S0005-AD-PRO-010

0910-LP-751-9100 Hardcopy
0910-LP-811-5800 CD-ROM

INTERACTIVE ELECTRONIC TECHNICAL MANUAL (IETM) PROCESS PLAN

PROCESSES AND GUIDANCE FOR IETM IMPLEMENTATION

Distribution Statement A: Approved for Public Release; distribution is unlimited.

Published by COMMANDER, NAVAL SEA SYSTEMS COMMAND and COMMANDER, SPACE AND NAVAL WARFARE SYSTEMS COMMAND

5 December 1995

0910LP7519100

S0005-AD-PRO-010

APPROVAL FOR RELEASE

The IETM Process Plan was developed by an IETM working group which was chartered by NSWC 00 and subsequently tasked by SEA 04 to develop the IETM Process Plan. The working group, comprised of representatives from the Navy System Commands, gathered experts from logistic and engineering disciplines, to produce this process plan. As SPAWAR shares many technical manual processes and much of the infrastructure, it has participated in the development and concurs in the release of the IETM Process Plan. This plan is intended to instruct and guide Programs in the development of IETMs in a way that provides for its life cycle use and maintenance within the NAVSEA/SPAWAR infrastructure.

The IETM Process Plan is to be used by all NAVSEA, SPAWAR, and associated PEOs and DRPMs in the acquisition of new, or conversion of existing hardcopy, technical manuals, into IETMs.

Signed and approved for use:

RADM David P. Sargent, USN
Commander, Naval Surface Warfare Center

Date: 12/5/95

Peter F. Brown
Naval Sea Systems Command
Deputy Commander for
Fleet Logistics Support

Date: 11/29/95

Ronald E. Knudsen
Space and Naval Warfare Systems Command
Assistant Commander, Policy, Operations
and Acquisition Support Directorate

Date: 11-30-95

FOREWORD

The Integrated Electronic Technical Manual (IETM) Process Plan (IETMPP) was initiated to ensure that all Programs use a comprehensive approach and standard methodology to create or convert to digital technical manuals (TMs). The IETMPP allows Programs to flexibly determine an appropriate IETM strategy, given their respective Program requirements, while ensuring standard processes that enable the Navy to continue to support these new logistic products using the centralized logistic management systems currently in place.

The Plan's organization is as follows:

Chapter 1. Executive Overview - a brief summary of the processes described within the IETMPP. This can be used by managers to assess whether or not their Programs are executing Navy standard processes and considering necessary issues prior to implementation of IETMs.

Chapter 2. The Plan - more detailed information regarding the processes involved in implementing IETMs. This chapter is for program managers who must plan for, acquire, deliver, maintain, and update the final IETM product.

Chapter 3. Appendices - detailed information required for IETM implementors to contractually define or produce IETMs that are compliant with Navy instructions and policies and supported by existing centralized Navy management systems.

To provide a single reference for cognizant managers, significant portions of the information herein has been consolidated from other documents that are of broad and diverse scope and may not be immediately available; they are:

a. The Acquisition Manager's Guide to CALS Implementation, MIL-HDBK-59

b. Navy Interactive Electronic Technical Manual (IETM) Acquisition Guide, Initial Draft, produced by NSWC, Carderock Division

c. Navy/Marine Corps Manager's Desktop Guide for CALS Implementation, produced by the CALS Resource and Implementation Cooperative

d. Technical Manual Technology Orientation, Course No. 0006, NAVSEA/SPAWAR Technical Manual Management Program, prepared by Naval Sea Data Support Activity, Port Hueneme, CA.

Sincere appreciation is extended to many who have contributed long hours and expertise in developing the information necessary to create the IETMPP. Questions or comments on the IETMPP can be forwarded to:

PHD-NSWC (Code 5B20) - Attention: Wayne Honea
Internet: honea_wayne@om.nswses.navy.mil
DSN 551-2971 (805) 982-2971

LIST OF CONTRIBUTORS

ACTIVITY	NAME
NAVSEA 03J1	Andrew Mazzeo
NAVSEA 04TD3	George White
	Andy Kelly
NAWC WEAPONS DIV	Debby Young
NAWCAD PATUXENT RIVER	Darlene Janiszewski
NISE EAST DET NORFOLK	Robert S. Moyer
NISE WEST SAN DIEGO	Onie Espejo
NSWC CARDEROCK DIV	Anthony M. Cieri
	Joe Garner
	Roger Hammer
	Mark Kramer
	Jerry Mckernan
	Diego F. Navarrete
NSWC CRANE DIV	Bob Roach
	Steve Ickes
NSWC CRANE DIV LOUISVILLE DET	Chester Elswick
	Amy Lewellyn
	Glenn C. Raley
	Dan Smith
	Janet Staashelm
NSWC DAHLGREN DIV	Clark Henshaw
	Susan Horman
	Janice Sullivan
NSWC INDIAN HEAD DIV	David Krause
	Larry Martin
	Bonnie Bazemore
NSWC ORDST	Robert Smith
NSWC PORT HUENEME DIV	Doug Bauer
	Richard Benbow
	Brian Bouchet
	Ramona Braun
	Mary Carol Cowsky
	Liz Cervantes
	Karen Christ
	Joe Colon
	Kathy Dewitt
	James Dills
	Christopher Dimond
	John Egan
	Steve Erbach
	Frederick Fry
	Alan Ganzman
	Carrie Ganzman
	Charlie Giacchi
	Bob Graham
	Joe Gurskis
	Wayne Honea
	Lichi Hsieh

LIST OF CONTRIBUTORS

(Continued)

ACTIVITY	NAME
PORT HUENEME DIV (Cont.)	Chuck Kowalsky
	Christian L. Oakland
	Judy Larson
	Sil Maguad
	Laura Marshall
	Thelma Miranda
	Douglas Morgan
	Jim Moses
	Sandra Moya
	Jane Neri
	Lowell Nilson
	Michael O Daniel
	Erlinda Reyes
	Kathy Scharf
	Eddie Scott
	Dan Seemiller
	Richard A. Smith
	David Taylor
	Fred Taylor
	John Toth
	Bob Uehlein
NSWC PHD FCDSSA DAMNECK DET	Christine Stimson
NUWC NEWPORT DIV NORFOLK DET	Raymond Oh
NUWC KEYPORT DIV KEYPORT DET	Mike Myers
	Steve O'Hara
NUWC NPT	John Storvick
PEO (TAD) D414	Martin Swiss
ANTECH SYSTEMS INC	Mike Anderson
CSC	Peter Bovard
EG&G	Paul Murphy
ERON COMPANY	Joe O 'Neil
INGALLS/PASCAGOULA	Alan Skewes
LOCKHEED MARTIN	Rick Ellwein
MANTECH (CALS OSD)	Linda King
PRC	Ken Sulek
	Ray Hughes
	Debra Giles
	Cindy Sewell
	Gerry Wilson
	Bill Vollmar
	Mark Cooper
TECHMATICS, INC	Richard Skinner

TABLE OF CONTENTS

CHAPTER 1 - EXECUTIVE SUMMARY 1

1-1 INTRODUCTION 1
1-1.1 Goal and Objectives 1
1-1.2 Approach 1

1-2 DEPARTMENT OF DEFENSE (DoD) POLICY DIRECTION 2
1-2.1 Continuous Acquisition and Life-cycle Support (CALS) 2
1-2.2 SECDEF Policy on Use of Standards 2
1-2.3 DoD Acquisition Instructions 2

1-3 NAVSEA IETM IMPLEMENTATION PHILOSOPHY 3
1-3.1 Centralized Management 3
1-3.2 Leveraging Navy IETM Resources 3
1-3.3 IETM SOFTWARE 3
1-3.4 Multiple Subject Integration 4
1-3.5 Interfacing Data Bases 4
1-3.6 IETM Functionalities 4
1-3.7 Compatibility with ATIS 4
1-3.8 IETM Logistic Support Concerns 5

1-4 SELECTION AND DESCRIPTION OF IETM FUNCTIONALITY 5
1-4.1 Development of an IETM Concept Of Operations (CONOPS) 5
1-4.2 IETM Class Definitions 6
1-4.3 Class 5 Functionality 6
1-4.4 Use of Non-Text Supplemental Enhancements 7
1-4.5 Printing Requirements and Impact on Class Selection 7

1-5 ACQUISITION OF IETMS 7
1-5.1 Introduction 7
1-5.2 IETM Acquisition Process Phases 7

1-6 CLASS CONVERSION MODELS AND PROCESSES 8

1-7 COST CONSIDERATIONS 8

1-8 CONCLUSION 9

CHAPTER 2 - THE PLAN 1
SECTION 2-1 INTRODUCTION 1

2-1.1 PURPOSE....1
2-1.2 GENERAL TERM DEFINITIONS AND USAGE....1
2-1.3 GOAL AND OBJECTIVES....1
2-1.4 SCOPE....2
2-1.5 APPROACH....3
2-1.6 ROLES AND RESPONSIBILITIES....4
2-1.7 APPLICABILITY....4

SECTION 2-2 DEPARTMENT OF DEFENSE (DoD) POLICY DIRECTION....5

2-2.1 CALS PHILOSOPHY....5
2-2.2 SECDEF POLICY....5
2-2.3 DoD INSTRUCTIONS....5
2-2.3.1 Planning....6
2-2.3.2 Solicitations....6
2-2.3.3 Infrastructure....6
2-2.3.4 Existing Defense Systems....6

SECTION 2-3 NAVSEA IETM IMPLEMENTATION PHILOSOPHY....8

2-3.1 INTRODUCTION....8
2-3.2 CENTRALIZED MANAGEMENT....9
2-3.2.1. TMINS Assignment Identifies Content....9
2-3.2.2 Media and Format Suffix Code Identifies Variation....9
2-3.2.3 Media Volume Identification Labels Identifies Location....10
2-3.2.4 Data Set Bundling Identified in ESTEPS....10
2-3.3 LEVERAGING NAVY IETM RESOURCES....10
2-3.4 IETM SOFTWARE....11
2-3.4.1 New Software....11
2-3.4.2 Existing Software....11
2-3.4.3 Software Evaluation....11
2-3.5 INITIATING IETM DEVELOPMENT WITH SYSTEM DESIGN....12
2-3.6 MULTIPLE SUBJECT INTEGRATION....12

2-3.7 INTERFACING DATA BASES....12
2-3.8 SGML DATA AND DTDS....13
2-3.9 IETM FUNCTIONALITIES....13
2-3.10 COMPATIBILITY WITH ATIS....13
2-3.11 IETM LOGISTIC SUPPORT CONCERNS....14
2-3.11.1 Speed and Accuracy of Changes....14
2-3.11.2 User Environment....14
2-3.11.3 Equipment Availability....14
2-3.11.4 Training....15

SECTION 2-4 SELECTION AND DESCRIPTION OF IETM FUNCTIONALITY16

2-4.1 DEVELOPMENT OF AN IETM CONCEPT OF OPERATIONS (CONOPS)....16
2-4.1.1 Purpose of the CONOPS....16
2-4.1.2 Factors....16
2-4.1.3 Inclusion in the Statement of Work (SOW)....17
2-4.1.4 Use in Decision-Making....18
2-4.2 THE ROLE OF SGML IN IETMs....18
2-4.3 IETM CLASS DEFINITIONS....18
2-4.3.1 Class 1 - Electronically Indexed Page Images....19
2-4.3.2 Class 2 - Electronic Scrolling Documents....19
2-4.3.3 Class 3 - Linearly Structured IETMs....19
2-4.3.4 Class 4 - Hierarchically Structured IETMs....20
2-4.3.5 Class 5 - Integrated Data Base IETMs....21
2-4.4 EXTENDING FUNCTIONALITY AND DATA SOURCES TO IETMs....22
2-4.4.1 Linkage To Other Files And Applications....22
2-4.4.2 Class 5 Functionality....22
2-4.5 USE OF NON-TEXT SUPPLEMENTAL ENHANCEMENTS....23
2-4.6 PRINTING REQUIREMENTS AND IMPACT ON CLASS SELECTION....23
2-4.6.1 Printing Capabilities....24
2-4.6.2 Printing Limitations on Selection of IETM Level....24
2-4.6.3 Dealing with Non-Text Enhancements....25
2-4.7 IETM OBJECT DATA BASE STRATEGIES....25

SECTION 2-5 ACQUISITION OF IETMS 26

2-5.1 INTRODUCTION 26

2-5.2 IETM ACQUISITION PROCESS PHASES 26

2-5.3 PHASE 1: DEVELOP AN IETM CONCEPT OF OPERATIONS (CONOPS) 26

2-5.4 PHASE 2: DEVELOP PROCUREMENT PACKAGE 27

2-5.4.1 Development Of The SOW 27

2-5.4.2 Construction of CDRLs for Class 2 through 5 IETMs 27

2-5.4.3 IETM TMCRs and Supplemental Acquisition Requirements Statement 28

2-5.5 PHASE 3: DISTRIBUTE PROCUREMENT PACKAGE AND EVALUATE CONTRACTOR RESPONSE 29

2-5.6 PHASE 4: ACCEPTANCE AND TESTING OF IETM PRODUCTS 29

SECTION 2-6 CLASS CONVERSION MODELS AND PROCESSES 32

2-6.1 CONVERSION DECISIONS 32

2-6.1.1 Overview 32

2-6.1.2 IETM CONOPS 33

2-6.2 CLASS 1 CONVERSION MODEL 33

2-6.3 CLASS 2 CONVERSION MODEL 34

2-6.4 CLASS 3 CONVERSION MODEL 36

2-6.5 CLASS 4 CONVERSION MODEL 37

2-6.6 CLASS 5 IETM CONVERSION MODEL 39

2-6.7 COST OF CONVERSION 39

SECTION 2-7 COST CONSIDERATIONS 41

2-7.1 DEVELOPING COST DATA 41

2-7.2 COST ASSUMPTIONS 41

2-7.3 LIFE CYCLE COSTING 41

2-7.4 REQUIREMENT FOR HARD COPY 42

APPENDIX A ACRONYMS AND ABBREVIATIONS A-1

APPENDIX B POINTS OF CONTACT B-1

APPENDIX C - DOD IETM CLASSES C-1

APPENDIX D IETM CONCEPT OF OPERATIONS (CONOPS) D-1

1.0 IETM FUNCTIONALITY DETERMINATION D-1
1.1 Factors Influencing or Dictating Functionality D-1
1.2 System or equipment Attributes Affecting IETM Functionality D-2

2.0 THE FUNCTIONALITY DECISION MODEL D-7

3.0 IETM IMPLEMENTATION SCHEDULE D-7

4.0 URGENCY AND FREQUENCY OF INFORMATION UPDATE D-8

5.0 DOCUMENT TYPE DEFINITION (DTD) AND FORMATTING OUTPUT SPECIFICATION INSTANCE (FOSI) D-8

6.0 LOGISTIC SUPPORT ANALYSIS AND RECORDS (LSA/LSAR) AND IETMS D-9

7.0 SECURITY D-9

8.0 IETM LICENSES IN PLACE D-9

9.0 LINKAGE TO OTHER INFORMATION RESOURCES D-9
9.1 Required Linkages D-10
9.2 Optional Linkages D-10
9.3 Motion Video/Audio Back-Up D-12

10.0 DEVELOPMENT OF IETM VIEW PACKAGE REQUIREMENTS D-13

11.0 IETM TECHNICAL MANUAL IDENTIFICATION NUMBER (TMIN) D-13

12.0 ELECTRONIC TECHNICAL MANUAL DEFICIENCY EVALUATION REPORTING (E-TMDER) PROCESS D-13

13.0 CD VOLUME IDENTIFICATION LABELS D-14

14.0 BUILDING CD-ROM DELIVERABLES D-14

15.0 DISPLAY HARDWARE, OPERATING SYSTEMS, AND NETWORKS TO BE USED ABOARD SHIP D-14

16.0 ENVIRONMENTAL CONDITIONS AND IETM DISPLAY HARDWARE D-15

17.0 DISPLAY HARDWARE MAINTENANCE AND SUPPORT D-16

ATTACHMENT 1 TO APPENDIX D IETM CONCEPT OF OPERATIONS FOR THE SAGITTARIUS SYSTEM D-17

1.0 SYSTEM INTRODUCTION D-17

2.0 SYSTEM ATTRIBUTES D-17

2.1 COMPLEXITY OF THE SYSTEM D-17
2.2 CONFIGURATION VOLATILITY D-17
2.3 CLASSIFICATION AND SECURITY D-17
2.4 EXPECTED SERVICE LIFE D-17
2.5 NUMBER AND DEPLOYMENT OF SYSTEMS D-18
2.6 NUMBER OF IETM USERS D-18
2.7 QUANTITY OF DATA D-18
2.8 QUALITY OF DATA D-18
2.9 CONSOLIDATION OF SUBJECT MATTER D-19
2.10 MAINTENANCE LEVELS D-19
2.11 TRAINING LEVELS D-19
2.12 MANNING REQUIREMENTS D-19
2.13 EXISTING GOVERNMENT AND CONTRACTOR INFRASTRUCTURE D-19
2.14 IETM IMPLEMENTATION SCHEDULE D-20
2.15 URGENCY OF INFORMATION UPDATE D-20
2.16 SECURITY D-20
2.17 DISPLAY HARDWARE, OPERATING SYSTEMS, AND NETWORKS TO BE USED FOR ATIS COMPATIBILITY ABOARD SHIP D-20
2.18 ENVIRONMENTAL CONDITIONS AND IETM DISPLAY HARDWARE D-21
2.19 DISPLAY HARDWARE MAINTENANCE AND SUPPORT D-21

APPENDIX E SELECTING APPROPRIATE IETM FUNCTIONALITY E-1

APPENDIX F DOCUMENT TYPE DEFINITION(DTD) PROCESSES F-1

1.0 NAVY CALS DTD REPOSITORY F-1

2.0 DTDs AVAILABLE FOR NAVY RE-USE F-1

3.0 ACCESS TO THE DTD REPOSITORY F-2
3.1 World Wide Web (WWW) F-2
3.2 Anonymous FTP F-2
3.3 Email F-2
3.4 Telephone or Mail F-2

APPENDIX G EXISTING IETM INFRASTRUCTURE ASSETS G-1

1.0 LICENSING IETM SOFTWARE G-1

2.0 SOFTWARE LICENSING CLEARING HOUSE G-1

3.0 HARDWARE CLEARING HOUSE G-2
4.0 IETM SUBJECT MATTER EXPERTS G-2
APPENDIX H DEVELOPMENT OF IETM VIEW PACKAGES H-1
1.0 DEFINITION H-1
2.0 DEVELOPMENT OF AN IETM VIEW PACKAGE H-1
APPENDIX I MANAGEMENT AND TRACKING OF IETM IDENTIFYING DATA . I-1
1.0 LOGISTIC INFORMATION MANAGEMENT OF IETMS ON MEDIA I-1
2.0 TMIN NUMBERING I-1
3.0 ASSIGNMENT OF MEDIA AND FORMAT SUFFIX CODE I-2
4.0 RETRIEVAL OF CD-ROM APPLICABILITY FROM ESTEPS I-3
5.0 VOLUME ID AND STOCK POINT ASSIGNMENT REQUESTS I-3
6.0 ESTEPS DATA FIELDS REQUIRED TO TRACK MEDIA DATA I-4
7.0 DISTRIBUTION, MANAGEMENT AND CONTROL I-5
MEDIA VOLUME ID NUMBER REQUEST I-6
APPENDIX J BUILDING CD-ROM DELIVERABLES J-1
1.0 DISK LABELING J-1
1.1 Data Classification J-1
1.2 Handling Caveats J-1
1.3 Classification Color Rings J-1
1.4 Producing Organizations Name J-2
1.5 Classification Authority J-2
1.6 Declassification Date J-2
1.7 Producer Seal J-2
1.8 ISO 9660 and/or Compact Disk Data Storage Logos J-2
1.9 Title of Production or Disk Set J-2
1.10 Date Produced J-2
1.11 Platforms Supported (e.g., Windows, DOS, UNIX, MAC, All) J-2
1.12 Supplemental Data Formats Used J-2
1.13 Edition J-2
1.14 Volume Identification J-2
1.15 Identification Number for Disk (serial/copy #) J-2
1.16 CD-Recordables J-3

2.0 DISK CONTENTS J-4
2.1 Volume and File Structure J-4
2.2 Retrieval Viewing software J-4
2.3 IETM Data File J-4
2.4 Internal "READ.ME" File J-4
3.0 CD TESTING J-7
4.0 DESTRUCTION OF CD ROMS J-8
APPENDIX K IETM AND DISPLAY HARDWARE INTERFACING K-1
1.0 RUN TIME ROOT PATH ASSIGNMENT K-1
2.0 HARD DISK SPACE K-2
3.0 SYSTEM CONFIGURATION RESOURCES K-2
4.0 MISCELLANEOUS K-3
APPENDIX L ELECTRONIC TM DEFICIENCIES EVALUATION REPORTS (E-TMDER) L-1
1.0 GOAL L-1
2.0 INTERFACING TO GOVERNMENT PROVIDED TECHNICAL INFORMATION DEFICIENCY EVALUATION SYSTEM (TIDES) L-1
2.1 Overview L-1
2.2 Availability L-1
2.3 Data Format L-1
2.4 Launching the Application L-2
2.4.1 Attachments L-2
2.4.2 Data Collection L-2
2.4.3 Transportability L-2
2.4.4 Review and Chop Cycle L-2
2.4.5 The "Make Floppy" Button L-2
3.0 GENERIC TMDER ASCII FILE CONTENT AND FORMAT L-3
4.0 HARD COPY TMDER OUTPUT L-4
5.0 FORWARDING OF TMDER INFORMATION L-4
APPENDIX M OVERVIEW OF MIL-M-28001 SGML M-1
1.0 OVERVIEW M-1
2.0 SGML /MIL-M-28001 TUTORIAL M-1

2.1 Content M-2
2.1.1 DTD M-2
2.1.2 Instance M-2
2.2 Form M-2
2.3 Example of a DTD M-3
2.4 Example of a Marked Up Document M-4

