Previous Section

3.1 -- Non-digital Data Deliverables

3.1.1 -- Paper, Mylar Hardcopy

Paper or mylar hardcopy has long been the traditional medium for delivery of product data and related information. Technical data delivered on this medium may have originated from many sources including other existing hardcopy documentation, microfiche, microfilm, or any of the digital data formats described in the following sections. 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 Joint Engineering Data Management Information and Control System (JEDMICS) supports this type of paper to digital format conversion process.

3.1.2 -- Aperture Cards

Aperture cards are the traditional medium for initial delivery of TDPs. Aperture cards contain engineering drawings on microfilm and associated engineering metadata in digital punch-card formats. Because aperture cards contain both microfilm media and digital punch-card data, specialized infrastructure requirements are necessary to use this media. Single-purpose systems are currently in use to extract the data from aperture cards. In addition, converting the data contents of aperture cards to a more flexible digital data format would require additional infrastructure requirements that would include scanning hardware and software to support both text and graphics. JEDMICS supports the conversion of aperture card images and data to raster form.

3.2 -- Digital Data Deliverables

The technical data manager must choose from a variety of digital data formats and media options. For technical data delivery, the list includes:

Data Formats:

- **Text:**

  1. Raster
  2. American Standards Code for Information Interchange (ASCII)
  3. Native word-processing
  4. Standard Generalized Markup Language (SGML)
  5. Page Description Language (PDL)
  6. Portable Document Format (PDF)

- **Graphics:**

  1. Raster
  2. Native graphics format
  3. Computer Graphics Metafile (CGM)

- **Product Data:**

  1. Native CAD
  2. Initial Graphics Exchange Standard (IGES)
  3. Standard for the Exchange of Product Model Data (STEP)

Media:

- On-line access (e.g., CITIS)
- Physical media (e.g., optical disk, magnetic tape or disk)
- Mutually agreeable media

3.2.1 -- Text Formats

The possible text formats include ASCII, native word-processing, Standard Generalized Markup Language (SGML), and the neutral file format Portable Document Format (PDF). They are described below.

- **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. Raster files can be converted to digital (word processor or desk top publishing) documents using Optical Character Recognition (OCR).

  With the advent of raster scanning technologies, the ability to convert existing paper technical data to digital data files has become readily available. Raster conversion became the easiest and most cost effective method for digitizing the existing paper data. Although the quality assurance (QA) process by human interpretation required to verify the data content may increase costs substantially, OCR capabilities are improving rapidly to reduce the amount of document "clean-up" required. 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. Raster format is only recommended for legacy data, not for new data acquisitions.

  JEDMICS stores drawing images as raster data on optical disk media and will accept tiled or untiled raster data. DoD's implementation requirements for raster images are stated in MIL-PRF-28002, which is described in section 10 of this Desktop Guide.

- **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. ASCII text can be used 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.

- **Native Word-processing**
  Native word-processing formats are those resulting from creation of documents using Commercial Off-The-Shelf (COTS) software. Most word-processing packages allow users to import both text and graphics from many other sources, including raster, ASCII, other word-processing formats, COTS illustration software formats, and native Computer-Aided Drawing (CAD) formats. Many packages available today possess data conversion capabilities, substantially reducing the file format incompatibility problems that have existed in the past. This makes native word-processing format 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 is defined as "A standard that defines a language for document representation which formalizes markup and frees it of system and processing dependencies. The advantage of SGML is that the same text can be used in another document that is governed by a different DTD. 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. SGML tagging can be difficult and time-consuming, although COTS software packages are currently being developed to provide various levels of automatic tagging. Because of its comparative difficulty, SGML format may be best suited for final data deliverables rather than interim deliverables. When considering SGML as a deliverable format, the technical data manager must determine whether the applicable Document Type Definitions (DTD) and Formatting Output Specification Instances (FOSI) exist and 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. SGML requirements are stated in MIL-PRF-28001, and a description of this standard and its contents can be found in section 10 of this Desktop Guide.

- **Page Description Language (PDL)**
  A PDL file is executed by an interpreter that controls a printer or other output device. A PDL can be used to ensure that the composed document produced by an electronic publishing system would produce nearly identical hardcopy output on the widest possible spectrum of printer devices. However, PDLs are currently not standardized, and a Standard Page Description Language (SPDL) is still being developed. 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 developed in accordance with the CALS standards.

- **Portable Document Format (PDF)**
  Several industry-developed software products for creating platform-independent neutral data files are available that allow users to save information created in a variety of software applications and formats, including text, graphics, and spreadsheets, into a platform-independent file format. These files can then be viewed and printed by anyone possessing the appropriate reader software. Adobe Systems' Portable Document Format (PDF)

is currently the most popular neutral data file format. PDF has become a defacto military and industry standard for the interchange, presentation, and storage of digital data.

Almost any text and/or graphics document that can be output from an application can be output as a PDF file. The PDF file can be read by anyone having a freely distributed PDF reader. Users can view and print documents exactly as formatted by the original application without having to load and run that application. Users can navigate through the document using thumbnail sketches, hypertext links, and bookmarks. The document's text may be searched and extracted for use in other applications. Section 10 of this guide contains detailed information about PDF.

3.2.2 -- Graphics Formats

The graphics formats that can be used in TDPs include raster and CGM, which are described below.

- **Raster**
  See para.3.2.1 for a definition of raster.

- **Native graphic format**
  Native graphic/illustration formats include graphics created in COTS illustration software as well as data created using COTS CAD software. Native graphic formats are typically fairly easy to import into word-processing files, and are therefore suitable for interim deliverables.

- **Computer Graphics Metafile (CGM)**
  CGM data is a two dimensional vector presentation used primarily for charts, figures, and simple drawings. DoD's implementation requirements for CGM are found in MIL-PRF-28003, which is described in section 10 of this Desktop Guide.

3.2.3 -- Product Data

Product data is the most comprehensive form of digital data. Product data contains all information needed to describe a product completely, and a large portion of this information can be directly interpreted by a computer. Product data allows the simulation of systems modifications prior to implementation and evaluation of form, fit and function performance of components. In addition, product data with its inherent intelligence can be used to drive manufacturing processes. The product data formats described below include native CAD, IGES, and STEP.

