretable document. Examples are raster image files and page description language files.

20. **Document Image Standard**. A technical standard describing the digital exchange format of a print/display file of a report or other document.

21. **Document**. Any subset of data that, packaged for delivery on a single medium, meets the format, content, consistency, and completeness requirements of a unified control specification, whether delivered in hard copy or digital form. A document is a self-contained body of data.

22. **Engineering Data**. Any technical data (whether prepared by the Government, contractor, or vendor) relating to the specification, design, analysis, manufacture, acquisition, test, inspection, or maintenance of items or services. Engineering data is comprised of all information that contains

authoritative engineering definition or guidance on material, constituent items, equipment or system practices, engineering methods, and processes.

23. **Functional Standard**. A document that establishes and defines requirements for management, design processes, procedures, practices, methods, and data applicable to the creation of data products.

24. **CALS Government Concept of Operations (GCO)**. GCO is a Government document used to communicate information about the Government infrastructure and CALS implementation strategy for defense systems.

25. **Government Receiving System**. The collective term for all Government agencies and offices responsible for receiving, processing, reviewing, or approving technical data ordered on Government contracts, including the destination system.

26. **Graphics File**. Files containing illustrations, design data, schematics, etc., in processable vector graphics or non-processable raster graphics.

27. **Graphics Standard**. A technical standard describing the digital exchange format of graphics data.

28. **Interactive Electronic Technical Manual (IETM)**. A technical manual, prepared (authored) by a contractor and delivered to the Government, or prepared by a Government activity, in digital form on a suitable medium, by means of an automated authoring system; designed for electronic window display to an end user.

29. **Infrastructure**. As used in this document, infrastructure is the underlying foundation or basic framework required for the creation, exchange, management, and use of digital data in a CALS environment.

30. **Integrated Data File**. A digital data file which integrates text, graphics, alphanumeric, and other types of data in a single (compound) file.

31. **Integrated Weapon Systems Database (IWSDB)**. A physically distributed, logically linked data structure for the total collection of shared product definition and support data for one or more defense systems as specified in the contract(s).

32. **Interactive Access**. The ability to access authorized portions of the source data maintained in contractor or Government systems via on-line telecommunications data transfers in real or near-real time using various types of queries.

33. **Legacy Data**. Archived or existing data that is part of a formally defined configuration baseline.

34. **Open-Systems Architecture**. A system in which different types of computer systems are capable of communication through the use of common standards and protocols.

APPENDIX C

35. **Processable Data Document**. Technical data in digital source form that is either organized and formatted so that an automated data processing system can further structure or restructure the data in a variety of ways, or is compatible for direct processing by an automated design, engineering, or logistic support system. Processable data can be updated or transformed for other applications such as production of document images.

36. **Product Data**. All engineering data necessary to define the geometry, the function, and the behavior of an item over its entire life span. The term includes logistic data elements for quality, reliability, maintainability, topology, relationship, tolerances, attributes, and data elements necessary to completely define the item for the purpose of design, analysis, manufacture, test, and inspection.

37. **Product Definition Data**. Denotes the totality of data elements required to completely define a product. Product definition data includes geometry, topology, relationship, tolerances, attributes, and features necessary to completely define a component part or an assembly of parts for the purpose of design, analysis, manufacture, test, and inspection.

38. **Product Description Data**. Includes design, analysis, manufacture, test, and inspection information typically included in a technical data package (e.g., engineering drawings and associated lists). Product description data also includes data requirements for DoD parts on demand infrastructures, i.e., RAMP and FCIM initiatives.

39. **Product Design Data**. Product data that describes the physical configuration and performance characteristics of an item in sufficient detail to ensure that an item or component produced in accordance with the data will be essentially identical to the original item or component.

40. **Product Support Data**. Data that describes the equipment, tools, techniques, item characteristics, or analysis necessary to operate, maintain, or repair the item by its end user.

41. **Product Manufacturing or Process Data**. Product data that describes the steps, sequences, and conditions of manufacturing, processing, or assembly used by the manufacturer to produce an item or component, or to perform a process.

42. **Raster**. A matrix, constructed of orthogonally positioned rows and columns of discrete data points. The binary value of each data point indicates the presence or absence of a pictorial (visual) artifact. The aggregate of the artifacts, displaying their assigned values, represents a raster graphic.

43. **Source System**. The computer hardware, software, and network that will structure digital information for interchange.

44. **Submitted Data**. The configuration management-controlled master version of the data "formally" submitted to the Government.

APPENDIX C

45. **Target System**. The future CALS architecture that will be a fully interoperable, integrated, open-system environment for technical information supported by comprehensive functional, technical, and data standards.

46. **Technical Data Package**. A technical description that is adequate to support acquisition of an item, including engineering, production, and logistic support. The technical description defines the design configuration and procedures required to ensure adequacy of item performance. It consists of all applicable technical data, such as engineering drawings, associated lists, product and process specifications and standards, performance requirements, quality assurance provisions, and packaging details.

47. **Technical Data**. Recorded information, regardless of form or method of the recording of a scientific or technical nature (including software documentation). The term does not include computer software or data incidental to contract administration, such as financial or management information.

48. **Technical Standard**. A standard that controls the medium or process of exchanging data between a sending and a receiving system. Data exchange is defined in terms of presentation formats and transformations of those presentation formats.

49. **Text File**. A file that uses the ASCII or similar system to represent the text of a document. Data within a text file is delineated as human readable words, sentences, and paragraphs rather than data elements.

50. **Text Standard**. A technical standard describing the digital exchange format of textual data.

51. **Text/Graphics Integration**. The necessary indexing and linkages between a computer readable text file and a separate computer readable graphics file, or graphics subsection of the same text file, such that both portions can be output or updated as a single, apparently continuous, unit.

52. **Validation**. The effort required of the contractor or preparing activity, during which the technical data product is tested for technical adequacy, accuracy, and compliance with the provisions of the specifications and other contractual requirements. Validation is accomplished by comparing the data product with the actual systems or equipment for which the data product was prepared. Validation is normally conducted at the preparing activity or vendor's facility.

53. **Vector Graphics**. The presentation of images stored as a vector or other mathematical representations.

54. **Verification**. A review process conducted under DoD component control to ensure that a deliverable meets all requirements stipulated in the contract, is in compliance with applicable DoD standards and specifications (unless waived by contract), and is complete and consistent with hardware/product configuration.

APPENDIX C

55. **Working Data**. Data for work in progress that has not been formally submitted to the Government, but may be provided for information purposes with the understanding that it is preliminary and subject to further iteration.

APPENDIX D
APPLICATION GUIDANCE FOR ACQUISITION OF DIGITAL DELIVERABLES

10. SCOPE

10.1 **Applicability**. This appendix provides guidance to Government activities on acquisition of digital deliverables in the functional areas that currently produce the greatest volume of hard copy technical data. It is applicable to all DoD components that acquire defense systems and equipment.

10.2 **Purpose**. This appendix provides decision guidance and model language for tailoring the wording of standard DoD RFPs and CDRLs to allow and encourage the integrated preparation and submission of, or access to, digital data for design, manufacturing, and support applications.

10.3 **Reference documents**. See list of references in appendix A.

10.4 **Acronyms and definitions**. See list of acronyms appearing in appendix B. See list of definitions appearing in appendix C.

APPENDIX D

20. GENERAL GUIDANCE

20.1 **Contracting for digital data**. A major thrust of the CALS program is delivery of or access to defense system data in digital form. CALS requirements for digital data should be delineated in DoD solicitations and contracts. Invoking CALS requirements should be made with full consideration of the ability of contractors to provide digital data and the ability of Government activities to make cost effective use of digital data deliverables or access.

20.2 **Development of the data management strategy**. The Government acquisition manager should develop a GCO that includes plans for data management and use of digital data for defense system acquisition, design, manufacture, and support prior to preparing an RFP. The GCO should document Government plans to acquire and use computer systems that can access, receive, store, process, and distribute digital technical data formatted in accordance with CALS requirements. Key factors include the time frames and actions for Service/Agency implementation of CALS capabilities for each data product applicable to the acquisition. Before digital data delivery or access is specified, the acquisition manager should evaluate productivity and quality gains to be achieved as a result of using technical data in digitized format.

Engineering documentation and logistic support information that have a long life span and complex publishing requirements should be stored in Government or contractor repositories for access by a broad user community. Many other data products can be delivered or accessed in accordance with a mutually agreeable, popular desktop publishing, word processing, spreadsheet, cost reporting, or scheduling package. Types of data products which are conducive to this method of data interchange include program plans, program management reports and schedules, cost reports, technical reports, test plans, test procedures, test reports, and agenda and minutes documenting meetings. Generally, these types of documents have a relatively short life span and limited user community, and are less complex with respect to their graphics and publishing requirements.

20.3 **Application of decision templates**. This appendix provides guidance for analysis of how technical data should be acquired by the Government from the contractor. Decision templates are provided for the following product areas: Technical Manuals, Technical Data Packages (including engineering drawings), Logistic Support Analysis Records, and Training Products. Decision templates are provided for each area to assist the acquisition manager in determining the extent digital data acquisition is appropriate for their defense system.

In each case, the templates should be tailored to meet the requirements of the functional areas that apply to the defense system being acquired. Of the applicable CALS standards and specifications, most allow contract-negotiable options. The acquisition manager should choose options to satisfy program-specific requirements, such as multiple classes or types of data formats and different requirements for draft, preliminary, interim, and final deliverables.

The alternatives in the templates are applied individually to each technical data requirement and are not mutually exclusive. For example, the acquisition manager may choose digital document image data for preliminary review and approval and processable data files for final deliverables.

APPENDIX D

20.4 **Technology development and insertion**. The technology for interfacing systems continues to evolve. This is reflected in all aspects of technical data delivery and access, and in the telecommunications and computer-aided capabilities through which data delivery and access are implemented. Data that cannot be provided cost-effectively through interactive access today will be routinely exchanged using this medium in the future. New specifications and standards will be developed and implemented to allow digital documents and processable data files to be more efficiently managed. Acquisition managers should be alert for opportunities to apply advanced technology, as well as cautious about premature implementation. CITIS and Government technical information system architectures should plan for technology insertion, and for the attendant problems of managing both multiple concurrent capabilities (e.g., raster and vector graphics) and multiple concurrent technology levels (e.g., untiled and tiled raster).

APPENDIX D

30. DETAILED GUIDANCE

30.1 **Organization of guidance sections**. This section is organized by functional area. Each section can be used separately or in combination with others to contract for digital CALS data. The functional areas covered are:

a. Technical manuals (30.2),

b. Technical data packages (30.3),

c. Logistic support analysis records (30.4), and

d. Training products (30.5).

30.2 Acquisition of technical manuals.

30.2.1 **Scope**. This section addresses the selection of digital data deliverables for technical manuals or technical orders. Technical manuals are the operating and maintenance instructions for military technicians. They contain a combination of textual narrative and illustrative graphic images presented in a formal, structured, page-oriented format governed by specific functional standards. These manuals have traditionally been prepared and delivered in hard copy form as camera-ready copy, which are, in turn, printed in large lots.

30.2.1.1 **Digital data deliverables**. The implementation of automated data processing technology offers numerous improvement opportunities in both preparation of technical manuals and in the delivery, storage, distribution, and maintenance of these manuals. Technical manual data in digital form can be stored on magnetic or optical media, transmitted and shown on computer terminals, and printed on demand. Acquiring technical manual deliverables in digital form allows the military user to view required information without printing it on paper. Acquiring processable data files provides the opportunity to tailor outputs for particular uses and users. Data can be reformatted into step-by-step trouble-shooting formats for maintenance personnel, it can be adapted to expert system diagnostic programs, or it can be used to generate training aids.

