APPLYING CALS TO THE CREATION, MANAGEMENT, AND USE OF TECHNICAL MANUALS

SECOND EDITION

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Prepared by:
CALS Resource and Implementation Cooperative

Prepared for:
Navy CALS Acquisition/ Implementation Group

FOREWORD

Purpose

The Navy Computer-aided Acquisition and Logistic Support (CALS) Acquisition/Implementation Sub-Group has charged the CALS Resource and Implementation Cooperative (RIC) with developing acquisition guidance for each of the three process architectures defined in the Department of the Navy CALS Architecture/Implementation Plan. This document is the result of an exhaustive search and distillation of information pertinent to applying CALS to the creation, management, and use of Technical Manuals (TMs). The intended audience of this document is the Acquisition management team that may consist of Navy/Marine Corps Acquisition Managers, TM Managers, project engineers, and project logisticians. This document lends itself to incorporation into specific Naval Forces System Command and Marine Corps program manager guides for applying CALS to defense system procurements.

Scope

The three process architectures described in the Navy CALS Architecture/Implementation Plan are:

- Engineering Drawings
- Technical Manuals
- Logistic Support Analysis Record (LSAR).

This revision has been expanded to include:

- Process Flow
- Proposal Evaluation Criteria
- Discussion on Contractor Integrated Technical Information Service (CITIS)
- Decision Oriented Templates.

Overview

Section 3.0, *General Considerations*, provides topics of consideration that must be addressed by the acquisition management team pertaining to the application of CALS initiatives to TMs. This section covers the following considerations:

- TM Decision and Responsibility
- Identify/Establish the TM Requirement
- Identify TM User's Infrastructure
- TMs in a CALS Environment
- Life Cycle Considerations
- Contract Language.

Section 4.0, *Specific Considerations*, uses these topics as a basis to discuss specific transfer media and digital data format considerations through decision templates that will assist the acquisition management team in determining which of these will satisfy the defense system program's TM requirements. Sample contract language to help develop CALS-related contract documents and a discussion of validation and verification issues are also included.

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Appendixes A, B, and C as referenced in this document are in the back of the Desktop Guide.

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1.0 INTRODUCTION

Computer-aided Acquisition and Logistic Support (CALS) is a Department of Defense (DoD) and industry strategy intended to enable more effective generation, exchange, management, and use of digital data supporting defense systems and equipment. Technical Manuals (TMs) are publications that contain instructions for the installation, operation, maintenance, and support of defense systems, defense system components, and support equipment. Using CALS standards to define the digital environment for the creation, management, and use of TMs will provide the method for transitioning from paper-intensive defense system acquisition and support processes to automated and integrated digital processes.

It should be noted that the application of digital technologies to Navy processes should be seen as a way to improve and streamline these processes by providing better methods of creating, managing, and using data, not as a method of replacing existing business practices.

1.1 Scope

Considerations that must be addressed when the acquisition management team is acquiring TMs in digital format include who will use the data and what infrastructure will they need to use it. Three levels of activity (see figure 1) exist, and all must have the ability to access and apply the digital data.

The first activity is the acquisition program office itself. It will be impossible possible to manage a program adequately if the TM agent does not have the capability to review and comment on the TM that is being delivered. The acquisition management team must insure that appropriate hardware and software are in place to review the data before digital data is ordered and delivered.

The second level of activity that must be considered is the specific Navy infrastructure program that will manage and store the digital data once it's created. The data delivered must be compatible with the existing Navy infrastructure in place or being developed. If changes to the Navy infrastructure are required, they must be fully justified and coordinated with personnel responsible for the configuration control of the Navy infrastructure system.

The final level of activity that must be considered is the end user. It does the end user no good to generate and make available digital data that they are incapable of using. The acquisition management team cannot assume the systems exist and will be used. The specific environment must be determined. Questions must be asked. What systems are available in the field? For a specific user, what data media and formats are compatible with what they already have or are planning to get? How will they acquire the new equipment and software they need if existing systems are inadequate? How will these new systems be supported? Who will pay for these new systems? The answers to these and similar questions will provide a comprehensive plan for implementing and using the digital data that is acquired. The answers depend on the specific users in the specific program.

It is recognized that each defense system program is unique with individual constraints and access to a distinct set of infrastructure systems. This document is intended to provide the acquisition management team with an overview of Navy business practices

for the creation, management, and use of TMs in a CALS environment yet maintain flexibility for innovative approaches. Specific implementation of this process may be further tailored with guidance set forth by each Naval Forces System Command.

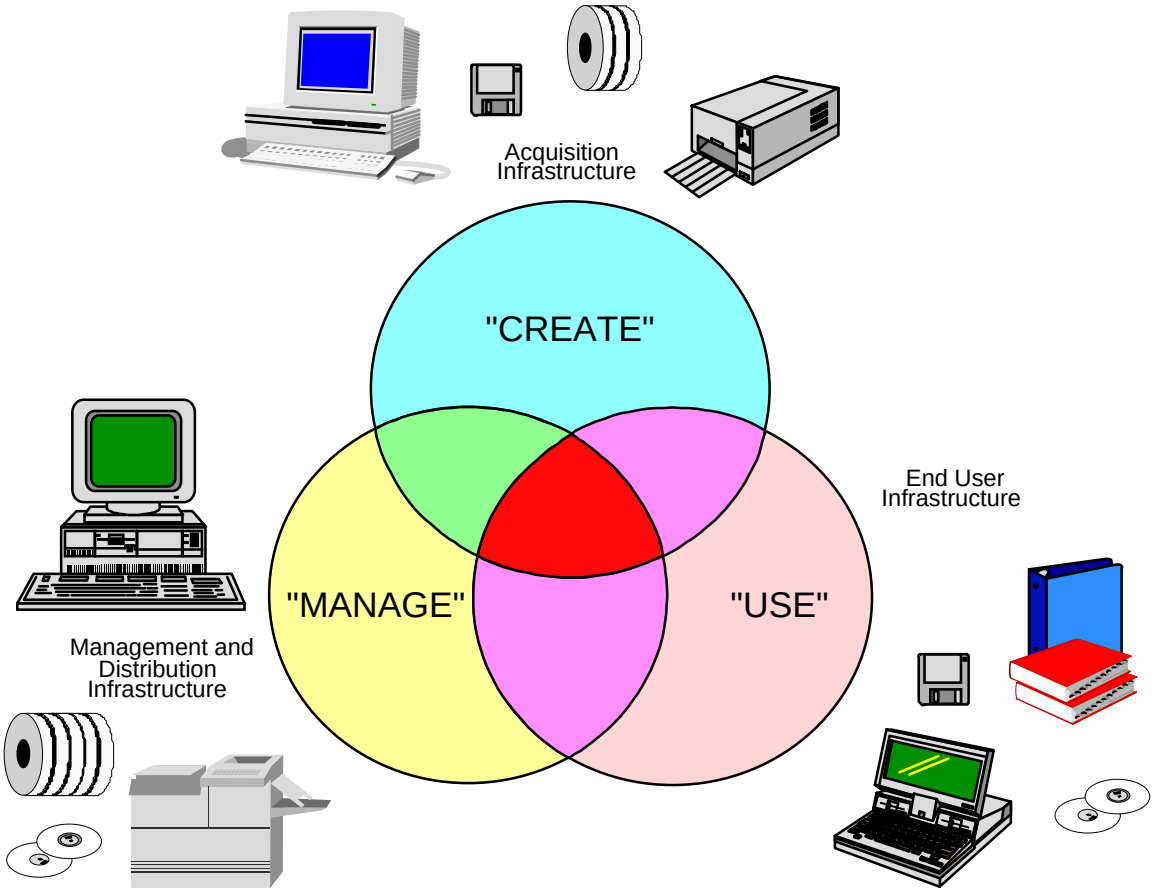

FIGURE 1. The Three Levels of Data Activity

1.2 Purpose

The planning processes for the creation, management, and use of TMs in a CALS environment needs to take advantage of the capabilities provided by the automation and integration of information systems. Various format options are available for the delivery of TMs that are needed to define and support a defense system. The intent of this document is to:

- Provide an overview of the TM acquisition process
- Provide a step-by-step process for each TM decision
- Describe delivery options available for TM acquisition
- Provide a method to determine the cost associated with each option
- Provide guidance for specific contract language required to support the options selected
- Discuss contractor validation and Government verification procedures.

This document contains ordering information for the deliverable media and digital data format for TMs. The guidance in this document addresses the delivery consideration of TMs as defined in MIL-HDBK-59. The Contract Data Requirements List (CDRL) guidance contained in this document applies to all types of TMs.

2.0 REFERENCES

2.1 Acronyms

A complete list of acronyms used throughout the Desktop Guide is in Appendix A. The following acronyms are used in this section of the guide.

ADMAPS	Automated Document Management and Publishing System
ASCII	American Standards Code for Information Interchange
ATIS	Advanced Technical Information System
CALS	Computer-aided Acquisition and Logistics System
CALS RIC	CALS Resource and Implementation Cooperative
CALSIP	CALS Implementation Plan
CDRL	Contract Data Requirements List
CGM	Computer Graphics Metafile
CITIS	Contractor Integrated Technical Information Service
CLIN	Contract Line Item Number
CTN	CALS Test Network
DoD	Department of Defense
DoDI	DoD Instruction
DTD	Document Type Definition
EDI	Electronic Data Interchange
FOSI	Formatting Output Specification Instance
FRC	Final Reproducible Copy
GCO	Government Concept of Operations
IETM	Interactive Electronic TM
IGES	Initial Graphics Exchange Specification
ILS	Integrated Logistics Support
JEDMICS	Joint Engineering Data Management and Information Control System
LRU	Line Replaceable Unit
LSAR	LSA Record
NIFF	Navy Image File Format
OS	Output Specification
PC	Personal Computer
PDL	Page Description Language
SGML	Standard Generalized Markup Language
SOW	Statement of Work
SPAWAR	Space & Navy Warfare Systems Command
SPDL	Standard Page Description Language
TDP	Technical Data Package
TM	Technical Manual
TMCR	TM Contract Requirement
TMM	Technical Manual Manager
TMPODS	TM Print-On-Demand System
WRA	Weapon Replaceable Assembly

2.2 Definitions

Definitions used in this section and throughout the Desktop Guide are in Appendix A: Definitions.

2.3 Applicable Documents

Documents referenced in this section and throughout the Desktop Guide are listed in Appendix A: Applicable Documents.

3.0 GENERAL CONSIDERATIONS

The development of a CALS strategy for TMs needs to be carefully examined to maximize the value for a specific defense system program. Program attributes such as technology, costs, quantities, and schedules have a profound effect on the deliverable requirements of TMs. Therefore, the acquisition management team must consider the life cycle of the procurement and the Navy infrastructure in place to support the TMs for their program.