- **Native CAD**
  Some product data can be captured using the resources of commercially available Computer Aided Design (CAD) machines. These machines capture drawings and lists in their own proprietary formats which are generally not compatible with other competing CAD systems. Where the government has its own CAD systems and a vendor has a compatible CAD system, the exchange of product data by directly using the native CAD data file formats can be explored. The Program Manager will need to remember that this data will be used on any other machine or CAD product, it may have to be converted into some other file format which is interpretable by another machine.

- **Initial Graphics Exchange Standard (IGES)**
  The incompatibility of different CAD machines and their output formats forced the Computer Aided Design community to establish a neutral file format to exchange outputs from different CAD machines. This is the Initial Graphics Exchange Standard, and the DoD Implementation of this standard is found in MIL-PRF-28000. IGES is divided into five different classes of drawing information, each addressing a specific aspect. More information on IGES is found in section 10 of this Desktop Guide. Note that IGES will soon be replaced by STEP, which has a wider range of application and capability.

- **Standard for the Exchange of Product Model Data (STEP)**
  Though not yet a fully recognized CALS standard, the greatest amount of work being conducted today to support the CALS strategy is in the area of STEP. STEP is not just a standard, but represents a standard for writing standards. Embodied within STEP is the methodology for developing an unambiguous means by which specific product information can be exchanged between computer systems. A series of Application Protocols governing the exchange of specific types of functionally-related information form the backbone of STEP. As these Application Protocols are developed, they will gradually replace the less specific construct exchange capability of IGES. STEP provides for far greater specificity for exchanging product data information, but the cost is that a STEP Application Protocol can only be used by a very narrow functional community, e.g., Ship Piping Systems. If another functional user wants to use STEP to establish their data exchange requirements they will have to develop their own new Applications Protocol. It is envisioned that complete product information can eventually be captured and exchanged using a combination of various Application Protocols. Information on STEP and ISO 10303 can be found in section 10 of this Desktop Guide.

4.0 -- Digital Technical Data Implementation

The development of an acquisition strategy for technical data needs to be carefully examined to maximize the value for a specific defense system program. Program development elements such as technology, costs, end-item quantities, and schedules have a profound effect on the delivery requirements for supporting technical data. Therefore, Program Managers must consider the life cycle of the procurement and the existing and planned infrastructure to support the technical data for their program.

4.1 -- Delivery Option Advantages

Delivery of the data as paper, raster, neutral, or processable data file has both advantages and disadvantages. Table 8-1 lists some of the comparative advantages and disadvantages of each of these formats.

The following paragraphs of this section are devoted to the acquisition of technical data in a digital environment. The flow chart in Figure 8-1 leads a Program Manager through a logical series of decisions designed to provide the basis for data format and delivery media selection.

The flow chart also recommends who specifically is accountable for performing each task, 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. In many cases, these are the same entity.

Type	Paper	Raster	PDF	IGES	Native File Formats	SGML	STEP
ADVANTAGES	1. Already a deliverable form 2. Can be copied and distributed. easily	1. Importable into documents. 2. Already a deliverable form. 3. Electronic indexing, filing, and archiving. 4. Nearly exact fidelity for illustrations providing format is standard. 5. Files can be compressed to reduce size.	1. Direct conversion through existing software. 2. Page fidelity maintained on a variety of platforms. 3. Already a deliverable form. 4. Navigational links can be embedded. 5. Security can be added. 6. PC-based technology commonly available.	1. Known, mature standard. 2. Built into CAD/CAM software or purchased from 3rd party. 3. Neutral file represen-tation.	1. Known file type. 2. Greater intelligence than neutral formats. 3. Widely used and accepted. 4. Fairly easy to convert text and graphics files between common COTS formats.	1. Files are free of system and processing dependencies. 2. Data created once can incorporated into other SGML documents. 3. SGML-tagged text can be incorporated into a database for greater reusability.	1. User specific. 2. Shape intelligence. 3. Multi-dimensional. 4. Unambiguous represen-tations. 5. Greater specificity within a domain. 6. Intended to eventually replace IGES.
DISADVANTAGES	1. Changes require a new document. 2. Not importable. 3. Bulky filing system. 4. Originals can deteriorate over time.	1. Editing is tedious. 2. Relatively large file sizes. 3. Induced errors from incompatible hardware. 4. Quality depends on original, chosen level of pels/inch, and on accuracy of equipment used to scan original image.	1. Designed for text-based documents. 2. Proprietary format. 3. Drawing data limited to imported raster or encapsulated post-script converted files.	1. 2 Dimensional. 2. No intelligence attributed to shapes. 3. Subject to misinter-pretation on different systems. 4. Limited in scope.	1. Can be limited to compatible systems. 2. Can be difficult to exchange complex drawing (e.g., CAD) files. 3. Proprietary file formats. 4. Proprietary vendor support. 5. Can be special purpose only.	1. Can be difficult and costly to create. 2. Capability to utilize SGML files not yet widely implemented. 3. Reader software required to view SGML files.	1. Evolving standard. 2. Limited applications. 3. Requires ISO certification a domain application protocol; tedious approval process.