30.2.1.2 **Interactive Electronic Technical Manual (IETM)**. An IETM is a computer-based collection of technical information needed for troubleshooting and maintenance of a defense system. The information is visually arranged and formatted for interactive presentation to the end user on an electronic display system. Unlike other visual systems that display a page of text from a single document, IETMs present interrelated information from multiple sources, tailored to user queries in a hypertext format. This hypertext document consists of a collection of interconnected writings. These interconnections allow a user to browse through a document by selecting points of interest or hotspots that may be connected to other related hotspots or menus. Also, text, graphics, audio, or computer programs may be incorporated into the content of the document creating what is known as a hypermedia document.

APPENDIX D

IETMs permit the user to locate information more easily, and to present it faster, more comprehensively, and in a form that requires much less storage than paper. See MIL-D-87269, MIL-M-87268, and MIL-Q-87270 for IETM requirements.

30.2.2 **Decision node discussion**. Figure D-1 applies a decision template for acquisition of digital deliverables to technical manual deliverables. The following paragraphs discuss the required decisions shown in figure D-1.

30.2.2.1 **Deliverable options - decision #1**. Technical manual data can be delivered as composed documents or processable files. The composed document deliverable option offers the least flexibility, even in digital form. It is a static, formatted presentation of the manual, which can only be archived, viewed, and printed after receipt. Processable files, on the other hand, offer more robust capabilities. These files can be updated or transformed into many different data types.

With appropriate data processing systems, processable files can support creation of job guides, training documents, and eventual on-line distribution of selected portions of the data to maintenance personnel. In addition, a separate indexing mechanism may be needed for either machine or human search or access.

30.2.2.1.1 **Destination system constraints on form**. Processable data files are preferable to composed documents, but the presence of both text and graphics may cause some difficulty because not all presently installed computing equipment and software can simultaneously process text and embedded graphics. Nonetheless, during the period of intended use, available hardware and software at both the contractor's site (i.e., the source system) and the Government's site (i.e., the destination system) will be the deciding factor as to which form the deliverable may take.

30.2.2.1.2 **Interim dual deliverables**. Requirements for technical manual deliverables may include both composed documents in digital form and processable data files. However, until more advanced Government systems are available, it may be necessary to accept a hard copy (paper) technical manual for approval, reproduction, and distribution, and a digital form of the manual for archiving or update and maintenance. When the Government implements more advanced computer systems, processable technical manual files (with or without composed document image files of the technical manual) should suffice. Check with the appropriate Service CALS point of contact for up-to-date guidance.

30.2.2.2 **Forms options - decision #2**. A technical manual is made up of both text (including narrative and tables) and graphics. Integrating these elements into a complete technical manual and dealing with user requirements that are different for interim review and approval than for final delivery may require more than merely choosing a single optimum form. The acquisition manager may have to choose the appropriate forms for multiple deliverables (e.g., a document data file consisting of word processor to support in-process reviews, and processable data files for the final deliverable).

30.2.2.2.1 **Forms options - decision #2 (for composed documents)**. As shown at the top left of figure D-1, if composed documents have been selected at decision #1, the forms for technical

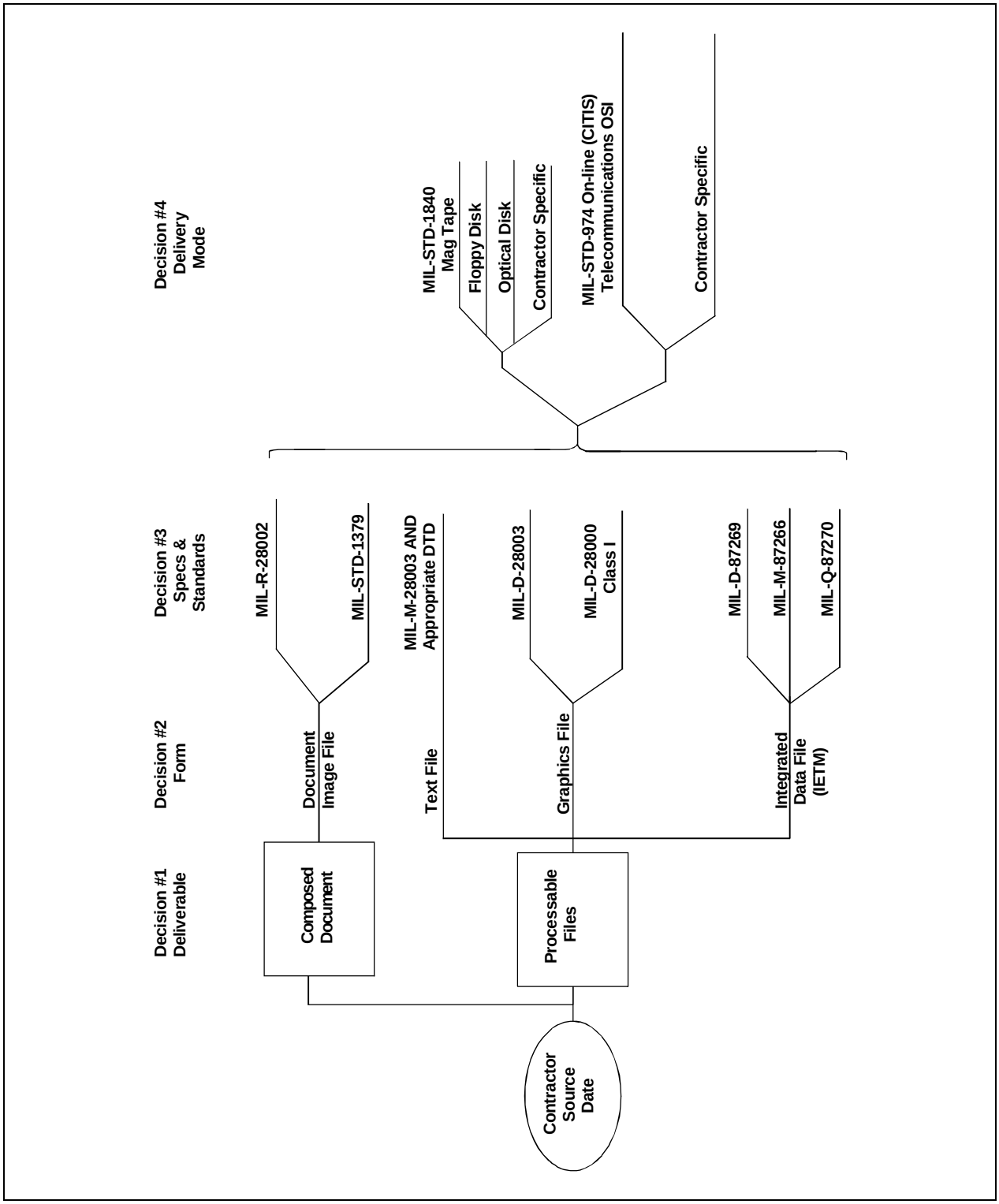

FIGURE D-1. Decision template for technical manuals.

manual delivery can be either hard copy (paper or microfilm) or a digital composed document image file. The digital form of this deliverable consists of composed page images of the full manual. Two examples of digital composed document files are Page Description Language (PDL) and raster. These options offer greater advantages than hard copy in storage, distribution, viewing, and printing. They also provide slightly more flexibility than hard copy with respect to future data uses, although their formats will be fixed and unyielding. PDL and raster provide a two-dimensional image of each manual page, offering no further updating or processing features beyond replication. Both hard copy and digital forms of composed documents complicate update and maintenance efforts.

30.2.2.2.2 **Forms options - decision #2 (for processable files)**. If processable files are selected at decision #1, the forms for technical manual delivery can be either one or more sets of text and graphics files, or an integrated data file that contains text and graphics in a compound data architecture. A particular type of integrated data file is the IETM (see 30.2.1.2).

30.2.2.3 **Specification and standard options - decision #3**.

30.2.2.3.1 **Decision #3 for composed documents**. Technical manuals acquired as composed documents may be acquired in the form of either camera-ready masters or digital document image files. The intended application may also require an additional indexing mechanism for efficient subsequent processing. Camera-ready masters should be delivered in accordance with MIL-M-38784 or other appropriate MIL-SPECs or MIL-STDs. Digital document image files in raster form should be acquired in accordance with MIL-R-28002. Conversion systems for paper copy are in place for converting legacy data to the MIL-R-28002 format. MIL-R-28002 provides two options: Type I and Type II. Type I raster graphics binary format consists of Group 4 encoding as defined in FIPS PUB 150 (Consultative Committee on International Telegraphy and Telephony (CCITT) Recommendation T.6). Type II raster graphics binary format is the delimitation of the NIST Office Document Architecture (ODA) Raster Document Application Profile (DAP) to suit Government applications.

The term "tiled raster data" refers to drawings that are segmented into several grids of small blocks containing raster data. These blocks of data are compressed individually. Modifications to a tiled drawing are easier to control since only those small blocks of data requiring changes are modified. Storage of document images in a PDL such as PostScript provides an alternative form. PDL document image files can be acquired as interim deliverables, or as final deliverables in addition to (but not in place of) processable data files using MIL-STD-1840 and MIL-M-28001.

30.2.2.3.2 **Decision #3 - specifications and standards for graphics**.

30.2.2.3.2.1 **Raster versus vector graphics**. Graphics data may be in either raster or vector formats. Assuming an adequate scanning resolution, raster provides nearly exact fidelity for illustrations. Vector graphics translates data between different sending and receiving systems in native forms (this can introduce errors, even when an intermediate, neutral format is agreed on). For example, a line expressed as a series of pixels connecting a pair of end points, versus a line expressed as an origin, direction, and length. Vector representations are easily edited, maintained, and updated. Vector representations also generally have the advantage of much smaller file size, even when the

raster bit-map image has been compressed using an algorithm such as that specified by MIL-R-28002. Nevertheless, raster graphic illustrations are frequently encountered because scanning remains the only practical way of converting a legacy of hard copy drawings into digital data. Additionally, DoD components have made investments in systems that convert legacy data to raster. Digital representation of hard copy legacy data may require support for both raster and vector formats for graphics.

30.2.2.3.2.2 **Specifications for vector graphics**. There are two choices of standards to consider for vector graphics: MIL-D-28003 for CGM and MIL-D-28000 for IGES. For technical manuals, CGM is the preferred option but IGES is allowed. Extensions to the standard to allow translations of native CAD data into CGM are still being developed. If technical manual illustrations are being derived directly from design data, then system limitations may constrain the choice of delivery standard. In selecting the appropriate option, the acquisition manager should recognize the potential problems created by multiple translation steps (e.g., unique CAD system to IGES to CGM). MIL-D-28003 specifies an application profile (AP) with two option levels: Level I for publication quality data, and Level II for draft quality data. Uncompressed raster data can be included in a CGM file, but MIL-D-28003 should only be used where the predominant form of the graphics information is vector. MIL-D-28000 specifies several subsets of IGES designed to meet different application needs. When IGES is used for technical manual illustrations, the Class I Technical Illustration subset is appropriate. Data would be delivered in ASCII, as specified by MIL-D-28000.

30.2.2.3.3 **Decision #3 for processable text**. Processable text data files should be acquired in accordance with MIL-M-28001, which specifies the CALS implementation of SGML. A Document Type Declaration created in accordance with MIL-M-28001 is required to completely and rigorously describe the document's structure/content. Similarly, a Formatting Output Specification Instance (FOSI) created IAW MIL-M-28001 is required to completely and rigorously describe the document's formatting.

Whenever possible, the use of previously developed Document Type Declarations and FOSIs contained in the SGML Reuse Library (SRL) or associated with governing specifications, is desired. If none of these Document Type Declarations or FOSIs are suitable (with or without modification), a unique Document Type Declaration or FOSI may have to be developed.

30.2.2.4 **Digital delivery/access mode options - decision #4**. As shown at the right side of figure D-1, physical media is currently the only economical option for the delivery of large document image files or processable data files. While telecommunications bulk transfer of these files may be possible, it is usually not an economical option because of the large volume of data contained in these large files, particularly the raster document image and raster graphics files. When CITIS interactive access to a contractor's technical manual database is chosen, then telecommunications are warranted as a delivery mode for deliverables. Consult MIL-STD-974 and MIL-STD-1840 for guidance regarding data delivery. Security aspects will also affect the selection of delivery method.