TMs are any technical publication or other form of documentation used to install, operate, maintain, test, repair, overhaul, or provide logistic support of ships, aircraft, defense systems, or defense material. TM data may be presented or delivered in any form including, but not limited to, hard copy, audio and visual displays, magnetic tape, discs, and other electronic devices. TMs are divided into three major categories; Description, Operation, and Maintenance with Illustrated Parts Breakdown; Installation and Checkout Procedures; and Technical Repair Standards. The acquisition guidance provided in this document will apply to these categories.

The following sections discuss various topics of consideration that must be addressed:

- TM Decision and Responsibility
- Identify/Establish the Requirement for the TM
- Identifying the TM User's Infrastructure
- TMs in a CALS Environment
- Life Cycle Considerations
- CDRLs.

3.1 TM Decision and Responsibility

The following sections of this document are devoted to the acquisition of TMs in a digital environment. The purpose of the flow chart (see figure 2) is to lead the acquisition management team through a logical series of decisions and responsibilities associated with the overall process of TM format and delivery media selection. Cost comparison information and recommended CDRL language is also provided.

The flow chart also recommends who specifically is accountable for performing each task and function or making a decision. In addition to identifying the responsible agency or agent for each of the tasks, functions, or decisions, this chart also identifies supporting agencies and their inputs as required.

NOTE: Shadowed task/function boxes alert the user of additional details and/or decision flow charts.

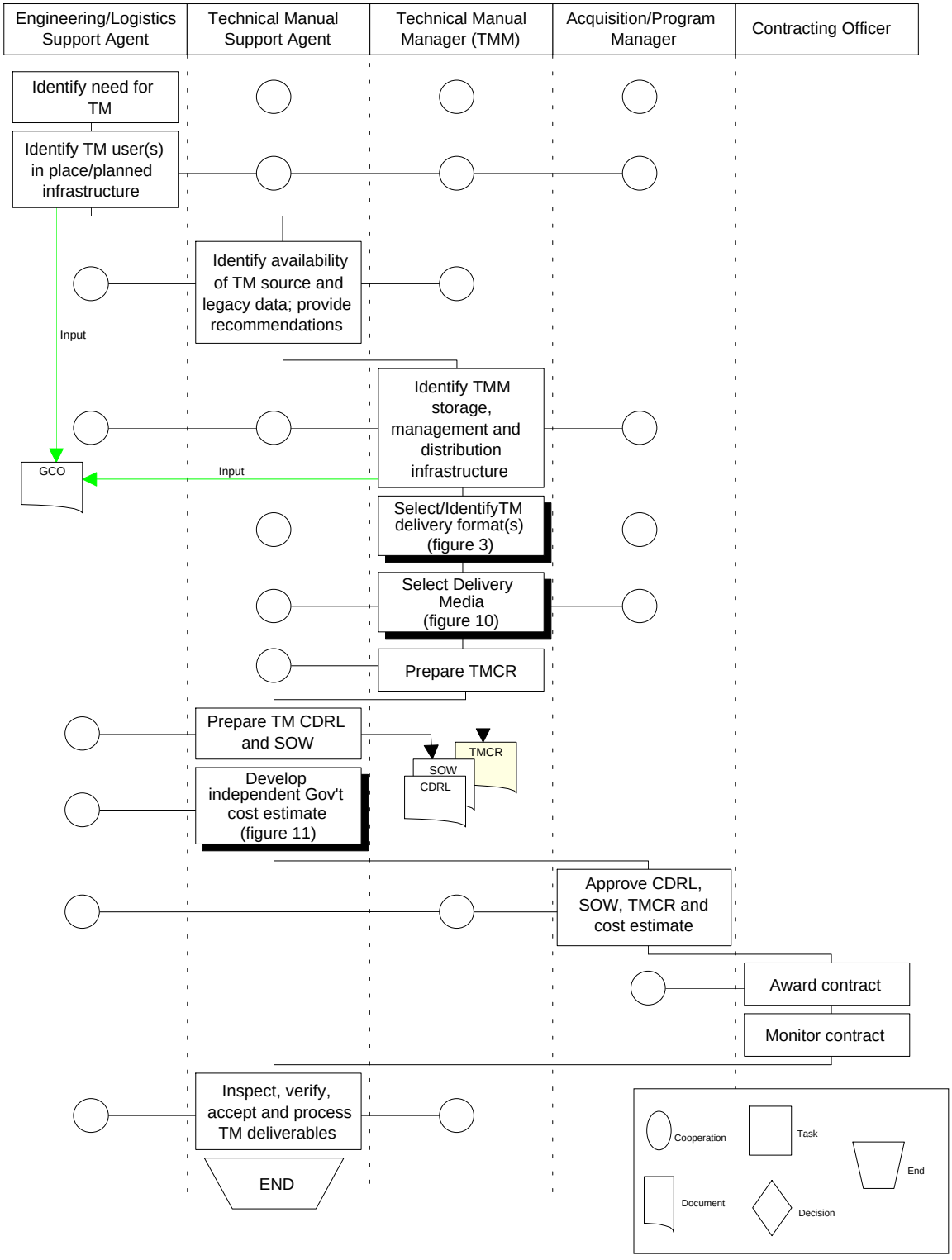

FIGURE 2. TM Decision and Responsibility Flow Chart

3.2 Identify/Establish the Requirement for the TM

The acquisition management team must first identify the requirement to procure a TM. This is usually brought about through the Logistic Support Analysis Record (LSAR) process and other requirements, such as the need to perform maintenance on the equipment. The LSAR database generated during the initial phases of the defense system program will usually define the requirement for particular TMs.

3.3 Identifying the TM User's Requirements

The acquisition management team must now identify the intended TM user's infrastructure. The users include: Those involved in the acquisition, review, and approval; the TM management infrastructure; and the end user (who may not yet operate in a digital environment). The acquisition management team should consider the existing and planned infrastructures for both Government and contractor facilities; available CALS data exchange standards; and the various digital data deliverable options in terms of media, format, and access. Documentation of this review will take the form of a Government Concept of Operations (GCO). The review will include:

- The identification of current, near, and midterm infrastructure plans for the enterprise
- The ability for peer-to-peer communication
- The throughput capability to support movement of data electronically using the installed telecommunications infrastructure
- The personnel and their disciplines at all locations that are members of the acquisition management team
- The digital data resources or source data (libraries of historical data, standards, and specifications) available to support program acquisition and logistics processes.

Provisioning for end user hardware and software requirements to support a fielded defense system are normally under the funding discretion of the acquisition management team and must be considered during the CALS implementation strategy and planning process.

A more detailed guidance is provided in section 4, Guide for Developing a CALS GCO, in the "Navy/Marine Corps Manager's Desktop Guide for CALS Implementation."

3.3.1 Infrastructure Development

Effective acquisition of digital data can be done only with full consideration of the ability of Naval Forces activities to receive, store, distribute, and use digital data that complies with the CALS standards. The acquisition management team must establish the uses for which the data is required (see 3.3.2) and the Navy infrastructure modernization programs (see Appendix C) available to support this data. In response to DoDI 5000.2, DoD components are incrementally upgrading the infrastructure toward a comprehensive technical information management architecture through joint service programs like Joint Engineering Data Management Information and Control System

(JEDMICS) (see Appendix C). The evolution of this 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 implement the CALS strategy effectively.

The availability of digital data processing and telecommunications technology and approved standards for creation, storage, transmission, data 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 Naval Forces components must be assessed with respect to program needs and schedules. The GCO and CALS Implementation Plan (CALSIP) counterparts are excellent vehicles for making these determinations. The acquisition management team must plan to access or acquire digital data products.

The data user infrastructure, which is the computing environment available to a particular user, must be considered when acquiring digital data. This environment establishes the data processing capabilities of that user. The following areas identify a user's infrastructure:

- Hardware: Determine the current and planned hardware available to support the defense system program.

- 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.

- Networks: Determine the local- and wide-area networking capabilities and whether CITIS will be used.

The Navy infrastructure modernization programs specifically designed to aid in the creation, management, and use of TMs are:

- Automated Document Management and Publishing System (ADMAPS)

- TM Publish-On-Demand System (TMPODS)

- Advanced Technical Information Support/Interactive Electronic TM (ATIS/IETM)

An overview of these information management infrastructure programs is contained in Appendix C.

3.3.2 Data Uses

TMs are subject to all uses defined in MIL-HDBK-59. The acquisition management team will need to identify the use of the data by all organizations involved in the acquisition program. The acquisition management team must consider how data will be processed to make good decisions on digital data requirements. The five defined categories of data processing typical of most defense system programs are:

- 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. This activity is an excellent candidate for applying the Contractor Integrated Technical Information Service (CITIS) concept.

- 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. Core CITIS functions (approve, comment, view) are intended to provide this capability and should be given consideration.

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

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

- Archive: The placing of data into a repository to preserve it for future use.

3.4 TMs in the CALS Environment

The acquisition management team should be aware that it is possible to acquire TMs in a variety of forms depending upon the needs of the users. Maintenance manuals and the like may be procured as Interactive Electronic TMs (IETMs). The user would be the technician whose main concern is finding the desired maintenance-related information quickly and easily without being burdened in the field with the entire maintenance manual. On the other hand, description, operation, and installation and checkout manuals may be procured best in raster or Page Description Language (PDL) since these manuals are not used as often. Obviously, it is better to leave these decisions up to the individual program office since each defense system program is unique in its requirements.

Primary considerations for the acquisition management team to address when applying CALS to the creation, management, and use of TMs is the media, format, and content of TM data deliverables and their respective end users.

Paper, microfiche, and microfilm have been included in this discussion of CALS because much of the Navy's TM inventory is still available on these media. Navy CALS initiatives (see Appendix C, Navy Infrastructure Modernization Programs) are being developed to reduce or eliminate the need for these forms of media in the future. The benefits associated with using digital data far exceed what is being discussed in this paper. For TMs some benefits of digital data include: (1) Improving the handling and reducing the storage of TM data with electronic filing and archiving ideally creating a data repository; (2) reducing the costs associated with printing and distributing TMs by providing on-line access to this repository, so that naval personnel could access the data repository from their field activity and view and/or print the specific TMs they require; and (3) eliminating the need for field activities to incorporate change pages by keeping the data repository's TM data current. Also, this data repository may incorporate other related data to form a knowledge base to aid in the creation of IETMs.

3.4.1 Nondigital Data Deliverables

3.4.1.1 Paper

Paper or final reproducible copy has long been the traditional media for delivery of Navy product data and related information. TMs delivered on this media may have originated from many sources including other existing paper documentation, microfiche, microfilm, or any of the digital data formats described in the following sections. TMs originating on this media are governed by standards such as MIL-M-38784 and MIL-M-81927(AS).

Since paper is not a digital form of media, no digital data infrastructure requirements are necessary. However, converting the data content of paper to a digital data format requires infrastructure systems that include scanning hardware and software to support the conversion of both text and graphics from hardcopy to electronic format. The TM Print-On-Demand System (TMPODS) supports this type of paper-to-digital format conversion process (see Appendix C, TMPODS).

Since paper documents are difficult to maintain and update, it is not expedient to obtain them instead of digital data. Scanning a document into TMPODS is most useful when used with legacy data.