Table 8-1. -- Advantages and Disadvantages of Deliverable Options

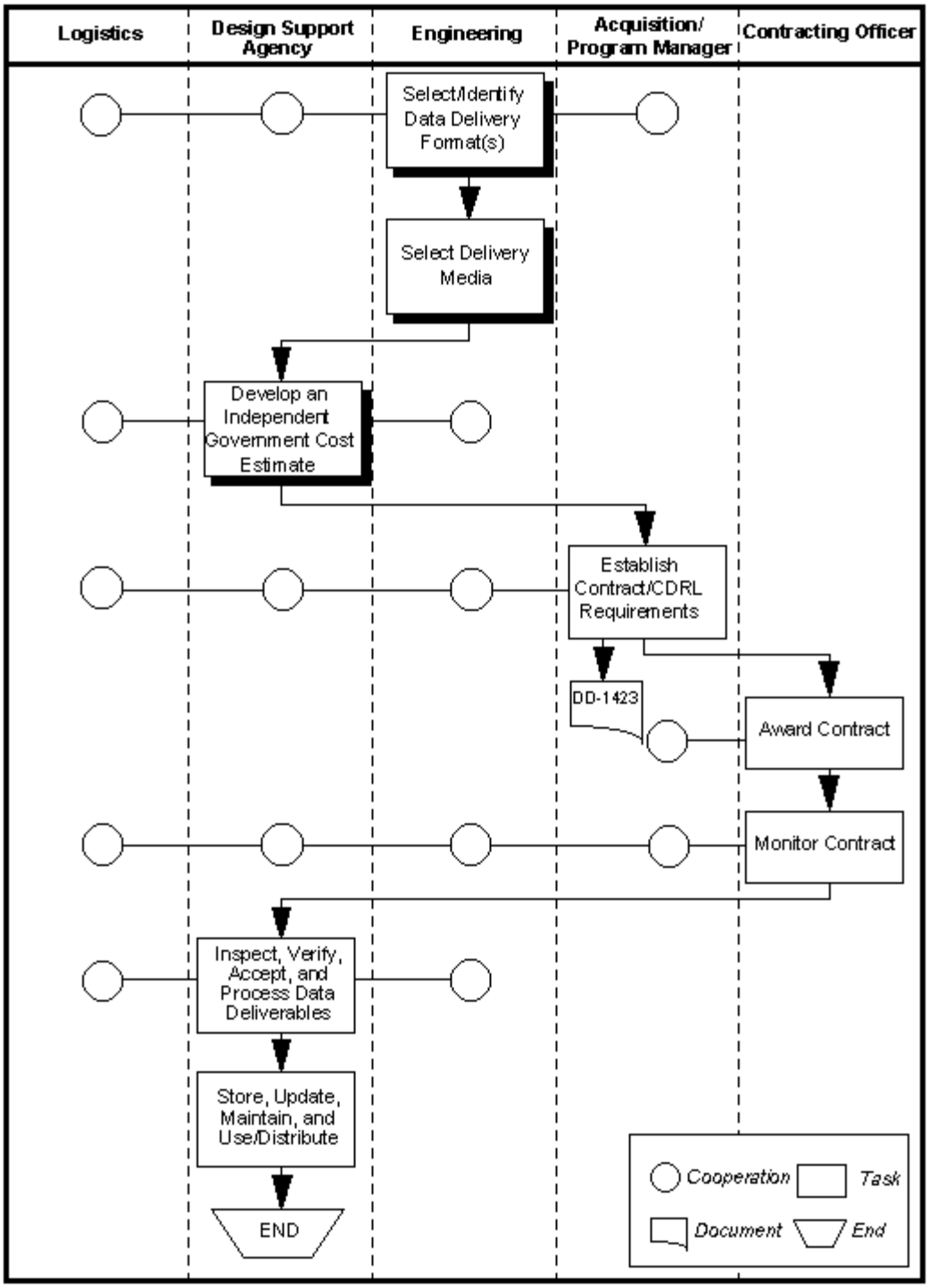

Figure 8-1. -- Technical Data Decision and Responsibility Flow Chart.

4.2 -- Technical Data in the CALS Environment

The CALS strategy provides the Program Manager with a framework of standards, specifications, and

systems to create, manage, and use information in a digital environment. The Program Manager should recognize the benefits of requiring digital data deliverables. A couple of the benefits of digital data include: (1) Improving the handling and reducing the storage of technical data, primarily engineering drawings, with electronic filing and archiving ideally creating a data repository; and (2) reducing the costs associated with printing and distributing technical data, especially during the development stages, by providing on-line access to contractor databases (see Section 6 -- CITIS) or by transferring data through a magnetic media or telecommunications capability.

Figure 8-2 is intended to help the technical data manager determine the status and/or existence of the technical data and ultimately to lead the technical data manager 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 data requirements (acquire and/or develop data), the technical data manager should be concerned with the potential long term engineering and support functions and requirements when procuring the technical data.

