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DOCUMENTATION PREPARATION UNDER THE SOFTWARE TECHNOLOGY FOR ADAPTABLE, RELIABLE SYSTEMS (STARS) PROGRAM: A REVIEW OF APPLICABLE STANDARDS

Catherine W. McDonald
Robert I. Winner, *Task Leader*

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One of the main goals of the Software Technology for Adaptable, Reliable Systems (STARS) Program is to reduce the cost and improve the quality of DoD software. This includes the development and demonstration of a software development and maintenance technology. In order to accomplish this goal, appropriate documentation must be developed along with the software. The STARS Office has mandated the use of the Standard Generalized Markup Language (SGML) in the preparation and electronic transfer of all its software documentation. The purpose of this paper is to provide a review of the seven standards that may impact STARS software documentation and the use of SGML. These standards are DoD-STD-7935, MIL-M-38784B, ISO-8879-1986(E), MIL-STD-1840A, MIL-D-28000, MIL-M-28001 and DoD-STD-2167A. Each standard is reviewed in detail and analyzed with respect to its impact on the STARS Program. Finally, a five-step process is recommended for any program, such as STARS, that may be planning to use SGML for the electronic transfer of its software documentation.

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PREFACE

This paper communicates the results of a study the Institute for Defense Analyses (IDA) conducted of relevant standards that will impact the preparation and delivery of software documentation prepared by the Software Technology for Adaptable, Reliable Systems (STARS) contractors. This document responds to the objective of Task Order T-D5-429, *Software Technology Acceleration Project*, which is "to provide technical expertise and support in development of strategies designed to insert modern software practices throughout the DoD community." This study will be used to develop the standards for STARS software documentation and will be used by the STARS Office to provide guidance to their Prime Contractors and their sub-contractors.

The document was reviewed by the following members of IDA: Dr. David Carney, Mr. Clyde Roby, and Dr. John Salasin.
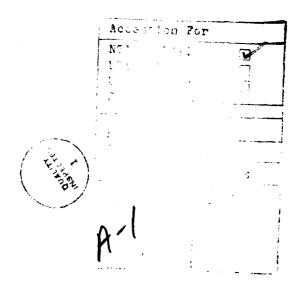
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1.0 INTRODUCTION

1.1 PURPOSE

This paper provides a summary of seven standards that may impact Software Technology for Adaptable, Reliable Systems (STARS) software documentation and the use of the Standard Generalized Markup Language (SGML). The analysis of these standards is based on the following steps which should be taken when a program, such as STARS, plans to use SGML for the electronic transfer of its software documentation.

- Establish types of required documentation.
- Establish document style and structure guidelines.
- Establish document formatting guidelines.
- Establish a standard for graphical data.
- Establish appropriate document type definitions.

There are several standards that address the preparation and presentation of documents. This list was not meant to be inclusive. However, this list represents those standards that were felt to have the most impact on the STARS decision to use SGML.

- DoD-STD-7935, "Automated Data Systems (ADS) Documentation," 15 February 1983.
- MIL-M-38784B, "Manuals, Technical: General Style and Format Requirements," 16 April 1983.
- ISO-8879-1986(E), "Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML)," 15 October 1986.
- MIL-STD-1840A, "Automated Interchange of Technical Information," 22 December 1987.
- MIL-D-28000, "Digital Representation for Communication of Product Data: IGES Application Subsets," 22 December 1987.
- MIL-M-28001, "Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text," 26 January 1988.
- DoD-STD-2167A, "Defense System Software Development," 29 February 1988.

The STARS Program has already announced its intention to use SGML. Now the STARS Program must make a decision about the standards it will adopt when using SGML. ISO-8879 only provides guidance for using SGML document types, inclusion of graphics, and even the SGML-related tags are decisions that are left to the user. Other

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standards must be used in conjunction with ISO-8879 to meet the user's needs. Document format, structure and style must be standardized within the Program to ensure consistency in both the preparation and delivery of software documentation by prime contractors.

1.2   BACKGROUND

The STARS Program will result in the development and demonstration of a software development and maintenance technology which will improve the quality and reduces the cost of Department of Defense (DoD) software. Appropriate documentation will need to be developed along with the software. The STARS Program Office has decided to use SGML in the preparation and electronic transfer of this documentation.