NOTE: The acquisition management team should accept paper deliverables only for the purpose of verifying the digital deliverables.

3.4.1.2 Microfiche/Microfilm

Microfiche and microfilm are other traditional media for delivery of data to the Navy. It is not a recommended media for obtaining new data, but it is discussed here since legacy data in this form already exists. The data provided on microfiche and microfilm are governed by specifications, such as MIL-M-38748 and MIL-M-9868, which provide guidelines for data format and content. Converting the data contents of microfiche or microfilm to a more flexible digital data format requires additional infrastructure requirements that include scanning hardware and software to support both text and graphics. TMPODS also supports the conversion of microfiche and microfilm to a digital form (see Appendix C, TMPODS)

3.4.2 Digital Data Deliverables

Digital data deliverables available in the CALS environment are extensive. Digital data provides the acquisition management team with a variety of digital data formats and media options. For TM delivery, the list includes:

Data Formats:

- Raster
- Illustrated Text Data Files:
  a) Text:
     1) American Standards Code for Information Interchange (ASCII)
     2) Standard Generalized Markup Language (SGML)

b) Illustrations:
   1) Computer Graphics Metafile (CGM)
   2) Initial Graphics Exchange Specification (IGES)
   3) Raster

c) PDL

- IETM

Media:

- MIL-STD-1840 magnetic tape
- Magnetic disk
- Optical disk
- CITIS - interactive access

3.5 Life Cycle Considerations

TMs are developed using LSAR and engineering drawings as source data. The LSAR consolidates logistics-oriented technical information in conjunction with data from the various engineering disciplines and Integrated Logistic Support (ILS) elements to reduce redundancy, facilitate timely usage, and enhance consistency among data elements and disciplines. The quality and productivity of TM 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, TMs, and training materials will provide even greater benefits to the defense systems program.

TMs are generally not required until the later acquisition life-cycle phases of a defense system program. In addition, TMs available during these earlier phases may be preliminary copies that have not been verified or have not received final acceptance but are useful for test verification, training, and operation. Final Reproducible Copies (FRCs) are available in the later phases. The acquisition management team must also consider the information volume and typical use (see 3.3.2) to determine the appropriate TM deliverable format.

3.6 CDRLs

Delivery of defense system data in digital form requires changes to Navy solicitations and contracts including their attachments and enclosures. These changes should be made with full consideration of the ability of Navy activities to make cost effective use of digital data deliverables or access. Each defense system program may include unique requirements for which additional program-specific tailoring will be needed. Most of the applicable CALS standards and specifications contain contract-negotiable options from which the acquisition management team must choose to satisfy program-specific requirements including multiple classes or types of data formats.

The TM Contract Requirements (TMCRs) will identify the types of TMs required and include language that specifies exactly how data will be delivered (including media, format, and content) under the contract. However, the TMCR does not address software TM requirements such as operator manuals, systems operator manuals, etc. In the case of software manuals, the Statement of Work (SOW) and CDRL will specify the TM-related data requirements and their preparation and delivery. CALS standards should be invoked, whenever possible, for digital delivery of support products such as

engineering drawings and TMs. The media for delivery such as magnetic tape, optical disk, or on-line (networks or telephone modems) should be compatible with Government-receiving system capabilities. Some digital deliverables, especially interim deliverables, may be efficiently acquired by agreeing on a common word processing package in the contract and specifying the appropriate and compatible physical media such as magnetic disk, magnetic tape, etc.

4.0 SPECIFIC CONSIDERATIONS

Once the general considerations have been reviewed, an additional process of determining how to implement these decisions must be accomplished. The information contained in this section provides a process for selecting which options are best suited for the defense system program objectives. It should be noted that certain considerations must be accomplished concurrently. The options must be evaluated for usefulness with respect to each phase of the defense system's life cycle and whether the defense system program's infrastructure can support a particular option. Once the most suitable options have been selected, the process to validate and verify these options should be determined.

The following sections discuss additional topics of consideration that must be addressed.

- Deliverable formats and media selection
- Determination of level of TM development or modification
- Cost issues associated with the selected deliverable option
- Sample language for contract deliverables.

4.1 TM Delivery Format Selection (see figure 3)

The purpose of this section is to determine the status and/or existence of the TM and ultimately to lead the acquisition management team to a decision as to the specific type of digital data and media format required to support the defense system program. In addition to the immediate TM requirements (acquire and/or develop a TM), an important consideration is that the acquisition management team should be concerned with the potential long term engineering and support functions and requirements when procuring the TM.

4.1.1 TM Delivery Options

4.1.1.1 Raster

Raster data is a binary representation of an image. Raster may be thought of as the electronic version of a paper document. It contains no intelligence and must be reviewed through human interpretation. There are two types of raster data, tiled and untiled. Tiled raster is the preferred format. A tiled raster image resembles a two-dimensional grid with each "tile" or set of pixels representing a portion of the image. Formatted raster can be either tiled or untiled. Text and graphics in raster data formats are stored digitally, which allows more rapid and consistent access to the stored images than paper. In addition, raster data formats can be sent via electronic means to remote sites. Through a difficult process, raster files can also be converted to digital (word processor or desk top publishing) documents and edited through manipulation of individual pixels.

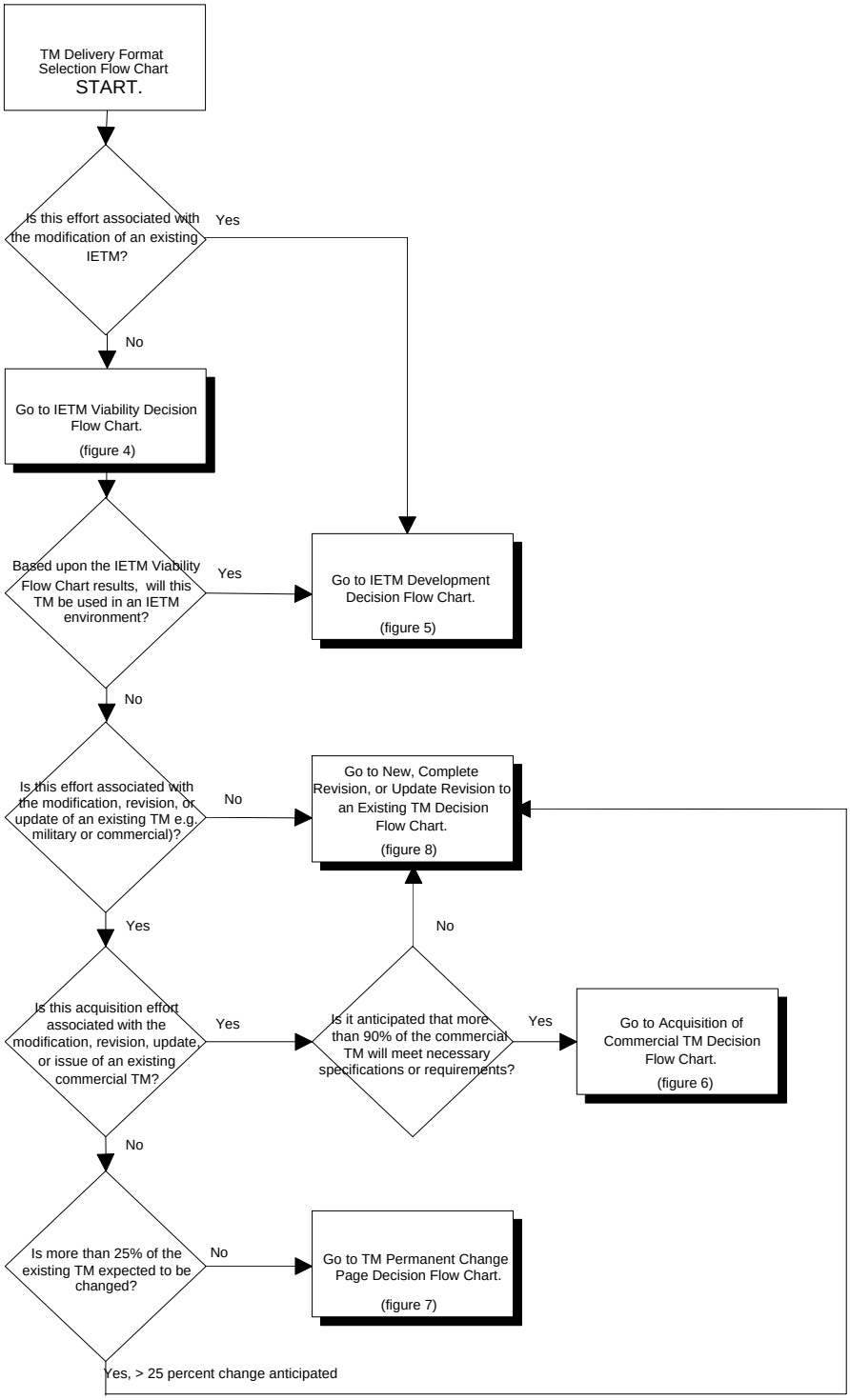

FIGURE 3. TM Delivery Format Selection Flow Chart

With the advent of raster scanning technologies, the ability to convert existing paper TM to digital data files has become available. Raster conversion became the easiest and most cost effective method for digitizing the Navy's existing paper TMs. However, the quality assurance (QA) process by human interpretation required to verify the data contents may increase costs substantially. Also, raster image files require a large amount of memory storage due to their file structure and contain no additional

information other than each tile's position on a grid. Technologies are evolving that will be able to convert the raster images to other digital forms (such as vector) for processing, but the acquisition management team should consider other processable data form's first unless the TMs required are legacy data. TMPODS stores drawing images as raster data on optical disk media (see Appendix C, TMPODS).

4.1.1.2 Illustrated Text Data Files

Illustrated text data files provide a dynamic form of source data with two possibilities: (1) Separated files for text, graphics, alphanumeric and audio/visual data; or (2) integrated files consolidating some or all of these different data representations. Text data files include word processing and desk top publishing applications. Such data files can provide the source data for multiple data applications that allow creation of standard and custom documents as well as manipulation of the data for annotate/excerpt or update/maintain purposes. Illustrated text data files can also import generic text [ASCII, SGML (MIL-M-28001), etc.] and graphics [raster (MIL-R-28002), CGM (MIL-D-28003), IGES (MIL-D-28000), etc.] from other sources that may be otherwise incompatible. In addition, there are PDLs, sometimes called text presentation metafiles, which are used to drive output devices such as printers.

There may be instances when obtaining illustrated text data files involves obtaining more than one format of graphical data. This may be due to multiple graphic sources. This is an acceptable and highly likely situation. The acquisition management team must be aware of this possibility and be prepared to develop/modify the defense system contract requirements accordingly.

Text Formats:

There are two possible text formats for consideration. They are the ASCII and tagged ASCII or Standard Generalized Markup Language (SGML). They are described below.