APPENDIX N OVERVIEW MIL-D-87269 SGML N-1

1.0 OVERVIEW N-1

2.0 IETMDB ACQUISITION CONSIDERATIONS N-2
2.1 IETMDB Generic Layer N-2
2.1.1 Architectural forms N-3
2.1.2 Nodes N-3
2.1.3 Links. N-4
2.1.4 Maintenance of the Generic Layer N-4
2.1.5 Required MIL-D-87269 SGML element types N-4
2.2 IETMDB Organizational Level Content Layer N-4

APPENDIX O ASN MEMORANDUM ON USE OF SPECIFICATIONS O-1

APPENDIX P DRAFT SECDEF MEMORANDUM ON DELIVERY OF DIGITAL DATA PRODUCTS P-1

APPENDIX Q ATIS - CD-ROM MANAGEMENT INTERFACE (IETM.NDX FILE) Q-1

1.0 GENERAL Q-1
1.1 Contents Q-1
1.2 Comments Q-1

2.0 INTERFACE FILE - IETM.NDX FORMAT Q-1

3.0 PROCESSING OVERVIEW Q-5
3.1 String Replacement Q-5
3.2 Predefined Replacement Values Q-5
3.3 Working Directory Q-6
3.4 Executable Q-6
3.5 Selection Q-7
3.6 Command Line Arguments. Q-7
3.7 IETM Execution Q-7

4.0 EXAMPLES Q-7
4.1 Example 1 ..... Q-8

4.2 Example 2 ..... Q-8
5.0 DOCUMENT MANAGEMENT Q-9
6.0 IDENTIFIER CONTROLLER Q-9
7.0 PROCESSING DETAILS / PROGRAM DESIGN Q-10
7.1 Data Base Import Processing Rules: Q-10
7.2 Command Line Generation Processing Rules: Q-10
8.0 IVNAV PROCESSING Q-12
9.0 ETM INSTALLATION LIMITATIONS Q-13
10.0 JUKEBOX REQUIREMENTS Q-15
10.1 Use of Jukeboxes with IETMs Q-15
10.2 "Selective Build" Option for Non-Raster Image CDs Q-15
10.2.1 Background Q-15
10.2.2 What Are Build Options? Q-16
10.2.3 Implementation Q-16
APPENDIX R QUALITY ASSURANCE AND CONTROL (QA/QC) R-1
1.0 INTRODUCTION R-1
2.0 RESPONSIBILITY FOR INSPECTIONS R-1
2.1 Responsibility For Compliance R-1
2.2 Technical Manual Quality Assurance (TMQA) Program R-1
2.2.1 QA Responsibilities R-2
2.2.2 QA Program Organization R-2
2.2.3 Technical Manual Quality Assurance Program Plan R-2
2.2.3 Record And Documentation Compliance R-3
2.3 IETM Quality Assurance Program (QAP) R-3
2.3.1 Function and Structure of Contractors QA Organization. R-4
2.3.2 Description of the Authoring System R-4
2.3.3 Word List R-4
2.3.4 Electronic Display Device (EDD) R-5
2.3.5 Written Operating Procedures R-5
2.3.6 Contractor Quality Reviews R-5
2.3.7 Source Data Management Plan R-5
2.3.8 Control of Subcontractors And Vendors R-6
2.3.9 Sampling Inspection Plan. R-6
2.3.10 Validation Approach Summary R-6
2.3.11 Verification Support Approach Summary R-6

2.3.12 Classification of Defects (CD) R-6
2.3.13 Implementation of the QAPP R-7
2.3.14 Changes to QA Procedures R-7
2.4 Guidance And Quality Planning Conference R-7
2.5 Government Inspections R-7
2.5.1 QA Process Inspection (QAPI) R-8
2.5.2 In-Process (Quality Product) Reviews R-8
2.6 Inspections And Quality Reviews R-9
2.6.1 Contractor Quality Assurance Inspections and Records R-9
2. 6.2 Review of Maintenance and Operating Procedures. R-9
2.7 Validation R-10
2.7.1 Engineering Reviews R-10
2.7.2 Validation of IETMs and Related TI. R-10
2.7.3 Validation of the IETMDB R-13
2.7.4 Validation of Automated IETM Assembly Processes R-13
2.7.5 IETM System Validation R-14
2.7.6 Post-Validation Review R-15
2.7.7 Validation Performance R-15
2.7.8 Support Equipment R-15
2.7.9 Validation Records R-15
2.7.10 Validation Certification R-16
2.7.11 Disposition of Validated Data R-16
2.8 Verification Support R-17
2.9 Sampling R-17
3.0 PACKAGING R-17
3.1 Technical Manual Schedules And Status Report R-17
3.2 Technical Manual Quality Assurance Data R-17
3.2.1 Validation Plan R-17
3.2.2 Validation Certification R-17
3.2.3 Verification Incorporation Certification R-17
3.3 Technical Manual Standard R-18
3.3.1 Interactive Electronic Technical Manual (IETM) R-18

TABLE OF FIGURES

Figure 1 - IETM Acquisition Phase....2-28
Figure 2 - IETM Acquisition Process Model....2-32
Figure 3 - General Conversion Overview....2-34
Figure 4 - Class 1 Conversion Process....2-36
Figure 5 - Class 2 Conversion Process....2-37
Figure 6 - Class 3 IETM Conversion Process....2-39
Figure 7 - Class 4 IETM Conversion Process....2-40
Figure 8 - Process Model for Determining IETM Class....E-1
Figure 9 - Sample Unclassified Label for DoD Produced CD-ROM Disk....J-1
Figure 10 - Sample Classified Label for DoD Produced CD-ROM Disk....J-1

CHAPTER 1 - Executive Summary

1-1 INTRODUCTION

The Interactive Electronic Technical Manual Process Plan (IETMPP) will standardize IETM implementation throughout the Navy by developing: (i) consistent, managed processes, (ii) shared experience to reduce costs and risks, (iii) pragmatic limitations of options without limiting choice or innovation, and (iv) a focus for technical manual (TM) data management to provide responsive, cost effective, and affordable solutions. It discusses all levels of IETMs from raster scanned images to highly structured data base management and expert systems. This executive summary provides a brief description of the guidance, processes, elements, and issues in acquiring new data as an IETM or in converting existing data to an IETM format.

1-1.1 GOAL AND OBJECTIVES

A standardized set of IETM processes will enable the Navy TM infrastructure to operate in a controlled manner with centralized management of IETM resources. These processes allow Programs the flexibility to use various solutions to cost effectively meet Program requirements. The IETMPP goal is to accelerate IETM implementation to derive maximum benefit from:

a. Reduced weapon system maintenance costs and time

b. Increased weapon system availability

c. Reduced training costs and course lengths

d. Improved technician performance and quality

e. Reduced costs to author, deliver, manage, and update TM information.

1-1.2 APPROACH

The desired TM end-state is an IETM that has all data created through a structured process that provides all subjects and applications with a single source of data. To achieve this end-state, the Navy technical data strategy for all new programs (and major upgrades) is to acquire:

a. the highest reasonable level of automation, using open systems

b. hierarchically structured data in an object-oriented data base

c. functional integration of technical data

d. revisable data bases

e. electronic display devices with interactive software

f. sophisticated viewing software.

However, the majority of existing data required to support Navy weapon systems over the next decade is already available, but only in hard copy or word processing form. Accordingly, the Navy is assisting cognizant managers of existing (legacy) programs to convert data to standard formats and structures, to the highest level of IETM functionality, consistent with the benefits to be derived from enhanced quality, improved readiness, and increased productivity. The Program and its cognizant managers are ultimately responsible for ensuring that Fleet requirements and missions are adequately supported. Roles and responsibilities of other participants are defined.

1-2 DEPARTMENT OF DEFENSE (DoD) POLICY DIRECTION

The Office of the Secretary of Defense has issued a number of policy instructions and memoranda impacting the implementation of IETMs. Three are of significant interest.

1-2.1 CONTINUOUS ACQUISITION AND LIFE-CYCLE SUPPORT (CALS)

CALS is a DoD initiative, begun in 1985, to guide DoD and industry toward effective generation, exchange, management, use, and distribution of digital data to design, manufacture, maintain, modernize, and operate complex and diverse defense systems. The CALS philosophy for TMs is to migrate from acquisition and use of paper-intensive forms of technical data to integrated, highly automated products and support processes. To accomplish this CALS has sponsored a number of Military Specifications on the formatting, preparation, and exchange of digital data. It has also been a primary force in encouraging technology insertion and innovation for both new acquisitions and conversion of legacy data and data systems. A draft SECDEF memo also requires that all new programs acquire digital data vice hard copy.

1-2.2 SECDEF POLICY ON USE OF STANDARDS

The Secretary of Defense initiated action to migrate away from the use of government specifications and standards in favor of performance standards and accepted commercial processes and practices, where applicable. An Assistant Secretary of the Navy memorandum further supports this initiative and identifies program implementation requirements. The Core CALS Standards (i.e., MIL-X-2800X series) have been designated as "performance" standards (MIL-PRF-2800X) and can now be used in any contractual process. Other military specifications and standards, including a number that apply to IETMs, require a waiver for use in the contractual process.

1-2.3 DoD ACQUISITION INSTRUCTIONS

DoDI 5000.2 directs the application of CALS to new defense system acquisitions and provides a basis for applying CALS to existing defense systems. Implementing CALS policy requires a new acquisition strategy to plan and contract for defense systems. Requirements for CALS should be incorporated in defense system program plans, the appropriate sections of the Request for Proposal (RFP), and the subsequent contract. The IETMPP includes information on Planning, Solicitations, Infrastructure, and Existing Defense Systems.

1-3 NAVSEA IETM IMPLEMENTATION PHILOSOPHY

NAVSEA has adopted an aggressive policy for the implementation of IETMs. This policy is more than just a progressive decision to implement CALS; it responds to the new funding realities. Maintenance, training, and technical data infrastructure support budgets have already been severely reduced. IETMs can fill the gaps and help meet mission requirements. Nearly all needed TMs are currently aboard ship in a digital (raster) form, viewable through a standard system. Early evaluations show 25-30% savings in the costs of managing and administering IETM data over its hard copy counterpart. Results from some of the more sophisticated IETMs show that a 30% reduction in formal classroom time is a reasonable expectation. These savings are preliminary, but consistent with other findings of reduced times and costs for maintenance, training, and infrastructure while achieving increased quality, performance and system availability.

1-3.1 CENTRALIZED MANAGEMENT

The Systems Commands are responsible for the TM management process. NAVSEA has established the Enhanced Ships Technical Publications System (ESTEPS) to manage NAVSEA publications. Diffusion or dispersal of this management responsibility will result in duplication, errors, and loss of data integrity. ESTEPS maintains critical administrative data for each publication. The requirement for this type of information increases with the use of IETMs. For example, ESTEPS is now required to track variations in TM formats (e.g., hard copy, CD-ROM, magnetic disk, etc.) and display device requirements. As a result each TM will have four points of control:

- Content identified by TM Identification Number (TMIN) assignment
- Variation identified by Media and Format Suffix Code
- Storage location identified by Media Volume Identification Labels
- Data set bundling identified in ESTEPS

1-3.2 LEVERAGING NAVY IETM RESOURCES

The rapidly growing acceptance of IETMs and the associated explosion of innovative technology, software, hardware, and other products have increased the level and rate of innovative change. The potential benefits of an acquisition manager's desire to assess and field new technology are appreciated. To this end, the Navy must improve its corporate technical support to all Programs through coordination, standardized procedures and processes, and shared technical experiences. It must also focus on management of corporate assets and resources to achieve cost savings and return on investment. There are three key assets: expertise, software, and hardware.

1-3.3 IETM SOFTWARE

Programs should investigate new technology as well as the software currently under license to determine the right level of innovation and sophistication to satisfy Program needs. As experience and expertise will also be available, this can substantially reduce cost and risk. However, where existing licensed software is found to be insufficient for the Programs requirements, new software will have to be procured. Most Programs have little

experience in negotiating software licenses, may not be aware of traps and pitfalls, and may not consider full life cycle and other Navy implications. SEA 04TD will assist in qualifying and licensing these tools for wide-scale application and has agreed to act as the software clearing house to assist the Programs.

1-3.4 Multiple Subject Integration

While many logistic functions use the same data, traditional logistic products require data re-authoring, tailoring, and reformatting, making it difficult share and relate data. As IETMs move into a data base environment, the ability to share data across functional disciplines is significantly enhanced with the applications software that supports each discipline being responsible for presenting the data to a specific set of users. There are significant potential cost savings and productivity and quality benefits to be derived from managing and updating less data and from enabling user activities to derive data from a single source.

1-3.5 Interfacing Data Bases

The CALS end-state consists of many distributed and dispersed data bases that function as a single integrated data base. IETMs can seek out data in other data bases and make it seamlessly available to the user. Ideally, IETMs should be interfaced to (i.e., independent, but directly connected), not integrate in with associated logistic support data bases such as configuration, supply, and others whenever it is cost effective to do so.

1-3.6 IETM Functionalities

The Navy has recognized that a range of IETM functionality, and therefore format and cost options, is needed to support various Program requirements. Functionality can range from modest use of raster scanned documents to integrated data bases that are paired with expert systems. Programs needs to consider all factors and attributes described in the IETM Concept of Operations (CONOPS) to assist them in selecting the highest level of functionality that meets Program requirements and cost constraints.

1-3.7 Compatibility with ATIS

Advanced Technical Information Support (ATIS) system provides software that performs library functions and supports the display of all Classes of digital TMs. ATIS lists all digital TMs for the user. While it is desirable to have all IETMs be compatible with ATIS, it is recognized that there may be conditions where that is not possible or practical; for example, on IETMs where:

- the software programming is integrated into the operating software of the weapon
- the constraints and restrictions mandated by the ATIS software severely impact on Program or user needs or preclude the specific IETM implementation.

If for any reason the IETM chosen is not ATIS compatible, particularly those integrated into the system or equipment, the Program assumes the responsibility for roles that ATIS currently fills and must address how and ensure that all potential legitimate users have access to the data.

1-3.8 IETM Logistic Support Concerns

Given the advantages identified in using IETMs, there are also some real concerns; some of which already exist with hard copy TMs and some of which are new; e.g.:

- Speed and accuracy of changes
- User environment
- Equipment availability
- Training

The impact of IETMs on training has already been demonstrated in the electronic classroom and in on-the-job training. Clearly, there is a major interface between training and the development of IETMs. Establishment of system training procedures is an ILS process and should be done early in the system acquisition or IETM development process. There are three strategies for approaching this interface:

a. developing the IETM and passing of files, software, etc. to the training community for interface with curriculum development programs such as Authoring Instructional Material (AIM);

b. coordinate with training in the initial development of the IETM, with resulting product being able to provide on-the-job training support with the IETM subsequently interfaced with training curriculum using tools such as AIM;

c. full integration of training materials into the IETM enabling the Fleet and Training communities to use the singular product.

The Program must decide early on which approach will provide the most benefit and must plan for the support of that program throughout the life cycle.

1-4 SELECTION AND DESCRIPTION OF IETM FUNCTIONALITY

1-4.1 Development of an IETM Concept Of Operations (CONOPS)

Whether acquiring new data or converting existing data, the Program decision to use an IETM involves a commitment of resources to accomplish one or more objectives to reduce costs and improve availability, productivity, and quality. The decision on what type of functionality to select has critical impact on the:

- Cost of and time required for conversion,
- Functionality available to the users,
- Costs and ability to maintain and update the data,
- Ability to interface and interact with other data files, and
- Ability, cost, and effort to migrate in the future to newer technology.

It is vital that the cognizant manager document the many interacting factors, assumptions, and considerations that formulate an implementation strategy. This document is the IETM CONOPS that establishes the conditions within and under which the IETM will function. Preparing the CONOPS should clarify issues and establish parameters to help a manager select optimal IETM functionality levels consistent with Program requirements. If IETM development is to be contracted out, the CONOPS provides key information to the bidders. Whether an IETM is being acquired as part of a new hardware system or being converted under contract, the resulting CONOPS will be referenced in the SOW along with the environment within which the IETM will be developed, fielded, and used. Additionally, the SOW should indicate other information to help the bidder propose the system and Program staff to evaluate the responses to required and desired functionality requirements.

1-4.2 IETM CLASS DEFINITIONS

CD-NSWC has generalized the range of functionality and formats of digital TMs into five classes, as shown in "DoD Classes of Electronic Technical Manuals," Appendix C. To facilitate discussion of options and differences, they are defined in fairly broad, general terms that necessarily overlap. They are insufficient to serve as a basis for contractual use (e.g., direct the Contractor to prepare a "Class 3" manual). The SOW or TMCR should specify exact functionality requirements without referring to this set of definitions. The functionality and considerations for the five Classes of IETMs are:

- Class 1 - Electronically Indexed Page Images
- Class 2 - Electronic Scrolling Documents
- Class 3 - Linearly Structured IETMs
- Class 4 - Hierarchically Structured IETMs
- Class 5 - Integrated Data Base IETMs

1-4.3 CLASS 5 FUNCTIONALITY

There four basic methods to implement Class 5 functionality:

- Integrated - The expert system and the IETM are an integral part of the built-in diagnostic process of the internal operating system of the equipment.
- Imbedded - The expert system is a part of the IETM. Subject matter experts add experience to assist in and improve diagnostic procedure presentations. It may contain extended levels of diagnostics, maintenance procedures, not typically available to the user, or additional details on assemblies, components, etc.
- Independent - The expert system is created to provide the functionality, but uses the IETM only as a source of data.
- Interfaced - Either an imbedded or independent IETM can be interfaced to the designated system, receiving specific signals or data on an intermittent, as required basis, at regular update periods, at specific events (e.g., overhaul) or on a direct connection basis.

1-4.4 USE OF NON-TEXT SUPPLEMENTAL ENHANCEMENTS

As IETMs become more sophisticated, new supplemental files, such as video features (e.g., movies, illustrations, pictures, graphics) and audio features (e.g., sounds, verbal instructions) are being added. This supplemental data must agree completely with the written procedures for performing the task and are only intended to aid in training and enhance the understanding of, and ability to perform a specific task.

1-4.5 PRINTING REQUIREMENTS AND IMPACT ON CLASS SELECTION

The Fleet currently continues to require a hard copy representation of each applicable TM present aboard each ship. At present, Class 1, 2 and most Class 3 IETMs can produce traditional hard copy TMs. A continuing demand for hard copy will limit flexibility and distort the cost/benefit analyses needed to determine which IETM best suits a system and its users. This is due to the fact that the ability to create hard copy becomes significantly more difficult, and may not even be possible, as IETMs migrate toward increasingly sophisticated Class 3, 4 and 5. This may artificially limit the choices available to the Program and may significantly restrict the potential benefits.

1-5 ACQUISITION OF IETMS

1-5.1 INTRODUCTION

The general philosophy of IETM acquisition is to procure standard tagged (in accordance with MIL-PRF-28001 or MIL-D-87269) IETM data bases that are optimally structured to create survivable data in a revisable data bases and economical data base maintenance through sharing of common objects. This philosophy is a key element in the migration toward the Navy's Integrated Product Data Environment, and tagged object databases should be procured in all new acquisitions

1-5.2 IETM ACQUISITION PROCESS PHASES

- Phase 1: Develop an IETM CONOPS. It provides potential offerors with anticipated support requirements of the proposed system and users and the issuing Program with a context for evaluating the proposed IETM solutions against those support requirements. The CONOPS provides a common language, common set of assumptions, common understanding and common point-of-departure for all participants in the process. It assists the Program in ensuring that needed IETM resources are in place or that deficiencies are identified.

- Phase 2: Develop Procurement Package. Preparation of the procurement package includes developing the SOW, Contract Data Requirements List (CDRL) and Technical Manual Contract Requirements (TMCR).

- Phase 3: Distribute Procurement Package and Evaluate Contractor Response. The IETM Acquisition Process Model illustrates the process of distributing an RFP and evaluating responding contractors IETM proposals.

- Phase 4: Acceptance and Testing of IETM Products. The TMCR describes the QA responsibilities of the contractor preparing the IETM and acquiring Program.

1-6 CLASS CONVERSION MODELS AND PROCESSES

The Program decision to convert data, usually from hard copy to a digital format, involves a commitment of resources to reduce costs and to improve availability, productivity, and quality. The decision on what type of IETM to select is critical in that it impacts cost of conversion, functionality available to the user, costs and ability to maintain and update the data, ability to interface and interact with other data files, and the ability, cost, and effort to migrate to newer technology. The first step is to develop an IETM CONOPS. The act of preparing the CONOPS should raise and clarify issues and establish needed parameters. If development of the IETM is to be contracted out, the CONOPS will provide key information to the bidders. The IETMPP provides information and considerations on conversion of data from an existing legacy (generally hard copy or basic word processing form) to an acceptable digital format with functionality that will benefit the user.

1-7 COST CONSIDERATIONS

- Developing Cost Data. There is no existing cost model that facilitates a rigorous, cost effective analysis to select an optimal TM automation level, but costs must be estimated or obtained from contracts for various levels of TM automation. Where possible, RFPs should require bidders to specify costs for comparative purposes.

- Cost Assumptions. The general cost of acquiring an IETM of any Class is assumed to be nearly the same cost as incurred in procuring a hard copy technical manual. The costs of preparing and delivering data may differ significantly, due to the sunk costs in existing TM authoring systems versus investment and training costs for new IETM authoring systems. Offsets such as the reduced costs of handling and authoring the data (e.g., camera-ready versus loading the data base) need to be evaluated. As Contractor costs are driven by perceived risk, Programs and contractors need to be aware of potential resources available to offset costs, perform services, and eliminate or limit risks.

- Life cycle costing. Cost projections used in making acquisition estimates for IETMs must always be based on the complete life cycle of the Technical Information (TI), not merely its acquisition.