During the review of the proposals presented by the STARS prime contractors, it became obvious that (1) there were several standards related to the preparation and distribution of software documentation and (2) that not all the primes were using or were aware of the same standards. This paper was prepared to familiarize IDA, the sponsor, and the prime contractors with these standards and how the standards may impact the STARS Program Manager's decision to use SGML. This document assumes that the reader is familiar with SGML and its concepts. If the reader is not familiar with SGML, suggested reading includes Appendix A of ISO-8879 and the article by Coombs, Renear, and DeRose in the November 1987 issue of *Communications of the ACM* entitled "Markup Systems and the Future of Scholarly Text Processing."

1.3   SCOPE

Section 2.0 of this paper provides a short summary of the seven relevant standards. Section 3.0 discusses how the standards may impact each other and the STARS program. Section 4.0 is a list of recommended actions STARS should take to establish a common SGML standard for the competing prime contacts.

1.4   REFERENCES

Government

Department of Defense, DoD-STD-7935, "Automated Data Systems (ADS) Documentation," 15 February 1983.

Department of Defense, MIL-M-38784B, "Manuals, Technical: General Style and Format Requirements," 16 April 1983.

Department of Defense, MIL-STD-1840A, "Automated Interchange of Technical Information," 22 December 1987.

Department of Defense, MIL-D-28000, "Digital Representation for Communication of Product Data: IGES Application Subsets," 22 December 1987.

Department of Defense, MIL-M-28001, "Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text," 26 January 1988.

Department of Defense, DoD-STD-2167A, "Defense System Software Development," 29 February 1988.

Department of Defense, *US Government Printing Office, Style Manual*, 1984.

Department of Defense, DoD-D-1000, "Engineering Drawings and Associated Lists," Revision B, Amendment 4, 18 August 1987.

Non-Government

American National Standards Institute, "Digital Representation for Communication of Product Definition Data," ANSI Y14.26M, 1981. (Note: This is the same as IGES V3.0 specification.)

Coombs, Jean H., Allen H. Renear, and Steven J. DeRose, "Markup Systems and the Future of Scholarly Text Processing," *Communications of the ACM*, Volume 30, Number 11, November 1987, pp. 933-947.

International Organization of Standards, ISO-8879-1986(E), "Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML)," 15 October 1986, UDC Number 681.3.06. (Available through the American National Standards Institute.)

Smith, Joan M. and Robert Stutely, *SGML: The User's Guide to ISO 8879*, Ellis Horwood Limited, 1988.

1.5   TERMS AND ABBREVIATIONS

ADS	Automated Data Systems
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Exchange
CAD	Computer-Aided Design
CALS	Computer-aided Acquisition and Logistics Support
CGM	Computer Graphics Metafile
DID	Data Item Descriptions
DoD	Department of Defense
DoD-D	Department of Defense Directive
DoD-STD	Department of Defense Standard

DTD	Document Type Definition
IDA	Institute for Defense Analyses
IGES	Initial Graphics Exchange Specification
ISO	International Organization of Standards
MIL-D	Military Document
MIL-HDBK	Military Handbook
MIL-M	Military Specification
MIL-STD	Military Standard
PDL	Page Description Language
SGML	Standard Generalized Markup Language
STARS	Software Technology for Adaptable, Reliable, Systems
UDC	Universal Decimal Classification

2.0 STANDARDS

2.1 OVERVIEW

Three of the standards reviewed, MIL-M-28000, MIL-M-28001 and MIL-STD-1840A, were developed by the Computer-aided Acquisition and Logistics Support (CALS) Policy Office.[1]

ISO-8879 is the official SGML standard adopted by DoD and provides the syntax for describing a document. Both ISO-8879 and MIL-M-28001 provide Document Type Descriptions (DTDs) that may serve as guidelines to developing the STARS DTDs. DoD standards 2167A and 7935 discuss the types of documents that are required in the development of software for weapon systems and automated data systems. These two standards, along with MIL-M-38784B, also establish guidelines for document style and structure. MIL-M-3878A and MIL-STD-1840A address the formatting issues for technical manuals. MIL-STD-1840A and MIL-M-28000 discuss the structure and format of graphical data and its inclusion in various types of publications.