- ASCII

  ASCII was developed as a method of translation for computer processors to interpret alphanumeric characters and symbols through binary representation. ASCII is the basic text information used by most word processing applications and contains no formatting information other than line feed and/or carriage returns. Word processing applications can import ASCII text from other word processing applications, and some word processing applications can translate formatted ASCII from other word processing applications into their own format. This makes ASCII text ideal for most interim deliverables since it can also be imported into an SGML application where it can be SGML-tagged to become a CALS-compliant deliverable.

- SGML

  SGML as defined in MIL-STD-1840 is "A standard that defines a language for document representation which formalizes markup and frees it of system and processing dependencies. It provides a coherent and unambiguous syntax for describing whatever a user chooses to identify within a document." In the SGML scheme, the document contains only generic tags identifying such structural elements as paragraphs, sections, etc. but no typesetting markup. However,

SGML's tagging of ASCII text is a rather cumbersome proposition and may be best suited for final data deliverables rather than interim deliverables. When considering SGML as a deliverable format, the acquisition management team must determine whether the necessary computer environment is available and in place to accept the SGML documentation. Any TMs that will be maintained throughout the life cycle of a defense system should be delivered in SGML format. Additional features associated with SGML are described in Appendix A. [see Document Type Definition (DTD), Output Specification (OS), and Formatting Output Specification Instance (FOSI).]

Graphics and Illustration Formats:

There are three possible graphics formats for consideration. They are Computer Graphics Metafile (CGM), Initial Graphics Exchange Specification (IGES), and raster. They are described below.

- CGM

  CGM data is a two-dimensional vector presentation used primarily for charts, figures, and simple drawings. Many types of TMs contain illustration data in this category. This is the preferred format for obtaining graphical digital data into TMs. CGM requirements are stated in MIL-D-28003.

- IGES

  IGES data is a three-dimensional vector presentation used primarily for engineering drawings. IGES may be the preferred choice for graphical data if a CAD database was used as the source. IGES requirements are stated in MIL-D-28000.

- Raster

  See 4.1.1.1 for discussion of raster.

PDL:

A PDL file is executed by an interpreter that controls a raster printer or other output device. A PDL can be used to ensure that the composed document produced by an electronic publishing system (which may impose additional processing limitations, such as font variations, kerning, or hyphenation) would produce nearly identical hardcopy output on the widest possible spectrum of printer devices. MIL-STD-1840 provides for the interchange of PDL data files. However, PDLs are currently not standardized, for a Standard Page Description Language (SPDL) is still being developed. MIL-STD-1840 requires that a system must provide portability of files (PostScript or Impress PDL specifications). PDL document image files can be acquired as interim deliverables or as final deliverables in addition to, but not in place of, other digital data deliverables.

4.1.1.3 Interactive Electronic TM (IETM)

An IETM is a computer-based collection of information needed for the diagnosis and maintenance of a defense system. It is optically arranged and formatted for interactive presentation to the end user on an electronic display system. Unlike other optical systems that display a page of text from a single document, IETMs present interrelated information from multiple sources tailored to user queries. Currently, IETMs are being developed by the AEGIS program to run on the ATIS platform (see Appendix C).

Specifications and other items to define IETMs are:

- MIL-D-87269, *Data Base, Revisable: Interactive Electronic Technical Manuals, for the Support of*
- MIL-M-87268, *Manuals, Interactive Electronic Technical: General Content, Style, Format, and User-Interaction Requirements*
- MIL-Q-87270, *Quality Assurance Program: Interactive Electronic Technical Manuals and Associated Technical Information; Requirements for*
- Hypertext and Hotspots.

A 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. The user could then continue to follow along these "paths" to other cross-referenced points in that collection of writings. This creates a "pageless" document that, depending on the source database, can contain a collection of information from a variety of sources. Also, rather than limit these documents to pure text, we may incorporate graphics, audio, video, and/or computer programs into the content of the document creating what is known as a hypermedia document.

By streamlining access to the desired information and by providing multiple paths to other related information, the IETM offers a more efficient and more comprehensive method of using technical information. Unrestricted by the page-oriented display and the use of sole-source information, the IETM duplicates on the personal computer (PC), the research environment available in a well-equipped multimedia library; displays only the actions appropriate for resolving a specific problem; provides fault-isolation tables and diagrams; and guides the technician through the troubleshooting process via a user-friendly query method. IETMs permit the user to locate information more easily and to present it faster and more comprehensively in a form that requires much less storage than paper.

Derived from the LSAR and CAD data, the IETM will inherently become an integral part of the defense system for the outset. Data created throughout the defense system's life cycle will contain all of the information needed to create and revise the necessary IETMs for the program.

IETMs require a computer environment with the appropriate presentation systems and software to invoke them.

4.2 IETM Viability (see figure 4)

The acquisition management team should consider whether the TM will ultimately be used in an interactive computer environment, the IETM. The IETM format offers the user distinct advantages over the traditional TM. Some IETM benefits include: (1) Reduction in the false removal rate of Line Replaceable Units (LRUs) or Weapon Replaceable Assemblies (WRAs); (2) reduction in troubleshooting time; (3) reduction in the TM support costs associated with distribution, management, and storage; and (4) allowing training activities to concentrate more on generalized training vice system specific training. The acquisition management team should first determine whether the end item or defense system program is currently in the early phases of design, whether the life cycle requirements for the TM exceed five years, and whether the TDP or LSAR database contains, or can be economically altered to include, a numbering system similar to MIL-STD-1808. If any of these considerations can be answered "NO," then an IETM is not recommended; proceed to 4.4. If all considerations can be answered "YES," then a business case analysis should be performed to determine the economic feasibility of the IETM. If results from this analysis recommend pursuing an IETM or quality readiness and/or support factors lend adequate credence to the need for an IETM, development of an IETM should be pursued. In this case, go to 4.3.

4.3 IETM Development (see figure 5)

Once IETM development has been selected, the acquisition management team must first determine whether this effort will be associated with an existing IETM. This may include the modification of an existing IETM or the creation of a supplement to an existing IETM. If this is indeed the case, then the acquisition management team must determine whether an existing infrastructure and display device will be used in conjunction with the IETM and whether this infrastructure uses a proprietary format. If all of the above conditions are true, then the final IETM developed should remain in the existing proprietary format. However, if any of these conditions is not met, then it is advised that the IETM be developed using the new IETM standards. See "NOTE" below and proceed to 4.8.

NOTE: For both cases stated above, any existing source or legacy data used to develop the IETM that is not presently in a digital format should be converted to an acceptable digital format for proper utilization in the IETM format. All appropriate standards and specifications should be used in converting and/or developing the required data.