30.2.2.4.1 **Decision #4 - magnetic tape**. The standard physical media option is magnetic tape. The mature, stable, non-proprietary standard which MIL-STD-1840 requires for magnetic tape supports most originating and destination systems.

30.2.2.4.2 **Decision #4 - floppy disk**. The preferred physical media option for small files is floppy disk. Like magnetic tape, floppy disk is a mature, stable technology that is usually available at all sending and destination systems.

30.2.2.4.3 **Decision #4 - optical disk**. Optical disk (CD-ROM, WORM, or WMRM) are alternative physical media options of the future, and are generally well suited for data archiving because they can accommodate very large volumes of data quite efficiently.

30.2.2.5 **Digital deliverable summary**. Selection of the options at each node of the Technical Manuals decision template should be aligned to the needs of the organizations responsible for technical manual publication and maintenance within each military department. However, requirements for interim deliverables that are provided only for review and approval (verification) may be evaluated differently than are requirements for final deliverables. Delivery of processable data is less important when the principal applications are view and annotate, than when the intended applications are update/maintain and process/transform. Consequently, document image files may be more appropriate early in the life-cycle of the program; however, processable data files should be the deliverable of choice when the Government assumes the responsibility for technical manual update and maintenance.

30.2.2.6 **Example - delivery of digital data as processable files**. Selection options for technical manuals may be processable technical manual files composed of:

a. SGML text files in accordance with MIL-M-28001 and MIL-STD-1840,

b. Raster graphics files in accordance with MIL-R-28002, Type I and MIL-STD-1840, and

c. Vector graphics files in accordance with MIL-D-28003 and MIL-STD-1840.

30.2.3 **Decision guidelines**. As noted previously, digital delivery options for technical manuals are not mutually exclusive. There will often be cases when several options will be combined for specific deliverables during a defense system acquisition. The decision criteria presented in this handbook are intended to aid in selecting the best options. The following is guidance for applying the criteria to technical manuals.

30.2.3.1 **Intended data use**. The following general guidelines are provided:

a. Select processable files if internal or third party updates and maintenance is anticipated, document image files if no further revision or change is anticipated.

b. Select processable files if the future creation of specialized documents and aids is envisioned.

c. Select vector graphics files if update and maintenance of illustrations and drawings is desired, raster graphic files if hard copy illustrations are being converted to digital form.

30.2.3.2 **Life-cycle phases**. The acquisition life-cycle phase of the defense system and its technical data is an important consideration. The following general guidelines apply:

a. Select document image files if a program is in a late phase (i.e., engineering and manufacturing development, or production and deployment) and large amounts of data already exist in hard copy.

b. Select document image files for interim deliverables for in-process review prior to assumption of management and maintenance responsibility.

c. Select processable data files for final delivery when maintenance and update responsibility is assumed by the Government.

30.2.3.3 **Delivery cost**. Costs associated with the delivery process are a consideration. Select tape for delivery of large volumes of digital data.

30.2.3.4 **Available technology**. The limitations of the Government receiving system are a consideration. Select document image files if the receiving system lacks update and maintenance capability, processable data files for subsequent processing and transformation.

30.2.4 **Contract implementation of digital data delivery**. Block 16 of the CDRL should cite delivery of digital data in accordance with MIL-STD-1840. The physical media standards or magnetic tape delivery mode should also be specified.

30.3 **Acquisition of technical data packages**.

30.3.1 **Scope**. A TDP is a technical description of the product's design, manufacture, quality assurance, and packaging characteristics adequate for procurement. Depending on the contract phase when the TDP is ordered, the technical description should be sufficient to support an item's initial acquisition strategy, logistics support, and reprocurement strategy. Other considerations include the DoD infrastructure in place to make use of TDP data including:

a. Data conversion systems,

b. Availability of engineering analysis tools, and

c. Data requirements for parts on demand infrastructures, i.e., RAMP and FCIM initiatives.

The technical description of an item consists of all applicable technical data, such as engineering drawings and associated lists, product manufacturing and process specifications and standards, performance requirements, quality assurance provisions, and packaging detail. This section addresses digital acquisition of the elements of a TDP as defined by MIL-T-31000.

30.3.2 **TDP elements**. Digital acquisition should be considered for the following MIL-T-31000 TDP elements:

a. Engineering drawings, product drawings and associated lists, conceptual design drawings and associated lists, developmental design drawings and associated lists, commercial drawings and associated lists, special inspection equipment (SIE) drawings and associated lists, special tooling drawings and associated lists, and specifications;

b. Software documentation;

c. Test requirements documents;

d. SIE operating instructions;

e. SIE descriptive documentation;

f. SIE calibration procedures;

g. Preservation, packaging, packing, and marking data; and

h. Quality Assurance provisions.

30.3.3 **TDP decision node discussion**. Figure D-2 applies the decision template for acquisition of digital deliverables to TDP deliverables. The following paragraphs discuss the required decisions shown in figure D-2.

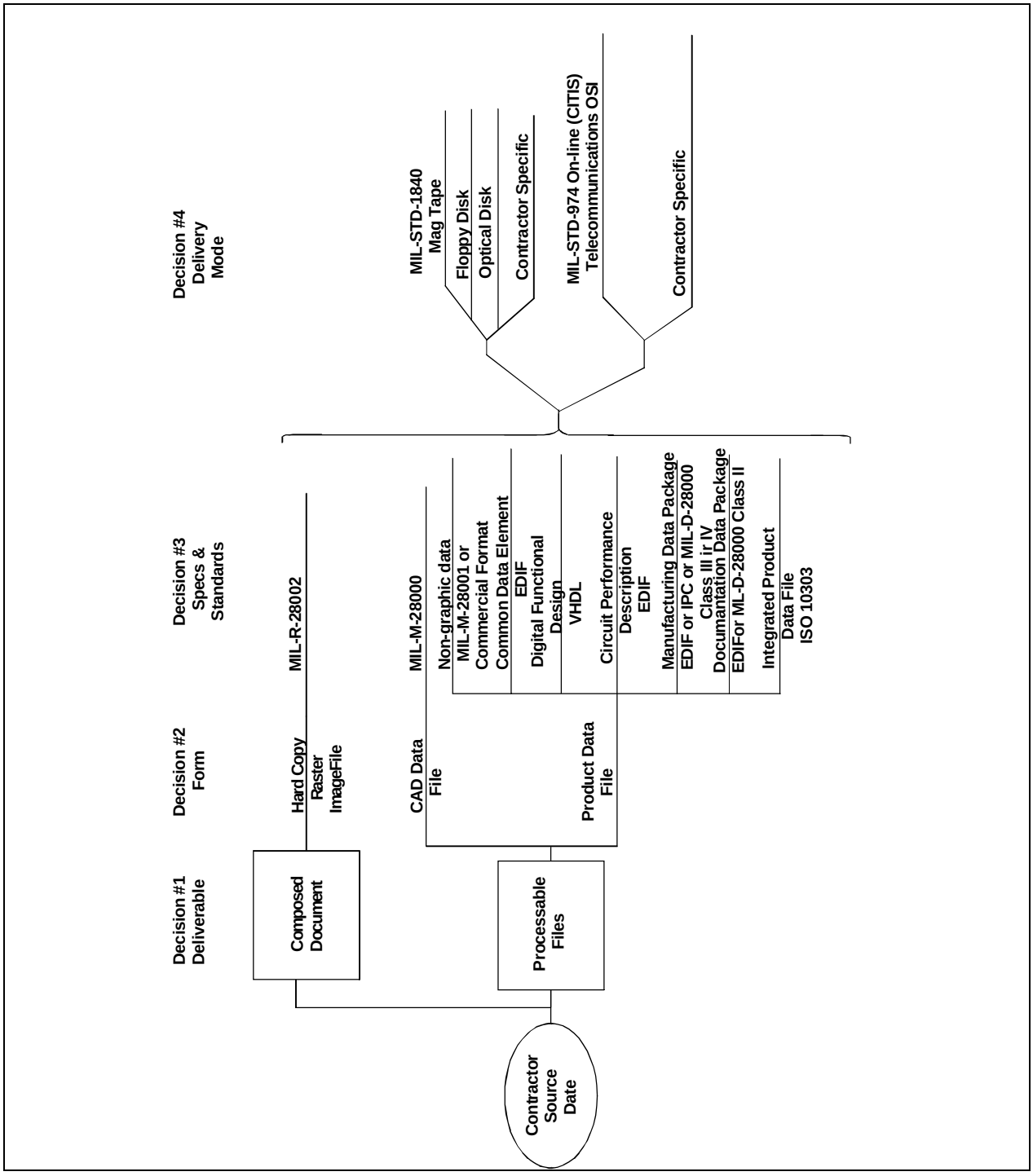

FIGURE D-2. Decision template for MIL-T-31000 product drawings and associated lists.

30.3.3.1 **Delivery options - decision #1**. Technical information describing product drawings and associated lists falls into three distinctly different delivery forms:

a. Document (drawing image) - hard copy (paper or microfilm) of engineering drawings or digital images (raster image file) of engineering drawings.

b. Processable data files - CAD and computer-aided engineering (CAE) systems create and use vector graphics files, defining the geometry and associated data attributes of defense system assemblies, subassemblies, and components. Data generated in this manner is capable of being updated; hence, the files containing the data are referred to as processable data files. In defense system development contracts, digital delivery of processable data files is preferred and should be considered the standard form of communication between the contractor and the program office.

30.3.3.2 **Form options - decision #2**. As depicted in figure D-2, the deliverable form options for product drawings and associated lists are hard copy, raster image files, CAD data files, and product data files. Paper and microfilm mounted in aperture cards are two examples of media used for hard copy. Raster image files provide a representation of digitally scanned paper drawings or aperture cards. The information in a raster image file is not machine intelligible. CAD data files consist of vector data with geometrically accurate and precise representations of the product, together with associated annotations (dimensions, tolerances, etc.). CAD data can be either two-dimensional or three-dimensional. Product data files are the most complete and flexible delivery option and also provide a methodology for linking CAE and support processes.

30.3.3.3 **Specifications and standards options - decision #3**. The specifications and standards option depicted in figure D-2 include:

a. Document (raster image file);

b. CAD data files;

c. Product data files;

d. Common data elements data package;

e. Digital functional design;

f. Circuit performance description;

g. Manufacturing data package;

h. Documentation data package; and

i. Integrated product data file.

30.3.3.4 **Delivery/access mode options - decision #4**. The digital delivery mode options are shown at the right side of figure D-2. Physical media is currently the only practical option for the delivery of raster-formatted product drawings, though it is expected that network bandwidths and other telecommunications technologies will soon be in place to overcome current constraints. When CITIS interactive access to a contractor's design drawing database is chosen, then telecommunications are warranted as a delivery mode for deliverables when practical. Consult MIL-STD-974 for guidance regarding data delivery/access.

30.4 **Acquisition of Logistic Support Analysis Record (LSAR)**.

30.4.1 **Scope**. This section addresses the acquisition alternatives of LSAR data. Logistic support analysis builds upon data from related systems engineering and design analyses and produces a consolidated and integrated set of logistics-related technical data. The resulting LSAR is a logically integrated database consisting of both the engineering source data upon which analysis tasks are based and the analysis results. With the exception of very small programs, documentation of the LSAR is accomplished using DoD validated automated LSAR systems.

30.4.1.1 **LSAR data elements**. MIL-STD-1388-2 defines the total set of data elements that could make up an LSAR database. The acquisition manager should tailor the standard to defense system program requirements by selecting the subset of data elements actually required. This is done by incorporating in the contract DD Forms 1949-1 and 1949-2 listing the specific LSAR data that the contractor has to generate and provide (through access or delivery) to the Government. Some data elements (such as LSAR control numbers) are required because they are keys to the database organization. However, few defense system programs require all LSAR data elements.