2.2 DOD-STD-7935, "AUTOMATED DATA SYSTEMS (ADS) DOCUMENTATION," 15 FEBRUARY 1983

DoD-STD-7935 provides guidelines for the development and revision of the documentation for Automated Data Systems (ADS) of applications computer programs, and prescribes the standards and descriptions for each of the technical documents to be produced during the life cycle of an ADS. ADS is defined as "an assembly of procedures, processes, methods, routines, or techniques (including, but not limited to, computer programs) united by some form of regulated interaction to form an organized whole, specifically designed to make use of automatic data processing equipment." The objective of the standard is to provide managers of ADS projects with documentation of uniform format and content for review to assure the meeting of significant development milestones. It also provides ADS technicians with a standard record of technical information as a basis for coordination of later ADS development or use modification. There are eleven technical documents described in the standard: Functional Description, System/Subsystem Specification, Data Base Specification, Computer Operational Manual, Test Plan, Implementation Procedures, Data Requirements Document, Program Specification, Users

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[1] In August 1988, Deputy Defense Secretary William H. Taft ordered DoD weapons programs to use the data interchange standards developed by CALS. Besides the three standards mentioned above, the CALS Support Office has three draft standards out for review: MIL-R-Raster, "Raster Graphics;" MIL-D-CGM, "CGM Application;" and MIL-HDBK-XXX, "CALS Implementation Guide."

Manual, Program Maintenance Manual, and Test Analysis Report. A proposed outline and text format for each document type is provided in Section 3.0 of the standard.

2.3 MIL-M-38784B, "MANUALS, TECHNICAL: GENERAL STYLE AND FORMAT REQUIREMENTS," 16 APRIL 1983

MIL-M-38784B is a military specification approved by the DoD for use in developing technical manuals. Technical manuals are publications that contain instructions for the installation, operation, maintenance, training, and support of weapon systems, weapon system components and support equipment. Manuals prepared in accordance with this specification are intended for use in the operation and maintenance of equipment or for accomplishment of assigned missions. It covers the general style and format requirements for the preparation of manuscripts and reproducible copy for standard technical manuals and changes to those manuals. The only decision left to the author of a technical manual is the actual technical content of the manual; even the style of writing is specified (*U.S. Government Printing Office Style Manual*).

The major section of the document, Section 3.2, is dedicated to format issues. The specification covers everything from the size of the paper to capitalization to suggested type styles and sizes.

The specification identifies the structure of a technical manual. It specifies what will be included in the manual outline and publication divisions (volumes, parts, chapters, section and paragraphs). Paragraphs are divided into primary and subordinate paragraphs.

The last sections of the specification discuss how to make changes to a technical manual, quality assurance provisions (readability, etc.) and preparation for delivery (packaging).

2.4 ISO-8879-1986(E), "INFORMATION PROCESSING - TEXT AND OFFICE SYSTEMS - STANDARD GENERALIZED MARKUP LANGUAGE (SGML)," 15 OCTOBER 1986

The ISO-8879 standard was adopted for use by the DoD on 4 January 1988. SGML standardizes the application of generic coding and generalized markup concepts. It provides a coherent and unambiguous syntax for describing whatever a user chooses to identify within a document. The language includes:

- an abstract syntax for descriptive markup of document elements
- a reference concrete syntax that binds the abstract syntax to particular delimiter characters and quantities

- markup declarations that allow the user to define a specific vocabulary of generic identifiers and attributes for difference document types
- provision for arbitrary data content
- entity references
- special delimiters for processing instructions to distinguish them from descriptive markup

SGML was developed to solve such problems as device and system dependency, difficulties in integrating new technologies in the publications field, rekeying of data for multiple purposes, keying complexities, inability to develop multi-purpose training programs and the inability to interchange the structure of the text. The whole idea behind generic markup is to use nouns and adjectives to describe parts of a document---to identify what something is, not how it looks. SGML is a language to represent user-defined document structures in a rigorous and formal manner so that a computer may process it.

SGML can be used to describe any type of textual data from a novel to a mathematical equation. The Document Type Definition (DTD), however, narrows the metalanguage for use with a specific application. A DTD is a concise statement of what elements, entities, and/or attributes are allowed in a particular document. Through the DTD, an application can rigorously and strictly define a class of documents such as a job guide or flight manual. Descriptive tags may be tailored to the application with no concern for the delivery method or output device.