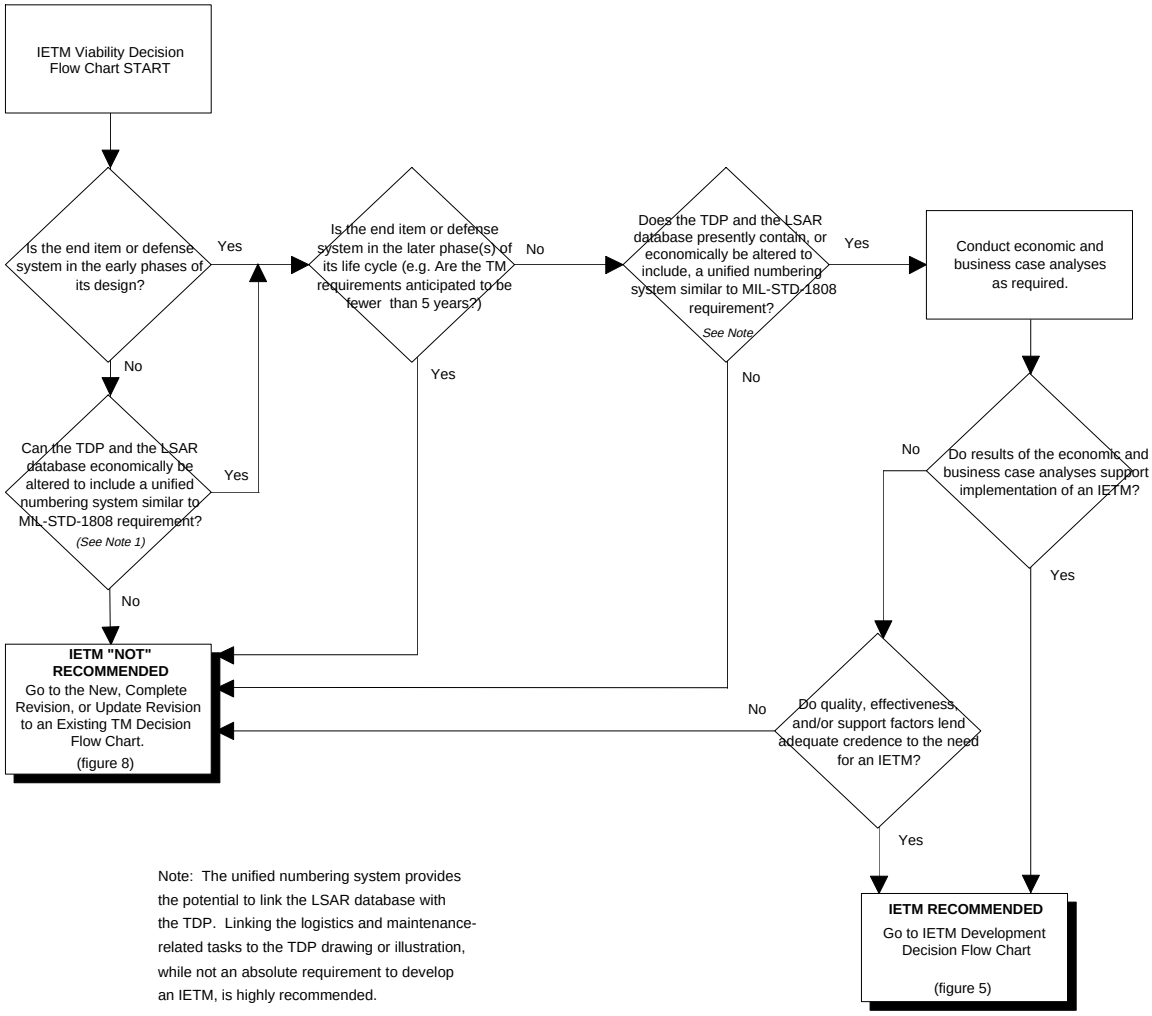

FIGURE 4. IETM Viability Decision Flow Chart

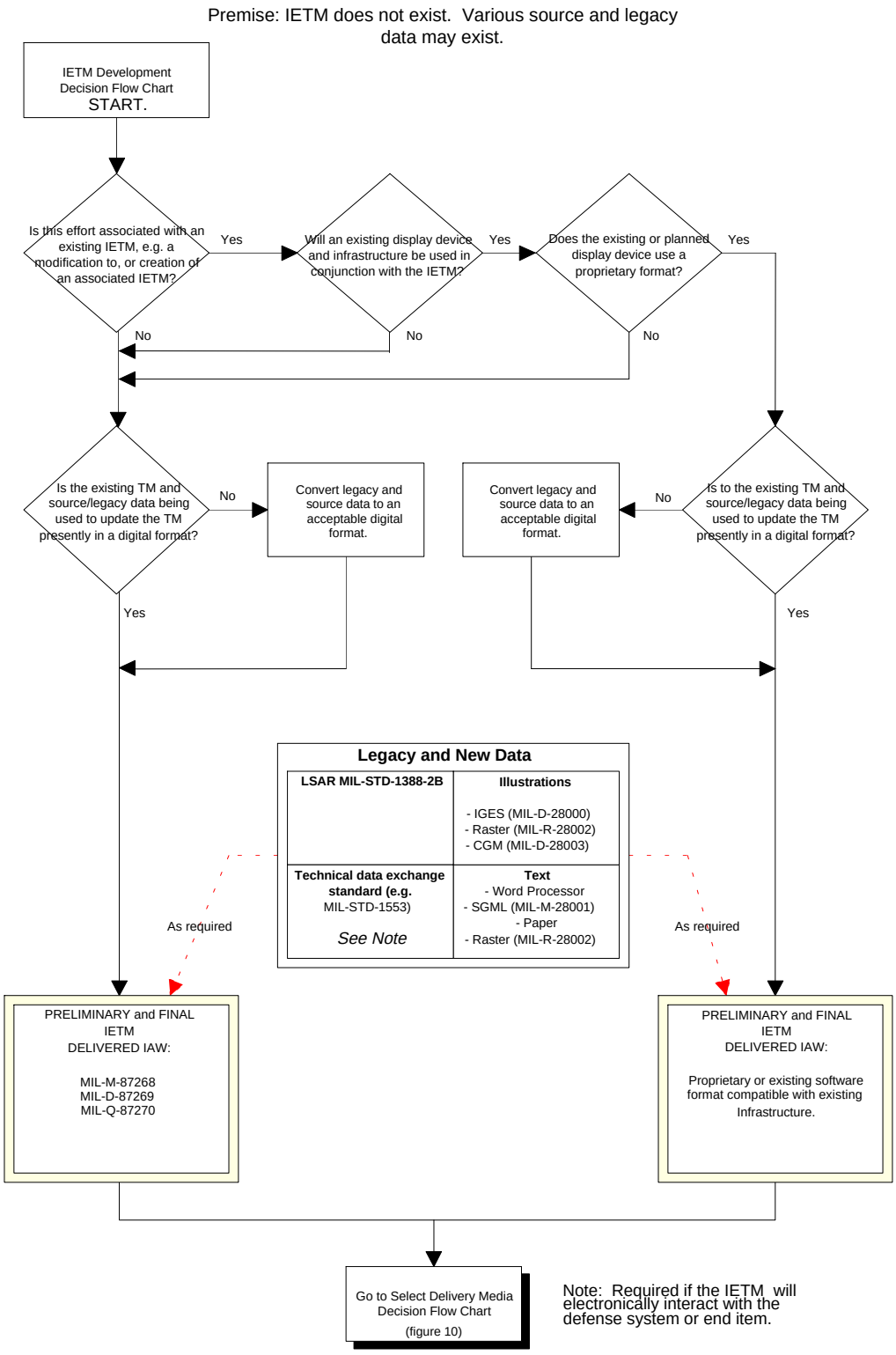

FIGURE 5. IETM Development Decision Flow Chart

4.4 Existing TM Availability

Utilization of existing TMs and legacy data is likely in the development of completely new systems with similar features. The acquisition management team should be aware that even on completely new defense system programs some portion of the TMs may exist in both digital and nondigital formats. This is most relevant when a program is entering the earlier life cycle phases. An important point to remember here is that acquisition of the proper level and type of digital data is most cost effective when defined early in the program's life cycle. If the TM does not exist and/or is not accessible to the Government, the acquisition management team should consider developing a new TM (see figure 8 and 4.5). If the TM does exist, the acquisition management team should proceed to 4.4.2, unless the acquisition effort is associated with the modification, revision, update, or issue of an existing commercial TM. In that case, go to 4.4.1.

4.4.1 Commercial TM Usage

Another consideration the acquisition management team must address is whether existing off-the-shelf TMs will satisfy the program's TM requirements. If **more than 90 percent** of the TM conforms to the technical content requirements defined in MIL-M-7298 and supports the maintenance concept of the equipment, the commercial TM may be used. In this case, go to 4.4.1.1. However, if **more than 10 percent** of the proposed TM fails to meet the necessary requirements to support the equipment, a new TM should be developed. If this is the case, go to 4.5.

4.4.1.1 Commercial TM Development (see figure 6)

Once it has been determined that a commercial TM will satisfy the technical requirements and maintenance concept of the equipment, the acquisition management team must determine the present format of the commercial TM and whether change pages and/or a TM supplement will be required. If the "basic" TM is available in a word processor format, the TM may be delivered in its present format providing that this is mutually compatible with the existing infrastructures. In this case, go to 4.7. If it is not, the TM should be delivered in raster format. In this case, go to 4.6. Also, if change pages and/or a TM supplement will be required in addition to, or instead of, the "basic" TM, then the development of these items is the same as that required for a new TM except that the format and style of the newly developed items may remain the same as the "basic" TM. Go to 4.5.

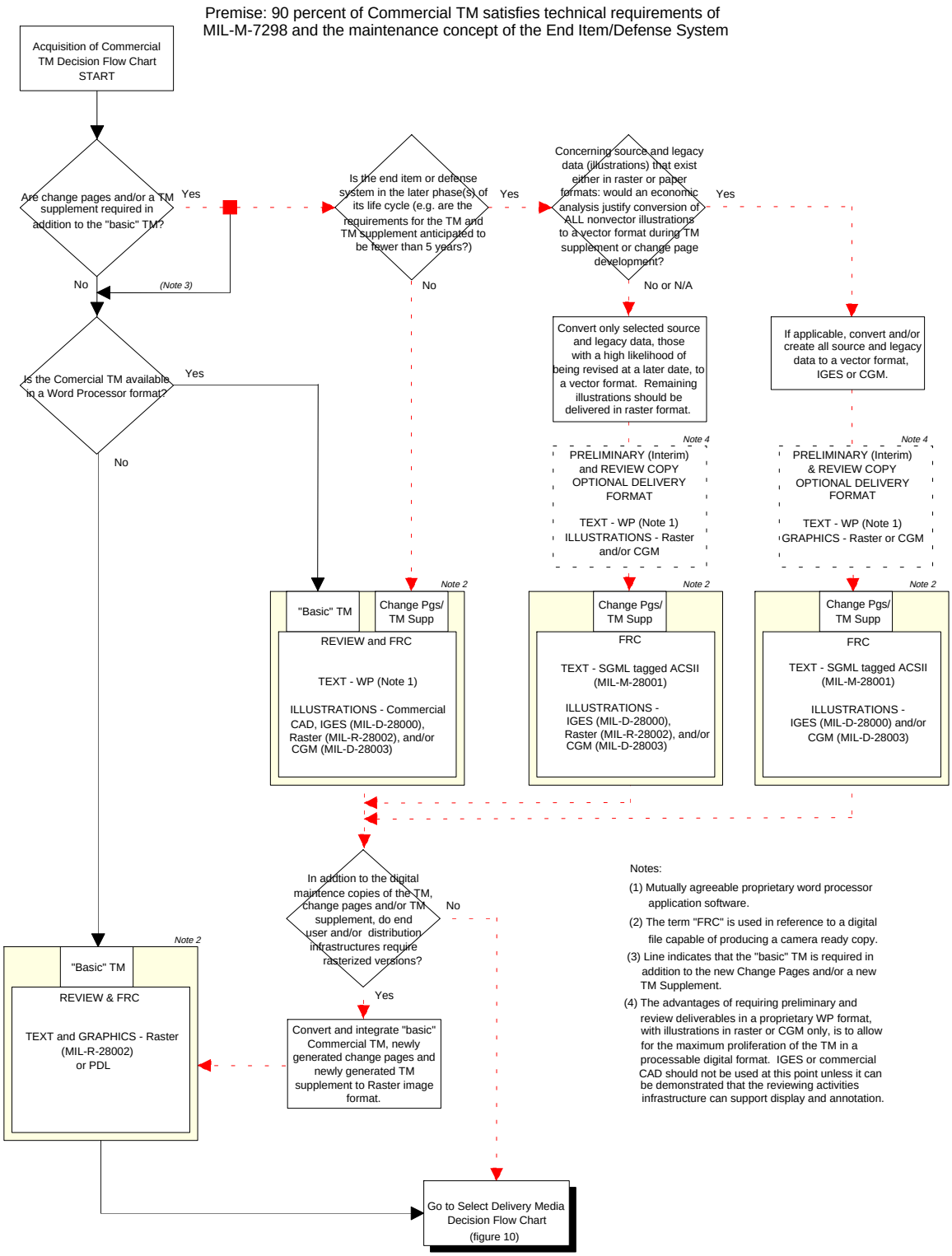

FIGURE 6. Acquisition of Commercial TM Decision Flow Chart

4.4.2 Revisions to Existing Military TMs

The acquisition management team must now determine how well the existing military TMs cover the maintenance concepts of the equipment. Changes to the hardware configuration or equipment components of the defense system may impact upon the accuracy of the TM's information. If **less than 25 percent** of the TM is affected by configuration changes, proceed to 4.4.2.1. If **more than 25 percent** of the existing TM is affected by these configuration changes, complete revision of the TM is recommended. Proceed to 4.5. However, if the configuration changes affect the existing TM in a range somewhere in between these two extremes, proceed to 4.4.2.2.

4.4.2.1 TM Permanent Change Page Development (see figure 7)

Once it has been determined that less than 25 percent of the TM needs revision, only change pages will be developed. The basic TM will be converted to raster if it is not already digitized. Change page development will follow the same decision path as the development of a new TM, but the newly created change pages will retain the format and style of the original TM. Proceed to 4.5.

4.4.2.2 TM Update Revision Development

Once it has been determined that more than 25 percent of the TM must be changed, the acquisition management team must decide how the final product will be delivered. The decision process follows the same basic path as that stated for a newly developed TM (see figure 8); the difference is the revised TM may retain the format and style of the original TM. Proceed to 4.5.

4.5 New TM, Complete Revision, or Update Revision Development
(see figure 8)

4.5.1 Source and Legacy Data Considerations

The acquisition management team must now consider whether any of the TM source data presently exists as legacy data. Legacy data developed from existing defense systems or from the creation of LSA data may contain enough information to warrant inclusion into the new defense system program.

NOTE: For newer defense system programs, this legacy data may exist in both digital and nondigital formats.