30.4.1.2 **Flexibility of the LSAR**. Because of the range of data that can be documented in an LSAR, the LSAR is able to satisfy the data requirements of a number of the deliverables commonly appearing on a CDRL, such as Provisioning Lists and Failure Modes, Effects, and Criticality Analysis (FMECA) reports. When these deliverables are submitted to the Government as processable data files, or when CITIS interactive access to the database is provided, improvements in data accuracy and integrity usually result. During the initial acquisition contract, the most cost effective means of LSAR data access or delivery should be evaluated to enable the contractor to offer as part of the subsequent phase proposal one or more digital means of data delivery or access.

30.4.1.3 **Relationship of standards for LSAR to other CALS standards**. MIL-STD-1388-2 is the technical standard for delivery of LSAR data in digital form. Because it serves as both a functional and a technical standard, it is unnecessary (and incorrect) to use MIL-STD-1840 to define requirements for delivery of LSAR data in digital form.

30.4.2 **Decision option discussion**. The master decision template for acquisition of digital deliverables as applied to the LSAR is displayed in figure D-3.

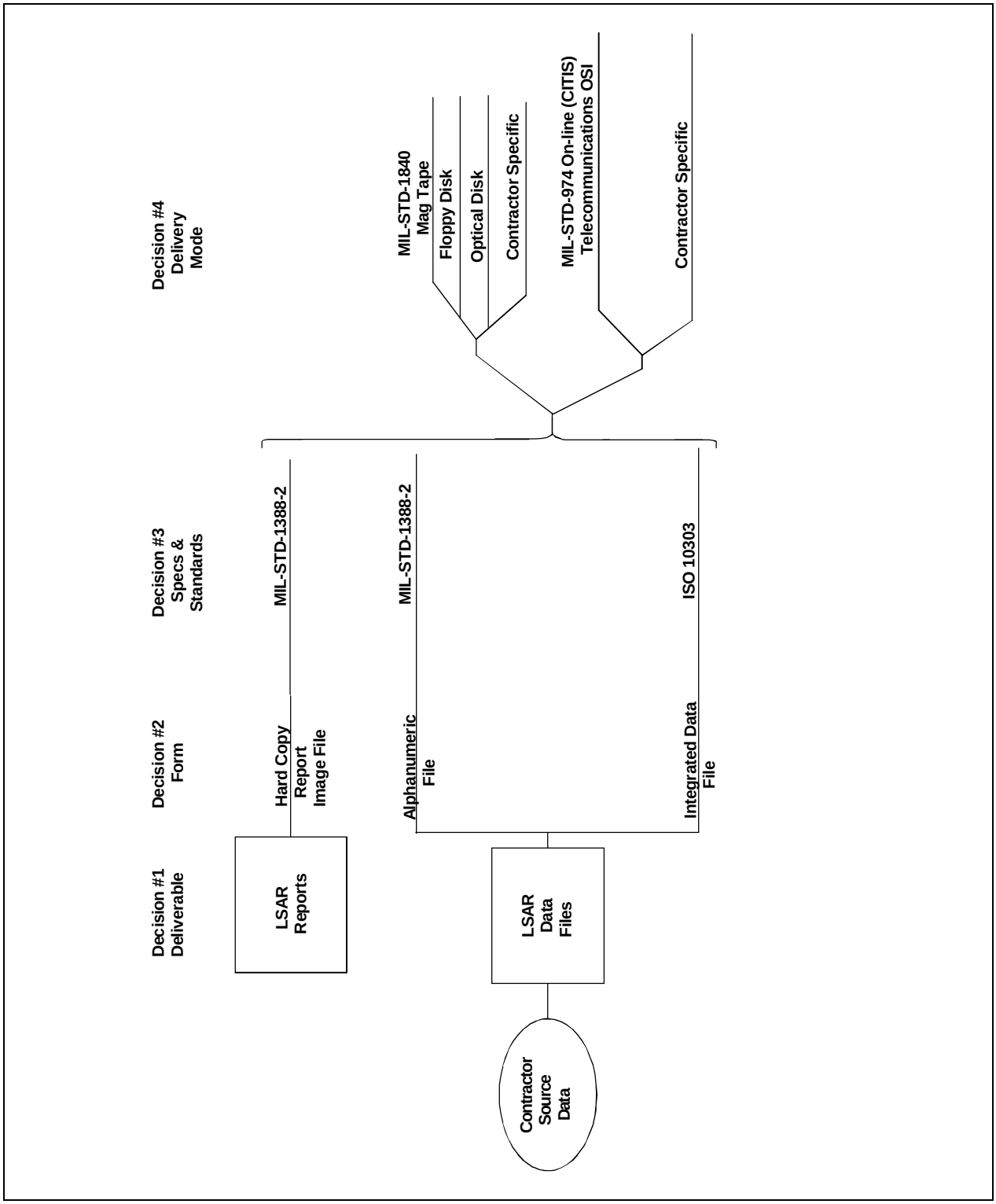

FIGURE D-3. Decision template for MIL-STD-1388-2, Logistics Support Analysis Records (LSAR).

30.4.2.1 **Deliverable options - decision #1**. LSAR data can be delivered as LSAR reports or LSAR data files. All options either encourage or require a contractor automated LSAR. The requirements for LSAR final deliverables will likely be a combination of these options.

30.4.2.1.1 **Deliverable options - decision #1 (for LSAR Reports)**. The LSAR reports option includes the reports identified in appendix B of MIL-STD-1388-2, plus any contractually required, project-unique reports that can be produced using LSAR data. Most reports allow refinement or focus for a specific user by tailoring or reformatting. Many of the reports were designed as analysis and data review tools and are not intended to be deliverable products. LSAR reports are static presentations of LSAR data and cannot be updated or processed further after delivery. They offer the least flexibility for LSAR data use. Therefore, requiring LSAR reports as a deliverable option is appropriate only for one-time deliveries or when no further processing capability is available.

30.4.2.1.2 **Deliverable options - decision #1 (for LSAR data files)**. The LSA documentation, including LSAR data, is generated as a result of performing any or all of the analyses specified in MIL-STD-1388-1, Logistic Support Analysis (LSA). Depending upon contractual language, exchange/delivery of the LSAR data may take the form of full file replacement or "change only" data (changes to the MIL-STD-1388-2 data tables since the previous submittal of the LSAR data). An internal data processing capability is required for each LSAR data file. Delivery of the LSAR relational data tables will provide the capability to subsequently produce any of the LSAR reports and other data files that the LSAR database was designed to support, and provides historical baseline data for defense system/equipment. Separate delivery of other LSAR data files places responsibility for their generation with the contractor rather than the Government. Because of the flexibility provided by these processable data files, they can be used to satisfy both interim and final LSAR delivery requirements. Periodic delivery can reduce time spent for on-site data reviews by providing a vehicle for advanced review of the data. Final contract deliverables can be consolidated and reduced by internal processing of LSAR data files in part or in total.

30.4.2.1.3 **Requirement for automated LSAR**. Regardless of which deliverable option is selected, SOW language requiring the contractor to establish an automated LSAR capability should be included in the LSA program.

30.4.2.2 **Form option - decision #2**. Each of the deliverable options for the LSAR provides one or more viable form options.

30.4.2.2.1 **Form option - decision #2 (for LSAR reports)**. LSAR reports (see figure D-3) can be delivered either as hard copy reports or as a report image file. Hard copy reports include both computer-generated LSAR reports (appendix B of MIL-STD-1388-2) and program-unique LSAR reports. Report image files, the digital equivalent of these reports, require no further data processing and can be loaded, viewed, and printed using standard system utilities. Both options are a fixed presentation of the LSAR data and the applicable DIDs must be selected for the desired reports. If the hard copy form is selected, the DID hard copy option should be noted.

30.4.2.2.2 **Form option - decision #2 (for LSAR data files)**. The basic format used for LSAR data files is alphanumeric data file. The use of an integrated data file is a future option presently under development that will be addressed in the next update to this handbook.

30.4.2.3 **Specifications and standards - decision #3**. There are no decision options on the standards for LSAR reports or LSAR master data files. These files are all alphanumeric tabular data files as specified in MIL-STD-1388-2. Since report image files can be generated by a sending system so easily, the technically feasible alternative of raster image data adds an additional level of data processing complexity, and is not a practical alternative.

30.4.2.4 **Digital delivery/access mode options - decision #4**. As shown at the right of figure D-3, there are two delivery mode options for LSAR report image files and for data files: physical media delivery or telecommunications transfer. Physical media consists of data delivery on magnetic tape or floppy disk, with the use of optical disk technology as a future alternative. Telecommunications involve the bulk electronic transfer of data files using a network that is compatible with a specific telecommunications standard (DISNs, TCP/IP, or Open System Interconnect's (OSI) GOSIP FIPS 146), or a public, or contractor-specific nonstandard telecommunications network. If interactive access is not chosen for interim reviews, the most cost effective option for final delivery of LSAR reports and data files will normally be magnetic media. If CITIS interactive access capability is established, the cost and accessibility benefits of telecommunications versus physical media delivery modes should be evaluated. For physical media delivery, use existing or program-unique DIDs and indicate the tape delivery option.

30.4.3 **Decision guidelines**. Options for delivery of LSAR data in digital form are not mutually exclusive. There will often be cases when several options will be combined for specific deliverables during a defense system acquisition. The decision criteria presented in this handbook focus on the best options, but has to be evaluated against program-specific requirements. The guidance below applies the decision criteria to the various LSAR options.

30.4.3.1 **Intended data use**. The following guidelines apply:

a. Select LSAR data files for consolidation of deliverables.

b. Select LSAR data files if significant internal analysis of the data is anticipated.

c. Select LSAR data files for input to automated Government receiving systems.

d. Select CITIS interactive access to support unique analyses.

30.4.3.2 **Life-cycle phases**. The following guidelines apply:

a. Select LSAR data files for later, high volume phases.

b. Select CITIS interactive access to replace early phase LSAR deliverables.

c. Select CITIS interactive access to support LSAR data reviews in all phases.

d. Select LSAR hard copy reports for early phases if low volumes of data in the current or later phases do not justify the cost of additional automated processing.

e. Select LSAR hard copy reports for non-developmental programs with limited service life data requirements.

30.4.3.3 **Delivery cost**. The following guidelines apply:

a. Select LSAR report image files if multiple report copies are required and the processing capabilities of Government receiving system are limited.

b. Select LSAR data files, in general, as the most cost effective option for all deliverables.

c. Select CITIS interactive access to minimize on-site review requirements.

d. Select magnetic media for delivery of high volumes of digital data.

30.4.3.4 **Available technology**. The following guidelines apply:

a. Select LSAR hard copy reports or interactive access if no internal data processing system capabilities are available.

b. Select LSAR report image files or interactive access if only limited internal data processing system capabilities are available.

c. Select LSAR data files for Engineering and Manufacturing Development or Production and Deployment phases if internal data processing capabilities are available or planned for that time.

30.5 **Acquisition of training products**.

30.5.1 **Scope**. This section provides guidance in determining training products to be delivered to the Government in digital form, and describes appropriate acquisition alternatives. Many but not all training products are suitable candidates for digital development, delivery, and application. Many training products contain a combination of textual narrative and illustrative graphic images presented in a formal, structured, page-oriented format, which allows use of the same technologies and CITIS capabilities as are used for preparation and delivery of technical manuals. The guidance for selection of training products, including Interactive Courseware (ICW), is contained in MIL-STD-1379, MIL-HDBK-284, or similar service-specific functional standards.

30.5.1.1 **Data sources for training products**. The LSAR consolidates logistics-oriented technical information in conjunction with data for the various engineering disciplines and ILS elements to reduce redundancy, facilitate timely usage, and enhance consistency between data elements and disciplines. The quality and productivity of training product development are enhanced when the LSAR is used as a principal data source for this process. Integration of the databases that produce LSAR task analysis (and other) data, technical manuals, and training materials will provide even greater benefits.