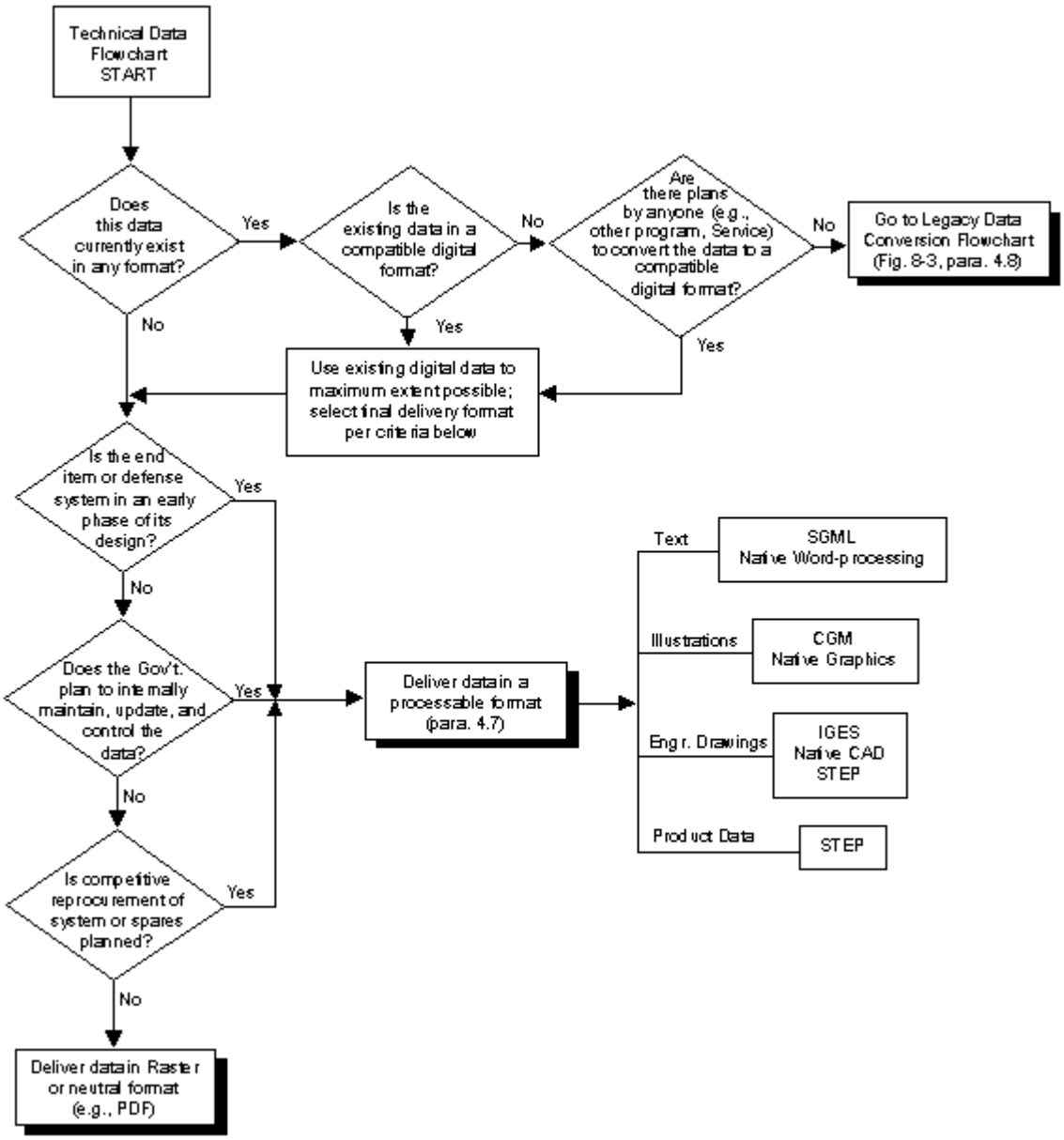

Figure 8-2. -- Technical Data Development Decision Flow Chart.

4.3 -- Existing Data Availability

Utilization of existing legacy data is quite common when new systems use features of older systems. The Program Manager should be aware that, even on completely new defense system programs, some portion of the technical data may already exist (see Figure 8-2). This is most relevant when a program is entering the Concept Exploration and Definition (Phase 0) and prior to Concept Demonstration Approval, Acquisition Milestone I. It is important to remember that acquisition of the proper level and type of digital data is most cost effective when defined early in the program's life cycle. Nondevelopmental Items (NDIs), Commercial Off-The-Shelf (COTS) acquisitions, and reverse engineering efforts may already have some form of technical data that will be acceptable for the current acquisition. See paragraph 4.7 and Figure 8-3

for a discussion of legacy data conversion.

4.4 -- Program Life-cycle Considerations

Digital technical data can be beneficial to all types of programs -- new starts, mature programs, retrofits, and mods. It is more cost effective and beneficial when applied to programs that have substantial data requirements, are in an early phase of development, and/or have long-term data requirements. The Program Manager must consider the program phase when selecting the final data format because it will determine the amount of data being created and the frequency of data updates. Neutral data formats may be more cost effective for programs late in their life-cycle because less data is typically created during those phases, and what is created is less likely to be changed. In general, new programs should plan for delivery of technical data in a processable format.

4.5 -- Government Maintenance and Control of the Technical Data

The Program Manager must consider whether the Government plans to maintain and control the technical data internally. This deals with the underlying issues of who will maintain and control the data once it has been delivered to the Government and how they will do it. The key point to remember is that if the Government plans to maintain, update, and/or produce various configurations of the data in the future, the data should be delivered in an "intelligent" format, i.e., in processable data files versus document image files such as raster format. Conversely, if the Government does not plan to "update or maintain" the data, it is recommended that the Program Manager consider a raster or neutral file format (e.g., PDF) delivery.

4.6 -- Competitive Reprocurement

The Program Manager must consider whether competitive reprocurement of the system, spares, and follow-on support is planned. This prompts the Program Manager to consider future requirements for the data. Competitive procurements, as addressed in the Acquisition Plan, can be significantly enhanced with the availability of "intelligent" digital information. If future acquisitions are not anticipated, cost associated with delivery of the data in a processable data file format may be unwarranted. If competitive reprocurement is planned, delivery of an "intelligent" format such as processable data files is recommended. If competitive reprocurement is not planned, delivery of raster or neutral files may be more cost effective.

4.7 -- Data Format Determination

Assuming the existence of usable technical data, the Program Manager must consider whether any portion of the data exists in a digital format. Again, the purpose is to lead the Program Manager into another series of questions to define further which digital delivery format best satisfies the defense system program objectives and requirements. Potential concerns here include: (1) data associated with existing in-service items that may or may not be in digital format; (2) new data that potentially could be developed in a non-digital format; and, most likely, (3) data that is a varying mixture of digital and nondigital elements.

4.8 -- Legacy Data Conversion

Utilization of existing legacy data, whether it be engineering drawings, technical manuals, or other

technical data, is likely in the development of completely new systems with similar features. The technical data manager should be aware that even on completely new defense system programs, some portion of the data may exist in both digital and nondigital formats.

Since almost all new data today is created in digital form, any legacy data being used will likely have to be converted into some digital format in order for it to be incorporated into any new packages. However, that format can vary from unintelligent raster to SGML or STEP to a database format, with conversion costs increasing as the complexity and capability of the format increases. The format selected will depend on the type of data and its intended use. Figure 8-3 shows some of the primary legacy data conversion considerations.

Several of the Services have already launched major efforts to convert existing hardcopy data to digital format. The Air Force is converting many of its Technical Orders to an Indexed PDF format. The Navy is also converting technical manuals and engineering drawings to digital format. If the legacy data needed for a new item does not currently exist in digital form, the technical data manager should investigate these conversion efforts to determine if any portion of that data will be converted in time to be of use for data development/revision.