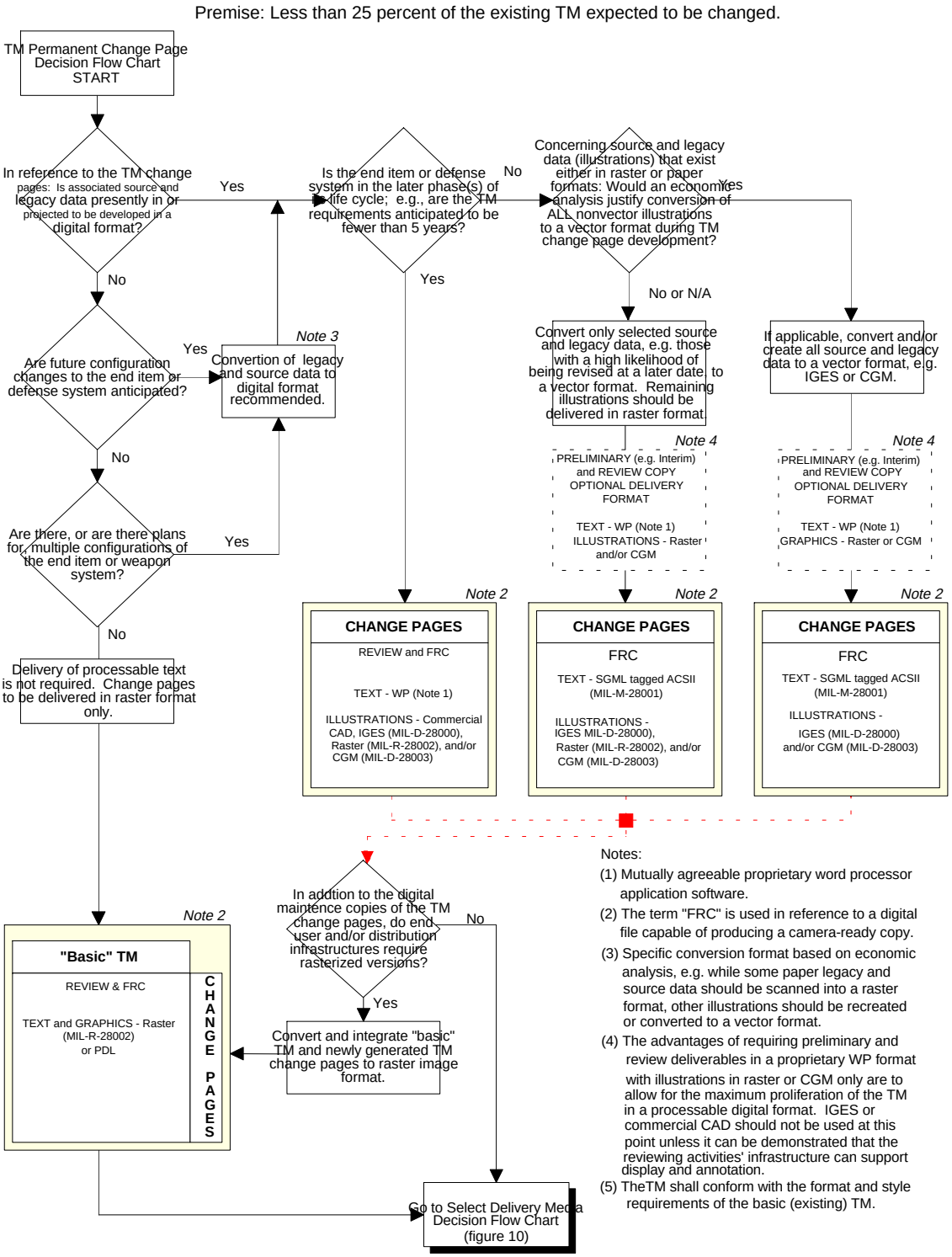

FIGURE 7. TM Permanent Change Page Decision Flow Chart

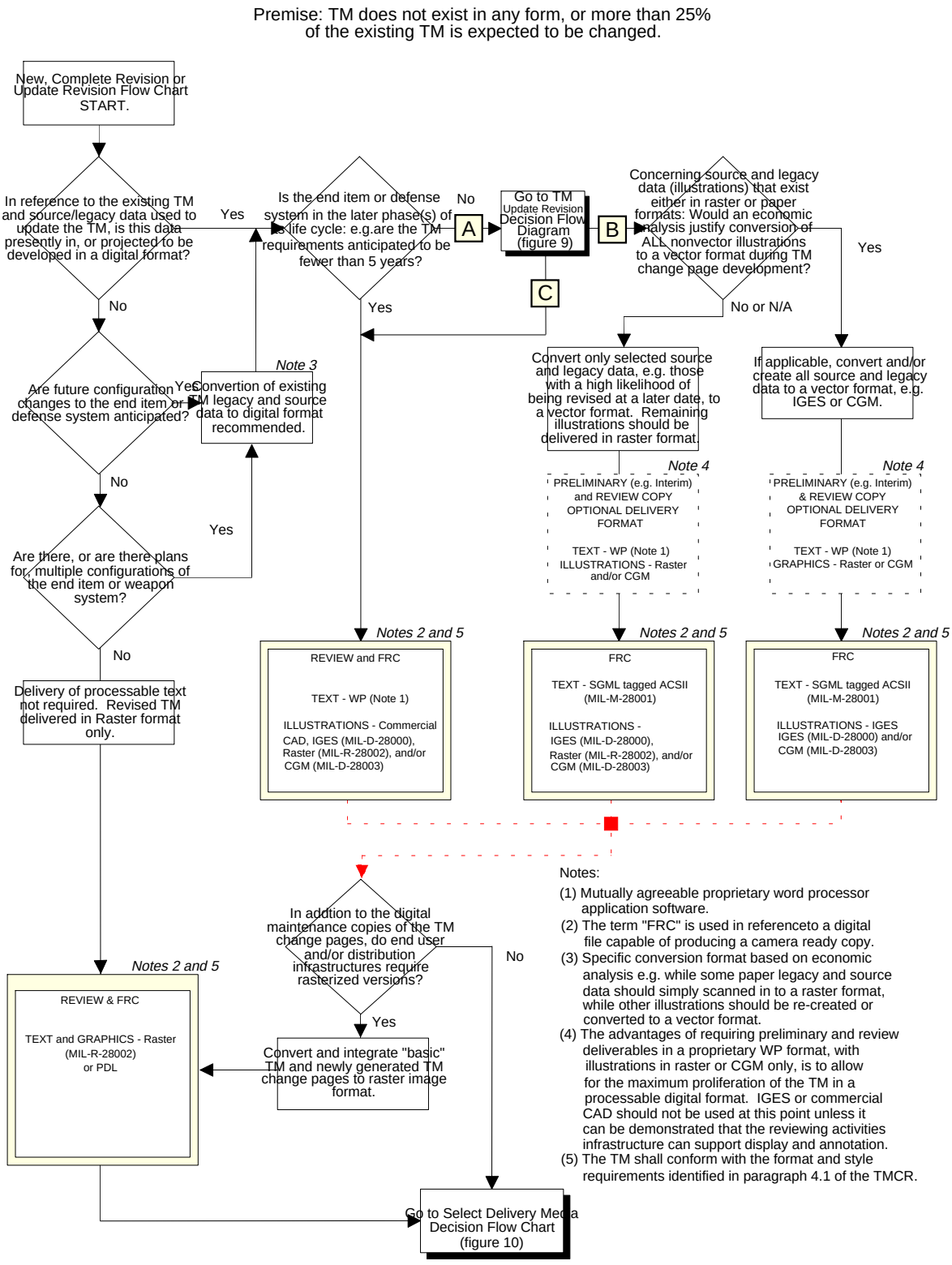

FIGURE 8. New, Complete Revision, or Update Revision to an Existing TM Decision Flow Chart

If legacy data does exist in a digital format, the acquisition management team should proceed to 4.5.3 to address life cycle considerations. If no legacy data is to be procured for the defense system's TMs or no digital legacy data exists, the acquisition management team should consider whether configuration changes and/or multiple configurations are anticipated for the end item or defense system. Go to 4.5.2.

4.5.2 Defense System Configuration Considerations

Configuration differences may play an important part in the acquisition of defense system TMs. The differences may be as small as printed circuit card modifications or as large as entire equipment changes. The acquisition management team must determine whether multiple configurations will exist. A different TM may be procured for each configuration. Another consideration is whether future changes to the TM are anticipated. If multiple configurations and/or configuration changes are anticipated, conversion of the source or legacy data to digital format is recommended. Specific conversion format may be based on an economic analysis that may recommend some paper legacy and source data simply be scanned into a raster format and other illustrations be recreated/converted to a vector format. In this case, proceed to 4.5.3. If this is not the case, the defense system program should consider delivery of the TM in raster format for both text and graphics. Go to 4.6.

4.5.3 Program Life Cycle Considerations

The acquisition management team must now consider the current phase of the end item or defense system program and the anticipated requirements for the TMs. If the end item or defense system program is currently in the later phase(s) of its life cycle and the TM requirements are anticipated to be **fewer than five years**, the need to deliver SGML-formatted TMs is not recommended, especially since most of the data for the TMs may be in hard copy or proprietary digital format. If this is indeed the case, delivery of both review and Final Reproducible Copies (FRC) of the TMs in a mutually agreeable format is recommended. Go to 4.7. If the TM requirements are anticipated to be **at least five years** and this TM development process is concerned with a TM Update Revision, proceed to 4.5.4. Otherwise, go to 4.5.5.

NOTE: The term "FCR" is used in reference to a digital file capable of producing a final reproducible copy.

4.5.4 Additional TM Update Revision Decisions (see figure 9)

As discussed in 4.4.2.2, a TM Update Revision may retain the style and format of the original TM. With this in mind, additional considerations concerning SGML formatting arise. DTDs may exist that support the modification of the original TM while retaining the original style and format. If these DTDs do exist, then proceed to 4.5.5. If these DTDs do not exist, then the acquisition management team must consider, through economic analysis, whether it is cost effective to modify or create a DTD to satisfy the style and format requirements of the original TM. If it is determined to be economically practical, proceed to 4.5.5. If not, it is recommended that the new TM Update Revision be delivered in a mutually agreeable format for both text and illustrations. Go to 4.7.