2.5 MIL-STD-1840A, "AUTOMATED INTERCHANGE OF TECHNICAL INFORMATION," 22 DECEMBER 1987

The purpose of this publication is to standardize the digital interface between organizations or systems exchanging digital forms of technical information necessary for the logistic support of weapon systems throughout their life cycle. This standard addresses technical information and product definition data. It standardizes the format and information structures of digital data files used for the transfer and archival storage of digital technical information. The format, information structures, and transfer procedures are applicable in all cases where the information can be prepared and received in the form of American Standard Code for Information Exchange (ASCII) text files, product definition data files, raster image files or graphics files.

Technical publications consist of text and associated illustrations. The files of a technical publication consist of a declaration file, text files (in ASCII) tagged to the contract (may use MIL-M-28001), illustration files (in Initial Graphics Exchange Specification

(IGES), Computer Graphics Metafile (CGM) or raster format), files in Page Description Language (PDL) form and other files (output specification file, special word file, etc.). The standard dictates very detailed requirements for the structure, content and order of information. For example, the declaration file must precede the data files and provide information about the identifications, source, destination, classification, etc. of the document. The standard also specifies the file header records for:

textual data	CGM data
document type definition	PDL
IGES data	gray scale
raster data	special word
output specification data	

2.6 MIL-D-28000, "DIGITAL REPRESENTATION FOR COMMUNICATION OF PRODUCT DATA: IGES APPLICATION SUBSETS," 22 DECEMBER 1987

This specification identifies the requirements to be met when product definition data is delivered in the digital format of IGES as specified by ANSI standard, Y14.26M - *Digital Representation for Communication of Product Definition Data*. MIL-D-28000 is designed to be incorporated into a contract to define the technical requirements to be met when purchasing product definition data or product data in digital form. Product definition data is defined as "the totality of data elements required to completely define a product. Product definition data includes geometry, topology, relationship, tolerances, attributes and features necessary to completely define a component part or an assembly of parts for the purpose of design, analysis, manufacture, test, and inspection." The specification defines product data as "all data elements necessary to define the geometry, the function, and the behavior of a piece part or an assembly of parts over its entire lifespan." IGES is a specification that provides a neutral format for the representation and transfer of vector graphics data used for illustration purposes among Computer-Aided Design (CAD) systems and application programs.[2]

This specification defines the technical requirements for the exchange of digital product data in specific application subsets. These subsets are technical illustrations, engineering drawings, and electrical/electronic applications. The technical illustration subset addresses entities that support the exchange of figures and illustrations normally

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[2]These definitions can be found in section 6.6 of MIL-D-28000, pages 31-33.

found in a technical publication. The emphasis is on visual clarity for human interpretation. The engineering drawings subset is used to encode product data being acquired in accordance with DoD-D-1000 (Engineering Drawings and Associate Lists) for delivery in digital form. Exchange emphasis is on completeness, visual equivalency for human interpretation, and functionality of the received drawing model. The electrical/electronic applications subset addresses the representation and exchange of electrical and electronic products including printed wiring boards, printed wiring assemblies, hybrid microassemblies, cables, and wiring harnesses. Emphasis is on component and circuit element descriptions, their placement, their connectivity, and the routing of electrical paths.

2.7 MIL-M-28001, "MARKUP REQUIREMENTS AND GENERIC STYLE SPECIFICATION FOR ELECTRONIC PRINTED OUTPUT AND EXCHANGE OF TEXT," 26 JANUARY 1988

This specification establishes the requirements for the digital data form of technical publications. Data prepared in conformance to these requirements will facilitate the automated preparation, storage, retrieval, exchange, and processing of technical documents from heterogeneous data sources. The requirements set forth by this specification include:

- procedures and symbology for markup of unformatted text in accordance with this specific application of SGML

- SGML compatible codes that will conform a technical publication to specific format requirements

- output control codes that will conform automated document processing functions to a uniform structure

This specification establishes the requirements for the digital forms of all technical publications. Data files satisfying the requirements of this specification will be one of two types: Type I - MIL-M-38784A conforming technical manuals and Type II - technical manuals conforming to other military specifications. Documents prepared in accordance with 38784 and 28001 must conform to the DTD defined in Appendix A and the output specification in Appendix C of 28001. The DTD and output specification for a MIL-M-38784A conforming manual do not have to be delivered with the tagged text. Technical manuals conforming to other military specifications may develop their own DTD but must use only those tags in the baseline tag set defined in Appendix B of 28001. In this case, the DTD must be delivered with the publication along with a compatible output specification.