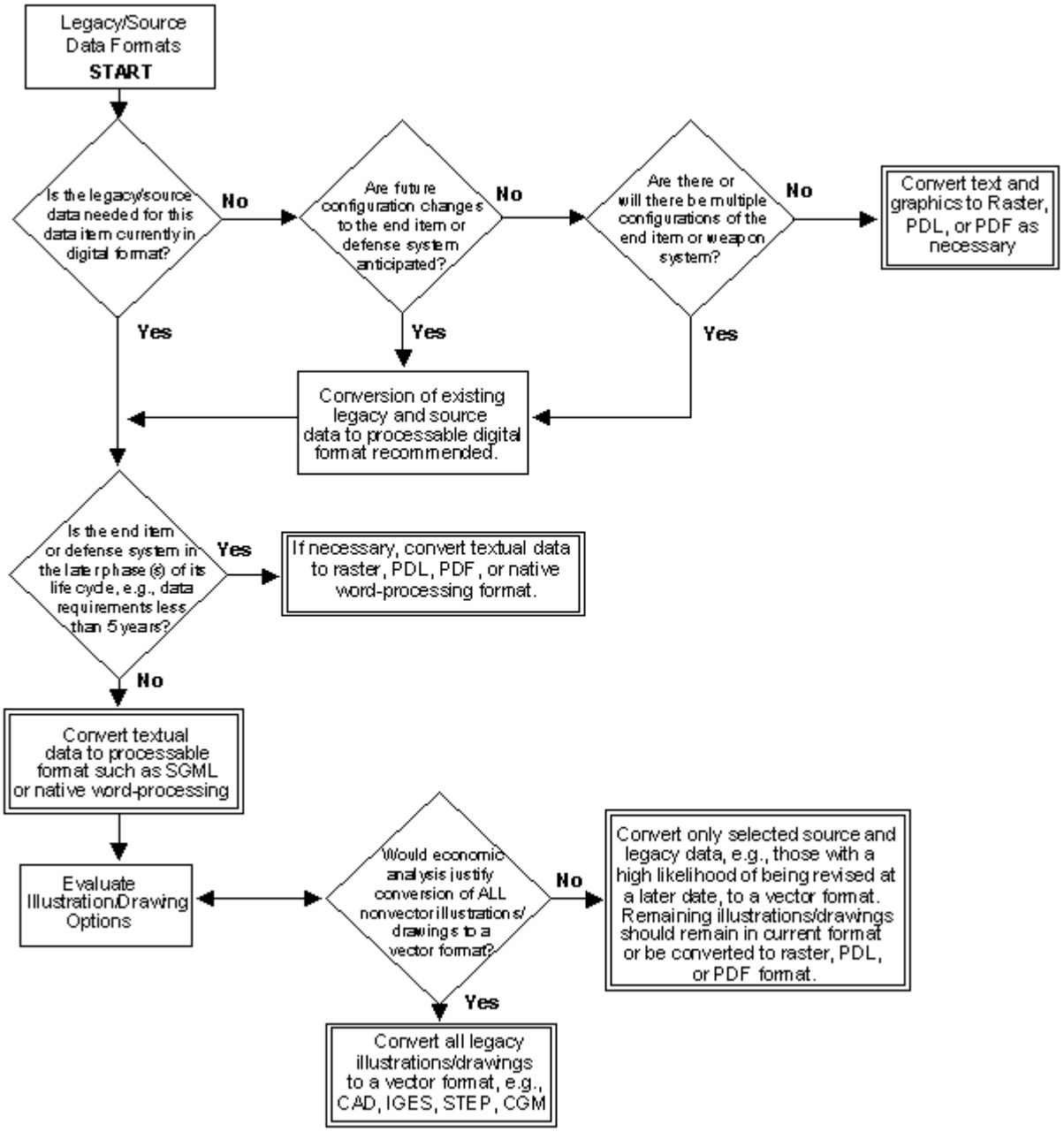

Figure 8-3. -- Legacy/Source Data Conversion Decision Flow Chart.

4.8.1 -- Defense System Configuration Considerations

Configuration differences may play an important part in the acquisition of defense system technical data. The differences may be as small as printed circuit card modifications or as large as entire equipment changes. The technical data manager must determine whether multiple configurations will exist, and whether different data will be procured for each configuration. Another consideration is whether future changes to the data 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 that some paper legacy and source data simply be scanned in to a raster format and other illustrations be recreated/converted to a processable format.

4.8.2 -- Program Life Cycle Considerations

The technical data manager must now consider the current phase of the end item or defense system program and the anticipated requirements for the data. If the end item or defense system program is currently in the later phase(s) of its life cycle and the data requirements are anticipated to be fewer than five years, the delivery of complex processable items such as SGML-formatted text or product data in STEP format is not recommended, especially since most of the existing data may be in hard copy or proprietary digital format. If large amounts of legacy data exist in hardcopy with no plans for conversion to digital form, the large scanning effort that would be required would have to be justified with an economic analysis.

4.8.3 -- Conversion of Illustrations or Drawings

The technical data manager must now determine, through economic analysis, whether conversion of all existing illustrations/drawings is justified. Conversion in this case means converting nonvector graphics, both source and legacy data that currently exists in raster and hard copy formats, into a processable vector format. If it is determined that conversion of all existing nonvector illustrations/drawings to a vector format is cost effective or if no source or legacy illustrations exist, then the recommended solution is to convert and/or create all applicable illustrations in a vector format such as Mutually Agreeable Commercial Software (MACS) graphics or CAD format, IGES, and/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, PDL, or PDF format.

> ***Note:*** ***To provide maximum proliferation of the preliminary data for review, it may be beneficial to request that these deliverables be provided in their proprietary native formats. 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.***

4.9 -- Delivery Media Decision

According to DoD 5000.2-R:

> *"Beginning in FY97, all new contracts shall require on-line access to, or delivery of, their programmatic and technical data in digital form, unless analysis shows that life-cycle time or life-cycle costs would be increased by doing so. Preference shall be given to on-line access to contractor developed data through contractor information services rather than data delivery."*

Therefore, all electronic technical data should be delivered on-line, if possible, except in cases of very large files that cannot be efficiently handled by the current infrastructure. Very large files are typically defined as being larger than 30 MB, but users may also have difficulty with even relatively small files (e.g.,

5 MB) if they are using modems and standard phone lines to download or access the files. Large files should be delivered via physical media (e.g., tape, CD-ROM) in accordance with MIL-STD-1840. Because of their inherently large file sizes, raster files are more likely to be delivered via physical media than other data formats. Figure 8-4 shows some of the delivery media considerations and options.