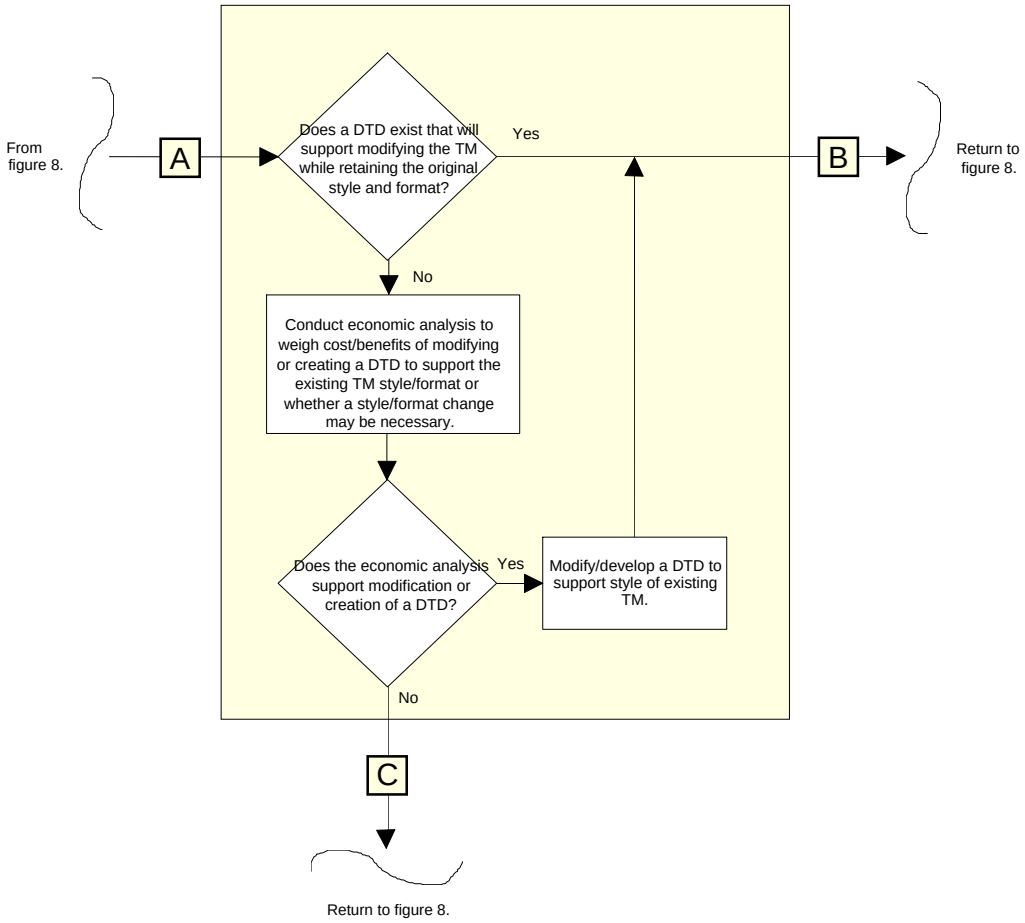

FIGURE 9. TM Update Revision Decision Flow Chart

4.5.5 Conversion of Illustrations

The acquisition management team must now determine, through economic analysis, whether conversion of **all** existing illustrations is justified. Conversion in this case means converting nonvector illustrations, both source and legacy data that currently exists in raster and hard copy formats, into a vector format. If it is determined that conversion of **all** existing nonvector illustrations to a vector format is cost effective or if no source or legacy illustrations exist, then the recommended solution would be to convert and/or create all applicable illustrations to a vector format, IGES or CGM. If economic analysis determines that conversion of all existing illustrations is not practical, it is recommended that only selected source or legacy illustrations (those with a high likelihood of being revised at a later date) be converted to a vector format. Remaining illustrations should be delivered in raster format. In either case, see "NOTE" and go to 4.7.

NOTE: To provide maximum proliferation of the preliminary TMs for review, it may be beneficial to request that these deliverables be provided in a proprietary word processor format with illustrations in either raster and/or CGM formats only. SGML, IGES or commercial CAD should not be used at this point unless it can be demonstrated that the reviewing activities' infrastructure can support display and annotation.

4.6 Document Image Files (Raster, PDL)

The document image file delivery option, which consists of either raster (see 4.1.1.1) or PDL (see 4.1.1.2) files, allows the acquisition management team to obtain TM data in a digital format. The data uses of the document image file deliverables are somewhat limited but do provide for view, archive, comment, and annotate capabilities. Also CITIS, if available, provides another method for delivery of preliminary deliverables. The GCO is designed to assist the acquisition management team in determining CITIS availability. Suggested delivery media options (see figure 10) include: (1) Optical disk or CD-ROM, (2) Magnetic disk, or (3) 9-track magnetic tape, all in accordance with MIL-STD-1840.

NOTE: Paper TMs may be requested in addition to the document image file deliverables but only for verification of the document image file data.

4.6.1 Cost

Once the data delivery format selected is in document image files, the cost of acquiring this data can be calculated. Figure 11 is designed to assist the acquisition management team in determining all the steps associated with both the creation and/or conversion of the TM deliverable and, used in conjunction with table 1, will determine the approximate total cost of this process. Costs associated with paper TM delivery and/or on-line delivery using CITIS have not been included in this document.

NOTE: Table 1 provides an approximation of costs associated with this data deliverable. Specific program requirements may vary from those presented here and may be substituted for the rates shown.