30.5.1.2 **Coverage**. This section addresses the delivery of page-oriented training products in digital form. Similar guidelines apply to the delivery of multimedia training products and pageless (free frame) training products when they are appropriate. Because the technology for delivery of digital data is progressing rapidly, the contents of the section are not intended to restrict or constrain the use of innovative, cost-effective digital delivery of training materials. MIL-STD-1379 contains detailed guidance for delivery of ICW and other specific training deliverables.

30.5.2 **Decision option discussion**. Figure D-4 shows the decision template applied to page-oriented training product deliverables. Decisions regarding whether training products should be delivered in digital form and the specifications for that form should be consistent with decisions made for other contract deliverables such as technical manuals. The following sections describe the decisions to be made in determining the form and appropriate specifications for training product deliverables.

30.5.2.1 **Delivery options - decision #1**. As depicted in figure D-4, training documentation can be delivered as composed documents or processable files. The composed document deliverable option offers the least flexibility, even in digital form. It is a static, formatted presentation of the specification, which can only be archived, viewed, and printed after receipt. Processable files, on the other hand, offer more robust capabilities. These files can be updated or transformed into many different data types. With appropriate data processing systems, processable files can be maintained and updated.

30.5.2.2 **Form options - decision #2**. A training product is made up of both text (including narrative and tables) and graphics. At the top left of figure D-4, if composed documents have been selected at decision #1, the forms for training product delivery can be either hard copy (paper) or a digital composed document image file. The digital form of this deliverable consists of composed page images of the full training product. While digital form offers greater advantages than hard copy in the areas of storage, distribution, viewing, and printing, it is only a two-dimensional image of each training product page, offering no further updating or processing features beyond replication. If processable files have been selected at decision #1, the forms for training product delivery can be either one or more sets of text and graphics files. At present, a training product's processable data file will be composed of one set of files for textual data and a separate set of files for graphic illustrations or drawings.

30.5.2.3 **Specifications and standards options - decision #3**. The specifications and standards option depicted in figure D-4 include:

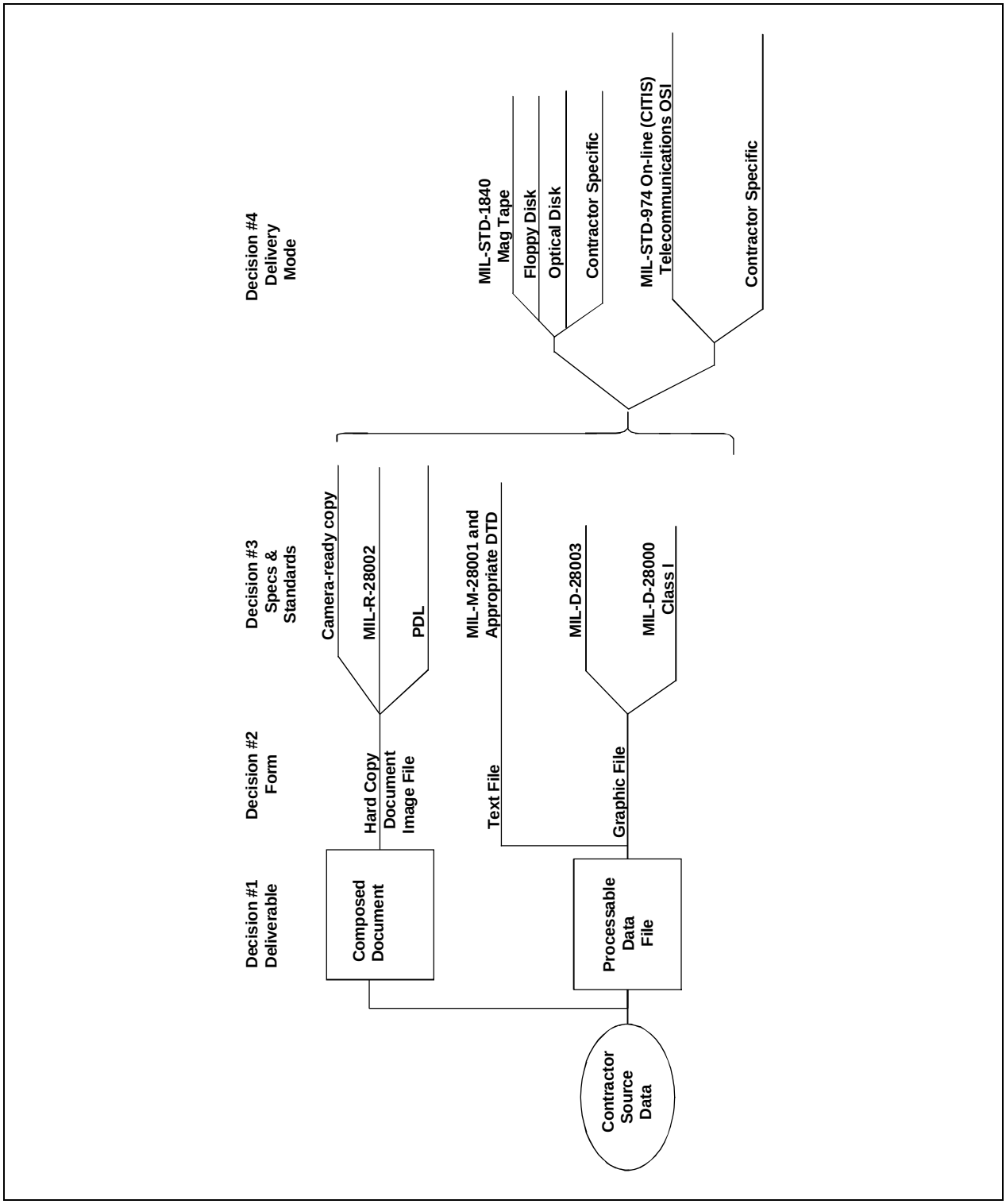

FIGURE D-4. Decision template for training documentation.

a. Document (composed document) - MIL-STD-1379 guides training product decisions. Very rarely will training products be best delivered in raster forms. Only hardware specifications for training systems are likely candidates for this option. MIL-R-28002 is applicable to all digital document image files for specifications.

b. Processable data files (text and graphics).

(1) Text file - processable text files should be acquired in accordance with MIL-M-28001. MIL-M-28001 specifies the digital data format for the structure, layout, and text of technical publications. It applies SGML for describing a document in a machine processable format.

(2) Graphics file - there are two choices of standards to consider for graphics files. MIL-D-28003 for CGM and MIL-D-28000 Class I subset for IGES. The MIL-D-28003 CGM is appropriate for graphics in the categories of technical illustrations, charts, etc., while engineering drawings derived from design data are the domain of IGES. For training documentation, CGM is the preferred option but IGES is allowed.

30.5.2.4 **Delivery/access mode options - decision #4**. With the exception that the reader should refer to figure D-4, all delivery mode options for decision #4 are identical to 30.3.3.4.

30.5.3 **Decision guidelines**. Options for delivery of training products in digital form are not mutually exclusive. There will often be cases when several options will be combined for specific deliverables during a defense system acquisition. The decision criteria presented in this handbook can be used to help make the decisions on the decision template. The following is guidance for applying the criteria to training products.

30.5.3.1 **Intended data use**. The following guidelines are provided:

a. Select processable files if Government updates and maintenance is anticipated for the future.

b. Select processable files if the future creation of specialized documents and aids is envisioned.

c. Select raster image files if only an automated print-on-demand capability is desired or available.

d. Select vector graphics files if update and maintenance of illustrations and drawings are desired.

30.5.3.2 **Life-cycle phases**. The following guidelines are provided:

a. Raster image or print/display files should be acquired early in the life-cycle of the program if most cost effective.

b. Processable training product files should be the deliverable of choice when the Government assumes the responsibility for training manual updates and maintenance.

c. Select static page-oriented documents if a program is in a late phase and large amounts of data already exist in paper form.

30.5.3.3 **Available technology**. The following guidelines are provided:

a. Options should be aligned to the automated publishing systems/computer resources in the Military Department receiving the deliverable.

b. Select hard copy if no internal data processing system capabilities are available or planned.

c. Select raster print/display files if only minimal data processing capabilities are available internally.

APPENDIX E

GOVERNMENT CONCEPT OF CONTINUOUS ACQUISITION AND LIFE-CYCLE SUPPORT OPERATIONS GUIDANCE

10. INTRODUCTION

10.1 **Purpose**. This document is provided as GFI to address how the Government intends to use data associated with XXX program in conformance with the CALS strategy. CALS is a strategy that will enable more effective generation, exchange, storage, and use of data for defense systems and equipment, including management, planning, design/engineering, manufacturing, logistic support, and operation data. As such, this document is intended to give participating contractors and other Government activities an understanding of the CALS approach that will be implemented for the XXX program.

10.2 **Scope**. The policies and strategies set forth in this document are applicable only to the XXX program. The concepts contained in this document apply to all types of data and information that are generated by contractors and by the Government during the life-cycle of the XXX program.

10.3 **Application**. This GCO is provided to Government and contractor activities as guidance for their preparation of CALS related plans and development of CALS capabilities. Government activities should use this document in defining their participation in the XXX program. Contractors should use the GCO in conjunction with a RFP as source information for developing a CAC. This GCO and resulting CAC(s) provides a basis for further Government and contractor planning for implementation of CALS in the XXX program. Participating activities are encouraged to propose beneficial changes to the information provided herein that improve operation, increase quality, and reduce costs. The GCO is provided for planning purposes and should not be considered as a commitment on the part of the Government.

APPENDIX E

20. REFERENCES

20.1 **Scope**. This appendix is not a mandatory part of the handbook. The information contained herein is for guidance only.

20.2 **Specifications, standards, and handbooks**. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto.

SPECIFICATIONS

MIL-D-28000	Digital Representation for Communication of Product Data: IGES Applications Subsets and Application Protocols
MIL-M-28001	Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text
MIL-R-28002	Raster Graphics Representation in Binary Format, Requirements For
MIL-D-28003	Digital Representation for Communication of Illustration Data: CGM Application Profile
MIL-T-31000	Technical Data Packages, General Specification For
MIL-M-38784	Manuals, Technical: General Style and Format Requirements

STANDARDS

MIL-STD-100	Engineering Drawing Practices
MIL-STD-490	Specification Practices
MIL-STD-974	Contractor Integrated Technical Information Service (CITIS)
MIL-STD-1388-1	Logistic Support Analysis
MIL-STD-1388-2	DoD Requirements for a Logistic Support Analysis Record
MIL-STD-1777	Internet Protocol
MIL-STD-1778	Transmission Control Protocol

APPENDIX E

MIL-STD-1840 Automated Interchange of Technical Information

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

FEDERAL INFORMATION PROCESSING STANDARDS

FIPS PUB 127 Database Language - Standard Query Language (SQL)

FIPS PUB 146 Government Open Systems Interconnection Profile (GOSIP)

FIPS PUB 161 Electronic Data Interchange (EDI)

(Copies of Federal Information Processing Standards (FIPS) are available to Department of Defense activities from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

HANDBOOKS AND MANUALS

DOD 5520.22-M Industrial Security Manual for Safeguarding Classified Information

MIL-HDBK-59 DoD CALS Implementation Guide

(Application for copies should be addressed to the Naval Publications and Forms Center (NPFC), 5801 Tabor Avenue, Philadelphia, PA 19120 or Defense Communications Agency, DDN PMO (B613), Washington, DC 20305.)

APPENDIX E

30. DATA REQUIREMENTS

All XXX program data will be considered for generation in digital format. This goal will be achieved through orderly steps where each deliverable is evaluated for economic feasibility, intended use, frequency of use and infrastructure of users. Understandably, certain data deliveries may remain in hard copy format and may be considered for conversion to digital form when justified by economic and usage factors.