- Requirement for Hard Copy. The continuing requirement for hard copy can significantly influence the feasible or even the possible choice of IETM functionality. Hard copy cannot necessarily be mandated away. The Fleet still requires it, because maintenance technicians need hard copy technical manuals to perform three primary forms of maintenance:

  a. To support maintenance during casualties when power is not available;

b. To carry TM information to the place where maintenance is accomplished; and

c. To provide readable, usable data especially large drawings and schematics.

1-8 CONCLUSION

As stated earlier, the purpose of the IETMPP is to provide for standardized, cost effective, responsive, and affordable implementation of IETMs throughout the Navy by developing: (i) consistent, managed processes, (ii) shared experience to reduce costs and risks, (iii) pragmatic limitations of options without limiting choice or innovation, and (iv) a focus for TM data management. This is a dynamic area where technology is constantly impacting on our ability to create, gather, process, store, retrieve, display, and update data. Change is the norm. Consequently, specific procedures may have to change over time. However, significant effort has been placed on creating processes that will transcend those changes through coordination, use of standards, modification of existing processes, consolidation of options, and sharing of knowledge to minimize cost and risk and maximize the likelihood of success. Finally, this is a user document, intended to simplify and standardize a Program's approach to creation and use of IETMs. Any suggestions or corrections that will make it of greater benefit to the managers and technicians will be appreciated.

CHAPTER 2 - The Plan

SECTION 2-1 INTRODUCTION

2-1.1 PURPOSE

The purpose of the Interactive Electronic Technical Manual Process Plan (IETMPP) is to standardize IETM implementation throughout the Navy by developing: (i) consistent, managed processes, (ii) shared experience to reduce costs and risks, (iii) pragmatic limitations of options without limiting choice or innovation, and (iv) a focus for technical manual (TM) data management to provide responsive, cost effective, and affordable solutions.

2-1.2 GENERAL TERM DEFINITIONS AND USAGE

Table 2-1 is a glossary of unique terms and associated definitions as used within the IETMPP. Appendix A is a list of abbreviations and acronyms used within the IETMPP.

Table 2-1

Glossary of Terms

Term	Description
Program	• The organizational activity (e.g., acquisition program office, in-service engineering activity) responsible for IETM planning and decision-making.
Cognizant manager or engineer	• The acquisition, technical, and functional managers and engineers who are responsible for the creation, review, validation, delivery, maintenance, and update of TMs in any format.
IETM	• Electronic technical manual (ETM) is a general term that describes all combinations of technical manual data in digital formats, stored in optical or magnetic media, and viewed through electronic display devices. As such, they include all interactive variants. The term, IETM, will be used to describe all forms of digital TMs in order to simplify discussion and avoid inadvertent confusion throughout the IETMPP.
ASCII File	• American Standard Code for Information Interchange or ASCII is a 256 character set. The IETMPP uses the term "ASCII file" in a commonly used sense to connote an addressable, revisable text file including those typically found in word processing or publishing system formats.

2-1.3 GOAL AND OBJECTIVES

The vision of the IETMPP is to provide a standardized set of IETM processes. This will enable the Navy TM infrastructure to operate in a controlled manner with centralized logistics management of IETM resources. The processes allow programs the flexibility to

use various solutions to cost effectively meet program requirements. The IETMPP goal is to accelerate IETM development, implementation, and maintenance processes that facilitate Program determination of when IETM benefits are commensurate with the cost of IETM conversion or implementation. The potential benefits are derived from the following objectives:

a. Reduce weapon system maintenance costs and time

b. Increase weapon system availability

c. Reduce training costs and course lengths

d. Improve technician performance and quality

e. Reduce costs to author, deliver, manage, and update TM information.

2-1.4 SCOPE

This IETMPP includes discussion for all levels of IETMs, from raster scanned images to highly sophisticated and structured data base management systems (DBMS) and expert systems. The IETMPP provides guidance in the processes and issues of cost effectively developing, implementing, and supporting IETMs and it addresses the following subjects:

a. Department of Defense (DoD) policy direction

b. Navy IETM philosophy

c. Navy Concept of Operations

d. Acquisition process guidance

e. Legacy technical manual conversion

f. Coordination of IETM software procurements

g. Naval Sea Systems Command (NAVSEA) IETM and compact disk - read only memory (CD-ROM) logistic tracking information

h. IETM hardware and software maintenance

i. Coordination of IETM display resources aboard ship

j. Initiation of IETM implementation aboard ship

k. Electronic Technical Manual Deficiency Evaluation Reports (E-TMDER) Issuance

l. Standard Generalized Mark-up Language (SGML) overview for both Military Specifications MIL-M-28001 and MIL-D-87269

m. NAVSEA supported Document Type Definitions (DTD), repository, and the registration process.

The IETMPP is consistent with processes as defined in:

a. Technical Manual Management Program (TMMP), NAVSEAINST 4160.3A, that provides NAVSEA TM acquisition guidance for Acquisition Managers; and

b. NAVSEA Technical Manual Management Program Operations and Procedures Manual, NAVSEA S0005-AA-PRO-010/TMMP, that provides supporting detailed procedures for NAVSEAINST 4160.3A.

The IETM Process Plan addresses the processes required to support and produce unclassified IETMs only.

2-1.5 APPROACH

The desired TM end-state is an IETM that has all data created and structured through an application of the Logistic Support Analysis (LSA) process. These data are managed in a revisable data base that provides all subjects and applications with a single source of data. To achieve this end-state, the Navy technical data strategy for all new programs (and major upgrades) is to acquire:

a. the highest reasonable level of automation, using open systems

b. hierarchically structured data in an object-oriented data base

c. functional integration of technical data

d. revisable data bases

e. electronic display devices with interactive software

f. sophisticated viewing software.

This approach provides the optimal results for current uses, while still allowing the Navy to take full advantage of future innovation. The acquisition of structured data ensures its survivability through continuous migration to new technologies without major conversions or severe impact. While the realization of this strategy has been a goal since 1985, a draft memo (Appendix P), being prepared for Secretary of Defense (SECDEF) signature, states that requirements for delivery of all technical information after January 1996 stipulate digital/electronic formats.

This approach, however, cannot be applied to the majority of existing data that will be required to support Navy weapon systems over the next decade (e.g., data already available, but only in hard copy or word processing form). It is recognized however, that converting existing data to standard formats and structures can enhance quality, improve readiness, and increase productivity. Accordingly, the Navy is assisting cognizant managers of existing (legacy) programs to convert data to the highest level of IETMs consistent with the benefits to be derived. These actions are given new impetus by Appendix P that also requires all programs with more than ten years of active service life remaining to convert their technical data to standard digital formats. These actions are further stimulated by the continuous decline of data conversion costs and increase in the

number and sophistication of authoring and viewing software packages. Much of the data existing today may never achieve an advanced digital state, however, technological advancements in conversion software make it prudent for Navy policy to ensure that proposed processes do not preclude, and even facilitate, future conversions.

2-1.6 ROLES AND RESPONSIBILITIES

The Program and its cognizant manager is ultimately responsible for ensuring that Fleet requirements and missions are adequately supported. To that end, each Program should establish an IETM team to research and develop an IETM Concept of Operations (CONOPS) prior to procuring IETMs. The cognizant manager should ensure that the IETM team contains adequate representation from program logistic disciplines, program engineers, In-Service Engineering Agents (ISEAs), design agents, and the Chief of Naval Education and Training (CNET). Their functions and requirements are described below.

a. Cognizant manager - Responsible for implementation, execution and management of IETM processes supporting the weapon systems or equipment; provides the IETM developers with engineering and technical data

b. Integrated Logistic Support (ILS) Manager - Responsible for ensuring that the Program is supported with accurate TMs and training; leads the procurement of TM, training and courseware materials (if applicable) and monitors the process and progress for any system under his or her cognizance

c. Program engineer - Defines technical requirements for the weapon system and assists in interpreting and validating technical information that will produce the TM and courseware

d. ISEA - Acts as the Government agent for technical issues and provides additional technical support functions; assigns Technical Manual Identification Number System (TMINs) numbers; verifies the parts of the TM and training using Logistic Support Analysis Record (LSAR) input; and provides proposed changes and alterations to the deliverable products

e. Design agent - Provides initial technical data for the Program and may author the IETM content

f. CNET - Provides the facilities and maintains the training facility and curriculum after a ready-for-training date has been reached.

2-1.7 APPLICABILITY

The IETMPP is intended for Program personnel, including cognizant managers, logisticians, and engineers involved in the acquisition of new or maintenance of existing systems. Thus, the IETMPP provides guidance to perform the functions needed to select the best level of TM automation for a given case and to acquire or convert data to that level. Existing procedures and policies will be used, when applicable. New policies, procedures, and changes in infrastructure will also be required to effectively support digital TMs.

SECTION 2-2 DEPARTMENT OF DEFENSE (DoD) POLICY DIRECTION

2-2.1 CALS PHILOSOPHY

The philosophy of Continuous Acquisition and Life-cycle Support (CALS) is to guide DoD and industry toward effective generation, exchange, management, use, and distribution of digital data to design, manufacture, maintain, modernize, and operate complex and diverse defense systems. The CALS philosophy for TMs is to migrate from acquisition and use of paper-intensive forms of technical data to integrated, highly automated products and support processes. The IETMPP, focusing on only IETMs, is in consonance with these CALS philosophies.

2-2.2 SECDEF POLICY

A 29 June 94 policy memo from the Secretary of Defense, Dr. Perry, initiated action to migrate away from the use of government specifications and standards in favor of performance standards and accepted commercial processes and practices, where applicable. This would allow DoD contractors to produce less costly deliverables that provide the user with the same functional support. The Assistant Secretary of the Navy issued a memorandum 27 July 94 (Appendix O) that further supported this initiative and identified program implementation requirements.

In executing the policy, the Navy and other military TM communities have reviewed commercial and international TM format and content specifications and standards with the goal of using them in lieu of military specifications and standards; none were found to be complete enough for use. Commercial and international organizations responsible for maintenance of these documents were asked to adopt certain military specification or standards; none were willing. In May 1995, the Core CALS Standards (i.e., MIL-X-2800X series) were designated as "performance" standards (MIL-PRF-2800X) and can now be used in any contractual process. Those specifications and standards, not specifically listed on the DODISS as "performance specifications and standards" will require a waiver from SECNAV for use in the contractual process. NAVSEA Code 04TD3 is monitoring the developments in this area and can be contacted for the status of TM specification waivers. It should be noted that the waiver process is only one of several ways that Programs can contractually implement performance criteria that is not currently in a performance specification. Specific Points of Contact are provided in Appendix B.

2-2.3 DoD INSTRUCTIONS

DoDI 5000.2 directs the application of CALS to new defense system acquisitions and provides a basis for applying CALS to existing defense systems. Implementing CALS policy requires a new acquisition strategy to plan and contract for defense systems. Requirements for CALS should be incorporated in defense system program plans, the appropriate sections of the Request for Proposal (RFP), and the subsequent contract. CALS

implementation requires a significant upgrade in the DoD infrastructure. DoD components are building this infrastructure to acquire, exchange, and use digital data deliverables and will continue to expand the ability to receive, store, manage, and distribute digitized technical data.

2-2.3.1 PLANNING

Defense Federal Acquisition Regulation Supplement (DFARS) Part 207.105 requires acquisition managers to describe the extent of CALS implementation in their acquisition plan. This plan establishes the framework for effective implementation of the CALS strategy by identifying system and infrastructure requirements.

2-2.3.2 SOLICITATIONS

DoDI 5000.2 establishes a core of fundamental policies and procedures for implementing various engineering, manufacturing, and support disciplines. It also states that all DoD acquisition plans and solicitations must address the following:

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

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

c. Authorized Government access to contractor data bases.

DoDI 5000.2, Part 6, Section N, states that preference shall be given to the acquisition of contractor information services instead of data deliverables and to require delivery in digital vice hard copy form. When signed, Appendix P or its successor is expected to mandate that after January 1996 all new requirements for technical data will require digital delivery and/or plan for on-line access to contractor data bases.

2-2.3.3 INFRASTRUCTURE

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

2-2.3.4 EXISTING DEFENSE SYSTEMS

DoDI 5000.2 requires that existing defense systems exploit opportunities to obtain cost savings by retrofitting digital information technology into their programs. Program phase, type, size, and duration are influencing factors in implementing CALS. Appendix P will place new requirements for conversion of legacy data to digital data on all Programs

having more than a few years of service life remaining. Infrastructure modernization and process improvement programs must look to opportunities for retrofitting digital information technology into existing programs. In order to take advantage of this technology in existing programs, legacy data conversion, re-acquisition of technical data in digital formats, and re-authoring data into processable data files may be required.

SECTION 2-3 NAVSEA IETM IMPLEMENTATION PHILOSOPHY

2-3.1 INTRODUCTION

The Navy has adopted an aggressive policy for the implementation of IETMs. This policy is more than just a progressive decision to implement CALS; it responds to the realities of funding environment of the last half of the 1990s and beyond. Training, maintenance, and technical data infrastructure support budgets have already been severely reduced. IETMs are viewed as one positive way of attempting to fill the gaps and continue to meet mission requirements. Having nearly all TMs currently aboard ship available in a digital (raster) form and viewable through a standard system, Advance Technical Information Support (ATIS), the first step in carrying out this policy is nearly complete. The next steps involve the acquisition of digital data and the further conversion and enhancement of all digital data to maximize the investment and to meet the needs of the future Fleet. Section 2-1.3 described IETM benefits in terms of reduced times and costs for maintenance, training, and infrastructure with increased quality, performance and system availability. Early evaluations show 25-30% savings in the costs of managing and administering IETM data over its hard copy counterpart. Results from training show that a 30% reduction in formal classroom time is a reasonable expectation. While the savings reported are preliminary, they are also consistent with other findings. Both are critically needed to fill existing funding gaps.

While more difficult to measure, an IETM will create cost savings and generate productivity and quality increases in the hands of the sailor at the deck plate level. Operational tests performed by the three Services compared interactive electronic with hard copy delivery of TM data and showed that IETMs provide the following types of improvements in weapon system support:

a. increased overall ability to locate, comprehend, and retain required information, leading to greater effectiveness in maintenance performance;

b. decreased false removal rates of good components;

c. increased effectiveness in successful fault isolation (reduction in time, increase in percentages of successful fault isolation actions);

d. reduced time in integrating maintenance actions with collateral functions (e.g., with maintenance reporting);

e. improvement in maintenance management procedures;

f. potential for significant decrease in formal School Command training time for individual systems, prior to assignment to organizational level work centers;

g. increased enthusiasm shown by technicians for IETM use over paper TM use in performing logistic support functions; and

h. potential for significant improvement in automated on-the-job training (both system related and other types) from availability of electronic display systems (EDS)

equipment in work centers. (Courseware for this type of interactive, electronically displayed training material is currently being developed extensively by all three Services for schoolhouse training.)

Acquisition managers, project engineers, and Fleet maintenance managers will quickly see that these findings have significant implications for system and equipment availability. The savings are real and are important factors in calculating life cycle costs, but they are also often difficult to estimate for new, unfielded systems or equipment.

2-3.2 CENTRALIZED MANAGEMENT

The Systems Commands are responsible for the TM management process. NAVSEA and SPAWAR have established the Enhanced Ships Technical Publication System (ESTEPS) to manage their publications. ESTEPS maintains data for each publication such as TM maintenance activity (TMMA), stocking point, equipment/system applicability, reported deficiencies, and distribution information. With the introduction of IETMs, ESTEPS is required to track additional data on each TM due to the introduction of variations in TM formats (e.g., hard copy, CD-ROM, or magnetic disk) and display device requirements. The requirement for this type of information not only continues, but increases with the use of IETMs. While not new or different, the process is significantly more complex. IETMs introduce variations (i.e., the same technical content in different forms and formats). Clearly, the engineering challenge is to ensure that all variants are updated in the same way at the approximately the same time. Adding new IETM data formats and media types only increases this multi-dimensional problem. The Navy's centralized management and control of the identification processes is critical to ensure that the Fleet is properly served and that the costs of that service are contained. For this reason it is imperative that all IETM implementors follow the standardized processes contain herein. Appendix I provides more detailed data, but the following are the primary control issues:

2-3.2.1. TMINS ASSIGNMENT IDENTIFIES CONTENT

The TMINS assignment identifies the unique technical content contained in each TM. Any variation of the technical data file (including hard copy) that is composed of the exact same technical content will be identified by a single TMIN. This assumes that any reauthoring and supplemental data do not effectively change what is being done and how it is being done. Multiple TMINs for the same technical content ensures that the data will rapidly fall out of synch and drastically increase update costs.

2-3.2.2 MEDIA AND FORMAT SUFFIX CODE IDENTIFIES VARIATION

Identification of the data form and format, as well as the applications that created and is used for viewing them, are needed to distinguish between unique variations of the same TM content. The variations are cataloged by adding a two digit suffix code to the TMIN as a variation identifier for processing purposes. Except for hard copy TMs, format variants are to be identified by adding a suffix to the TMINS number assigned for each TM (see Appendix I).

2-3.2.3 MEDIA VOLUME IDENTIFICATION LABELS IDENTIFIES LOCATION

Media volume identification labels identify what is stored on each media volume (e.g., CD-ROM, magnetic disk, hard drive). The information tracked includes which variations of which TMs appear on which CDs, as well as any other data, contained on the media. Existing fields within ESTEPS are being used to track media volume identification labels. Appendix I provide further information on media volume identification labels.

2-3.2.4 DATA SET BUNDLING IDENTIFIED IN ESTEPS

ESTEPS tracks who owns the data and is responsible for the bundling process that creates a logical set of data on a single media. The owner must ensure data availability, maintenance accomplishment and other support functions, and cost effectively performed. They must also ensure that the consistency of the data is maintained across all data sets where it may appear or be used (e.g., DD 963, FFG 7, CG 47, VLS, CIWS).

2-3.3 LEVERAGING NAVY IETM RESOURCES

The rapidly growing acceptance of IETMs and the associated explosion of innovative technology, software, hardware, and other products have increased the level and rate of innovative change. The current laissez-faire policy toward creation of new and better electronic technical products was adopted to stimulate innovation and encourage progress. Prototypes have often been uniquely tailored (stove pipe) for support of a single equipment or system in a software bound solution that had little impact on or interface with any other initiative. As these prototypes become mature systems, they must be integrated into an overall Navy technical data management strategy and support infrastructure. Innovative freedom and flexibility to apply new technology is contending with user's evolving needs and rising expectations and with the need to manage and control data, software assets, risk, and costs. The challenge is to manage and optimize the existing resources and provide support for innovation without sponsoring uncontrolled proliferation. A corporate-wide cooperative effort will maximize IETM success throughout the Navy. Appendix G provides additional discussion.

To this end, the Navy must improve its corporate technical support to all Programs through coordination, standardized procedures and processes, and shared technical experiences. It must also focus on management of corporate assets and resources to achieve cost savings and return on investment. There are three key assets: expertise, software, and hardware.

- Expertise - While most Programs seek innovation, they also need to manage risk. Knowing there are Government experts to assist in developing IETM requirements and that there are others that have used a software package or implemented a particular strategy can be of enormous assistance to the cognizant managers.

- Software - Procuring and making IETM tools available promotes economies of scale in procurement, growth of subject matter experts, and development of skilled logistic and technical personnel. This provides significant resources to help new applications implement IETMs and reduces costs and risks.

- Hardware - Shipboard office and work spaces are often already crowded. Introducing new hardware into them may cause space, heat, noise, electro-magnetic interference or other problems. Costs beyond equipment purchase and installation, such as development of training, maintenance, spares, hardware, interface requirements, and software upgrades are often overlooked. Capitalizing on use of existing equipment and sharing development costs with other Programs can minimize both cost and excess proliferation.

2-3.4 IETM SOFTWARE

The Navy is keenly aware of the potential benefits of an acquisition manager's desire to assess and field new technology. Programs should investigate new technology as well as the software currently under license to determine the right level of innovation and sophistication to satisfy Program needs. As experience and expertise will also be available, this can substantially reduce cost and risk. However, where existing licensed software is found to be insufficient for the Programs requirements, new software will have to be procured. Procurement and licensing of this software should also be coordinated to ensure that the Navy gets what it needs for the current stage of the Program, potential life cycle support requirements, and other potential users.
Appendix G provides detailed information on IETM software.

2-3.4.1 NEW SOFTWARE

Most Programs have little experience in negotiating software licenses, may not be aware of traps and pitfalls, and may not consider full life cycle and other Navy implications. SEA 04TD has considerable experience in qualifying and licensing these tools for wide-scale application and has agreed to act as the software clearing house to assist the Programs and to begin to exercise some control. When looking to license IETM software tools that cost in excess of $20,000, Programs should contact SEA 04TD to gain advice in who, what, and how to license. Use of SEA 04TD does not impede and may actually speed up the licensing process. CD-NSWC and NSWC IETM Working Group (WG) can provide cognizant managers with information on software that is in use by the Navy and often on software that is not currently licensed.

2-3.4.2 EXISTING SOFTWARE

When existing software is to be used, Programs should contact SEA 04TD for advice on who, what, and how to license, and for assistance in negotiating additional licenses.

2-3.4.3 SOFTWARE EVALUATION

Once procured, cooperative efforts will allow new IETM software products that introduce beneficial technologies to be evaluated. The evaluation will identify benefits and the results can be shared across Programs. Cognizant managers are encouraged to take advantage of the NSWC IETM WG knowledge assets and experience, in assisting them in successfully implementing IETMs for their Programs

2-3.5 INITIATING IETM DEVELOPMENT WITH SYSTEM DESIGN

IETM development should begin in the system design phase. System interfaces should support IETMs and integration of system feedback for expert systems to build historical data and support the user with knowledge-based advice. IETMs are generally developed concurrently with their supported weapon system.