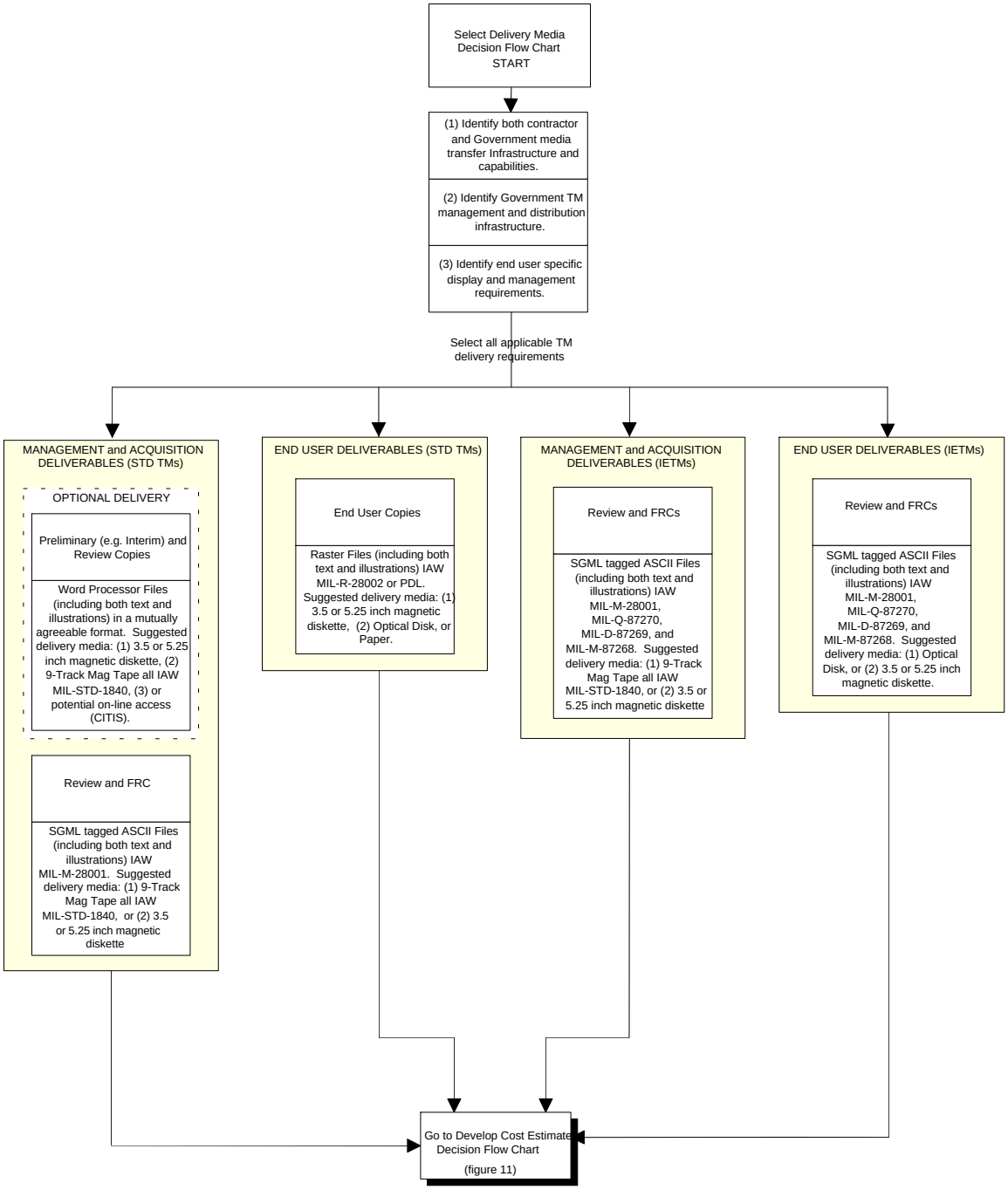

FIGURE 10. Select Delivery Media Decision Flow Chart

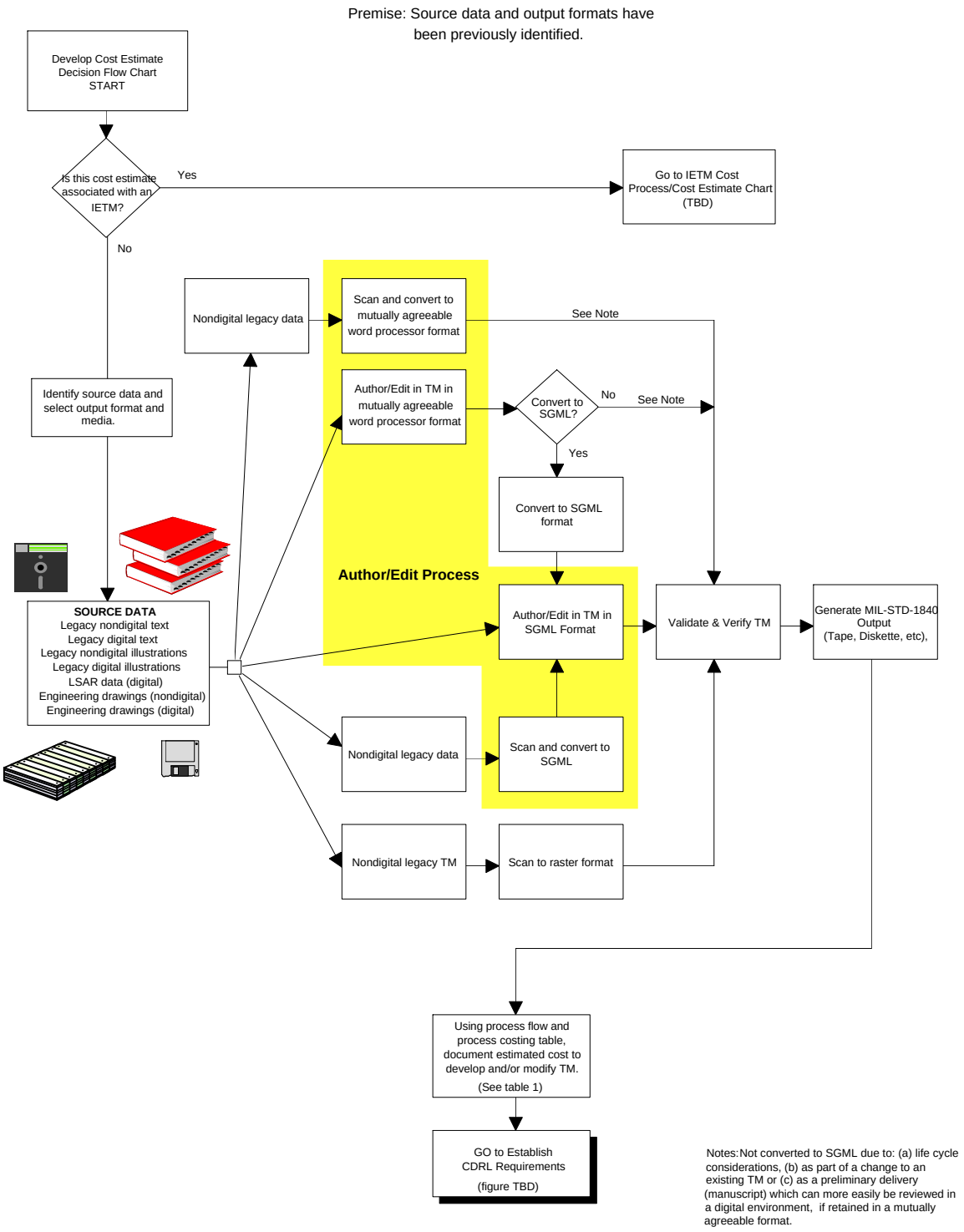

FIGURE 11. Develop Cost Estimate Decision Flow Chart

TABLE 1. Cost Associated with Developing/Converting the Deliverable Options

Process	Note 1	Text	Parts Lists	Tables	Block Diagm	Line Art	Schematic or Wiring Diagrams	Exposed Views
	S	4.0	4.0	4.0	4.0	5.0	6.0	15.5
Create in WP format	I	6.0	5.5	5.5	6.5	7.0	8.0	20.0
	C	12.0	7.0	7.5	9.0	9.0	10.0	40.0
	S	3.0	3.0	3.0	4.0	5.0	6.0	15.5
Create in SGML format	I	4.5	4.5	4.5	6.5	7.0	8.0	20.0
	C	9.0	5.5	6.0	9.0	9.0	10.0	40.0
Scan & Convert to WP		$16.00/Pg						
Scan & Convert to SGML		$16.00/Pg						
Scan & Convert to Raster		$2.00/Pg						
Convert from WP to SGML		$14.00/Pg						
Validate/Verify TM		0.5 hr/Pg						

4.6.2 CDRLs

To invoke this data deliverable option, specific TMCRs and CDRLs must be developed to identify the types of TMs required and include language that specifies exactly how data will be delivered under the contract including media, format (in this case raster), and content. To invoke this data deliverable option, a sample CDRL and a TMCR addendum sheet (see figures 12 and 13) have been developed. The sample CDRL may be used for any of the deliverable options by specifying the required deliverable as indicated. The information contained in the following contract vehicles should be tailored to meet the requirements of the specific defense system program. CALS standards should be invoked whenever possible.

CONTRACT DATA REQUIREMENTS LIST
(Data Item)

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. Please DO NOT RETURN your form to either of these addresses. Send completed form to the Government issuing Contracting Officer for the Contract/PR No. listed in Block E.

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY TDP _____ TM __X__ OTHER____________________

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
	(Defense System)	(Specify Deliverable)

4. AUTHORITY (Data Acquisition Document No.)	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
SEE BLK 16		

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
DD	D		
8. APP CODE		11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION
A			

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
15. TOTAL			

16. REMARKS

BLK 4: (Add TMCR No./Statement of Work Paragraph No.)
Note: Requirements should be specified in TMCR/Statement of Work.

BLK 9: See TMCR (Add No.) for Distribution Statement.

Note: See General DD Form 1423 Glossary for instructions on completing this form.

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

DD FORM 1423-1, JUN 90

FIGURE 12. Sample CDRL for TM Deliverables

TMCR Attachment (1)

ADDENDUM SHEET

The descriptions below identify any deviations/waivers or additions to the requirements defined in the referenced TMCR paragraphs.

TMCR Paragraph No.	Description
4.1.a	The text and tabular material for both the review and final manuscript copies shall be delivered in a raster data file. Navy Image File Format (NIFF) shall be used for the raster data contained in a MIL-R-28002 raster data file. Additional requirements for raster data files are contained in SPAWAR-S-903.
4.1.b	The illustrations and drawings shall be delivered in a raster data file. Navy Image File Format (NIFF) shall be used for the raster data contained in a MIL-R-28002 raster data file. Additional requirements for raster data files are contained in SPAWAR-S-903.

FIGURE 13. Sample TMCR Addendum Sheet for Raster Deliverables

NOTE: This addendum sheet was developed using Space and Naval Warfare Systems Command (SPAWAR) TM Contract Requirement (TMCR). Any specific paragraphs listed in this TMCR addendum sheet reference this document.

4.7 Illustrated Text Data Files

The illustrated text data file deliverable option, described in 4.1.1.2, includes the vast majority of data formats available to the acquisition management team. Illustrated text data file deliverables provide the greatest flexibility and data manipulation capabilities. It is very important that the acquisition management team know the specific digital and management infrastructure and end user requirements when specifying this deliverable option due to the number of digital formats and software applications available. Also CITIS, if available, provides another method for delivery of preliminary deliverables. The GCO is designed to assist the acquisition management team in determining CITIS availability. Suggested delivery media options, which may vary depending on the specific user's requirements (see figure 10), include: (1) Optical disk or CD-ROM, (2) Magnetic disk, or (3) 9-track magnetic tape, all in accordance with MIL-STD-1840.

NOTE: In addition to the digital maintenance copies of the TM, change pages, or TM supplement, a rasterized version may also be required by the end user and/or the distribution infrastructures. If this is the case, convert and integrate the new change pages or TM supplement, as applicable, into the rasterized "basic" TM.

NOTE: Paper TMs may be requested in addition to the digital data deliverables but only for verification of the digital data.

4.7.1 Cost

Once this option has been selected as the data delivery format, the cost of acquiring this data can be calculated. Figure 11 is designed to assist the acquisition management team in determining all the steps associated with both the creation and conversion of the TM deliverable and, used in conjunction with table 1, will determine the approximate total cost of this process.

NOTE: Table 1 provides an approximation of costs associated with this data deliverable. Specific program requirements may vary from those presented here and may be substituted for the rates shown.

4.7.2 CDRLs

To invoke this data deliverable option, specific TMCRs and CDRLs must be developed to identify the type of TM required and include language that specifies exactly how data will be delivered under the contract including media, format (in this case a processable text data file), and content. To invoke this data deliverable option, a sample CDRL and a TMCR addendum sheet (see figures 12 and 14) have been developed. The sample CDRL may be used for any of the deliverable options by specifying the required deliverable as indicated. The information contained in the following contract vehicles should be tailored to meet the requirements of the specific defense system program.

TMCR Attachment (1)

ADDENDUM SHEET

The descriptions below identify any deviations/waivers or additions to the requirements defined in the referenced TMCR paragraphs.

TMCR Paragraph No.	Description
4.1.a	The text and tabular material for the review manuscript copy shall be delivered in (add mutually agreeable word processor application software). The text and tabular material for the final manuscript copy shall be delivered in SGML-tagged ASCII in accordance with MIL-M-28001. Additional requirements are contained in Appendix A of the TMCR.
4.1.b	The review illustrations and drawings shall be delivered in a raster data file. Navy Image File Format (NIFF) shall be used for the raster data contained in a MIL-R-28002 raster data file. Additional requirements for raster data files are contained in SPAWAR-S-903. The final illustrations and drawings shall be delivered in IGES in accordance with MIL-D-28000.

FIGURE 14. Sample TMCR Addendum Sheet for Illustrated Text Data File Deliverables

NOTE: This addendum sheet was developed using Space and Naval Warfare Systems Command (SPAWAR) TM Contract Requirement (TMCR). Any specific paragraphs listed in this TMCR addendum sheet reference this document.

4.8 IETM Deliverables

The IETM deliverable option, described in 4.1.1.3, is the most dynamic and comprehensive data deliverable option available to the acquisition management team. It is of the utmost importance that the acquisition management team know the specific digital and management infrastructure and end user requirements when specifying this deliverable option due to the vast network of data resources associated with an IETM. The GCO is designed to assist the acquisition management team in gathering the necessary background information. Selected delivery media options, which may vary depending on the specific user's requirements (see figure 10), include: (1) Optical disk or CD-ROM, (2) Magnetic disk, or (3) 9-track magnetic tape, all in accordance with MIL-STD-1840.

NOTE: Paper TMs may be requested in addition to the IETM but only for verification of the digital data.

4.8.1 Cost

IETMs should be built on a solid foundation of basic logistics technical information (comprehensible, valid, appropriate task procedures; accurate configuration identification; etc.). Creating and maintaining such information for IETMs is a major cost. The technology to author, distribute, and use IETMs is a lesser, largely one-time cost. Cost analysis information was not available at the time of printing.

4.8.2 CDRLs

To invoke this data deliverable option, specific TMCRs and CDRLs must be developed to identify the type of TM required and include language that specifies exactly how data will be delivered under the contract including media, format (in this case a processable text data file), and content. To invoke this data deliverable option, specific CDRLs and TMCR addendum sheets are being developed as examples (not available at the time of printing). The information contained in the following contract vehicles should be tailored to meet the requirements of the specific defense system program.

4.9 Contractor Validation

The contractor should be required to validate that the delivered TM conforms to the contractual requirements. Specific validation agenda should be provided in the contractor's validation plan and associated documentation.

4.10 Government Verification

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

4.10.1 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 lowest level of acceptance is the data content and format. The acceptance process at this level is identical to acceptance of the data product provided on paper. This level of acceptance will be accomplished by viewing the data either through use of computer video screen or by viewing a paper printout of the data product.

The next level of acceptance is adherence to the specified CALS data exchange format. This will usually be compliant with the CALS standardization documents or other national or international data exchange standards. This level of acceptance may be aided by automated tools obtained, if available, from the CALS Test Network (CTN) or each service-component CALS office. The next level of acceptance is applied to the MIL-STD-1840 digital data format if it has been specified. Again, automated tools may be used to verify compliance. Other formatting requirements may be subject to inspection and acceptance including X12 EDI format, when specified.

Finally, the physical media may have acceptance criteria to be applied. This level of acceptance will not be used if data has been formally delivered by the CITIS. The means of inspection to be used should be provided to the contractor as soon as these

means have been determined. Any or all levels of acceptance may be performed at the contractor's facility or at the Government's facility, as required. In addition to digital data acceptance, CITIS requires additional acceptance requirements be applied.

4.10.2 CITIS Acceptance

Acceptance of the service and the CITIS Contractor Line Item Number (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(Draft) 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 information functions, provision for value-added information functions and the like.

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 may be rerun if major maintenance has been accomplished or if sending or receiving systems have been changed enough to warrant an additional test. If specific test data are deemed necessary for adequate testing of a CITIS, that test data should be provided and results reviewed on-site 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 value-added 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 specified deliverable type can be achieved including successful download of data into the customer's system when contractually required. This data may be real product data or test data, as appropriate.

APPLYING CALS TO THE LOGISTIC SUPPORT ANALYSIS PROCESS

SECOND EDITION

30 June 1993

Prepared by:
CALS Resource and Implementation Cooperative (RIC)

Prepared for:
Naval Forces CALS Architecture and Environment