30.1 **Data types**. Data types to be digitally developed, delivered, and maintained include, but are not limited to, the following:

a. Management and administrative data including program plan, program schedules, engineering support plans, system engineering management plan, configuration management plan, cost performance report, financial data, notifications, requests, general communications, etc.

b. Product description data including design, analysis, manufacture, test, and inspection information typically included in a technical data package (e.g., engineering drawings and associated lists). Product description data also includes data requirements for DoD parts on demand infrastructures, i.e., RAMP and FCIM initiatives.

c. ILS/LSA plans and reports include LSAR data, LSAP, ILSP, LORA, reliability and maintainability data, and other data for plans and reports.

d. Publications include technical publications, technical manuals, User's manuals, training materials, and operation manuals, and other support manuals.

30.2 **Data use**.

30.2.1 **Data users**. Table E-I provides an overview of the users that are involved with and require access to XXX program data, their location, and their general data requirements.

APPENDIX E

TABLE E-I. Data users associated with XXX program.

ACTIVITY	LOCATION	FUNCTION	DATA REQUIREMENTS
AF Materiel Command	WPAFB Dayton OH	Design Agent	Engineering Data Engineering Drawings R&M Data Reports/Plans
		ILS	LSAR Data Tech Pubs Reports/Plans R&M Data Provisioning Data ILS/LSA Data
		Training	Training Planning Data Training Materials Manpower Rqmts Data
Aviation Army Systems Command	St. Louis MO	ILS Support	LSAR Data Tech Pubs Reports/Plans Design Data
		Training	Training Materials
Aeronautical Systems Center	WPAFB Dayton OH	Engineering Support (Safety Interface)	R&M Data Reports/Plans Engineering Data Engineering Drawings
		Quality Assurance	ILS/LSA Data Tech Pubs Maintenance Data
		Engineering Support (Avionics & Software)	Engineering Data Reports/Plans
		Engineering Support (Vehicle Dynamics)	Engineering Data Reports/Plans
		MP&T	Hardman Data Training Planning Data Training Material Tech Pubs
Army Material Command	Alexandria VA	T&E (Joint Test Coordination)	Engineering Data Engineering Drawings Reports/Plans Test Plans Test Reports Tech Pubs Technical Illustrations
		T&E Training	Training Planning Data Training Materials Manpower Rqmts Data Reports/Plans

APPENDIX E

ACTIVITY	LOCATION	FUNCTION	DATA REQUIREMENTS
		Data Analysis	Engineering Data Test Data R&M Data QA&QE Data Operational Data
		Engineering Support (S&V)	Engineering Data Engineering Drawings Reports/Plans
		Technical Data	Tech Pubs Technical Illustrations Engineering Drawings
		In-Process Review	TDP Elements Engineering Drawings, Assoc. Lists & Related Documents
		Supply Support	Provisioning Data
		Depot Planning	ILS/LSA Data Tech Pubs Maintenance Data
		Logistics Data Analysis	ILS/LSA Data Engineering Data Test Data Operational Data
PMS400 NAVSEA	Washington DC	Installation/Integration Logistics Data Analysis	Installation Control Drawings ILS/LSA Data Engineering Drawings
		MP&T	Hardman Data
		Hardman/NTP	Training Planning Data Manpower Requirements Data
		Training Devices	Engineering Drawings Engineering Data Tech Pubs Training Planning Data Training Materials
		Financial	Cost Data Expenditure Reports
		Facilities	Facilities Data Maintenance Data
		Hazard Analysis	Safety Data
		ILS Support	LSAR Data Tech Pubs Reports/Plans

30.2.2 **Use requirements**. The data use requirements are the ways in which the program data will be used/processed by authorized users. The five defined methods of data processing typical of the XXX programs are described below. (Note: Two or more methods may be required by a single user, i.e., the methods are not mutually exclusive.)

a. View Only (V) - the ability to examine a data file without the ability to change it. This includes viewing selected portions of one or several documents as well as side-by-side comparisons of documents.

b. Comment/Annotate (C) - the ability to evaluate and highlight for future reference or to make annotations, approvals, and comments without the ability to change the original file. Annotations are associated with a specific item or location within a document such that the annotations are displayed whenever that point or area of the document is displayed.

c. Extract/Process/Transform (E) - the ability to extract and modify the format, composition, and structure of all or a portion of the data into another usable form without affecting the original content or format.

d. Update/Maintain (U) - the ability to change data either directly or through controlling software, in the active files on the host computer. (Contractor-maintained XXX technical data.)

e. Archive (A) - the placing of data into a repository to preserve it for future use.

Table E-II provides a sampling of contract data typical of an XXX program by data type and depicts how the data is intended to be used. This list is not intended to be all inclusive; rather it leads to a decision point for the format and delivery mode of the data deliverables. DIDs used are typical DIDs but are not intended to be all inclusive.

Table E-II. XXX Programs Contract Data Use Requirements Sample

DATA TYPES	DID	ACQ MGR	COST ANAL	ILS TRAINING	ILS SUPPORT	ILS ANAL	HAZ ANAL	SAFETY	QA	CONTAINER DESIGN/AGENT	DATA ANAL	TECH DATA
MANAGEMENT & ADMINISTRATION DATA												
Conference Agenda	DI-ADMIN-81249	C,E,A	C,E,U	C,E	C,E	C,E			V	V	C,E	V
Conference Minutes	DI-ADMIN-81250	C,E,A	C,E	C,E	C,E	C,E		V	V	V	C,E	V
Contract Progress Reports	DI-MGMT-80227	A	V	V	V	V			V		V	
Data Accession List	DI-A-3069A	E	E		E			E	V		E	
Configuration Management Plan	DI-CMAN-80858A	C,E,U,A	C,E	C,E	C,E	C,E		C	C,E	C	C	V
Cost Performance Report	DI-F-6000C	C,E,A	C,E									
Program Plan	DI-MGMT-80909	C,E,A	C,E	C,E	C,E	C,E		C	C,E	C,E	C,E	C,E
ILS/LSA PLANS & REPORTS												
LSA Tasks	DI-ILSS-(Various)	C,E	C,E	V	C,E				V		C,E	
Support Site Activation Plan	DI-FACR-81047	C,E,A	C,E	C,E	C,E	C,E			C,E	C,E	C,E	
Software Test Plan	DI-MCCR-80014A	C,E,A	C,E	C,E	C,E	C,E		C,E			C,E	
Integrated Support Plan	DI-ILSS-80395	C,E,A	C,E	C,E	C,E	C,E		C,E	C	C	C,E	
Engineering and Technical Service Accomplishment Report	DI-MGMT-80061A	E,A	E	E	E	E		C,E	E	E	E	E
System Engineering Management Plan	DI-MGMT-81024	C,E,A	C,E	C,E	C,E	C,E		C,E	C,E	C,E		
Technical Report - Study Services	DI-MISC-80608	E,A	E	E	E	E		C,E	E			
PRODUCT DESCRIPTION DATA												
Technical Data Package Elements (Engineering Drawings & Associated Lists)	MIL-T-31000											
Master Integrated Program Schedule	DI-MISC-81183	V	V	V	C,E,U	C,E,U		C	C,E	V	V	C,E
Management Plan	DI-MGT-80004	U	U	U	U	U		C	U	V	V	C,E
Scientific and Technical Reports	DI-MISC-80711				E				E	E	V	C,E
Test Plan Test Reports	DI-NDTI-80566 DI-NDTI-80604				E	C C				E E		

Table E-II. XXX Programs Contract Data Use Requirements Sample - Continued

DATA TYPES	DID	ACQ MGR	COST ANAL	ILS TRAINING	ILS SUPPORT	ILS ANAL	HAZ ANAL	SAFETY	QA	CONTAINER DESIGN/AGENT	DATA ANAL	TECH DATA
Test/Inspection Hazardous Materials	DI-NDTI-80809A DI-ILSS-81168A				E	C C		E E	C,E	E E		
Training Facilities Report	DI-ILSS-81089							E				
Training Equipment Requirements Document	DI-ILSS-81073							E				
Mission Training Task Analysis Report	DI-ILSS-81078							E				
Lesson Plan	DI-ILSS-81095							C,E				
Trainees Guide	DI-ILSS-81100							C,E				
Logistic Support Analysis Report	DI-ILSS-81173	C,E	C,E,A	C,E	C,E						C,E	
Computer Software Product End Items	DI-MCCR-80700	C	C,E		C,E,U	C,E,U					C,E,U, A	
Support Equipment Installation Data	DI-ILSS-80454	C,E,A	C,E	C,E	C,E	C,E	C		C		C,E	
Failure Summary and Analysis Report	DI-RELI-80255	E,A	E	C,E	E	E		C,E			E	
FMECA Report	DI-R-7085A	E,A	E	C,E	E	E		C,E			E	
Engineering Change Proposal	DI-CMAN-80639A	C,E,U,A	C,E,U,A	C,E,U	C,E,U	C,E,U	C,E	C,E	C,E	C,E	C,E	C
Contract Work Breakdown Structure	DI-MGMT-81334	C,E,U,A	C,E	C	C	C		C	C	C	C	
Cost Schedule Status Report	DI-F-6010A	C,E,A	C,E									
PUBLICATIONS												
Interface Control Drawing Documentation	DI-CMAN-81248	C,E,A	C,E	C,E	C,E,U	C,E,U		C,E			C,E,U	
Technical Manuals	TMCR-167-91	C,E,A	C,E	C,E	C,E	C,E	C,E	V	V	V		C,E,U
System/Segment Design Document	DI-CMAN-80534	U,E,A		C	C,E	C			C		C	

LEGEND:

V =	View Only	E =	Extract/Process Transform
U =	Update/Maintain	C=	Comment/Annotate
A=	Archive		

APPENDIX E

30.3 **Data delivery/access media**. Specific data formats and delivery modes will be stated on individual CDRL items. Proper safeguards will be used for classified information (DOD 5520.22M). In general, the following formats and delivery media are recommended for each data type:

a. Management and administrative data - this data should be available through CITIS. On-line management status data should be analogous to that available to contractor program managers.

b. Product description data - this type of data will conform to IGES (MIL-D-28000) format with delivery in accordance with MIL-STD-1840. As digital format and delivery standards are introduced for additional product description data (i.e., intelligent product data, models, etc.), CDRL delivery requirements may be modified appropriately.

c. ILS/LSA plans and reports - text-based documents should be generated in commonly used word processing formats. Ancillary graphics, spreadsheets, and other associated data files should be developed in common business software. These files should be provided as separate files in their native formats (as specified in CDRLs) as well as incorporated into a master document. It is preferred that these files be delivered electronically over the communications network. Depending on file size and communication speed, this may necessitate mutually agreeable commercial software (MACS) file compression routines or floppy disk delivery. Relational database formats, as described in FIPS PUB 127, should be capable of being accessed via Structured Query Language (SQL) and delivered in accordance with MIL-STD-1840. LSAR data tables will be in accordance with MIL-STD-1388-2.

d. Publications - manuals (paper-based and electronic), standards, specifications, handbooks, work packages, and any other documentation that will be updated and maintained over the life-cycle of the program should be developed using SGML (MIL-M-28001) and CGM graphics (MIL-D-28003) and delivered in accordance with MIL-STD-1840.

30.3.1 **Preliminary format and media recommendations**. Since plan/report data types are most common, MACS formats will typically be most frequent. Although electronic deliveries are preferred, these may be limited by the network speed and file size. Therefore, delivery by floppy disk is recommended for MACS deliverables that will overburden the network. As CITIS capabilities and XXX program network performance are increased, more MACS deliveries can be made over the network rather than by disk. The CALS specifications and standards provide implementation-specific guidance for preparation of text and graphic data files for technical publications or product data interchange. These standards are relevant for the preparation of files that are used in MIL-STD-1840, but can also serve many other data transfers and neutral language format purposes. This set of standards defines how technical data is to be represented digitally in a number of different formats (see 4.3.2).