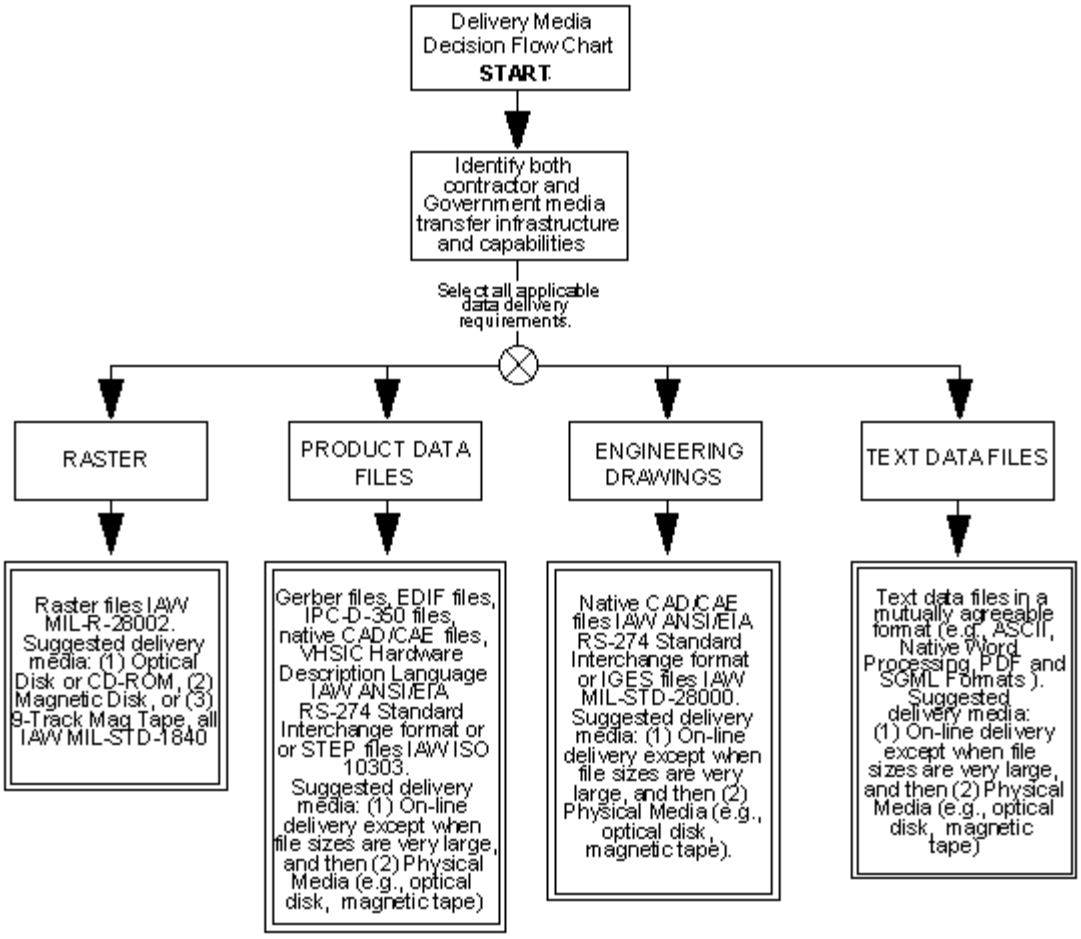

Figure 8-4. -- Select Delivery Media Decision Flow Chart.

5.0 -- Contracting Issues and Costs

This section contains information regarding contracting for the various types of technical data as well as general cost information. Note that the sample documents included are related primarily to the elements of Technical Data Packages.

5.1 -- Cost

An important consideration in the acquisition of any technical data will be the costs associated with acquiring that data. No single element, be it cost or other technical consideration, should determine the manner in which technical data is delivered to the government. Rather, it should be a combination of factors including service length of the end item, competitive reprocurement, volume of expected or anticipated changes, complexity, and cost which should determine the manner in which data is delivered to the government. This is a major trade-off decision to be made by the Program Manager who must strive to get the greatest possible benefit from the technical data delivery mechanism at the lowest possible cost.

5.1.1 -- Data Conversion Costs

The cost of data conversion from paper to digital formats can vary widely depending on the final format selected, and the condition and complexity of the original document. According to the Defense Automated Printing Service, which provides extensive conversion services, the following conversion costs apply:

Text to Raster:	$0.13/page
Text to PDF (no tagging):	$0.43/page
Text to SGML:	Depends on the work and requirements

The prices listed above do not include any clean up or Quality Assurance (QA) of the scanned in documents. Some clean up will often be required for any scanned in documents, and the clean up effort will depend primarily on the condition of the original document. For example, a "clean" copy of a document (i.e., easy-to-read type, few extraneous page markings, simple graphics) can often be converted to raster or PDF with little or no clean up required.

5.2 -- Contract Data Requirements Lists (CDRLs)

Standard practices of human observation, interpretation, and review must be used to determine whether data presentation, format, and technical content meet contractual requirements as specified in the CDRL. Chapter 3 of DoD-5010.12-M (May, 1993) provides instruction for completing the DD Form 1423 CDRL. The Acquisition Management System and Data requirements control List (AMSDL), DoD 5010.12-L, also provides a complete list of the currently approved Data Item Descriptions (DIDs).

To invoke any data deliverable option, a specific CDRL and supplemental contract attachments have been developed to be used as an example (see Figures 8-5 through 8-8). The information contained in this example CDRL should be tailored to meet the requirements of the specific defense system program. The CDRLs must include language that specifies exactly how data will be delivered (including media, format, and content) under the contract. CALS standards and specifications should be invoked where appropriate. Note that if a CDRL is not used, the CALS requirements for data content, format, and delivery media should be specified in the Statement Of Work (SOW).

The following figures depict some of the forms that can be used to require digital data deliverables. The example provided here depicts information for a TDP. The DD Form 2554-1 contains detailed information on the delivery of TDP elements, and can be provided as supplemental information to the CDRL Form 1423. Note that the information provided on Form 2554-1 could be included directly in Block 16, Remarks, on the CDRL Form 1423.

CONTRACT DATA REQUIREMENTS LIST
(Data Item)

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 440 hours per response, including the time for reviewing 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
	PRODUCT DRAWINGS AND ASSOCIATED LISTS	XXX WEAPONS PLATFORM

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	VARIED; SEE BLK 16		
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A			

16. REMARKS

BLK 4/5: DI-DRPR-81000, DD FORM 2554-1 with attachment.

BLK 7: Government office responsible for inspection is _____. (Add office.)