2-3.6 MULTIPLE SUBJECT INTEGRATION

The CALS strategy for an integrated product data environment would logically expect future IETMs to be fully integrated with LSA and product design data bases. While many logistic functions use the same data, traditional logistic products such as TMs require data re-authoring, tailoring, and reformatting, making it difficult share and relate data. As IETMs move into a data base environment, the ability to share data across functional disciplines is significantly enhanced with the applications software that supports each discipline being responsible for presenting the data to a specific set of users. There are significant potential cost savings and productivity and quality benefits to be derived from managing and updating less data and from enabling user activities to derive data from a single source. Therefore, the careful development of data may significantly reduce the costs of initially creating, maintaining, and updating data, for all logistic subjects. For new acquisitions, use of the LSA process greatly simplifies data preparation and can substantially reduce the costs of tailoring and reauthoring to satisfy multiple subject requirements. However, LSA does not have to be invoked in order to use the disciplines and processes to create the data base. Integrating existing legacy systems requires significant data conversion, structuring, and re-authoring.

2-3.7 INTERFACING DATA BASES

The planned CALS end-state consist of many distributed and dispersed data bases that function as a single integrated data base. IETMs will seek out useful data in other data bases and make it seamlessly available to the user. Ideally, IETMs should be interfaced (i.e., independent, but directly connected) with associated logistic support data bases such as configuration, supply, and others whenever it is cost effective to do so. This interface capability can provide needed information in a timely manner to assist sailors in performing their duties. “Interfacing to” versus “integrating with” associated data bases into the IETM will avoid duplicating existing data base management efforts. One significant caution is that each data base has its own criteria and cycle for update and data available in one may not match the revision or change level available in the other. If the information being provided is critical, the software should conduct version checks and/or should issue appropriate cautions. Many current data bases may not have the functionality to allow free access from multiple users. Negotiations with those responsible for maintaining the source data can ensure that the data will be provided to the IETM application in the form required or that the application can reference the logistic support data in its current shipboard format.

2-3.8 SGML DATA AND DTDS

The use of SGML tagging protects the investment in data by ensuring its survivability through innovation and technology evolution and by preparing it for future migration without costly conversions. It reduces the costs of ownership of data by enabling data to be transported across applications and ensuring that support of vendor proprietary formats is not necessary. While the use of standard SGML tags is not mandatory, it is strongly encouraged. The decision not to use SGML tags may require conversion from a proprietary tag set to a standard SGML tag set at a later time. Further, use of SGML tagging will be an element of review during the Defense Acquisition Board Milestone Reviews and to pass Logistic Readiness Reviews. Paragraph 2-4.2 addresses the role of SGML in IETMs, Appendix M provides an overview of SGML as defined by MIL-M-28001, and Appendix N provides an overview of SGML as defined by MIL-D-87269. Existing DTDs should be used when possible to support standardization of SGML data. New or modified existing DTDs are to be registered with CD-NSWC and made available for future use. Appendix F provides information on developing and registering DTDs.

2-3.9 IETM FUNCTIONALITIES

The Navy has recognized that a range of IETM functionality, and therefore format and cost options, is needed to support various Program requirements. Functionality can range from modest use of raster scanned documents to integrated data bases that are paired with expert systems (see paragraph 2-4.3 for a description of the IETM classes). Programs need to consider all of the factors and attributes described in the IETM CONOPS (Appendix D) to assist them in selecting the highest level of functionality possible to meet Program requirements within cost constraints.

2-3.10 COMPATIBILITY WITH ATIS

ATIS provides software that performs library functions and supports the display of all Classes of digital TMs. ATIS lists all digital TMs for the user. Once the desired TM is found, ATIS (i.e., PC based Windows) launches the appropriate viewer for that IETM. ATIS provides a guaranteed set of hardware that enables IETMs created by different Programs to be viewed on the same display hardware, minimizing the amount of unique display equipment aboard ship. Additionally, ATIS and a 240 CD jukebox will be available on Shipboard Non-tactical ADP (SNAP) terminals on ships. A limited number of SNAP terminals are available and they are desk top units. Consequently, terminals will not be available for use in all work spaces and areas and additional laptops or other portables are still required. Also, displaying IETMs on the SNAP LAN potentially increases the number of IETM displays by the number of SNAP terminals available. Further, many of the SNAP displays are 19" or 21" Super VGA monitors that may be black and white or may not have the resolution of color capability required to adequately display IETMs. Clearly, there are licensing issues that must be resolved by the Program in the early planning stages. While it is desirable to have all IETMs be compatible with ATIS, it is recognized that there may be conditions where that is not possible or practical; for example, on IETMs where:

- software programming is integrated into the weapon system operating software

- the ATIS software constraints and/or restrictions severely impact on a Program or user or preclude a specific IETM implementation (cognizant managers should be aware of those restrictions and ensure that they do not impact).

If for any reason the IETM chosen is not ATIS compatible, particularly those integrated into the weapon system or equipment, the Program assumes the responsibility for roles that ATIS currently fills and must address how and ensure that all potential legitimate users have access to the data. Directions on making IETMs ATIS compatible are found in Appendix Q.

2-3.11 IETM LOGISTIC SUPPORT CONCERNS

Given the advantages identified in using IETMs, there are also some real concerns; some of which already exist with hard copy TMs and some of which are new.

2-3.11.1 SPEED AND ACCURACY OF CHANGES

As with hard copy TMs, the currency and accuracy of the IETMs is always a concern. While IETMs significantly enhance the ability to physically update and distribute changes, many of the processes that accomplish those actions may remain unchanged or even be negatively impacted, unless business process reengineering has accompanied the conversion. For example, engineering backlogs or long review cycles will remain regardless of whether the data is digital or paper. Further, emergency updates and changes may not be easily entered into the electronic version of the manual at the user level. Where changes are telecommunicated, any numbers or other key data may need to be verified.

2-3.11.2 USER ENVIRONMENT

All facets of the IETM must be usable to the sailor in a variety of work conditions and the IETM display hardware must operate in the environments created by those conditions. For example, size and weight or having too little or too much enough light or too much noise, heat, cold, exposure to the weather or contact with steam, water, grease, oil or solvents or giving off electromagnetic interference, etc. are all factors that could negatively impact performance. "Ruggedizing" the equipment addresses many of the issues, but also substantially drives up the unit cost. Cost is a critical factor in determining whether adequate IETM display hardware is available to assure that the sailor has access to the IETM whenever and wherever it is needed to perform work.

2-3.11.3 EQUIPMENT AVAILABILITY

As dependence on IETMs grows, availability becomes a concern. Logistic support (e.g., maintenance capability, spares, training) planning is needed to ensure reasonable availability as compared with the 100% availability of hard copy TMs. As with all shipboard equipment, each set of hardware that is placed in the Fleet (or at any activity) requires that standard logistic analyses and support planning be done. If the standard institutional support processes are not invoked, specific plans for support must be established, documented, funded, and executed. Proliferation of systems complicates the support process, increases administrative and support cost, and overburdens ship and other support forces with the need for more skills, training, spares, and documentation.

Definition and use of common systems simplify planning and implementation and increase the likelihood that actions to provide the support will occur. However, after Detail Ship Design is complete, no current mechanism require Programs that share common work places aboard ship to coordinate the use, distribution, and support of IETM display hardware. It is imperative to do so in order to minimize the costs associated with IETM display hardware support, as well as minimizing other impacts (e.g., space) on the ship. These logistic support issues must be evaluated and addressed to ensure the effective availability of the IETMs provided by the minimum number of units at reasonable costs.

2-3.11.4 TRAINING

The impact of IETMs on training is being demonstrated and implemented through practical applications in AEGIS combat systems, Gas Turbine System, and others. IETMs are a key factor in the implementation of the electronic classroom and use of on-the-job training. Clearly, there is a major interface between training and the development of IETMs. Establishment of system training procedures is an ILS process and should be done early in the system acquisition or IETM development process. A Training Plan or at least a general equivalent, is needed prior to Contract award to permit definition of the IETM functionality to support formal classroom, and on-the-job training for system operation, maintenance, and other special forms of logistic support if needed. Each Program must determine the training strategy which best supports their Program. Three possible strategies are listed below:

a. develop the IETM and passing of files, software, etc. to the training community for interface with curriculum development programs such as Authoring Instructional Material (AIM);

b. coordinate with training in the initial development of the IETM, with resulting product being able to provide on-the-job training support with subsequent interfacing with training curriculum using tools such as AIM;

c. full integration of training materials into the IETM enabling the Fleet and Training communities to use the singular product.

The Program must decide early on which approach will provide the most benefit and must plan for the support of that program throughout the life cycle.

SECTION 2-4 SELECTION AND DESCRIPTION OF IETM FUNCTIONALITY

2-4.1 DEVELOPMENT OF AN IETM CONCEPT OF OPERATIONS (CONOPS)

Whether acquiring new data or converting existing data, the Program decision to use an IETM involves a commitment of resources to accomplish one or more objectives to reduce costs and improve availability, productivity, and quality. The decision on what type of functionality to select has critical impact on the:

- Cost of and time required for conversion,
- Functionality available to the users,
- Costs and ability to maintain and update the data,
- Ability to interface and interact with other data files, and
- Ability, cost, and effort to migrate in the future to newer technology.

Appendix E presents a functionality decision model that will assist the cognizant manager in selecting the appropriate functionality for his or her program. The model refers to IETM Classes (described below). IETM Classes are a convenience, a way of grouping together some general sets of functionality for discussion purposes. The first step in Appendix E is to develop an IETM CONOPS.

2-4.1.1 PURPOSE OF THE CONOPS

Many interacting factors potentially affect which IETM functionality would best support a Program during the acquisition and service life of a system or equipment. Whether acquiring a new weapon system or converting hard copy data to support an existing system, it is vital that the cognizant manager document the factors, assumptions, and considerations that formulate an implementation strategy. This document is the IETM CONOPS. It establishes the conditions within and under which the IETM will function. Preparing the CONOPS should clarify issues and establish parameters to help a manager select optimal IETM functionality levels consistent with Program requirements. If IETM development is to be contracted out, the CONOPS provides key information to the bidders (see section 2-5). Development may be iterative. New conditions such as budget reductions, program phasing, emerging technologies, evolving functionality requirements, etc., may cause a review of the CONOPS and a rethinking of some decisions.

2-4.1.2 FACTORS

The following factors will help cognizant managers and contractors in the development and implementation of appropriate IETM options:

1. IETM functionality, as based upon
    - Data quantity
    - System complexity
    - Configuration volatility

- Subject matter consolidation
- Maintenance levels
- Training
- Manning requirements
- Infrastructure

2. Required and optional linkages
3. Electronic TM deficiency evaluation reporting (E-TMDER) process (Appendix L)
4. LSA and IETMs
5. DTDs (Appendix F)
6. Development of IETM view package requirements (Appendix H)
7. IETM implementation schedule
8. Number and expected lifetime of acquired/legacy system
9. Number of IETM users and data maintenance personnel
10. Frequency of data update
11. IETM licenses and expertise available (Appendix G)
12. IETM Technical Manual Identification Numbers (TMIN) (Appendix I)
13. ATIS compatibility (Appendix Q)
14. CD volume identification labels (Appendix I)
15. CD-ROM deliverable options (Appendix J)
16. Display hardware, interfaces, operating systems, networks to be used
17. Environmental conditions and IETM display hardware
18. Display hardware maintenance and support

2-4.1.3 Inclusion in the Statement of Work (SOW)

The factors reviewed in Appendix D, the CONOPS, are not intended to be exhaustive, but they should include the primary management considerations when deciding a program's optimal IETM level. Whether an IETM is being acquired as part of a new hardware system or being converted under contract, the resulting CONOPS will be referenced in the SOW along with the environment within which the IETM will be developed, fielded, and used. Additionally, the SOW should indicate other information that helps bidders propose their systems and helps the program staff evaluate the responses to the required and desired functionality requirements. Too often, however, detailed descriptions and/or "laundry lists" of highly desirable or mandatory features are substituted for firm requirements. This may restrict all bidders to a solution that may or may not be optimal or that unnecessarily drives up the costs of the proposed solution (e.g., one proposal looked as if all features of the most popular primary software had been listed as highly desirable or mandatory;

clearly only custom software could meet those requirements). Where the Program has decided on specific features, functionality or characteristics that are required to support various aspects of the system, the SOW and TM contract requirements (TMCR) should reflect that. The purpose of Appendix D is to advise bidders of those things that would best serve the system, particularly where the Programs may only have a general set of requirements.

2-4.1.4 USE IN DECISION-MAKING

The decision on the optimum level of IETM support can result from the accumulation of information from all of the factors in this CONOPS or from any single factor (e.g. remaining service life, complexity of the system). The decision also may be made solely to satisfy external factors (such as direction from higher authority, required interface with other systems or manning). Consequently, the CONOPS is not intended to be a "score sheet" with a weighted quantitative value for each factor and a "right" answer. Instead, it provides a "check list" of items to be included in the deliberative process to ensure that the cognizant manager is assisted in selecting the highest level of automation and best variation of IETM for his or her program.

2-4.2 THE ROLE OF SGML IN IETMs

The concept behind SGML and its variations, plays a critical and constant role in IETM implementation. SGML is used to refer to either the International Standards Organization (ISO) standard 8879, which describes how one would develop an SGML application, or to the resultant application itself. ISO 8879 defines a standard syntax and methodology for adding information identifiers (tags) to a document. These tags describe document structure and/or format in a neutral way, independent of systems, devices, and applications. MIL-PRF-28001 has been developed as an application of the ISO 8879 standard. Alternately, MIL-D-87269 had been developed to define a standard methodology and syntax for adding tags to describe data structure and/or content in a neutral way, independent of systems, devices, and applications. Each military specification avoids the limitations and restrictions of vendor proprietary systems by enabling the transport of data between differing contractor or government authoring systems. SGML ensures data survivability despite technology advancements through its ability to be transported from existing to new vendor or government systems with no or little conversion. SGML tagging also moves the technical data infrastructure closer to a neutral data base that can be viewed and shared on a much wider basis, inching us closer to the reality of an "Integrated Weapon System Data Base," the CALS end-state. Appendices M and N provide a more detailed description of SGML as it relates to MIL-PRF-28001 and MIL-D-87269, respectively.

2-4.3 IETM CLASS DEFINITIONS

The range of solutions for digitizing and electronically presenting TM data is expanding at an increasing rate, making discussion and comparison of alternate systems difficult. To deal with this problem, CD-NSWC has generalized the range of functionality and formats of digital TMs into five classes, as shown in "DoD Classes of Electronic Technical Manuals," Appendix C. CD-NSWC has also submitted these classes to the Tri- Service IETM Working

Group, which it chairs, for their adoption. Class 1 and 2 TMs are referred to as ETMs, as they lack the significant interactivity of other digital TM Classes. To simplify the following information, the term "IETM" will be used to identify ETMs and IETMs alike.

The Classes are defined in fairly broad, general terms that necessarily overlap. They facilitate discussion of options and differences, but they are insufficient to serve as a basis for contractual use (e.g., direct the Contractor to prepare a "Class 3" manual). The SOW or TMCR should specify exact functionality requirements without referring to this set of definitions. The functionality and considerations for the five Classes of IETMs are described below.

2-4.3.1 Class 1 - Electronically Indexed Page Images

These IETMs include digital page images obtained from raster scanning, using the Navy Implementation of Raster Scanning/Navy Image File Format (NIRS/NIFF). They are intelligently indexed, based on the front matter (i.e., table of contents, list of figures/foldouts/tables etc.) and rear index using MIL-M-29532. This indexing allows the user to select a topic from front matter and have the corresponding raster page from the body of the TM automatically displayed or to create an automatic collation of page changes. They retain a page orientation and can be directly printed.

2-4.3.2 Class 2 - Electronic Scrolling Documents

Most of these ASCII-based IETMs conform to SGML, per MIL-PRF-28001, and link front matter to corresponding material in the body of the TM. They may have additional links to cross-references, tables, figures, etc. and to voice, video, expert systems, or other special external applications. They generally have word search and bookmark capabilities, electronic sticky notes, and may contain raster or vector graphics. The linked manual can be viewed electronically or printed in compliance with existing military style and format specifications. While MIL-PRF-28001 is the preferred format at this time, other SGML formats (e.g., Hyper Text Markup Language, HTML) are emerging and provide the same benefits. Another data format, Postscript, a very common printer language and de facto standard, allows Class 2 interactivity. However, the Postscript file cannot currently be edited. Even when editing capability is developed, its use for other than minor changes may be practically limited by page integrity and other requirements. Consequently, if the Government chooses to maintain the TM data through Postscript files, it must first own or have access to the publishing system that generated those files before it can ensure that data maintenance and update responsibilities can be transferred between technical manual maintenance activities (TMMA).

2-4.3.3 Class 3 - Linearly Structured IETMs

These IETMs have enhanced functionality over Class 2. They may have MIL-PRF-28001 or MIL-D-87269 SGML tags applied to the ASCII text to allow user interaction through view packages. As described in Appendix H, view package requirements can be developed to emphasize functional subjects, such as: training, maintenance, and system overview. Being linearly structured, Class 3 IETM files can be used to print hard copy TMs, but while all of the data will appear in the proper sequence, the printed copy will not necessarily be in the

same format as the traditional "MIL SPEC" manual. Class 3 IETMs can include optional linkages, such as voice, video, expert systems or special applications. Some caution and planning are required, however, if a single data base is intended to produce the IETM and publish the hard copy TM.

2-4.3.4 CLASS 4 - HIERARCHICALLY STRUCTURED IETMS

Class 4 is a complete departure from the previous classes whose data is structured to support a classical publishing environment based upon sentences, paragraphs, chapters, pages, etc. Class 4 data is created, or reauthored and rebuilt into, and then managed as a hierarchical objects within a data base. In acquisition, Class 4 technical data is built into a structured data base, using LSA disciplines and formats to create the data base. Data is only created once with no duplication. For legacy TMs, two types of duplicate data are found:

- Identical data is exactly repeated each time it is found. Examples include warnings, cautions, notes, common procedural steps, graphics, etc.
- Redundant data sets are sets that convey the same information, but cannot be substituted for one another. Examples include paragraphs containing essentially the same steps, but which must be managed as individual data sets, because the words within the paragraph provide a different context for each occurrence (e.g., refer to different figures or different preceding paragraphs).

With Class 3, identical data can be eliminated; but because re-authoring is avoided to minimize cost or to preserve the ability to print hard copy, much redundancy remains. For conversion of legacy data to Class 4, data is re-authored to remove its formatting and to rebuild the data into a structured data base. Paragraphs or information can be decomposed to simple statements that approximate LSAR type of entries at the step level. As the new structure eliminates previous need for duplicate data, the redundant data also is eliminated. The application (view) program then provides the necessary context and transition. The total amount of data being stored and managed is significantly reduced and multiple updates within the IETM are eliminated. Other SGML based data bases found in Class 2 and 3 IETMs also have the ability to store data once and apply it many times. They, however, can only share these information objects within a single IETM.

Data linkages in Classes 1 through 3 rely on application programs such as scripting or hyperlinks to define the linkages between data. Their DBMS manages the objects, if applicable, but not the structure. For Class 4, building a hierarchical data base structure (typically following an LSAR) provides the inherent logic and the linkages among and between data. This principle greatly simplifies the processing of change data and the use of application programs. IETM data modules are structured in conformance with MIL-D-87269 and may be represented as SGML-tagged file. All item links are built into the structure of the DBMS. The availability of modules (e.g., figures, text, tables, video, voice clips) enables the user to access information in a highly interactive manner and from a variety of paths. The text is created or edited to have the same "look and feel" as the steps in LSAR entries. IETMs have user interfaces developed in accordance with MIL-M-87268

and provide "frame-," rather than "page-" oriented displays. The Class 4 IETM can prompt the user or may directly receive fault code information from which the IETM software determines the appropriate path to display through the data base.

A third primary difference between Class 4 and the first three IETM classes is not bound by a predetermined sequence of presentation. Where the sequencing of data may be different for different view packages, Class 2/3 would have to establish the sequenced data files for each view package; Class 4 would create it directly. Classes 4 IETMs (and Class 5 IETMs that use Class 4s as a base) have the ability to naturally apply precondition and applicability statements within the IETM data base and to "branch on condition found." The program analyzes each condition and brings in the necessary data. This process continues through to a logical conclusion. By using these features, a Class 4 IETM can display only "user specific" data from the data base and can tailor presentations based on several input criteria. For example, it may only present certain maintenance choices to a trainee, but present additional choices to a journeyman working with the same equipment configuration and fault indicators. Class 4 IETMs can share data sets among users, thereby making data maintenance even more efficient.

Programs can encounter contractors with significant investments in legacy publishing systems, legacy IETM software tools, lack of work force training in or understanding of Class 4 production processes, etc. These can mitigate them from proposing delivery of Class 4 functionality. These factors tend to weight the decision toward the "status quo." The persistent comparison of sunk costs in existing systems with investments needed to execute new technology generally fails to consider all costs involved in product creation and review or of the potential savings to be achieved in the life cycle. Nonetheless, the acquisition of SGML tagged "linear databases" can provide many of the end-user features and some of the advantages found in maintaining object oriented databases through different strategies of use (see Chapter 2-4.7 "IETM Object Data Base Strategies"). Whether object oriented or linear, SGML tagged data bases support the longer term goal of the CALS data integration philosophy.

As its contents are contained in a hierarchically structured data base, Class 4 IETMs cannot be printed as a unit for distribution in hard copy form.

2-4.3.5 Class 5 - Integrated Data Base IETMs

The Class 5 IETM combines the functionality and capabilities of an expert system with a technical data base to allow the user to perform tasks more quickly and accurately. This plan does not address the requirements of expert systems or the efforts needed to achieve the full integration of a multi-functional Class 5 system. It does address the IETM component of a Class 5 manual and the interface to an expert system. Class 5 IETMs allow the subject matter experts in all areas (e.g., troubleshooting, fault isolation, accomplishing repairs, establishing alternate repair paths) to bring their knowledge to the maintenance unit and apply it in a specific situation. The system and equipment diagnostic programs can "talk" directly to the user through the IETM; relatively unskilled technicians can be led through complex procedures, seldom-used processes and procedures (e.g., annual

inspections) can be properly planned and executed without significant research; etc. Programs will also typically analyze the data received and add it to the knowledge base to allow the software to "learn" and apply its knowledge to future analytical processes.