This specification addresses the five steps in the publication preparation process:

- Creating a DTD for publication control;
- Authoring the publication and inserting SGML markup tags;
- Verifying the syntax according to the rules of SGML;
- Using the output specification to compose the document so that produced copy corresponds to the proper formal and style; and
- Generating a text presentation metafile in PDL to drive the display device.

The heart of this specification is found in the appendices. Appendix A specifies the role played by the DTD in an SGML implementation; a general description of DTD structure and content; the specific DTDs available for use in authoring, validating, and verifying an SGML-tagged technical document; and procedures for DTD development. The appendix introduction provides an overview of the concepts behind the SGML standard, a brief tutorial on reading an SGML DTD, guidelines for using SGML tags and DoD's SGML declaration. Two DTDs are also presented in Appendix A. This first DTD is for use when preparing a document that conforms with MIL-M-38784A. The second uses the same elements as the first DTD with the addition of more subordinate paragraphs and steps. This DTD may be used for MIL-M-38784A non-conforming documents or as a model for the development of a more appropriate DTD. Both DTDs allow for four types of non-SGML data: IGES data, CGM data, CCITT Group 4 data, and system generated data.

Appendix B contains an alphabetical listing of all elements contained in the DTDs presented in Appendix A.

Appendix C is a stand-alone document. It includes a document output specification (format and style guide) to be used for all applications of this specification. Although the format default values are set according to MIL-M-38784A, the values may be tailored to satisfy other format requirements. The appendix also provides an example of an SGML-coded source file and the composed sample document produced from the marked up file.

2.8 DOD-STD-2167A, "DEFENSE SYSTEM SOFTWARE DEVELOP-MENT," 29 FEBRUARY 1988

DoD-STD-2167A provides the means for establishing, evaluating, and maintaining quality in software developed for weapon systems and its associated documentation. The contract agency is responsible for tailoring the software management process to meet the needs of a particular project. The Data Item Descriptions (DIDs) associated with this standard describe a set of documents for recording information required by the management

process. The standard encourages the production of deliverable data using automated techniques.

3.0 ANALYSIS OF STANDARDS

MIL-M-38784B provides very strict rules for the preparation of technical manuals. Technical manuals are rigorously defined, emphasizing hardware and hardware components found in weapon systems. This specification does not appear to address the installation, operation, maintenance, training and support of software.[3] Over the past years it has become obvious that hardware and software can not be managed in the same way and this includes the documentation associated with each.

ISO-8879 provides both a formal specification of the markup language and a set of annexes that discuss the main concepts in an informal tutorial style. Although the annexes are helpful in understanding the standard, it is also true that the standard lacks such important items as an index and a list of abbreviations. Recently, Smith and Stutely of the UK have published a book that includes SGML syntax productions, a list of abbreviations, character entities and graphic representations, an index to ISO 8879, and a list of SGML keywords and reserved names. The ISO standard, supplemented by this text and the annexes, should provide the user with the appropriate information to utilize SGML to its fullest extent.

MIL-STD-1840A is not concerned with the specific data being transferred, but the process in which the data is transferred. A very detailed declaration file with 15 separate records must be included in the transfer of data from one source to another. These records state everything from who is sending the document to when the last change was made to the document to whether or not graphic files are included in the document. The data files may include text files, illustration files and product data files. The standard is concerned with identifiers or records rather than the actual text or graphics. These identifiers appear to be very good reference points, especially if graphics play a major role in the document.

MIL-D-28000 is a very detailed specification with relationship to the standards discussed, 28000 is concerned with a concrete product (i.e., hardware); it will have little if any impact on the development of software and software-related documentation. As stated earlier, the emphasis is on component and circuit element descriptions, their placement, their connectivity, and the routing of electrical paths.

Both MIL-M-38784 and MIL-STD-1840A form a part of MIL-M-28001. MIL-M-28001 translates the multiple document structures, formats and style of specifications such

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[3]Technical content is provided by the author---only concern of the standard is the formatting of the information.

as those found in MIL-M-38784 into rigorously defined terms and logical constructs needed for electronic interchange and publishing purposes. Two DTDs are provided in this standard: one conforming to MIL-M-38784 and one non-conforming. The non-conforming DTD may be tailored to meet the needs of a program. There is also a document output specification associated with this DTD that can be tailored to specific needs of a program. The standard allows for the inclusion of illustrations by referencing external graphics files. MIL-STD-1840A provides for both vector and raster illustration forms of the graphics files which 28001 utilizes. The authors of MIL-M-28001 feel that this specification, with its three appendices, supports most automated publishing applications within the DoD.