BLK 8: Approval shall be based on compliance with the requirement document(s) cited in BLK 4. The time required for Government approval will not exceed ____ days and turnaround time for the contractor to resubmit data to Government shall not exceed ____ days. (Add time required for Government approval and turnaround time for contractor to resubmit data to Gov't.) Government office responsible for approval is _____. (Add office.)

BLK 9: Technical data shall be marked (distribution statement and export control warning notice) IAW MIL-STD-1806 and CDRL supplement attachment. Vendor item drawings shall be marked distribution statement A, provided "Where-used-on" block is blank; otherwise, all remaining drawings shall be distribution statement _____ (specify letter). See CDRL supplement attachment.

BLK 14: For draft, regular, and repro media requirements, see DD Form 2554-1, BLKS 1.a,b, and c. CITIS distribution shall be compliant with GCO program user capabilities table.

THIS IS A SAMPLE CDRL. INFORMATION SHOULD BE TAILORED TO REFLECT PROGRAM REQUIREMENTS.

Note: (1) Complete this form IAW "Instructions for completing DD Form 1423" and DoD 5010.12-M (chapter 3). Include reference to DD Form 2554-1, CDRL supplement attachment(s), and attachment(s), as needed; (2) Complete DD Form 2554-1 (Enter digital data specification, exchange media, etc., in block 1.C or via contract attachment); and (3) complete attachment(s) for DD Form 2554-1 and CDRL supplement.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES: Draft	Final: Reg	Final: Repro
SEE BLK 16			
Addressee 1			
Addressee 2			
Addressee 3			

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

Figure 8-5. -- Sample CDRL For TDP Elements.

TDP OPTION SELECTION WORKSHEET

PRODUCT DRAWINGS AND ASSOCIATED LISTS

A. CONTRACT NO.	B. EXHIBIT/ATTACHMENT NO.	C. CLIN.	D. CDRL DATA ITEM NO.

1. DELIVERABLE PRODUCT (X and complete as applicable)

	a. ORIGINALS (Drawing masters) (Identify specification, type, grade and class, etc.)
	b. REPRODUCTIONS (Identify specification, type, grade and class, etc., and quantity of each)
X	c. DIGITAL DATA (Identify specification, exchange media, etc.) *See contract attachment for DD Form 2554-1 Digital Data Deliverables*

2. CAGE CODE AND DOCUMENT NUMBERS (X one)

	a. CONTRACTOR
	b. GOVERNMENT (Complete (1) and (2) or (3)

(1) Use CAGE Code	(2) Use Document Numbers	(3) To Be Assigned By:

3. DRAWING FORMATS AND DRAWING FORMS (X one and complete as applicable)

	a. CONTRACTOR FORMATS. Forms to be supplied by contractor.
	b. GOVERNMENT FORMATS. Forms to be supplied by contractor. Samples supplied by (Specify)
	c. GOVERNMENT FORMATS. Forms to be supplied as Government Furnished Material by (Specify)

4. TYPES AND QUANTITY OF DRAWINGS SELECTION (X one)

	a. CONTRACTOR SELECTS		b. GOVERNMENT SELECTS (Specify in Item 9)

5. ASSOCIATED LISTS (X and complete as applicable)

	a. PARTS LISTS (X one)		(1) Integral		(2) Separate		(3) Contractors Option
	b. DATA LISTS (X one)		(1) Not Required		(2) Required (Specify levels of assembly)		
	c. INDEX LISTS (X one)		(1) Not Required		(2) Required (specify levels of assembly)		

6. DETAILS (X one)

	a. MULTIDETAIL DRAWINGS PERMITTED		b. MONODETAIL DRAWINGS MANDATORY

7. QUALITY ASSURANCE PROVISIONS (X one)

	a. NOT REQUIRED. MIL-T-31000, para 3.8 does not apply.
	b. REQUIRED. MIL-T-31000, para 3.8 applies. Quality assurance requirements shall be documented as QAPs in accordance with MIL-T-31000, Appendix B. (X one)

	(1) DARCOM Form 2484-R Required		(2) DARCOM Form 2484-R Not Required

8. VENDOR SUBSTANTIATION DATA (X one)

	a. NOT REQUIRED		b. REQUIRED

9. OTHER TAILORING (Attach additional sheets as necessary)

This is a sample DD Form 2554-1 digital data denoted. Information should be tailored to reflect program requirements

DD Form 2554-1, DEC 89 0102-LF-009-0200 U.S. GOVERNMENT PRINTING OFFICE 1990 - 704-010

Figure 8-6. -- Sample DD Form 2554-1 Digital Data Denoted.

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Attachment XX
DD Form 2554-1, BLK 1.c and BLK 5, Digital Data Deliverables

2554-1, BLK 1.c/5	Order (...)	**Product Deliverables in Digital Format**
(1)	(...)	**Drawing Master Raster Data**
(2)	(...)	**Drawing Trial Raster Data**
(3)	(...)	**Drawing Master Product Data**
(4)	(...)	**Drawing Trial Product Data**
(5)	(...)	**Drawing Master Native CAD/CAE Data**
(6)	(...)	**Drawing Trial Native CAD/CAE Data**
(7)	(...)	**Drawing Master IGES CAD/CAE Data**
(8)	(...)	**Drawing Trial IGES CAD/CAE Data**
(9)	(...)	**Other -- See Note Below**
(10)	(...)	TBD
(11)	(...)	TBD
(12)	(...)	TBD

Requirements for CALS Product Deliverables

(1) Drawing Master Raster Data. Drawing master raster graphic tape shall be IAW MIL-PRF-28002, MIL-STD-1840 and the following requirements. Data shall be on a 9-track magnetic tape. Raster graphics shall be type 1 untiled raster data, 512 X 512 in size. Each delivered 9-track tape shall include a ANSI label. Raster image density shall be 200 PELS/Inch. The minimum number of PELS per line and minimum number of scanlines shall be IAW MIL-PRF-28002. Raster image orientation shall be PEL path of 90 line progression of 270. Acceptance of this data item shall be based upon: self merit/content; prior acceptance and validation of drawing trial raster data, BLK 1.c(2), if ordered; and visual comparative agreement with drawing originals or reproductions, if ordered.

(2) Drawing Trial Raster Data. Requirements shall be the same as those for drawing master raster data, BLK 1.c(1), SANS prior acceptance of self.