2-4.4 EXTENDING FUNCTIONALITY AND DATA SOURCES TO IETMs

2-4.4.1 LINKAGE TO OTHER FILES AND APPLICATIONS

To expand their usefulness and potential productivity gains, IETMs can be externally linked to associated referenced material or support data such as drawings, configuration data, or maintenance schedules and to additional software routines such as parts ordering, training, and expert systems. These links require separate programming to set them up and separate maintenance and update to assure that they remain current (e.g., do not continue to pull down a referenced drawing, even though it has been superseded or a revision is in file). These considerations become more complex as the size and integration of the files expands. Class 1 manuals can be linked through a technique known as "hot spotting," which involves the building of cursor position sensitive overlays for raster images. If a Class 1 IETM needs to be revised or changed (given there is no ASCII file available), the cost of converting the hard copy text and graphics into ASCII text and vector or raster graphics, may be offset by the savings in more efficient editing of text and graphics.

2-4.4.2 CLASS 5 FUNCTIONALITY

The four basic methods to implement Class 5 functionality are:

- Integrated - The expert system and the IETM are an integral part of the built-in diagnostic process of the internal operating system of the equipment. The expert system gets constant sensor and fault readings from the equipment and determines whether maintenance or other (e.g., emergency shut-down) action is required. The expert system may proceed to alert, alarm, troubleshoot, recommend course(s) of action, etc. Accumulated maintenance history and other data not found with the standard Class 4 and below IETMs will be associated with and directly accessible to the IETM and expert system.
- Imbedded - The expert system is a part of the IETM. Subject matter expert experience is added to assist in and improve diagnostic procedure presentations. It may contain extended levels of diagnostics, maintenance procedures, not typically available to the user, or additional details on assemblies, components, etc. Based on internal records of the maintenance history of the equipment, it may "learn" from actual maintenance performance and adjust steps (e.g., resequence tests points based on what is most often wrong with each specific piece of equipment), etc. It may or may not receive "on request" signals from external sources other than the user.
- Independent - The expert system is created to provide functionality discussed above, but uses the IETM only as a source of data. In this case the IETM can be a Class 2 and still adequately provide necessary data. The advantage for legacy data is that costs, particularly of re-authoring, of converting legacy data to a Class 4

format can be avoided. The disadvantage is that the expert system must do more "work" to extract and present the relevant data.

- Interfaced - Either an imbedded or independent IETM can be interfaced to the designated system, receiving specific signals or data on an intermittent, as required basis, at regular update periods, at specific events (e.g., overhaul) or on a direct connection basis. As opposed to integrated IETMs, interfaced IETMs are not an integral part of the system and are passive with respect to the system. They may be able, for example, to sound alarms or alerts, but not to take specific corrective or preventative action.

2-4.5 USE OF NON-TEXT SUPPLEMENTAL ENHANCEMENTS

As all levels of IETMs become more sophisticated, new supplemental files are being added. Examples include video features such as movies, illustrations, pictures, graphics and audio features such as verbal instructions, and sounds. These supplemental data "must" agree completely with the written procedures for performing the task and are only intended to aid in training and enhance the understanding of and ability to perform a specific task. However, two indirect affects are possible. First, as use of aids become more prevalent, it is possible that subtle changes in procedures will be reflected in the video or audio material, but not in the accompanying written TM material. Second, benefit statements commonly refer to a reduction in training time and the enabling of less skilled or experienced personnel to accomplish the same work. As a result, enhancements may alter expectations of who can accomplish a task (e.g., a 3rd Class can perform a repair using the digital version, but only a 1st Class or a specially trained user can use the hard copy alone). Finally, Class 5 IETMs may receive direct input from sensors, process data from diagnostic programs or perform and/or accept calculations, etc. The supplemental data should define the inputs to each process, the decision criteria, and off-line methods for obtaining these data. Where the user is dependent on the aids to accomplish the work, the written manual is no longer adequate without aids. This introduces a paradox that must be resolved by each IETM. Either the use of aids must be very limited to avoid potential consequences while significantly decreasing the potential benefits or a method for providing supplemental printed material must be included with manuals that require a complete hard copy. The latter possibility would increase the cost and effort of keeping the manuals current, something IETMs are intended to avoid.

2-4.6 PRINTING REQUIREMENTS AND IMPACT ON CLASS SELECTION

The Fleet currently continues to require a hard copy representation of each applicable TM present aboard each ship. At present, Class 1, 2 and most Class 3 IETMs can produce traditional hard copy TMs. A continuing demand for hard copy will limit flexibility and distort the cost/benefit analyses needed to determine which IETM best suits a system and its users. This is due to the fact that the ability to create hard copy becomes significantly more difficult, and may not even be possible, as IETMs migrate toward increasingly sophisticated Class 3, 4 and 5.

2-4.6.1 Printing Capabilities

Three basic levels of technical manual printing capabilities will be discussed:

- Fully formatted - an all-up, "MIL SPEC" version typical of current hard copy manuals. This is a formal printing option available only through standard TM requisitioning channels,
- Book version - an 8 1/2" X 11" (with fold-outs) printed all-up document with items in sequence, page numbers, etc. but lacking some specific formatting (e.g. double column, titles font and size). This document can be printed on a local printer. Oversized drawings, some tables, and fold-outs will have to be reduced in size or may have to be taped together for use. This can be a formal or a local printing option. If the option is formal, binding, foldouts and other standard features should be available, and
- Print screen - a printed copy of exactly what the user sees on the monitor. This option has no relationship to next or previous printing and no page numbers unless integrated in the image, etc. - a local printing option. In some cases, however, there is not even a print equivalent of what is seen on the screen.

2-4.6.2 Printing Limitations on Selection of IETM Level

Class 1 uses the raster page image files to display as well as print hard copy pages. Changes are made as page changes. Classes 2 and most 3 use MIL-PRF-28001 SGML files that are composed by a publishing system (that supports SGML) and then printed as an entire, fully formatted, hard copy TM. These same SGML files, sometimes with content information added to the tags, are processed through IETM conversion or authoring software and can be electronically displayed. There are five reasons why Class 4 and Class 5 cannot be meaningfully printed in their entirety:

- Their inherent structure does not support traditional page composition and printing;
- There is some video data for which there is no print equivalent;
- The statements in the steps are terse; the software provides the context and transition between steps. Following the statements by themselves is hard, particularly if branching is involved;
- Class 4 software uses "branch on condition found" criteria to determine what to display next. The program would have to "simulate" all conditions and follow each of them through to a logical conclusion to ensure that all options were captured. This would create a significant amount of redundant printed data and involve substantial amount of unique programming, testing, and continual update to ensure that all data was covered, adding costs and risks; and
- Class 5 data is being constantly introduced, processed, retained, and used. While this data does not change the way work is performed, it may directly impact what is done and when or in what sequence it is done. This would offer significant

sophistication to the program that composes a printed representation of that work, adding significantly to the cost and complexity.

A new process uses the LSAR as its source to produce both a fully formatted hard copy manual and a Class 4 data base from the same initial data base. Extra care is required in authoring/re-authoring the data to ensure that it will read well in the printed version. Note that both the Class 4 data base and the LSAR must be separately maintained and kept reconciled to ensure that the data content remains consistent.

2-4.6.3 DEALING WITH NON-TEXT ENHANCEMENTS

Use of audio and video can substantially enhance performance. This supplemental information, however, becomes an important part of the body of the manual and should be included with any hard copy version. In Class 4/5 IETMs, this inclusion can be the only way that important information is conveyed. MIL-M-87268 stipulates that audio data will also simultaneously appear on the screen in a printed form. From a practical perspective, no affordable printed material can replace video, but it should be possible, using a representative set of pictures or graphics with captions, to capture the essence of the information. This supplemental data and its surrogates will be created, SGML tagged, and managed as separate objects within the TM data file. IETM viewers can be instructed to ignore (not display) the SGML tagged surrogate data. Likewise, publishing systems can be instructed to ignore the SGML tagged audio and video supplemental data and print the surrogate data with appropriate reference (e.g., paragraph number, figure) and effective date and change information.

2-4.7 IETM OBJECT DATA BASE STRATEGIES

IETM implementors can take advantage of object oriented data base technology in their IETM implementation. There are two scenarios. Class 4 IETM objects are typically developed using only the Class 4 authoring tools. Class 4 IETMs include a structured (and reauthored, if a conversion) data base managed by an object oriented DBMS as part of the IETM authoring and IETM viewer software. The development of the structure is the key to full functionality. The Class 2 and 3 IETM development process generally use existing publishing or word processing systems to produce the content of the IETM and then further process it through Class 2 or 3 IETM authoring software. Other object data base tools are being developed to be implemented under existing publishing or word processor systems. This gives the IETM developer some flexibility in deciding whether to augment existing publishing assets with a supporting object data base or to migrate to a Class 4 IETM authoring tool that has the object data base and Class 4 authoring tools integrated into a single software package.

SECTION 2-5 ACQUISITION OF IETMS

2-5.1 INTRODUCTION

The general philosophy of IETM acquisition is to procure standard SGML tagged IETM data bases that are optimally structured to create survivable data in revisable data bases and to allow for economical database maintenance through sharing of common objects. This philosophy is a key element in the migration toward the Navy's Integrated Product Data Environment, and SGML tagged object databases should be procured in all new acquisitions. An IETM may also be procured as a logistic support product under a major weapon system or equipment buy, as a separate item under its own contract to support new equipment or as a conversion. While many of the documents and processes are the same, there are differences and this plan will point them out.

2-5.2 IETM ACQUISITION PROCESS PHASES

Figures 1 shows the general phases involved in the IETM acquisition process.

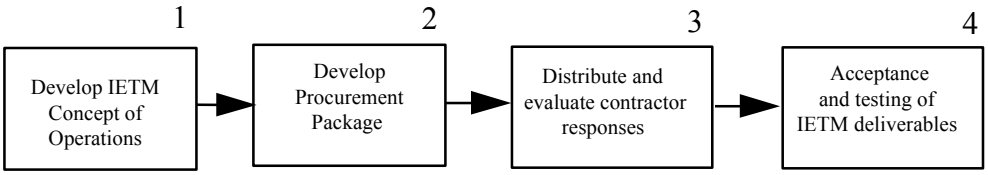

Figure 1 - IETM Acquisition Phases

2-5.3 PHASE 1: DEVELOP AN IETM CONCEPT OF OPERATIONS (CONOPS)

The IETM CONOPS provides potential offerors with anticipated support requirements of the proposed system and users as well as the issuing Program with a context for evaluating the proposed IETM solutions against those support requirements. The CONOPS provides a common language, common set of assumptions, common understanding and common point-of-departure for all participants in the process. It assists the Program in ensuring that needed IETM resources are in place or that deficiencies are identified. Subject matter experts from logistics, engineering, training, and the Fleet should be involved in the development of the IETM CONOPS to ensure that it covers all life cycle activities of the system being acquired.

The Program decision to convert data, usually to a standard digital format, involves a commitment of resources to accomplish one or more objectives to reduce costs and improve availability, productivity, and quality. The decision on what type of IETM to select is critical in that it impacts cost of conversion, functionality available to the user, costs and ability to maintain and update the data, ability to interface and interact with other data files, and the ability, cost, and effort to migrate in the future to newer technology. Section 2-4 has presented the Navy philosophy and considerations affecting IETMs, in general. Appendix E presents a functionality decision model that will assist the cognizant manager

in selecting the best conversion model for his or her program. The first step in Appendix E is to develop an IETM CONOPS. This is critical in establishing the conditions within and under which the IETM will be expected to function. The act of preparing the CONOPS should raise and clarify issues and establish needed parameters. This information is key to documenting the conditions and assumptions that were used to make the decision and to help formulate an implementation strategy. If development of the IETM is to be contracted out, the CONOPS will provide key information to the bidders.

2-5.4 PHASE 2: DEVELOP PROCUREMENT PACKAGE

Preparation of the procurement package includes developing the SOW, Contract Data Requirements List (CDRL) and Technical Manual Contract Requirements (TMCR). Specific development of these items is described below.

2-5.4.1 DEVELOPMENT OF THE SOW

In addition to specifically defining the requirements, the SOW identifies, references, and attaches copies of:

- The Program IETM CONOPS developed in accordance with Appendix D, and
- All appropriate IETM Process Plan Appendices.

Through the SOW, the Contractor receives information regarding the required functionality, end-user criteria, user environment, and delivery/implementation schedule, that is needed to develop the IETM.

2-5.4.2 CONSTRUCTION OF CDRLS FOR CLASS 2 THROUGH 5 IETMS

The list of deliverables will vary depending on the Class of IETM being acquired. Data Item Descriptions (DID) are not required for individual Exhibit Line Item Numbers (ELIN) of the CDRL providing the requirements are identified in the TMCR. (MIL-M-24784 will be updated with the required information to enable the TMCR to identify these deliverables. It has not been revised as of the date of this Plan.).

The following is provided as guidance only and is not intended to be a complete or approved list. This is a list of possible deliverables and includes items that are unique to the acquisition process for all IETM Classes. These CDRLs, as determined by using Appendix D, are:

a. Technical Manual Schedules and Status Reports
b. Outline Book Plan or equivalent (will apply to either the hard copy TM or IETM and defines the content and the structure of the TM)
c. Quality Assurance Program Plan
d. Validation Plan
e. Validation Certification
f. Verification Plan (optional)

g. Verification Certificate

h. Software Development Plan (7935A) (optional) (Note that the Program should specify that all software, including utilities, procured or developed to convert, develop, test or verify the IETM be delivered.)

i. The DTD (as accepted) and its final SGML tagged file, including:

- Graphic images in MIL-PRF-28002 Raster (for the case where the Program intends to use the SGML file to print hard copy)

- or -

- Graphic images in conformance with the MIL-PRF-2800X series of performance specifications. (Note: Audio, video, Expert Systems, and other externally linked files used within the Class 2/3 IETM or these same files types found within Class 4 or 5 IETM are delivered in the runtime version of the IETM, item l. below.)

j. Any graphics that exist in vector format (vendor format)

k. Source publishing system file (vendor format) if other than that as described in item i above

l. Runtime version of the IETM - that file that has been processed through the IETM application software, that would reside on media to be viewed by the end-user. This is to include all linked files in their native format. (This deliverable is not required if the same runtime version is the same SGML used as described in item i above.)

m. CD-ROM in accordance with the SOW

n. A Postscript file (only for those IETMs that are to be able to also provide hard copy products for distribution)

o. Hard copy foldouts (and supporting electronic files) bound in a Supplemental Manual (if required)

p. Contractors IETM cost data

q. Configuration Management Plan for the software and/or the data, as necessary

r. Audio and video materials in mutually agreed to formats and media

s. In Process Deliverables (incremental versions of the IETM, if desired)

t. Software Licensing Costs (for distribution in the user environment)

The media of delivery of the above items should be according to mutual agreements reached at the Technical Manual Selection Conference.

2-5.4.3 IETM TMCRs and Supplemental Acquisition Requirements Statement

Program management shall fill out a Technical Manual Acquisition Requirements Checklist (TMARC) (NAVSEA 9086/12 (REV 3/88)). NAVSEA Data Support Activity (NSDSA) will create a custom TMCR that describes the format, style and content requirements of the TM.

Field 20.b. of the TMARC, titled Magnetic Media should be marked with an "x" and "IETM" should be written in the blank line next to "identify the media." NSDSA and the Program will review and modify the TMCR to support the IETM acquisition.

If the IETM requires special display hardware, the Program should consider providing it as Government Furnished Property to the Contractor and identify it in section 6.0 of the TMCR. Section 7.0 of the TMCR allows for Contractor "Cost and Pricing" data. This should be acquired to enable better cost/benefit analysis of IETM applications.

The Program should be advised that the IETM TMCR was written to support MIL-M-87269 formatted IETMs. If the Program is procuring a Class 2 or 3 IETM, it is recommended that:

a. All "MIL-M-87269" references be replaced with references to "the selected DTD" in order to clearly define the SGML tags and syntax to be used, and
b. The TMCR be reviewed and references to "object data bases" be replaced with simply "data bases".

2-5.5 PHASE 3: DISTRIBUTE PROCUREMENT PACKAGE AND EVALUATE CONTRACTOR RESPONSE

Figure 2, the IETM Acquisition Process Model, illustrates the process of distributing an RFP and evaluating responding contractors IETM proposals. It illustrates what must be provided by the Government and contractor in the acquisition of IETMs. It is predicated on the fact that IETMs are being procured to satisfy a shipboard technician.

The IETM Acquisition Process Model below contains two acquisition process scenarios. Steps 1 through 11 identify the process of acquiring an IETM only. Steps 1 through 21 identify the IETM acquisition process when it is included a part of a larger System procurement.

2-5.6 PHASE 4: ACCEPTANCE AND TESTING OF IETM PRODUCTS

Section 4 of the TMCR describes the QA responsibilities of the contractor preparing the IETM and acquiring Program. Included in this section is the detailed descriptions of the QA products and processes to be performed in developing and accepting an IETM deliverable.

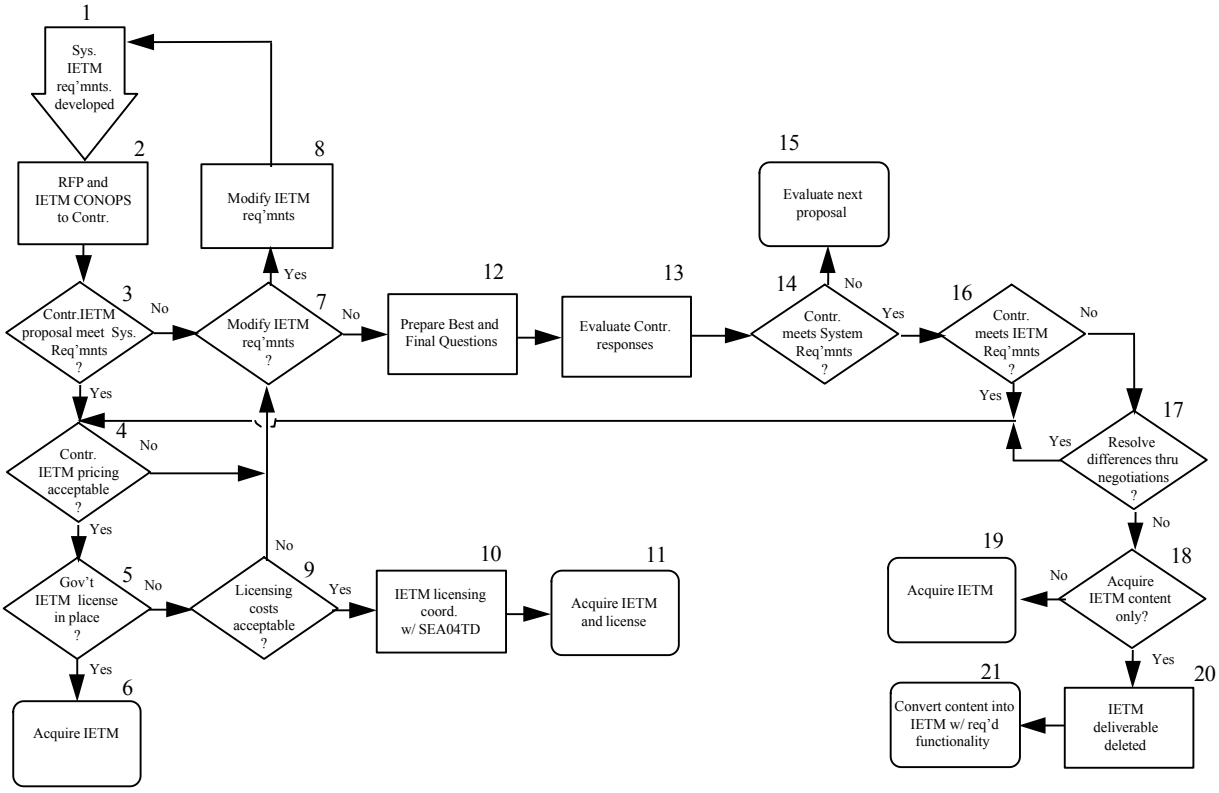

Figure 2 - IETM Acquisition Process Model

Step 1:	An IETM CONOPS is developed by conducting a Data Call in accordance with DoD 5010.12M during the acquisition planning process. The Data Call is used to gather and define the IETM requirements from the appropriate Logistic Managers. The IETM CONOPS development is explained in more detail in Appendix D. Note that the IETM CONOPS will include a list (including the scope) of all relevant software licensed for use by the Program. It will also require that the contractor stipulate the software packages selected and the anticipated total costs, including procurement of additional licenses for government technical management, reviewing activities, and users. Note also that the IETM requirements are a small portion of the total system RFP. Revisions and modifications can only be made at specified times and must be given to all bidders. Similarly, there are only specific times (e.g., Best and Final questions) when the Government is able to communicate deficiencies or request clarification.
Step 2:	The RFP and IETM CONOPS is released to bidders.
Step 3:	Contractor's proposals are received and evaluated against the IETM requirements.
Step 4:	If the contractors proposal meets all IETM functional requirements, determine whether the IETM development costs are acceptable.
Step 5:	If acceptable, determine whether the contractor has proposed using IETM software that is currently licensed to the Program. The contractor may not select IETM development software that is currently licensed by the Program or the Navy .