APPENDIX E

With the overall goal of CALS to migrate toward a "digital" environment, MIL-STD-1840 orchestrates the use of the CALS standards and is one of the fundamental standards for digital data interchange of textural, illustration, and engineering drawing information. Once the acquisition of the data has been resolved, it is MIL-STD-1840 that defines the process for how the technical data is to be transferred.

The CALS standards provide implementation-specific guidance for preparation of text and graphic data files for technical publications or product data interchange. MIL-D-28000 defines the technical requirements necessary to acquire product definition data or product data in a neutral public domain digital format. This specification provides a neutral format (IGES) for the representation and transfer of vector graphics data used for illustration purposes among CAD systems and application programs used by DoD and industry. MIL-M-28001 defines a standard for preparation of text information for technical publications. MIL-M-28001 SGML can be used as a text markup language to define the structure of a document's text with respect to a given DTD. It also provides a means for describing the format of a document's text with reference to a specified FOSI. MIL-R-28002 defines the technical requirements necessary to acquire raster graphics data and raster graphics applications. Raster data is presently providing a mean of converting legacy technical data into a digital format. MIL-D-28003 defines a standard to be met when vector-oriented picture descriptions of illustration data are delivered in the digital format of the CGM.

Specific MACS products have not been defined, but will include popular word processing, spreadsheet, database, project management, and graphics programs. These programs are commonly found in both Government and contractor offices and typically support conversion from one format to another.

30.3.2 **Contractor format and media recommendations**. The contractor is encouraged to identify and describe alternative formats and delivery media options offering increased utility and cost effectiveness. These formats should be compatible with the infrastructure and data formats described in table E-III. In determining suitability of a particular format or media option, the contractor should consider the lifetime and purpose of each deliverable.

Relatively short-lived data such as agenda, minutes, planning, schedules, spreadsheets, plans, and progress reports should be developed in MACS products commonly used by all participants of the XXX programs. Involved contractors should review the tools utilized by the Government for such purposes (see 50). Contractor responses in their CACs will help determine the method utilized to exchange data between the Government and the contractor.

Long-lived data such as engineering drawings, LSAR, and technical publications should be delivered in accordance with the appropriate digital exchange standard. These items are archived for long-term storage and protection for future developmental changes and support purposes.

Whenever possible, the Government and contractor CALS planning should focus on development of data in a digital format regardless of use. This will assist in ensuring that a future capability for delivery and processing of digital source data is retained.

APPENDIX E

40. CITIS

Implementation of the CALS initiatives for XXX program will require establishment and use of CITIS to provide Government access to contractor maintained data supporting the XXX program. Additionally, CITIS should be capable of storing GFI provided to the contractor. These services should be addressed in the CAC. On the basis of information in the bidder's CAC, the Government will determine the extent that the contractor's proposed CITIS capabilities provide cost-effective use of Government and contractor resources.

40.1 **CITIS capabilities**. Required CITIS capabilities will be stated in the contract. However, XXX program contractors should propose CITIS capabilities that add value to their current efforts. The CITIS services should include data management, security, telecommunications, and other attributes necessary to fully integrate the contractor's XXX database with the Government users. MIL-STD-974 defines functional requirements for CITIS. Some capabilities that should be implemented include:

a. On-line access to contractor-maintained databases containing management, financial, engineering, and logistics program data.

b. On-line access to databases should allow users to perform searches on data, make comments to data, produce and run preformatted (standardized) reports with output at their location, produce ad-hoc reports with output at their location, and download selected data to their location for use in further processing.

c. On-line access to contractor developed or owned applications. This capability should allow authorized users to run contractor-hosted applications from remote computers or terminals. These applications may include modeling, simulations, analysis, and other programs that provide Government users with insight into the contractor's current engineering, logistics, and management efforts.

d. File transfer capability should allow users to download contractor data files. This capability should also allow users to upload data files to the contractor (e.g., for GFI and information requests)

e. Electronic mail capability compatible with the Government E-Mail system(s). This may require communications to a centralized mail server or use of compliant E-Mail packages. GOSIP is the preferred Government communications protocol. FIPS PUB 146 provides information concerning GOSIP.

40.2 **CITIS data formats**. CITIS data satisfying a CDRL requirement should be formatted to include content specified by the DID. CITIS data required as a result of the SOW should include SOW specified data in a logical and acceptable format and be easily accessible. The contents and format of other CITIS data proposed by the contractor should be in a format consistent with the use requirement.

APPENDIX E

40.3 **Delivery criteria**. Data items will be deemed to be delivered either when they are electronically transmitted to the Government or when they are made available for Government access and the Contractor has given electronic notice of availability to the Government. Other CITIS data is not considered as a deliverable but is maintained by the contractor in accordance with update and availability requirements specified by the contract.

40.4 **Government access**. CITIS capabilities will be accessible by the Government from existing terminals, personal computers, and workstations. The Government intends to establish permanent communications between the Government's communications network and contractor sites. The exact implementation of these communications will depend on frequency of access, cost, data volume, and other factors. All communication methods proposed must be compliant with GOSIP.

40.5 **Data protection and security**. CITIS capabilities should include means to ensure only authorized access to and update of information contained within the database. Data associated with each XXX program will be subject to authentication and regular backup. Periodically, backups will be delivered to XXX program Government service centers.

Methodologies to handle classified data have not been fully determined. It is expected that authorized XXX program users will have access to classified information over CITIS using encryption and decryption devices. Until such time that these devices are determined, classified material should be delivered (in digital and hard copy format) through conventional means (e.g., U.S. Mail).

40.6 **Data rights**. Rights in technical and business data proposed for or available via CITIS, should be identified and negotiated in accordance with DFARS 252.227-7013.

APPENDIX E

50. DESCRIPTION OF GOVERNMENT INFRASTRUCTURE

This section describes the XXX program infrastructure that participating activities and contractors should consider in determining format and communication capabilities. This data is provided to allow program participants to understand the capabilities of other users and to make informed decisions regarding options and capabilities that will be or could be established to support the XXX program(s).

50.1 **User capabilities**. Table E-III describes a sample of the hardware, software, and communication network capabilities that each user activity would typically currently have. This information is not intended to be all inclusive; rather it gives prospective offerors a general insight into the infrastructure in-place to support the programs, including hardware, software, and networking capabilities of XXX program activities. This information will be updated as user automatic data processing equipment changes.

APPENDIX E

TABLE E-III. XXX Program user capabilities.

USER	FUNCTION	HARDWARE	SOFTWARE	NETWORKS
Location A	Program Management	Desk Top Publisher	S/W Applications 1, 2, and 3	Desk Top Publisher
	Configuration Management	PC	S/W Application 1	Modem
	Class Desk	Desk Top Publisher	S/W Applications 1, 2, and 3	LAN MGR 1
				E-mail
	Program Office, Engineering	Desk Top Publisher	S/W Applications 1, 2, and 4	LAN MGR 3
Location B	ILS	PC Compatibles Type 1	S/W Application 2	LAN MGR 3
		Workstation Type 1	S/W Application 1	E-mail
Location C	Participating Matrix Codes (Engineering, Cost Analysis, Product Assurance)	PC Compatibles	S/W Applications 1, 2, and 5	LAN MGR 3
		Desk Top Publisher	S/W Applications 1 and 2	E-Mail
		Work Station Types 1, 2, and 3	S/W Application 2	
	Service Center	PC Compatibles	S/W Application 2	LAN MGR 2
		Desk Top Publisher	S/W Application 1	Modem
		Plotter, Type 1	S/W Application 1	
		Work Station	S/W Applications 1, and 2	
Location D	ILS	PC	S/W Applications 1, 2, and 3	LAN MGR 1
				E-mail
Location E	Training	PC	S/W Applications 2, 5, and 6	E-mail
			Graphics S/W Application 2	

APPENDIX E

50.2 **Infrastructure Modernization Programs (IMP)**. The DoD is building various CALS-supporting systems for generation, receipt, storage, distribution, and processing of digital data. These systems, briefly described below, will be used to various extents in XXX programs depending on the programs' data requirements, existing capability, and IMP availability. Additional detail regarding exact systems to be used and their capabilities will be provided as they become available.

a. Digital document management and publishing systems - allows for the acceptance, validation, maintenance, and publishing of SGML-encoded technical manual data. These systems will provide for the continued use and maintenance of digitized technical documentation throughout the life-cycle of a defense system.

b. Digital technical information systems - these systems are typically designed to place current and accurate digital technical data into users' hands and allows engineers to access technical documentation, retrieve it from a digital repository, and create technical information files containing repair/planning data. Documentation to be available includes engineering drawing, technical manuals, preventive maintenance data, and engineering operating and sequencing data.

c. Joint Engineering Data Management Information and Control System (JEDMICS) - provides a standard digital system for storage, retrieval, reproduction, and distribution of engineering drawings and related technical data to support weapon system maintenance, reprocurement of spares, engineering, training, manufacturing, and logistics support.

d. Solicitation Package Automation (SPA) - stores CALS compliant digital solicitation packages (forms, clauses, technical specifications, and drawings) for print-on-demand output at the two inventory control points.

e. Joint CALS (JCALS) - a DoD initiative to address a global, integrated database serving all database system users; connectivity of all users by local and wide area networking; implementation and incorporation of existing and evolving digital data standards; provision of a trusted computing environment implementing B1 level security; and an open-systems environment to provide flexibility and to protect against its obsolescence. The primary goal of the current JCALS design is the integration of databases into a shared structure, an IWSDB, while creating an environment where logistic technical information can be globally accessed/retrieved and then processed efficiently.

APPENDIX E

60. XXX PROGRAM CALS IMPLEMENTATION

For the XXX program, the Government plans on establishing a distributed information network system. Figure E-1 depicts a representative functional arrangement of the XXX program network that will be implemented during Engineering and Manufacturing and used throughout the life-cycle of the XXX program.

As is illustrated, this network ties all XXX program activities together by a wide area network (WAN). This WAN will be implemented under a computer and telecommunications command network. Authorized users will have access directly or through dial-up modems as dictated by data volume, current and planned telecommunications, and program requirements. The function of the XXX program WAN is to provide the following electronic capabilities:

a. Communications between all activities via electronic mail (E-Mail),

b. Transfer of deliverable data files from the contractor to the XXX CALS service center or directly to users (as specified in the CDRL),

c. Transfer of contractor deliverable data files from the service center to users,

d. Transfer of program data files between DoD users,

e. Transfer of GFI directly to contractors, and

f. Access to CITIS by all authorized users.

Contract delivery of magnetic (or on-line transfer) data will be to the XXX program service center. The service center will perform data management and perform as the repository for all XXX program contract deliverables. Specific functions to be performed are to be determined.