(3) Drawing Master Product Data. Drawing master product data shall be IAW VHDL ANSI/IEEE 1076, EDIF EIA 548, and IPC-D-350 and the following requirements. Data shall be on MIL-STD-1840 magnetic tape format optical disk, CD-ROM, or magnetic disk with a mutually agreed upon format. Data shall be organized as one drawing per file with multiple sheets permitted. Entities unsupported or unspecified by the appropriate standards or specifications (VDHL, IPC, etc.) shall not affect the data transfer integrity of the product information delivered under the contract. Format version "(X)" shall be used. Acceptance of this data item shall be based upon: self merit/content; prior acceptance and validation of drawing trial product data, BLK 1.c(4), if ordered; and visual comparative agreement with drawing originals or reproductions, if ordered. Validation here means determination of acceptable transfer and translation of data from the contractor's CAD/CAE system to the _____ (add applicable interfacing system).

Note: **This is a sample attachment. Information should be tailored to reflect program requirements. See technical manuals section of the desktop guide for "compound documents" (specifications, software, documentation, lists, etc.).**

Figure 8-7. -- Sample Contract Attachment On "DD Form 2554-1, BLK 1.c and BLK 5, Digital Data Deliverables".

Contract #_____
Page 2 of _____

Attachment XX (Cont.)
Requirements for CALS Product Deliverables (Cont.)

(4) Drawing Trial Product Data. Requirements shall be same as those for drawing master product data, BLK 1.c(3), SANS prior acceptance of self.

(5) Drawing Master Native CAD/CAE Data. Drawing master native CAD/CAE data shall be as follows. The data file format shall be compatible with and delivered on a 9-track QIC tape, CD-ROM or magnetic disk, compatible with _____ (insert vendor product name). CAD/CAE system media shall be clearly labeled to describe the media format method, content, and media density. Data shall be organized as one drawing per file with multiple sheets permitted. Data format shall be compatible with _____ (insert vendor application package name, version number) format, using the native binary format supported by the _____ (insert vendor product name) CAD system. All information necessary to open and manipulate the data files, including: libraries, logical name definitions, and other supporting files shall be delivered with drawing files. Non-vendor-supported "Utilities" (i.e., software product) shall not affect the data transfer integrity of the product information delivered under the contract. Acceptance of this data item shall be based upon: self merit/content; prior acceptance and validation of drawing trial native CAD/CAE data, BLK 1.c(6), if ordered; and visual comparative agreement with drawing originals or reproductions, if ordered. Validation here means determination of acceptable transfer and translation of data from the contractor's CAD/CAE system to the _____ (add applicable interfacing system).

(6) Drawing Trial Native CAD/CAE Data. Requirements shall be the same as those for drawing master native CAD/CAE data, BLK 1.c(5), SANS prior acceptance of self.

(7) Drawing Master IGES CAD/CAE Data. Drawing master IGES CAD/CAE data shall be as follows. Data shall be delivered on a 9-track tape, QIC tape, or magnetic disk. Data shall be organized as one drawing per file with multiple sheets permitted. MIL-PRF-28000 defined entities are mandatory. Entities not fully supported or supported by a subset of MIL-PRF-28000 to best match the contractor's CAD features, shall be identified by the contractor. Unsupported or unspecified "volunteer" entities shall not affect the data transfer integrity of the product information delivered under the contract. Data product files shall be written in ASCII form. Acceptance of this data item shall be based upon: self merit/content; prior acceptance and validation of drawing trial IGES CAD/CAE data, BLK 1.c(8), if ordered; and visual comparative agreement with drawing originals or reproductions, if ordered. Validation here means determination of acceptable transfer and translation of data from the contractor's CAD/CAE system to the _____ (add applicable interfacing system).

(8) Drawing Trial IGES CAD/CAE Data. Requirements shall be same as those for drawing master IGES CAD/CAE data, BLK 1.c(7), SANS prior acceptance of self.

(9) TBD

(10) TBD

(11) TBD

(12) TBD

This is a Sample Attachment. Information should be Tailored to Reflect Program Requirements.

Figure 8-7 (cont.). Sample Contract Attachment On "DD Form 2554-1, BLK 1.c and BLK 5, Digital Data Deliverables".

ATTACHMENT XX
DD FORM 1423-1, BLK 14, "DISTRIBUTION"

CONTRACT # _____
PAGE 1 OF _____

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY TDP _____ TM _____ OTHER _____
D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR

14. DISTRIBUTION

a. ADDRESSEE	b. COPIES													
	Draft	Final		DIGITAL (DD FORM 2554-1, BLK 1.C & BLK 5)										
		Reg	Repro	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	( )	( )	( )

The contractor should be required to validate that the TDP and associated elements conform to the contractual requirements. In those instances where materiel has been developed or produced, the contractor shall validate that the TDP and associated elements accurately depict the materiel developed or produced under the contract. Use of the TDP in producing, inspecting, and testing satisfactory materiel is considered acceptable evidence that the validation requirement has been met. When specified in the contract or purchase order, the contractor's validation shall be documented in a TDP validation report.

5.3.1 -- Validation by Contractor Physical Configuration Audit (PCA) or Verification Reviews

The Government may require the contractor to validate the TDP through PCAs, Configuration Item Verification Reviews (CIVR), or by other methods through specific work tasks in the statement of work of the contract or purchase order. Unless such tasks are included in the contract or purchase order, the method of validation shall remain the contractor's option.

5.3.2 -- TDP Validation Report

A TDP validation report is used by the Government to review the procedures and evaluate the results of the contractor's validation of the TDP as conforming to the data requirements in the contract or purchase order.

5.4 -- 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.

5.4.1 -- Digital Data Acceptance

The unique aspect of CALS digital data deliverables is that they will be subject to inspection and acceptance on several levels.

1. Physical Media: 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.

2. CALS Data Exchange Formats: The second level of acceptance is adherence to the specified CALS data exchange format(s). This level of acceptance is applied to the MIL-STD-1840 digital data format if specified by the contract. This level of acceptance may be aided by automated tools obtained, if available, from the CALS Test Network or each Service component CALS office.

3. Data Content and Format: 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.

Section 9
Applying CALS to the Creation, Management, and Use of Technical Manuals

Next Section