	If not, the contractor shall determine and acknowledge the costs to the Program to obtain appropriate licenses for the contractor's selected IETM software for acquisition and life cycle use by users identified in the IETM CONOPS.
Step 6:	Acquire the IETM.
Step 7:	If the contractor does not meet the IETM requirements, the Program may consider whether the requirements are reasonable and justified or warrant modification.
Step 8:	If the IETM requirements are to be changed, then modify the RFP to incorporate the new IETM requirements with a modified CONOPS and distribute to the bidders.
Step 9:	Determine that the IETM software licensing costs are acceptable, that the software Contractor proposes meets Program needs or provides significant features beyond those IETM tools currently in use; endorse the request to procure the IETM software.
Step 10:	Acknowledge new IETM software licensing with SEA 04TD. By SEA 04TD centrally tracking the various IETM software packages used throughout the Navy, can assist in achieving economies of scale with IETM vendors as well as being able to advise what IETM software may be available to the Program at no charge.
Step 11:	Acquire IETM and IETM software license.
Step 12:	Prepare Best and Final questions for System procurement including questions involving the IETM.
Step 13:	Evaluate contractor responses.
Step 14:	The Program must evaluate whether the Contractor meets System requirements prior to proceeding to further steps.
Step 15:	If the Contractor does not meet System requirements evaluate the next proposal.
Step 16:	If the Contractor has met the System requirements, the IETM requirements must be evaluated. If IETM requirements are met, proceed to Step 4.
Step 17:	If the IETM requirements are not met, resolve any differences through negotiations.
Step 18:	If negotiations fail to identify an acceptable IETM solution, the Program can decide to acquire the IETM content in a mutually agreed non-IETM format.
Step 19:	If in-house or service bureau conversion of content into the required IETM is not desired, the Contractor proposed IETM must be acquired.
Step 20.	The Program must delete the IETM runtime and possibly the SGML file deliverables. If these delivery requirements are dropped, the contractor will be responsible for developing and delivering the IETM content and providing the source and SGML files, but not developing the IETM end product.
Step 21:	Once the content is acquired by the Program, it can be converted (in-house or by service bureaus) into an IETM having the required functionality. SGML should be the data format the content is received in. If not, both Program and Contractor should mutually agree to format.

SECTION 2-6 CLASS CONVERSION MODELS AND PROCESSES

2-6.1 CONVERSION DECISIONS

The Program decision to convert data, usually from hard copy to a digital format, involves a commitment of resources to reduce costs and to improve availability, productivity, and quality.

2-6.1.1 OVERVIEW

Figure 3 provides a general overview of the process. The decision on what type of IETM to select is critical, as it impacts cost of conversion, functionality available to the user, costs and ability to maintain and update the data, ability to interface and interact with other data files, and the ability, cost, and effort to migrate to newer technology. Section 2-3 presents the general Navy IETM philosophy and considerations.

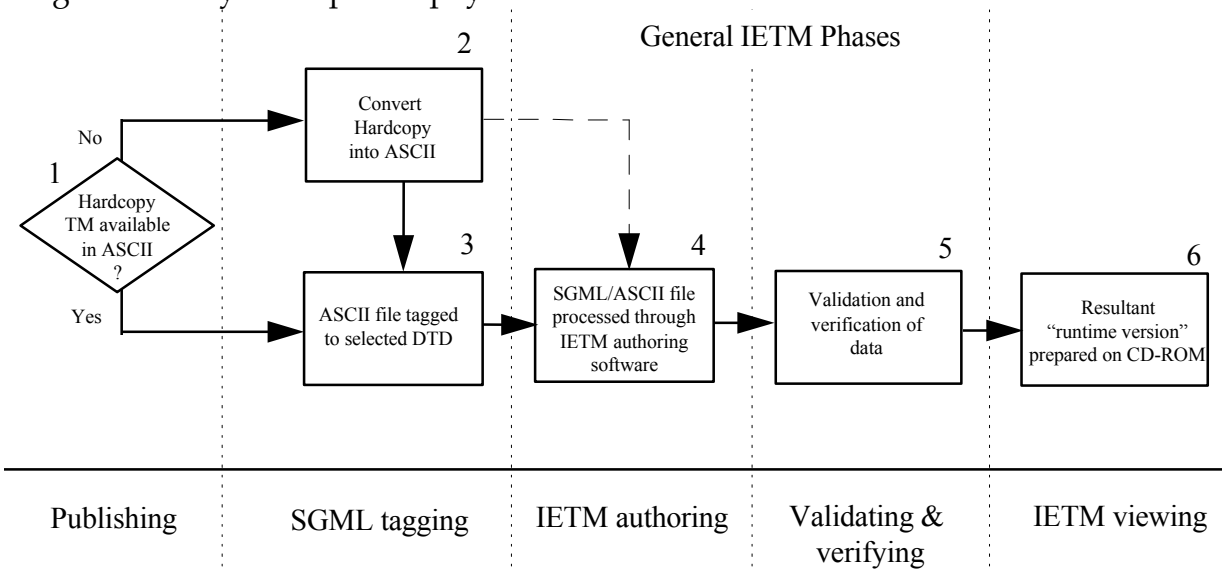

Figure 3 - General Conversion Overview

1:	If the ASCII file (typically from a publishing or word processing systems) of the TM can be obtained, the cost of converting and proofing can be avoided.
2:	If ASCII is not available, the existing TMs must be converted from hard copy into ASCII text and vector or raster graphics.
3:	When IETM development is contracted out, SGML tagged data should be acquired to provide the Program with the benefits described in paragraph 2-3.8 . Most IETM software tools allow commercial publishing formats to be processed directly through the IETM authoring software. Program s acquiring the data in this manner m ust be careful that not to become locked into a single contractor or vendor product as the only source capable of maintaining the IETM data base.
4:	The SGML/ASCII data is processed through a "IETM authoring software" to provide the features that the Program determined it needs to support its system.

5:	Conversion may result in data errors. The data must be revalidated and reverified to ensure that the converted data file is an accurate representation of the original. Where the conversion is from hard copy to ASCII, the verification is straight-forward. Where, however, the conversion includes linking, processing, dividing, reauthoring or replacing (e.g., with video) data, an engineering certification must occur. It will follow the normal TM verification and verification processes.
6:	The result of IETM authoring software, a "runtime" version, can be a proprietary file that can be viewed only through vendor proprietary software. To avoid this problem, the acquiring Program should obtain an SGML or commercial format file which is compatible with its own TM support infrastructure. There are some IETM viewing software packages that use the native SGML file in the viewer. In these instances there are no proprietary concerns. Distribution may be on CD-ROM or other electronic media.

2-6.1.2 IETM CONOPS

Appendix E presents a functionality decision model that will assist the cognizant manager in selecting the best conversion model for his or her program. The first step in Appendix E is to develop an IETM CONOPS. This is a critical step in establishing the conditions within and under which the IETM will be expected to function. The act of preparing the CONOPS should raise and clarify issues and establish needed parameters. This information is key to documenting the conditions and assumptions used to make the decision and to help formulate an implementation strategy. If development of the IETM is to be contracted out, the CONOPS will provide key information to the bidders (see section 2-5).

2-6.2 CLASS 1 CONVERSION MODEL

Figure 4 gives an overview of the procedure to follow when converting hard copy TMs into Class 1 format. Class 1 digital TMs have two mature conversion processes in place. One is managed by NSDSA and the other by Naval Air (NAVAIR) Technical Services Facility (NATSF). Any legacy hard copy TM should be forwarded to these sites for conversion. Conversion is already under Government contract and Programs should not attempt to convert legacy TMs into this Class 1 format other than at these conversion sites. In many cases NSDSA and NATSF may be funded to convert the TMs into Class 1 format. If conversion funds have not been allocated, NSDSA and NATSF will be able to quote the costs of converting the TMs.

NAVSEA has scanned virtually all of the 71,000 existing hard copy TMs that are used to support the ship library requirements. NAVAIR has scanned about 90,000 TMs. NSDSA or NATSF can assist the Program in determining whether required TMs have already been converted into this Class 1 format and whether the configuration of the Class 1 TM is up-to-date. These scanned images are also used as the source data for Technical Manual Publish On Demand System (TMPODS) that provides hard copy manuals without the need to store excesses or dispose of obsolescent material.

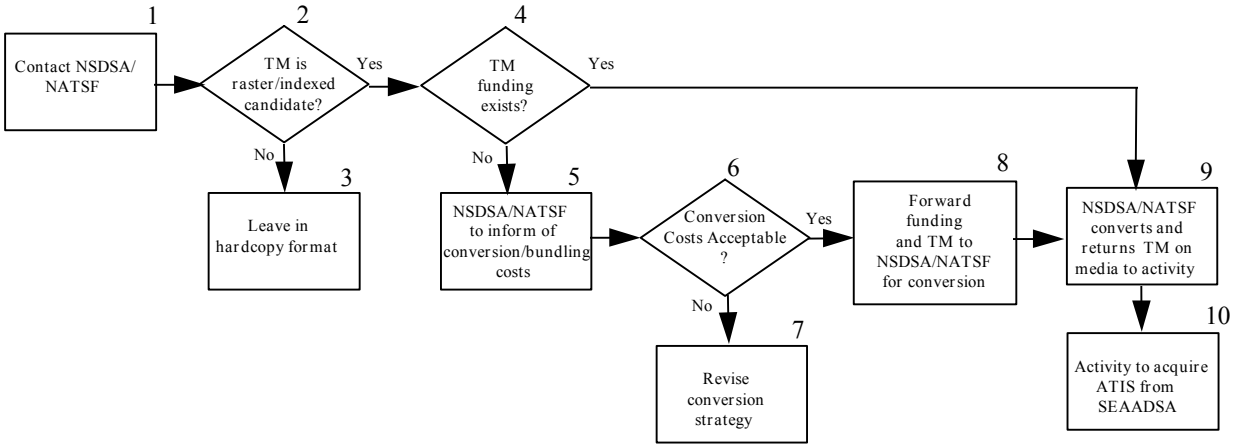

Figure 4 - Class 1 Conversion Process

Step 1:	Contact NSDSA or NATSF to initiate Class 1 conversion process.
Step 2:	NSDSA/NATSF determine whether hard copy TM is a raster candidate (e.g., front matter indexing in basic and changes , page quality, security classification, size of the TM, and whether color is used in the TM all det ermine suitability for scanning).
Step 3:	If the TM is not a Class 1 candidate, decide whether conversion of the TM to a higher , more costly IETM Class is justified.
Step 4:	NSDSA/NATSF determine if funding is available to support the conversion.
Step 5:	If not, NSDSA/NATSF provide the Program with an estimate of conversion costs.
Step 6:	Determine whether the conversion costs are acceptable.
Step 7:	If the conversion costs are not acceptable, evaluate the costs and benefits of converting to a more interactive Class of IETMs.
Step 8:	If the costs are acceptable, send the TMs and necessary funding to support conversion.
Step 9:	NSDSA/NATSF will return the converted TM on the agreed upon media.
Step 10:	Procure ATIS software from NAVSEA Logistics - Indian Head Detachment and ensure that appropriate display hardware exists where Class 1 TM is to be used.

2-6.3 CLASS 2 CONVERSION MODEL

Figure 5 describes the general process involved in converting a hard copy TM into a Class 2 IETM. TMs can be converted to Class 2 from existing legacy hard copy TMs or they can be acquired as Class 2 source data from the authoring contractor or government activity. Acquisition involves a slightly different decision-making process than conversion and is described in more detail in Section 5 of this document. As with Class 1, but on a smaller scale, a developing process exists that may relieve the Program of the costs of implementing the conversion process. Contact SEA 04TD or AIR 411 for more information on developing Class 2 conversion process.

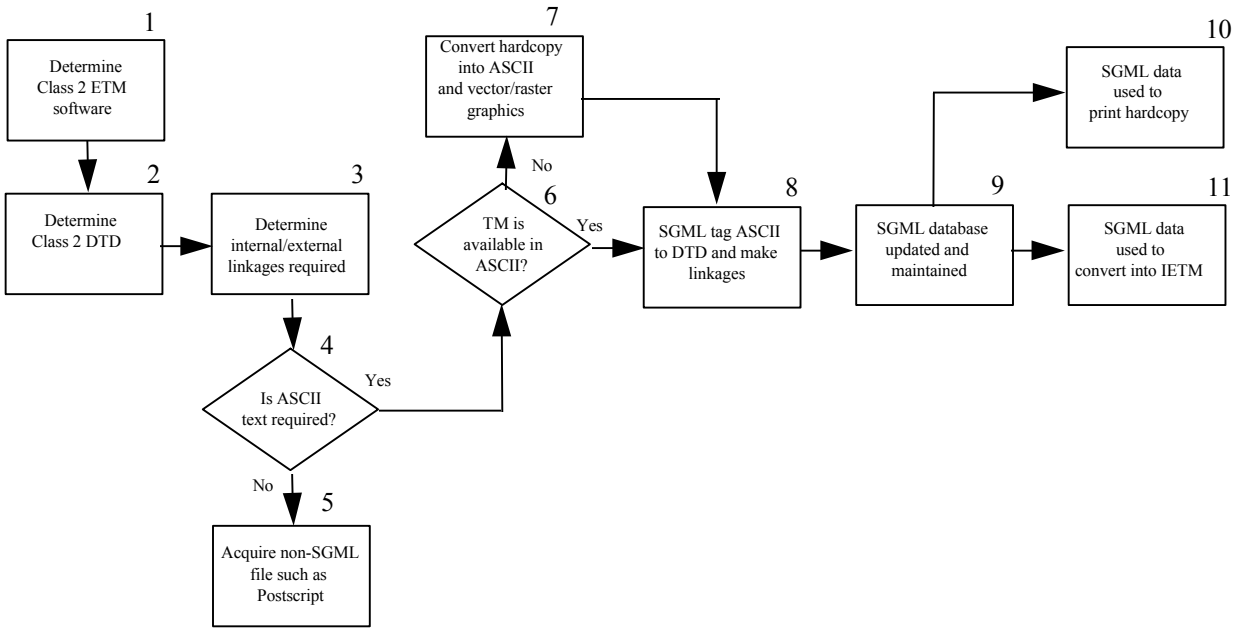

Figure 5 - Class 2 Conversion Process

Step 1:	Determine which software licenses are held at their activity and whether any experts are available to advise on how to properly implement the IETM software. If software has not been licensed for use by the implementing activity, the acquisition of software should be initiated. Appendix G outlines the steps to be followed in procuring IETM software. It also discusses IETM software licenses that are currently held and the Government experts who can answer questions regarding software features and implementation.
Step 2:	Determine which DTD will be used by evaluating the structure and the content of the data that is to be SGML tagged. DTDs and the software selected must also be compatible. Existing DTDs should be used whenever possible. Appendix F explains how to view those official DTDs that are registered with the Navy. It also provides the process to register a DTD with the Navy, if an existing DTD is not appropriate. Determine required linkages. They enable the user to select (typically by double clicking) a desired item of data (e.g., Figure 2-2), have the IETM locate (from within the IETM data file), and present data to the user. The front matter (e.g., table of contents, lists of figures or tables) provides examples of specific items of data that are linked to their respective location in the body of the IETM. Other examples are: parts lists can be linked to the Illustrated Parts Breakdown, chemicals can be linked to warning statements, references to other sections of the IETM, textual references to actual tables, figures, drawings, etc. are linked to their associated graphic. Evaluate which optional linkages best support the user in accessing information from the IETM. Optional linkages can be initiated by the user selecting an item within the IETM that links to external programs such as audio, video, expert system or special applications. Appendix D contains a table that allows the Program to identify the type of linkages to apply given a particular subject.
Step 4:	Is ASCII text required?

Step 5:	If not, arrange to accept delivery in a non-SGML format such as Postscript which can be further processed into an IETM having the functionality of a Class 2 IETM. It should be cautioned that Postscript cannot be edited. Therefore the activity producing the Postscript file has the only editable files. Programs should always acquire Postscript files with editable source files that produced the Postscript .
Step 6:	Determine the availability of the hard copy in ASCII and the graphics in raster or vector format.
Step 7:	If an ASCII file of the TM does not already exist, the hard copy TM should be converted into ASCII. The hard copy graphics should be converted into raster or vector formats depending on whether the graphic needs to be modified. Raster graphics can be edited using "draw" type programs. Raster editing is easy to learn and do. Complex, intense or precise drawings become more difficult to raster edit and benefit from conversion to a vector format and use of vector graphics software. The cost of conversion or redrafting to vector formats may be significant and the use of the software requires more training, but subsequent costs of updating the drawings and graphics will be greatly reduced . Note that all conversions should be validated or certified by a cognizant engineering authority.
Step 8:	The selected DTD and defined linkage requirements can then be used to SGML tag the ASCII and graphic files. Where the SGML tagged file is to be used to produce the hard copy TM, any supplemental data that is presented as audio or video enhancements to the IETM must also be tagged and surrogate files provided for the printed text (see paragraph 2-4.5 and 2-4.6). Optional linkages must also provide a textual identification of the destination link (e.g., a reference TM, program, data base). Paragraph numbers must be consistent in both the hard copy and IETM to facilitate easy user reference between the two products. If this is done, the SGML file can be processed into a hard copy publishing system that ignores all audio and video tagged files when composing and printing .
Step 9:	The resultant SGML tagged data base is the source file. All changes are made to this single source file to keep configuration control as simple as possible. Using the SGML file as the source file requires an SGML authoring system or an SGML input/output filter to an existing publishing system.
Step 10:	The SGML data is composed into a publishing system for hard copy printing. There is no Formatting Output Specification Instance (FOSI) used in this process. The printed hard copy will contain the same information , but may not have page integrity to the IETM.
Step 11:	Foresight in developing the SGML file will allow the same SGML file to be used for both hard copy printing and electronic display. The SGML file is processed through "IETM authoring software" that produces an IETM runtime file which along with other files described in the IETMPP are then written to CD-ROM for distribution.

2-6.4 CLASS 3 CONVERSION MODEL

The Class 3 conversion process, figure 6, is the same as the Class 2 process with one notable difference; that is, Class 3 IETMs have view packages that enable the viewer to present the

content of an IETM with different emphases. The creation of view packages, as explained in Appendix H, is accomplished after the conversion and SGML tagging of the data. As with Class 2, foresight must be used in generating the SGML tagged data to assure that any audio or video information is represented by text and graphics in the hard copy TM.

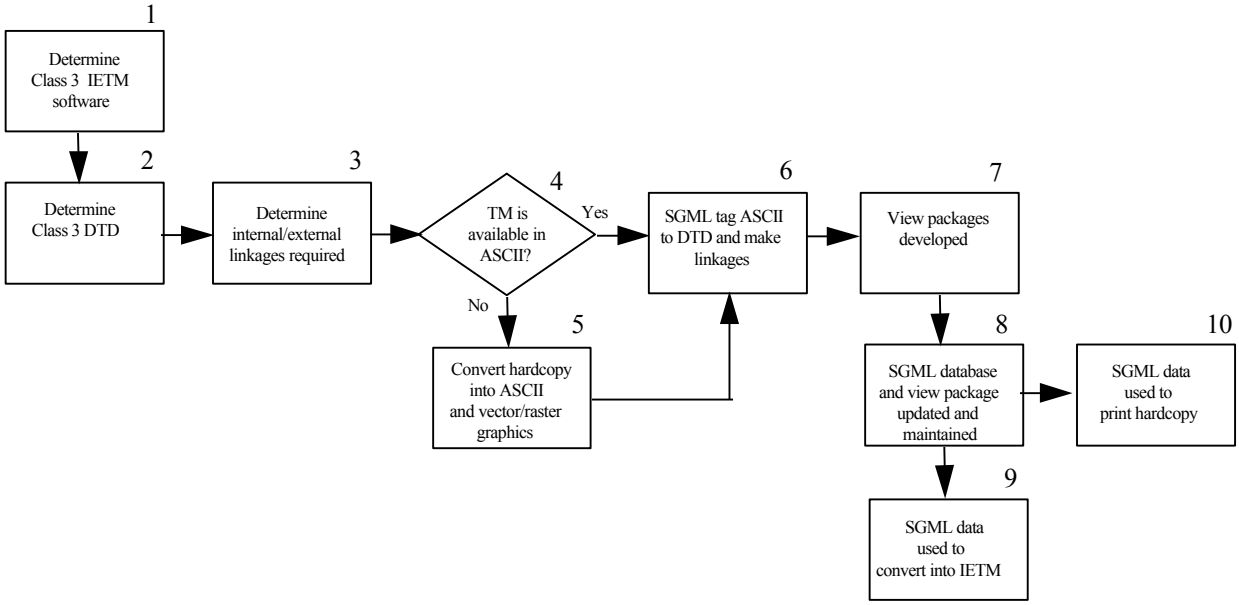

Figure 6 - Class 3 IETM Conversion Process

Steps 1-6	Same as those found in paragraph 2-6.3 Class 2 Conversion Process.
Step 7:	View packages are developed using IETM software tools. See Appendix H.
Step 8:	The resultant SGML tagged data base is the source file. All changes are made to this single source file to keep configuration control as simple as possible. Using the SGML file as the source file requires an SGML authoring system or an SGML input/output filter to an existing publishing system. All changes to the source data must be validated to determine whether they affect primary, secondary or even tertiary linkages in the view packages.
Step 9:	Foresight in developing the SGML file will allow the same SGML file to be used for both hard copy printing and electronic display. The SGML file would be processed through "IETM authoring software" that produces an IETM runtime file. The runtime file along with other files described in the IETMPP are then written to CD-ROM for distribution.
Step 10:	The SGML file can be used to print hard copy TMs by processing it into a hard copy publishing system. As the SGML file will have surrogate text and graphics that represent the audio and video material used, the publishing system will set up to ignore all audio and video tagged files when composing and printing .

2-6.5 CLASS 4 CONVERSION MODEL

Conversion of legacy TMs into Class 4 functioning IETMs is the most costly of conversions. The high cost is due to the re-authoring of the legacy data to take advantage of Class 4 functionality. The major costs of conversion are found in:

a. developing the hierarchical structure;

b. reauthoring the legacy TM to prepare data for use in a data base;

c. selecting the level of granularity and indenture for decomposing each section;

d. reauthoring and clean-up to eliminate repetition and redundancy;

e. adding photographs, animations, movies, verbal instructions, and other supplemental enhancements;

f. naming common and unique data objects and linking them into a logical presentation; and

g. validation of the reauthored information.