APPENDIX E

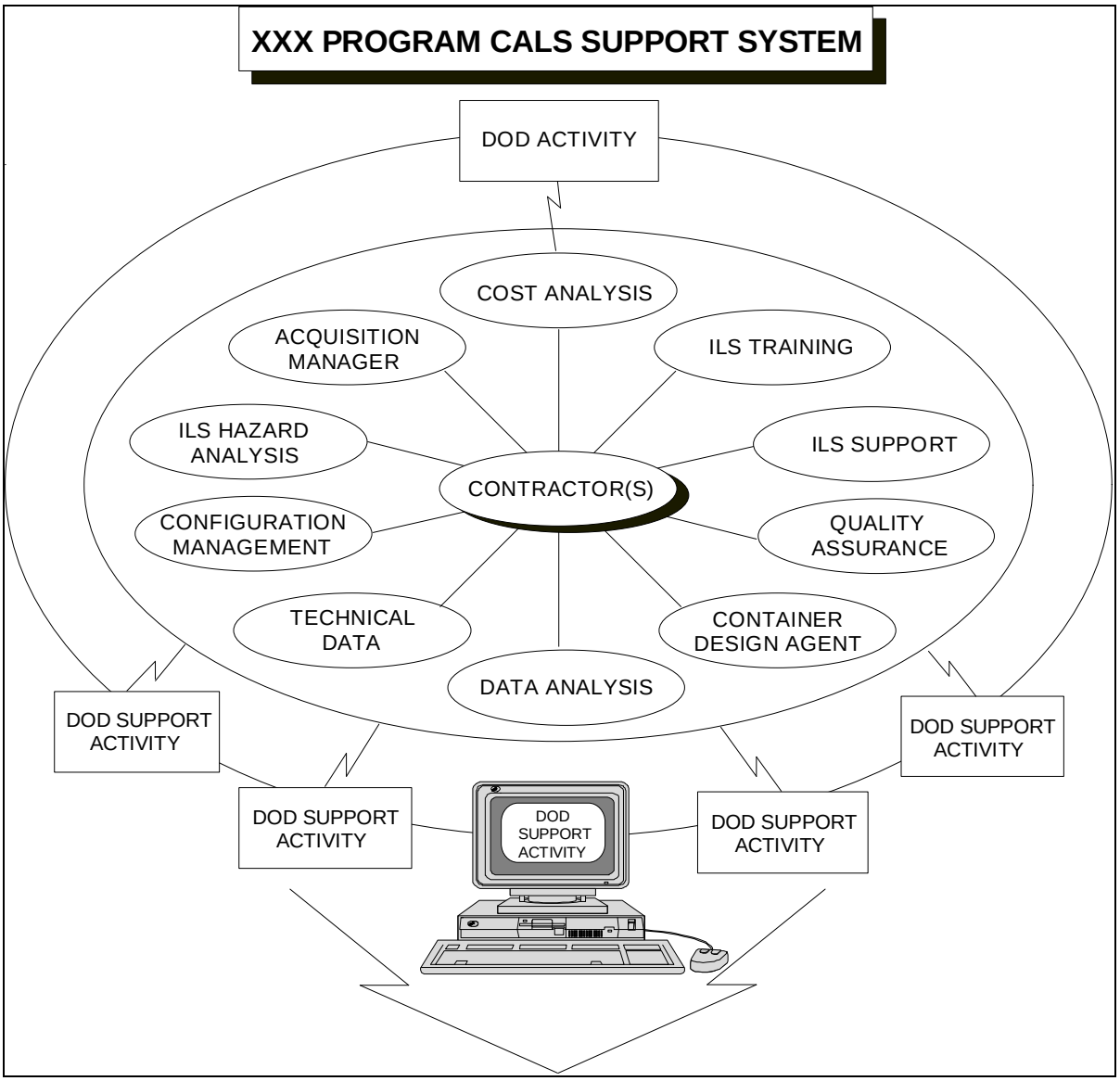

FIGURE E-1 CALS function arrangement

APPENDIX F

INFRASTRUCTURE QUESTIONNAIRE

The following sample questionnaire will assist in developing a GCO that will be used to tailor a particular data acquisition strategy to a specific defense system.

The following information is designed to help in determining the hardware, software, and networking capabilities/requirements for the _____ program. It will be used to develop a Government Concept of Operation (GCO) and will be provided in an RFP to potential bidders to assist in the development of the Contractor's Approach to CALS (CAC). The types of data, delivery method, access media, mechanics of interchange, and use of the data required for this program will be based upon your responses to this questionnaire. Please fill out this questionnaire as completely as possible and return to the program office no later than_____.

Questions may be directed to _____

PHONE: _____

ADDRESS: _____

_____

_____

I. **Data requirements**.

Check each data type and its intended use that your organization requires to perform assigned functions in support of this program. Definitions for the different means of using the data are found in MIL-HDBK-59 appendix E, section 30.2.2.

APPENDIX F

DATA TYPE	(V)	(C)	(E)	(U)	(A)
MANAGEMENT AND ADMINISTRATION DATA					
Program Plans					
Program Schedules					
Engineering Support Plans					
Progress and Status Reports/Master Schedule					
Contractual Vehicles					
Conference Agendas/Minutes					
Reviews and Audits Documents					
Technical Data Identification Checklists					
Standardization Program Plan					
Contract Work Breakdown Structure (WBS)					
Cost Performance Report					
Management Information System (MIS) Plan					
Configuration Audit Plan/Status Accounting Report					
Data Accession List					
Configuration Management Plan					
System Engineering Management Plan (SEMP)					
*					
*					
*					
ILS/LSA PLANS AND REPORTS					
Integrated Logistics Support Plan (ILSP)					
Logistics Support Analysis Plan (LSAP)					
Logistics Support Analysis Record (LSAR)					
Safety Assessment Reports					
Reliability Assessment Reports					
Maintainability Reports					
Hazardous Materials/Process Reports					
LSA Task (MIL-STD-1388-1)					

APPENDIX F

DATA TYPE	(V)	(C)	(E)	(U)	(A)
Maintainability Plan					
Level of Repair Analysis (LORA)					
Test and Evaluation Master Plan					
Test Reports					
Life-Cycle Cost Estimates					
Manufacturing Plan					
Environmental Impact Report					
Technical Report - Study/Services					
Quality Program Plan					
Computer Resources Integrated Support Document					
Design to Cost Plan					
*					
*					
*					
PUBLICATIONS					
Technical Reports					
Technical Manuals					
User's Manuals					
Operations Manuals					
Maintenance Manuals					
*					
*					
*					
PRODUCT DESCRIPTION DATA					
Technical Data Package					
System Specifications					
Engineering Drawings and Associated Lists					
Analysis Data					
Simulation Data					
Test Data					

APPENDIX F

DATA TYPE	(V)	(C)	(E)	(U)	(A)
Product Specification					
Software Development Plan					
Software Test Plan/Description/Report					
Systems Specification Report					
System Engineering Analysis Report					
Engineering Data					
*					
*					
*					

LEGEND:

(A) = Archive
(C) = Comment/Annotate
(E) = Excerpt/Process/Transform
(V) = View only
(U) = Update/Maintain
* = Additional Entries, As Required

II. **Hardware capabilities**.

List computer and peripheral equipment which will be used by your organization in support of this program.

HARDWARE	MANUFACTURER
Personal Computers	
Mainframes/Minis	

Check the appropriate system block to verify whether or not your organization has access to the following:

_____ JCALS System

_____ JEDMICS System

_____ RAMP Cells

_____ FCIM Capability

_____ CALS Tools

III. **Software capabilities**.

List operating systems and versions used with hardware described previously. Describe the most common/standard commercial software products that have been selected by your organization for each category. Provide version numbers if possible.

SOFTWARE CATEGORY	PERSONAL COMPUTER OPERATING SYSTEM AND APPLICATION SOFTWARE	MAINFRAME/MINI OPERATING SYSTEM AND APPLICATION SOFTWARE
Operating Systems		
Word Processing		
Database Management		
Spreadsheets		
CAE/CAD/CAM		
Graphics/Illustrations		
Other		

IV. **Network capabilities**.

Describe local- and wide-area network capabilities which will be used in support of this program:

CAPABILITY	EQUIPMENT/PRODUCT
Network Operating System	
Servers (File, Communications, E-mail, etc.)	
Network Protocols	
External Communication Capabilities (e.g., direct line, DISN, modems, T1 lines, etc.)	

V. **CALS requirements**.

Indicate your organizations familiarity and use of the following standards/specifications by entering the appropriate letter symbol in the space provided:

SPECIFICATIONS:

_____ MIL-D-28000
_____ MIL-M-28001
_____ MIL-R-28002
_____ MIL-T-31000
_____ MIL-M-38784

STANDARDS:

_____ MIL-STD-100
_____ MIL-STD-490
_____ MIL-STD-974
_____ MIL-STD-1388-1
_____ MIL-STD-1388-2

_____ MIL-STD-1777
_____ MIL-STD-1778
_____ MIL-STD-1840

LEGEND:

Familiarity:
A. In-depth knowledge.
B. Working knowledge.
C. Familiar.
D. Not familiar.

VI. **Point of Contact and User Information**.

NAME	CODE	FUNCTION	FREQUENCY *	TIME OF DAY

* Daily, Weekly, Bi-weekly, Monthly, Quarterly, etc.

CALS Point of Contact for your Organization_____

APPENDIX G

CALS POINTS OF CONTACT

DEPARTMENT /AGENCY	ADDRESS	COMMERCIAL	DSN
OSD	OUSD(A&T) CALS & EDI The Pentagon, Room 3D833 Washington DC 20301-8000	(703) 697-0051	227-0051
ARMY	U.S. Army Strategic Logistics Agency CALS Division 5001 Eisenhower Avenue Alexandria VA 22333-0001	(703) 274-4483	284-4483
NAVY	Office of the Chief of Naval Operations (N43) Pentagon Room 4B521 Department of the Navy Washington DC 20350-2000	(703) 697-9777	227-9777
AIR FORCE	DET 2 HQ ESC/AV-2 4027 Colonel Glenn Hwy Suite 300 Dayton OH 45431-1672	(513) 257-3085	787-3085
DEFENSE LOGISTICS AGENCY	DLA-CAN 5010 Duke Street Building 3A554 Alexandria VA 22304-6100	(703) 274-4210	284-4210
PM JCALS	PM JCALS ATTN: SFAE-PS-CAL-T Fort Monmouth NJ 07703-5626	(908) 544-2180	992-0414
NIST	National Institute of Standards and Technology Computer Systems Laboratory Bldg 225 Room A266 Gathersburg MD 20899	(301) 975-3262	
CTN	Defense Information System Agency (DISA) Center for Standards (CFS) Joint Interoperability and Engineering Office (JIEO/TBEC) 11440 Isaac Newton Square North Reston VA 22090-5006	(703) 487-8409 (703) 487-8342 (F)	364-8409

CONCLUDING MATERIAL

Custodians:

Army - CR
Navy - SA
Air Force - 16
DLA - DH

Preparing Activity

OUSD-DO
(Project ILSS - 0055)

Review activities:

Army - AL, AR, AT, CU, EA, IE, SC
Navy - NM, OM
Air Force - 01, 02, 08
DIA - DI
DISA - DC
DMA - MP
NSA - NS
OTHERS - DOE, FAA, NASA, NCS, NIST, TVA

User activities:

OASD - IR, WS
Army - AC, ET, LM, MT, PT
Navy - AS, CH, EC, MC, NW, OS, SH, TD, YD
Air Force - 04, 11, 13, 14, 16, 17, 18, 19, 27, 68, 70, 71, 79, 80, 82, 84, 99
Coast Guard - CG

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, not to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-HDBK-59B	2. DOCUMENT DATE (YYMMDD) 940610

3. DOCUMENT TITLE
Continuous Acquisition and Life-Cycle Support (CALS) Implementation Guide

4. NATURE OF CHANGE ***(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)***

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(include Zip Code)*	d. TELEPHONE *(include Area Code)* (1) Commercial (2) AUTOVON	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME Mr Don Langkamp	b. TELEPHONE *(include Area Code)* (1) Commercial (703) 756-8455 (2) AUTOVON 289-8455
C. ADDRESS *(include Zip Code)* CALS & EDI Office Policy & Planning Division 5203 LEESBURS PIKE SUITE 1609 FALLS CHURCH VA 22041-3466	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Standardization Program Division 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (7030 756-2340 DSN 289-2340

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DOD provided this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (DO NOT STAPLE), and mailed. In block 4, be as specific as possible about particular problem areas such as wording which required interpretations, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 5 any remarks not related to a specific paragraph of the document. If block 6 is filled out, an acknowledgment will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

(Fold along this line)

(Fold along this line)

DIRECTOR CALS & EDI
DEPARTMENT OF DEFENSE
RM 3D833, PENTAGON
WASHINGTON DC 20301-8000

DIRECTOR CALS & EDI
DEPARTMENT OF DEFENSE
RM 3D833, PENTAGON
WASHINGTON DC 20301-8000