Unlike the previous standards and specifications, DoD standards 2167A and 7935 provide guidelines for documentation specific to software. Although both standards refer to the electronic transfer of software documentation, no specific reference is made to SGML or the transfer of any graphics associated with the documentation. DoD-STD-2167A does provide for the tailoring of the standard to meet the needs of a specific program and contracts.

4.0 RECOMMENDATIONS

A fundamental end product of the STARS Program is the development of adaptable and reliable software technology. Tools, environments, and repositories will be built to assist in the acceptance and automation of this technology. STARS has mandated that all documentation pertaining to this technology will use the SGML standard, ISO 8879, to define its structure so that the document may be electronically transferred into the STARS software repository. The review of the seven standards and the subsequent recommendations are based on the following five steps which should be taken when a program, such as STARS, plans to use SGML for the electronic transfer of its software documentation:

1. **Establish Types of Required Documentation**

   Recommendation: Review DoD-STD-2167A and DoD-STD-7935 to make sure that the original tailoring effort is still appropriate.

   With the superseding of DoD-STD-2167 by DoD-STD-2167A, STARS should review the new standard, along with DoD-STD-7935, to make sure the original tailoring effort is still appropriate Both of these standards provide flexibility so that the standard can be tailored to the STARS software development process.

   There are various types of documentation that can accompany software, i.e., User's Manual, Program Maintenance Manual, and Test Plan. STARS has already tailored DoD-STD-2167 to meet its needs. The types of documentation required under the program are outlined in attachment "A.6 - Delivery Orders" of the *Software Technology for Adaptable, Reliable Systems (STARS) Competing Primes Lead Contracts* and the "Contract Data Requirements Lists," which specifies those deliverables that must be submitted electronically in SGML format, are presented in attachment A.7.

2. **Establish Document Style and Structure Guidelines**

   Recommendation: Generate tailorings of DOD-STD-2167A and DOD-STD-7935.

   Tailorings of DOD-STD-2167A and DOD-STD-7935 should be generated as they are the principle standards for the style and structure of software documentation. MIL-M-38784B addresses primarily weapon system hardware rather than software, but it should be consulted as a general guideline for technical manuals.

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3. **Establish Document Formatting Guidelines**

Recommendation: Use MIL-M38784B and MIL-STD-1840A as guidelines for formatting documentation.

Formatting guidelines are provided in MIL-M-38784B and MIL-STD-1840A. MIL-M-38784B addresses primarily weapon system hardware rather than software, but it should be consulted as a general guideline for technical manuals.

4. **Establish a Standard for Graphical Data**

Recommendation: Use MIL-STD-1840A and MIL-D-28000 as guidelines for graphics standard.

Both MIL-STD-1840A and MIL-D-28000 should be used as guidelines when determining the graphics standard for STARS since they address different types of graphical data. SGML provides for the inclusion of graphical data such as figures and diagrams in documents, but does not specify the representation or format for this data. The term graphics includes illustrations, engineering drawings, and computer graphics.

5. **Establish Appropriate Document Type Definitions**

Recommendation: Use ISO-8879-1986(E) and MIL-M-28001 as guidelines when developing its DTDs.

STARS should use as guidelines ISO-8879-1986(E) and MIL-M-28001 when developing its DTDs. MIL-M-28001 has already done a significant work in this area. It is not recommended that the STARS program adopt the rigid DTD for a MIL-M-38784 conforming manual presented in MIL-M-28001. However, it would be beneficial to the program to review the DTD developed for the non-conforming document (Appendix A, Section 60). The program may be able to use the DTD as a model for the development of a more appropriate DTD. The document output specification presented in Appendix C of the specification could also be tailored to meet the needs of STARS.

Recommendation: The proposed STARS Standards Working Group should be tasked to investigate how these and other standards map together. This mapping would show both relationships and conflicts among documentation-oriented standards that impact the use of SGML for electronic transfer of documents.

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Dr. Richard L. Wexelblat, CSED	1
Dr. Robert I. Winner, CSED	1
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