When Class 4 IETMs are created from scratch, the level of indenture and granularity of the data is optimized at the lowest or smallest level (i.e., the step). For conversions, figure 7, the costs of driving all TM data down to this optimal level may be prohibitively high. However, this is not the only option available. Class 4 IETMs can be developed with the objects being roughly the same size as comparable objects in Class 3 IETMs (e.g. one paragraph or a procedure). By minimizing the handling of the objects and substantially reducing the reauthoring desired or required, the conversion costs are reduced to the same range as Class 3. This compromise retains redundant data, sacrifices some data base maintenance efficiencies, requires more update effort, and reduces some flexibility. While some of the data may always remain in its initial conversion state, the Program has the option of beginning an incremental process of taking specific sections of the TM down one or more levels of indenture. These decisions can be made on the basis of specific maintenance needs, funds available, use of the sections, targets of opportunity, etc. This IETM would have the presentation features found in a normal Class 4 IETM, but would lack some robustness.

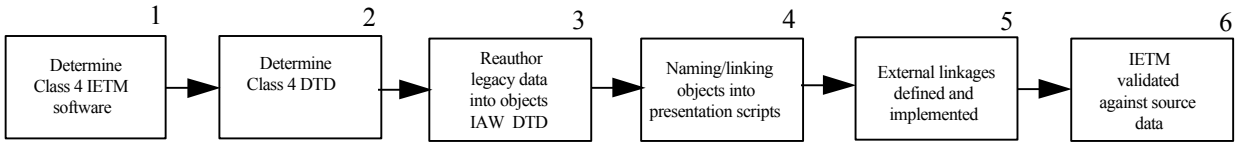

Figure 7 - Class 4 IETM Conversion Process

Step 1:	Determine what software licenses are held at their activity and whether experts are available to assist in implementing the IETM software. If software is not licensed for use by the implementing activity, the acquisition of software should be initiated. Section 2-3.4.1 outlines the steps to be followed in procuring IETM software. Appendix G lists IETM software licenses that are currently held and Government experts who can answer questions on software features and implementation.

Step 2:	Determine the DTD to be used by evaluating the structure and the content of the data to be SGML tagged. Existing DTDs should be used whenever possible. Appendix F explains how to view those official DTDs that are registered with the Navy. It also provides the process to register a DTD with the Navy, if an existing DTD is not appropriate.
Step 3:	Reauthor source data, creating objects of information in accordance to the selected DTD; eliminate repeated and redundant data, creating objects and linkages that allow these objects to be referred to many times. Editing raster graphics using "draw" type programs is easy to learn and do. Complex, intense or precise drawings become more difficult to raster edit and would benefit from conversion to a vector format and use of vector graphics software. The cost of conversion or redrafting to vector formats may be significant and the use of the software requires more training, but subsequent costs of updating the drawings and graphics will be greatly reduced. Some common hybrid processes allow vector overlays of changes to raster graphics, thereby allowing the use of vector graphic tools and precision without the cost of complete drawing conversion. Note that all conversions must be verified by a cognizant engineering authority
Step 4:	Name these objects to enable the authors to identify the object subject matter content. The named objects are used to create and tailor presentations to subject matter requirements. Tailoring can be done to many presentation criteria such as training, user knowledge levels, system configuration, subject emphasis, overviews.
Step 5:	Determine the internal and external linkages that best support the user in accessing information from the IETM. Internal linkages enable the user to select (typically by double clicking a mouse key) a desired item of data (e.g., Figure 2-2) and having the IETM locate (from within the IETM data file) and present data that to the user. Some examples of linkage are: parts lists to the Illustrated Parts Breakdown, chemicals names to warning statements, textual references to tables, figures, drawings, etc. to their actual graphic, references to other sections of the IETM. Desired external linkages should also be identified. They can be initiated by the user selecting an item within the IETM that links to external programs such as audio, video, expert system or special applications. Appendix D contains a table identifying the type of linkages that apply given a particular subject.
Step 6:	Have the cognizant engineering authority validate the complete IETM against the source data by to assure that the same content has been conveyed using the Class 4 IETM functionality.

2-6.6 CLASS 5 IETM CONVERSION MODEL

The conversion model for integrated and imbedded Class 5 IETMs begin with the Class 4 conversion model as a base. The decision tree in Appendix E provides the model for Class 5 determination. Independent Class 5 IETMs may find it necessary to reauthor portions of the manual to make it compatible with the expert system and system language. Since the Integrated Class 5 IETM is a part of the hardware system, the data format is dependent on the host system operating system and resident application code. Integrated Class 5 IETMs also tend to be configuration intensive.

2-6.7 COST OF CONVERSION

Table 2-2 provides the range of cost to be expected when converting legacy TM information into Class 1 - 5 ETMs or IETMs. Conversion costs in addition to display hardware costs, data maintenance, and CD-ROM production should be considered in evaluating the total costs involved in converting TMs.

Interactivity	Description	Class	Savings	Cost/Page[1]	Benefits
Low	Raster scanned with Indexing	1	Wt/Space	$ 2	Note 2
Moderate	Intelligent	2		$ 5-10	Note 3
Good	Interactive to user (printable)	3		$10-25	Note 4
High	Interactive to user (objects)	4		$40* - 100+	Note 5
Full	Interactive to user and associated systems	5	Training Fleet/Data Maintenance	$ 200+	Note 6

Table 2-2 - Cost of Conversion

Note 1: Conversion costs do not apply when procuring IETMs as first time data (see 2-7.2).

Note 2: Raster scanned and indexed IETMs provide weight and space savings by storing typically 100 Class 1 IETMs on a CD-ROM. The raster scanning effort at NAVSEA and NAVAIR also automatically collates page change packages. The user navigates through the IETM by selecting from the table of contents that is linked to the body of the TM or by arbitrary page or reference (e.g., Figure 2-2) selection.

Note 3: Intelligent IETMs (Class 2) give the user the added ability to search by key word(s) or as in Class 1, table of con tents data that is linked to the body. Change packages are typically integrated into the previous version of the IETM and redistributed.

Note 4: Class 3 IETMs have the same features as found in Class 2 with the added ability of providing the user with the ability to select view packages that present only selected data from the IETM to the user, thereby alleviating extraneous information as related to the emphasis of the view package. It should also be noted that an object oriented data base can used here without having it integrated into the IETM itself.

Note 5: Class 4 is a hierarchically structured data base managed by a data base management system that provides a very efficient method for maintaining the IETM content. Current costs for manual conversion are in the $100 per page range, although these costs can drop significantly if less granularity is desired. The efficiency of this process depends on those items listed in paragraph 2-6.5. New prototype conversion processes are showing that costs of $25 - 40 per page will be achievable in the near future (i.e., 2 - 3 years). Paragraph 2-4.7 explains the different strategies for using object oriented data bases with IETMs.

Note 6:	Class 5 IETMs (and functionality) provide the user with significant assistance from watching the system and alerting the user to specific conditions, to analyzing diagnostic data to provide recommendations, to presenting alternate maintenance solutions, to "learning" and recommending adjustments to processes.

SECTION 2-7 COST CONSIDERATIONS

2-7.1 DEVELOPING COST DATA

As noted previously, there is no existing cost model that facilitates a rigorous, cost effective analysis to select an optimal TM automation level. Nevertheless, costs must be estimated or obtained from contracts for various levels of TM automation. Where possible, RFPs should require bidders to specify all unique and recurring costs for comparative purposes. The costs of the following items should be considered:

a. Preparation of IETM acquisition documents and establishing a suitable contract.

b. Contractor preparation of IETMs in accordance with the contract requirements (e.g., TMCR).

c. Cost to the Government of contract administration, verifications, and acceptance testing.

d. Establishment of a logistic infrastructure capable of managing the accepted IETMs and relevant established information systems.

e. Pro rata cost involved in acquiring and maintaining the required Electronic Delivery System.

2-7.2 COST ASSUMPTIONS

The cost of acquiring an IETM of any Class is assumed to be nearly the same cost as incurred in procuring a hard copy technical manual, after the producing activity becomes familiar with the IETM production process. The costs associated with procuring the content of either a hard copy TM or an IETM are equal, because the content is the same. The costs of preparing and delivering data may differ significantly, due to the sunk costs in existing TM authoring systems versus investment and training costs for new IETM authoring systems. Offsets such as the reduced costs of handling and grooming the data for use (e.g., camera-ready versus loading the data base) need to be evaluated. Contractor costs will also be driven by perceived risk. New, unfamiliar, evolving or untested processes will be perceived as significant risk factors, particularly if the RFP is proposing ambitious schedules, fixed price awards, and/or award or incentive fees. Programs and contractors need to be aware of potential resources available (e.g., experience with other programs described in Appendix G) to offset costs, perform services, and must eliminate or limit risks.

2-7.3 LIFE CYCLE COSTING

Cost projections used in making acquisition estimates for IETMs must always be based on the complete life cycle of the Technical Information (TI), not merely its acquisition. When dealing with IETMs, these costs may take on some subtle new attributes. For example, the authoring of new data and re-authoring of existing data to create the data bases and / or the elaborate hyperlinking and scripting schemes needed for some IETMs involve heavy dependence on both subject matter experts and software programmers. The knowledge

acquired during data creation or conversion must be transferred to the Technical Manual Management Activity (TMMA). It is needed to allow the TMMA to effectively process subsequent engineering change packages, monitor test and verification and ensure that all of the impacts of the change have been considered and reconciled. This successful transfer is dependent upon the:

a. availability of hardware, software (with license to use), subject matter experts, software programmers, and logisticians with practical and useful experience needed to change data file;

b. unique procedures, software settings, and business rules of the particular application; and

c. understanding and use of elaborate flow diagrams to pinpoint linkages.

The number and variety of tailored procedures that require TMMA action and the uniqueness and complexity of these procedures have significant implications at a time when resources continue to shrink. Therefore, creators and introducers of new IETMs must be required to define and support Operations and Maintenance budgets to ensure sufficient funds are available to maintain and update resulting manuals.

2-7.4 REQUIREMENT FOR HARD COPY

The continuing requirement for hard copy can significantly influence the feasible or even the possible choice of IETM functionality. Hard copy cannot necessarily be mandated away. The Fleet still requires it, primarily because the majority of current display units do not:

a. support maintenance during casualties when power is not available;

b. carry TM information to the place where maintenance is accomplished; and

c. provide readable, usable data especially large drawings and schematics.

The increasing power, availability, and use and decreasing unit costs of battery-driven portable IETMs will eliminate the concerns over loss of power and will move the data to the maintenance area. The expansion of shipboard Local Area Networks (LANs) and the use of Commercial Off-The-Shelf (COTS) software , etc. will increase the usability of the IETMs within a variety of spaces and environments. The RFP can also invite the bidder to provide innovative suggestions for resolving problems. As discussed in Appendix D, the Government can also provide direction to the contractor for preparation and delivery of drawings that are more amenable to screen viewing.

Appendix A Acronyms and Abbreviations

ACAT	Acquisition Category
AIM	Authoring Instructional Material
AIMSS	Advanced Interactive Maintenance Support System
ASCII	American Standard Code for Information Interchange
ASO	Aviation Supply Office
ATIS	Advanced Technical Information Support
CALS	Continuous Acquisition and Life-cycle Support
CD-NSWC	Carderock Division - Naval Surface Warfare Center
CD-ROM	Compact Disk - Read Only Memory
CDRL	Contract Data Requirements List
CIWS	Close-In Weapon System
CNET	Chief of Naval Education and Training
CONOPS	Concept of Operations
COSAL	Consolidated Shipboard Allowance List
COTS	Commercial Off-The-Shelf
DBMS	Data Base Management System
DFARS	Defense Federal Acquisition Regulation Supplement
DLL	Data Link Library
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoN	Department of Navy
DTD	Document Type Definition
DTMB	David Taylor Model Basin
E-TMDER	Electronic Technical Manual Deficiency Evaluation Report
EDS	Electronic Display System
ELIN	Exhibit Line Item Number
ESTEPS	Enhanced Ships Technical Publication System
ETM	Electronic Technical Manual
FOSI	Formatting Output Specification Instances
FTP	File Transfer Protocol
HTML	Hyper Text Markup Language
IADS	Interactive Authoring and Display System
IETMPP	Interactive Electronic Technical Manual Process Plan
ISEA	In-Service Engineering Agent
ISO	International Standards Organization
LAN	Local Area Network
LSA	Logistic Support Analysis
LSAR	Logistic Support Analysis Record
MIL SPEC	Military Specification (e.g., MIL-D for drawings; MIL-M for manuals; MIL-R for Raster)

MIL-PRF	Military Specification - Performance
MIL-STD	Military Standard
NATSF	Naval Air Technical Services Facility
NAVAIR	Naval Air Systems Command
NAVCOMTELSTA	Naval Communications Telecommunications Station
NAVSEA	Naval Sea Systems Command
NAVSEAINST	Naval Sea System Command Instruction
NIFF	Navy Image File Format
NIRS	Navy Implementation of Raster Scanning
NSDSA	NAVSEA Data Support Activity
NSN	National Stock Number
NSTM	Navy Ships Technical Manual
NSWC	Naval Surface Warfare Center
NSWC IETM WG	Naval Surface Warfare Center Interactive Electronic Technical Manual Working Group
NTCSS	Navy Tactical Command Support System
OADR	Originating Agency Determination Required
OLE	Object Linking and Imbedding
OS	Output Specification
PC	Personal Computers
PHD-NSWC	Port Hueneme Division, Naval Surface Warfare Center
PIMS	Phalanx
PMS	Preventive Maintenance Subsystem
QA	Quality Assurance
RCN	Report Control Number
RFP	Request for Proposal
SCI	Sensitive Compartmented Information
SEAADSA	NAVSEA Automated Data Systems Activity
SECDEF	Secretary of Defense
SGML	Standard Generalized Mark-up Language
SNAP	Shipboard Non-tactical Automated Data Processing Program
SOW	Statement of Work
SPAWAR	Space and Warfare Systems Command
TAD	Theater Air Defense
TIDES	Technical Information Deficiency Evaluation System
TM	Technical Manual
TMARC	Technical Manual Acquisition Requirements Checklist
TMCR	Technical Manual Contract Requirements
TMDER	Technical Manual Deficiency Evaluation Report
TMIN	Technical Manual Identification Number
TMINS	Technical Manual Identification Numbering System
TMMA	Technical Manual Maintenance Activity

TMMP	Technical Manual Management Program
TSC	Top Secret Code
UIC	Unit Identification Code
UNC	Universal Naming Convention
URL	Uniform Resources Locator
VLS	Vertical Launch System
WAN	Wide Area Network
WWW	World Wide Web

Appendix B Points of Contact

This hardcopy version will provide the basic information. The Information Technology Page of the World Wide Web (http:\\www.nswses.navy.mil\~lev\net-page\pg-1.html) will also provide POCs that may be more current.

Questions or Comments on the IETMPP
PHD-NSWC (5B20) - Attention: Wayne Honea
Internet: honea_wayne@om.nswses.navy.mil
DSN 551-2971 (805) 982-2971

Digital Data Specifications and Standards
MIL-D-87269
CD-NSWC (Code 182) - Attention: Mr. Joe Fuller
Internet: fuller@oasys.dt.navy.mil
DSN 287-1358 (301) 227-1358
MIL-PRF-28001
CD-NSWC (Code 183) - Attention: Mr. Joe Garner
Internet garner@oasys.dt.navy.mil
DSN 287-1533 (301) 227-1533

DTD Review and Waiver Process
CD-NSWC (Code 183) - Attention: Mr. Joe Garner
Internet garner@oasys.dt.navy.mil
DSN 287-1533 (301) 227-1533

IETM Technology and Tri-Service Applications
CD-NSWC (Code 182) - Attention: Mr. Joe Fuller
Internet: fuller@oasys.dt.navy.mil
DSN 287-1358 (301) 227-1358

Status of Specification and Standards Waivers
SEA 04TD (Code 04TD31) - Attention: Mr. Mickey Ander
Internet: ander_mickey@hq.navsea.navy.mil
DSN 332-8700 (703) 602-8700

NAVSEA/SPAWAR Tracking of IETMS/CD ROMs
PHD/NSWC (Code 5B62) - Attention: Ms. Carrie Ganzman
Internet: ganzman_carrie@om.nswses.navy.mil
DSN 551-3141 (805) 982-3141

PHD/NSWC (Code 5B32) - Attention: Mr. Bob Uehlein
Internet: uehlein_bob@om.nswses.navy.mil
DSN 551-2964 (805) 982-2964

MEDIA Identification Numbers (e.g. CD-ROM IDs)
Internet: uehlein_bob@om.nswses.navy.mil
DSN 551-2964 (805) 982-2964

IETM Identification Numbers (TMINS)
PHD/NSWC (Code 5B61) - Attention: Ms. Tona Martinez
DSN 551-3168

Technical Manual Contract Requirements
PHD/NSWC (Code 5B61) - Attention: Mr. Alan Hatmaker
DSN 551-3159

Paper or electronic TMDERs on DOS formatted media
PHD/NSWC (Code 5B30) - Attention: Mr. Mike Snavely
Internet: snavely_mike@om.nswses.navy.mil
DSN 551-2970 (805) 982-2970

IETM Electronic Display Requirements
NAVSEA (Code 04TD34) - Attention: Mr. George White
Internet: white_george@hq.navsea.navy.mil
DSN 332-8700 (703) 602-8700

ATIS/IETM CD-ROM Management Interfacing
NAVSEA Logistics Indian Head Det.(Code 092) - Attention: Mr. Andy Kelly
Internet kelly_andy@hq.navsea.navy.mil
DSN 332-8700 (703) 602-8700 x220

CD-ROM Destruction
Director, National Security Agency
9800 Savage Road
ATTN l322-Building 9838
Ft George G. Meade MD 20755-6000

SNAP Network
Navy Tactical Command Support System (NTCSS) Shipboard Non-tactical ADP (SNAP) Program Office
Mr. Pete Davenport
(702-602-0814)

Appendix C - DoD IETM Classes

Descriptions of Electronic and Interactive Electronic Technical Manual (ETM/IETM) Classes

	Basic ETMs		Advanced IETMs		Extended IETMs	
	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5
	Non-Electronically Indexed Page Image	Electronically Indexed Pages	Electronic Scrolling Documents	Linearly Structured IETMS	Hierarchically Structured IETMs	Integrated Data Base (IETIS)
DISPLAY	•Full page viewing •Printed pages •Microform images	•Full page viewing •Page-turner/Next function •Intelligent index for user access to page images •Page integrity preserved	•Primary view is scrolling text window •Hot-spot access (Hyper-links) to other text or graphics •User selection and navi gation aids (key-word search, on-line indices) •Minimal text-format ting for display •User selectable call to (launch) another process	•View smaller logical blocks of text - less use of scrolling •Interaction through dialog boxes •Interaction per Mil-M-87268 to extent possible •Text and graphics simultaneously displayed in separate window when keyed together	•View smaller logical blocks of text - very limited use of scrolling •Interaction through dialog boxes with user prompts •Interaction per Mil-M-87268 •Text and graphics simultaneously displayed in separate window when keyed together	• Class 4 IETM functions •Interactive electronic dis play per Mil-M-87268 •Multi-function display session •Expert system allows same display session and view system to provide simultaneous access to many differing functions (e.g., supply, training, troubleshooting)
DATA FORMAT	•Film •WP/Comp system formats •SGML files •Mil-M-28001 •Page Description Language •Generic page image format	•Bit Map (raster) •Indexing and header files (Navy Mil 29532) •Mil-M-28001 or Postscript [ages •Generic: COTS imaging system formats	•Text - ASCII •Graphics - whatever viewer supports - e.g., BMP or CALS •Can be SGML tagged - no page breaks (browser) •Access/index often COTS dependent with Hypertext browser Generic: COTS with Hypertext browser	•Linear ASCII with SGML tags •SGML with content vice format tags •Maximum use of Mil-D-87269 •Generic: SGML tags equivalent to Mil-D-87269 tags	•Fully attributed data base elements (Mil-D-87269) •Mil-D-87269 content tags with full conformance with Generic Level Object Out-lines (architectural forms) •Authored directly to DB for interactive electronic output •Data managed by a DBMS •Interactive features authored-in vice added-on •Generic: COTS has Mil-D-87269 data definition/tags	•IETM info integrated at the data level with other application info •Does not use separate data bases for other application data •Identical to Class 4 stan dards for IETM ap plications data per Mil-D-87269 •Coding for Expert Systems and AI modules when used •Generic: COTS has Mil-D-87269 data definition/tags
FUNCT'ALT'Y-	•Print pages •View pages (no intelligent index)	•Acess pages by intelligent index/ header info •View page with pan, zoom, etc tools •Limited use of hot-spots •Useful for library or reference use	•Browse through scrolling info •User selection of graphics or hot-spot reference to more text Hot-spot and cross-reference usually added after original authoring	•Dialog-driven interaction •Logical display of data in accordance with content •Logical NEXT and BACK functions •Useful as interactive maintenance aid •User-selectable cross-refs and indices •Content specific help available	•Dialog-driven interaction •Logical display of data in accordance with content •Logical NEXT and BACK functions •Useful as interactive maintenance aid •User-selectable cross-refs and indices •Content specific help available	•Single viewing system for simultaneous access to multiple info sources •Same as Class 4 for IETM functions •Expert system to assist in NEXT functions, based on info gathered in session

Appendix D IETM Concept of Operations (CONOPS)

Completion of the items in this Appendix (and additional items deemed relevant to the Program) provides a tailored document which highlights processes, issues, and considerations related to the successful implementation of IETMs in both Program and Navy terms. The IETM CONOPS guides the Program in identifying/projecting the characteristics of the System (whether in the Fleet or being prepared for acquisition) that help define the functionality of the supporting IETM. Appendix E uses the System characteristic data gathered in developing the IETM CONOPS, to determine the functionality required of the supporting IETM.

The IETM CONOPS further helps to guide Programs in defining/planning the processes that are required in the life cycle support the IETM. Interplay between the items in the IETM CONOPS and the decisions of Appendix E may result in a number of iterations before the plan is finalized.

The IETM CONOPS will provide the Program and bidders with a total perspective on, and some insight into the range of factors and issues affecting their proposed IETM solution. The Government also will use the CONOPS to evaluate how well the bidder has understood and met the Program IETM needs.

1.0 IETM FUNCTIONALITY DETERMINATION

In selecting the IETM functionality to support a System or equipment and its users, all System attributes and factors must be considered. This will apply whether the IETM is being created to support a System to be acquired or an existing System currently in the Fleet. Although many of the considerations are the same, functionality decisions for new acquisitions focus on initial cost differences, cost avoidance, and life cycle benefits, while conversions deal with affordability, offsets, and near term trade-offs and benefits. To determine the functionality required or desired for a particular system or equipment, the Program must examine the mandates and restrictions of the infrastructure and user environment. Similarly, the attributes of the system or equipment itself must be analyzed to determine how the potential IETM functionality could best support it.

1.1 FACTORS INFLUENCING OR DICTATING FUNCTIONALITY

The Program should review the factors in Chapter 2-4 1.2 and the Selecting Appropriate IETM Functionality decision model, Appendix E, to determine their impact on the selection of IETM functionality. Brief descriptions or explanations of the Program requirements (e.g., the need for a fully formatted printed manual, whether an expert system is desirable or required) and rationale, where appropriate, should be provided. These requirements should be spelled out in detail in other sections of the SOW and TMCR. This section will help the Bidder understand the requirements, limitations, etc. and will help ensure that the IETM designed provides the functionality that best supports the system and end user.

1.2 System or equipment Attributes Affecting IETM Functionality

Evaluation of weapon and ship system or equipment attributes can dramatically affect the types of IETM functionality selected to provide optimal support for the overall system, its operators, and its maintainers. A particular attribute may conflict with specific limitations in the functionality determinations model, Appendix E (e.g., attributes suggest Class 4 functionality, but a fully formatted hard copy is required). A reconciliation of the limitations and / or development of compromises or strategies is required. The following attributes, at a minimum, should be considered:

a. Complexity of System. The Program must determine the complexity of a system or equipment and identify specific IETM functionality's required to support this level of complexity. Determining system complexity is, in the end, a subjective analysis. For new acquisitions, certainly any Acquisition Category 1 or 2 program would strongly indicate a level of sophistication or cost that would qualify as "complex." Large buy, lower unit cost systems (e.g., Automated Display System) may not in themselves be complex, but their number of interfaces with related critical equipment may qualify them as complex. Simple systems, or complex systems with simple maintenance requirements (e.g., remove and replace) may be adequately supported by a lower level of automation (e.g., Class 2 or 3 IETMs). Those systems with highly complex maintenance requirements (e.g., long troubleshooting guides, many interrelated components) may benefit substantially from the more comprehensive interaction and the addition of expert systems. As noted, tests have shown that major savings can occur when IETMs are used with more complex systems.

b. Configuration Volatility. The Program must analyze the potential for rapidly evolving or multiple System baselines which are often experienced in a new design or in an aggressive modernization or improvement program. Highly volatile systems generate a high volume of TM or IETM changes that must be maintained, updated, and distribute to users. They present a major challenge to those who must maintain engineering control of baseline, process changes, and configuration control all of which are required to ensure that users get the right information. This is a major problem with hard copy support and will remain a problem for digital data. However, the tools available to assist the Program in maintaining digital data are substantial. Class 3 and 4 IETMs can distinguish between configurations. When coupled with the reductions in costs of implementing changes and time to process the updates, these IETMs provide the most effective means of supporting different Ship Class configurations (e.g., U.S. and Foreign Military), multiple baselines or major upgrade programs. Other things being equal, Class 2 IETMs can provide an affordable, cost effective solution for those systems or equipment with minimal configuration volatility.

c. Classification and Security. The Program must define any security or classification requirements. Systems that are highly classified or perform in a high security environment also have a significant set of restrictions and requirements that will impact upon the IETM system, processes, functionality, access, and data protection.

d. Expected Service Life (Expected or Remaining). The Program must define the anticipated service life (expected or remaining) of the system or equipment to be supported. Higher initial conversion or implementation costs can be justified on IETMs that support systems with long projected service lives. There is also a draft memo currently being prepared for SECDEF signature that requires all hardware systems with an expected remaining service life of 10 years or more to convert all technical data to a digital format.

e. Number and Deployment of Systems. The Program should provide information on the number of systems (to be) fielded and define their location and deployment conditions as specifically as possible. The number of IETM display devices that are needed or planned to support each system must be included. This information will be used in the cost/benefit analyses. It will also aid the contractor in determining the quantity of IETM software viewers needed that, along with the information from below, will help them to determine IETM software licensing costs if new or additional licenses are required by the acquisition or converting program.

f. Number of IETM Users, Including Data Maintenance Personnel. The Program must establish or estimate the number and location of potential users and those who will maintain and update the data (e.g., contractor, ISEA). These data sets enable the contractor to evaluate how the IETM is to be used, by whom, and other factors that may influence the selection of software and even the make-up of the IETM to be proposed. Where the Program does not currently hold the needed licenses, the contractor needs the data to determine preliminary licensing costs associated with the proposed IETM authoring and viewing software. If the government activity has IETM viewer and authoring software licenses, these cost increases may be modest or even involve no increase at all. The total personnel involved gives an estimate of the quantity of CD-ROMs or other media that may be requested of the contractor or be needed to be produced by the Government.

g. Quantity of Data. For conversion of data to an IETM, the Program must define the amount of data to be converted, particularly where there are multiple baselines of the same essential data, or reference data that is directly associated with the TM. For new acquisitions, the Program must define its needs to accept and manage the data. Data control and management grows at least proportionally, often geometrically, with the growth in the volume of data being produced. Larger, more complex Systems are generating requirements for more, integrated technical data. The need for sophisticated data base management tools that can effectively and affordably handle the data are paramount to controlling future costs. During the acquisition process, contractors often use these tools for their data development and management purposes. However, as this data is often delivered in hard copy, there is little incentive to preserve the digital data and no contract funding to prepare the data to facilitate transition for use with sophisticated life-cycle management tools. If the Contractors anticipate a long term follow on support contract, there may even be a disincentive to making digital data available. Bidders can be asked to indicate how they will minimize the amount of data to be transitioned, how they will ensure that the data can be transitioned, and what

they will do to minimize the costs of maintaining and updating that data in the life cycle. This will stimulate them to think of the data set in whole life, rather than just contract terms.

h. Quality of the Data. For conversions, the Program must define the quality of legacy data. Quality can refer to the condition of the copy (i.e., not able to scan or convert without significant intervention) or to the editorial condition of the data (e.g., typos, errors, pen-and-ink changes) or to the condition of the content (e.g., factual errors, out-of-date, incomplete). Poor quality data may suggest that only a minimal investment in digitizing the data base is warranted, particularly if there is a small number of users, limited expected service life, non-critical equipment, etc. On the other hand, data conversion can present an opportunity to review the potential costs and benefits of combining it with a quality improvement effort. In many cases a substantial improvement in data usability and accuracy and reduced life cycle costs can be achieved at an affordable marginal cost. For example, as reauthoring costs are a primary driver of conversion costs, selection of Class 4 should be seriously considered to maximize investment and functionality, if extensive re-authoring is anticipated. Conversely, only reauthoring key, often used portions of the manual may add significantly to the quality without a major increase in cost.

i. Consolidation of Subject Matter. The Program should maximize the use of common data to reduce life cycle costs and increase efficiency, quality, accuracy, and timeliness of data. The Program should consider relevant and potential savings for all subjects when deciding what IETM functionality is appropriate. Requirements for defining the content of IETMs are exactly the same as those involved in defining the content of a hard copy TM. This same basic content is also used to support a variety of logistic products. Currently, however, each logistic product tailors, formats, presents, and re-authors this basic material in unique ways to support specific users (e.g., training, supply, operations, maintenance). By acquiring multiple unique but redundant products and then maintaining and updating them throughout their life-cycle, overall costs are significantly and unnecessarily driven up. There are two levels of coordination and control.

First logistic products can be developed jointly, but separately, with significant coordination to ensure compatibility of data. This coordination will provide the basis for a management structure to control changes to all related data files during the system life cycle. For existing systems, these individual files can be brought together under a single data management system, they cannot be combined or integrated without significant re-authoring and without agreement from the various communities responsible for updating them. This requirement for agreement has nothing to do with the underlying engineering data, but involves formatting, structuring, semantic, and other administrative issues imposed by the individual logistic disciplines.

The second is to create the data as a single data base where the engineering data is loaded into the data base. Class 4 IETMs author neutral data into an LSA-type structure maintained by a relational or object-oriented data base management system. This

makes the same data available to multiple applications. It should be noted that combining data into a single data base does not mean that all subjects will be forced into a single application program or view package. In fact, multiple application programs can select data from one or more data bases and provide the tailoring to meet specific logistic user needs without additional human intervention. Clearly, the CALS maxim "create once, use many times" can finally be fully implemented here.

The cost savings are very evident in having to create the engineering direction (e.g., maintenance step) only once, load it once, and, when changes occur, update it once. Equally evident is the avoidance of costs in not having to administer, store, and maintain multiple instances of essentially the same material. It is difficult to estimate the secondary and tertiary savings from not having to reconcile data, in providing all users, regardless of discipline, immediate access to exactly the same, most up-to-date data, from not having rejections, deferrals, and "re-dos" due to lack of complete or accurate technical data, etc. Where an IETM other than Class 4/5 is selected, the Program should state how the requirements of each user discipline will be satisfied and include these subject costs in the life cycle trade-off studies.

j. Maintenance Levels. As a result of early maintenance planning, the Program must analyze where required maintenance for a System or equipment is to be accomplished and must design logistic products, including TMs, to provide the optimum support. System maintenance, whether planned and periodic, preventative or corrective, requires development of a maintenance plan using LSA procedures. In general, the LSA details the series of fault isolation, overhaul, corrective maintenance (remove and replace), and other tasks required as well as scheduled test and inspection procedures, parts and other data. This information is established for all levels of maintenance. Where an LSA has been performed, LSARs form the basis of the IETM data base. Where MIL-STD-1388 is not invoked, the LSA disciplines should be followed in developing the hierarchical structure from system/sub-system down through the steps required to perform necessary logistic actions. Careful analysis and processing using known data and best engineering judgment can provide a highly acceptable product that approximates the LSA. For systems of high operational importance in high threat related activities, studies indicate that Class 3 or 4 IETMs should be used to increased system support effectiveness. Class 1 and 2 IETMs provide some improvement for the shipboard user, but this improvement generally requires getting more accurate data to the user faster. Organizational level maintenance can be best supported and improved by Class 3 or 4 IETMs with view packages that enhance and supplement the presentation to improve the sailor's method, quality, and productivity of performing maintenance.

k. Training Level. The Program should determine Fleet and training requirements, define its training strategy, and relate that strategy to the content of the IETM. As it relies heavily on TM information, training must be carefully coordinated with the acquisition or conversion of technical data to ensure that support is preserved, if not substantially enhanced, and even integrated. Programs may adopt one of the following IETM/training strategies as listed below:

- develop the IETM and passing of files, software, etc. to the training community for interface with curriculum development programs such as Authoring Instructional Material (AIM);
- coordinate with training in the initial development of the IETM, with resulting IETM product being able to provide on-the-job training support with subsequent interfacing with training curriculum using tools such as AIM;
- full integration of training materials into the IETM enabling the Fleet and Training communities to use a singular IETM product.

Of all logistic functions, training is best served by the Class 3 or 4 IETM technology. The addition of explanations, visual aids, videos, etc. can greatly simplify, enrich, and enhance the training material. Field tests of IETMs have repeatedly shown that:

- Improvements for all personnel at the same level of training result from the use of IETMs;
- IETMs can greatly improve the performance of inexperienced personnel; and
- Functions normally requiring more extensive training (e.g., troubleshooting) can be performed by personnel not having had this training.

For System that do not have significant training requirements, Class 1 or 2 IETMs may perform adequately.

l. Manning Requirement. The Program should detail the projected manning requirements and the desired impact of IETMs on them. If shipboard manning to support systems and equipment are sparse and/or the nature of the tasks is complex, more interactive and integrated IETMs will enable the support personnel to perform needed tasks most efficiently. Having Class 3 and 4 functionality available supports manning allowances, detailing personnel to fill those allowances, and protecting the ship from temporary shortages of key rates or ratings where lower rates or different ratings may be able to perform needed maintenance using the IETM.

m. Existing Government and Contractor Infrastructure. Programs should consider the Government and Contractor infrastructure investments that are currently in place, that support the development and maintenance of IETMs. Programs must decide that the current infrastructure is capable of supporting the IETM product having the required functionality or that infrastructure assets are needed to support the IETM requirements. The assets to be identified include, but are not limited to, hardware, software, training, processes, personnel, etc. Programs must evaluate the benefits of staying with "status quo" publishing processes against the benefits of adopting entirely new processes as would be the case in developing an IETM having Class 4 functionality. The persistent comparison of sunk costs in existing systems with investments needed to execute new technology generally fail to consider all costs involved in product creation and review, or of the potential savings to be achieved in the life cycle. Nonetheless, the acquisition of SGML tagged linear or object oriented databases provide the Program with data that

has the highest probability of transitioning into newer technology and processes that are to come.

As required by Appendix P, the Program should also require bidders to establish Contractor Integrated Technical Information Services (CITIS) to maximize use of the contractor infrastructure through the exchange and delivery of digital data. This ensures that Programs and end-users will be able to take advantage of the most advanced, evolving technology and achieve the greatest potential gains in using and maintaining IETM data bases.

2.0 THE FUNCTIONALITY DECISION MODEL

The model, Appendix E, is provided to assist managers in deciding the functionality's that best meet Program requirements and remain within Program resources. The decision model may or may not be included for contractor use in the RFP. In either case, the Program should document here, the results of their working the model. If the results are firm, the Program should discuss them in terms of requirements that are spelled out in detail in the TMCR. Programs may also decide to consider their results to be preliminary, or encourage Bidders to develop their own "best cost" or other solution with explanations on how and where the Bidder differs from the Government decision.

3.0 IETM IMPLEMENTATION SCHEDULE

For both new acquisition or legacy conversion IETM applications, the Program must define the type of products desired (see Chapter 2-5.4.2) and the schedule for delivery. Generally, shorter lead times for delivery tend to force the authoring or conversion activity to deliver an IETM that is closely associated with the authoring tools used at that facility or the quickest, least risk solution available. These solutions may or may not support the best interest of the Program or the Fleet. Longer lead times allow for contractors (as well as the acquiring Program) to investigate new technology, other authoring tools, and improved processes and determine the more cost effective, higher quality IETM products that best satisfy the user and System requirements.

4.0 URGENCY AND FREQUENCY OF INFORMATION UPDATE

The Program must decide whether a process for immediate Fleet update of critical information (e.g., safety or health related Advance Change Notices) is needed and, if so, must add requirements to define a process to be used during initial introduction and later transitioned to life cycle support. The Program must forecast the frequency of changes and therefore updates needed, the quantities required for distribution, and the media and communication technology available at the time, are all factors that determine the most efficient, cost effective way to disseminate updated information must be part of this process. Additionally, an analysis of the way data is bundled (i.e., placed together on a CD-ROM) can offer some solutions in minimizing costs (e.g., placing the most volatile data on a single CD-ROM that can be replaced with a shorter periodicity). Other technical information updates can be done over a longer period or on an "as needed" basis.

5.0 DOCUMENT TYPE DEFINITION (DTD) AND FORMATTING OUTPUT SPECIFICATION INSTANCE (FOSI)

The Program must identify the DTD to be used in acquiring or converting SGML data. The Program should use existing DTDs, whenever possible, to minimize development costs and proliferation of DTDs(see Appendix F for DTD definitions). DTDs define the SGML tags that describe the content or structure and the syntax for applying these tags. The textual and graphic content that makes up the IETM, is tagged in accordance with the DTD and then called an "SGML Instance." FOSIs define the format in which that the tagged information is to be "printed." due to the difficulty in developing FOSIs and the lack of commercial support for this concept, FOSIs are not currently required. The Navy has made available to any Program and contractor on the World Wide Web (WWW) those DTDs that have been developed, registered, and implemented Some viewing applications are dependent upon a specific DTD, so selection of a particular DTD may limit selection of IETM software.

If existing DTDs do not support the desired application, the Program should modify the existing DTDs that most nearly support the desired end. While development cost for new DTDs should be kept to a minimum, a new DTD can be created, where no existing DTD provides adequate support. It should be noted that the process to develop, review, and approve a DTD can be long and arduous and should be started early to ensure that Program procurement requirements can be met. If the Program decides that a new DTD is required, and that the IETM contractor is to develop it, a data deliverable associated cost will be required in the CDRL. Newly developed DTDs must be registered with the Navy through CD-NSWC. This process and an overview of the DTD development process are shown in Appendix F.

The Program need not require that a FOSI be provided in the acquisition of SGML data that is used for hard copy printing or electronic display. FOSIs have not proven easy to develop and have not been well implemented by commercial sources. Where fully formatted manuals or manuals where page change management are required, the Program shall require that "page-break" tags as well as paragraph numbers be included in the SGML instance. Contractors printing fully formatted (see Chapter 2-4.6.1) SGML files shall use their source publishing system style sheets that define hard copy output that complies with MIL-M-38784 style and formatting requirements.

6.0 LOGISTIC SUPPORT ANALYSIS AND RECORDS (LSA/LSAR) AND IETMS

Programs acquiring or having LSAR data (see Chapter 2-3.6) will specify that the LSAR will be considered as the "source" data base for the IETM. Programs re-authoring data with no LSA available should follow the LSA structure and LSAR formats in building data bases to support Class 4 /5 functionality. All processable IETM files should be modified only as a result of the LSAR data being modified. This establishes control and configuration management of both products. The LSAR does not contain graphics. These must be created separately and incorporated into the data base to complement textual

entities. The Program should be clear in defining the graphic file deliverables as described in Chapter 2- 5.4.2.

7.0 SECURITY

The Program will define the requirements for data protection, access restriction, and any handling of classified material or processing needed.

8.0 IETM LICENSES IN PLACE

Where applicable, the Program should make available to the contractor a list of the IETM software that is currently licensed for use by the acquiring or converting Program and for the Navy. The Program and the contractor should review and are encouraged to take advantage of existing IETM resources, both software and expertise, whenever possible. Many activities are buying IETM software tools for individual Program use or for use by many Programs residing at the same activity. At the heart of the issues, however, is the dilemma of wanting to stimulate innovation and progress on one hand and needing to avoid an uncontrolled hodgepodge of software with potential license violations and unnecessary license restrictions. This desire for conservation should not stifle the investigation and analysis of new hardware and software and the potential migration to new and advanced IETM solutions, where clear cost-effective advantages can be shown or where existing solutions do not meet the Program needs . However, contractors will be required to identify new viewer and authoring (conversion software), training, and other costs, if the Program in question does not have the contractor selected IETM software already under license. Appendix G contains additional details on licensing issues and the IETM expertise and software currently available.

9.0 LINKAGE TO OTHER INFORMATION RESOURCES

The Program must define the types of required and optional linkages, and the subject matter to which they can be applied. The Program can use the tables below to convey this information to the contractor. These linkages will ensure the end-user is presented with the best information possible. Defining what linkages the authoring activity can use and where will also help contain acquisition and display system resource costs. Optional linkages are distinguished by the fact that they link to or are drawn from data bases and applications separate from the IETM.

9.1 REQUIRED LINKAGES

While Class 4/5 already establishes these linkages, the Program must require that the following required linkages and descriptions are consistently applied to Class 2 and Class 3 IETMs:

a. Front Matter - all Table of Contents, Lists of Tables, Figures, Drawings, etc. should be linked to the body of the TM;

b. Figures, Tables, and Photographs - all textual figure, table, and photographic images referenced within the body shall be linked to their respective figure, table, or photograph;

c. Internal Cross References - all references to other textual areas within the TM shall be linked;

d. Warnings, Cautions, and Notes - all textual or graphic information that requires a warning, caution and note shall be linked such that the a warning, caution and note appears prior to the user being able to read the information to which it applies; and

e. Special Content - any special linkages within the document, such as linking stock numbers to Illustrated Parts Breakdown, acronyms to their definition, etc., must be defined by the Program in the Acquisition Package.

9.2 OPTIONAL LINKAGES

The Program must fill out Table D-1 below to provide the authoring activity with limits on the type of optional linkages that can be applied to a given subject matter. It should be noted that for Class 4/5 some audio and video is imbedded as the primary and often sole instructional data; these are not optional linkages. The Program will indicate in the appropriate block which optional linkages are of potential value. This is an enabling statement and, unless otherwise specified, is to be regarded as an option, not a requirement, for that subject area. The authoring activity may, at its discretion, provide linkages where they are warranted (e.g., benefit is expected to exceed costs, simplify instructions, clarify procedures) in that particular subject matter instance. Point of information; some Programs establish a budget (e.g., X minutes of video) and allow the authoring activity to determine where they would most beneficially be used. Additionally, not all existing or planned display systems will necessarily be able to handle all or any of the audio/visual material. For example, none of the NCTSS workstations have sound cards installed; some video formats require special video cards or drivers; sound and video files are usually large and may jam up access to the CD Jukebox, etc. These potential interface problems must be investigated and worked with the cognizant display system managers to ensure that the desired results are achieved at minimal costs.

POSSIBLE SUBJECT MATTER CONTENTS

EXTERNAL LINKS	General Info	Safety	Opera-tions	Funct Descrip	Sched Maint	Trouble Shooting	Correct Maint	Parts List	IPB	Install	Proce-dures	Readi-ness
Audio												
Motion Video												
Expert System												
Data Bases												
Other TMs												
Special Applications												
Voice Activated												

Table D-1 - Guide to Applying Optional Linkages

The Program should consider the benefits of the following types of optional linkages:

a. Audio. The end-user's environment can dramatically affect the benefits from the use of audio. For example, much of the shipboard environment is very noisy or not conducive to the user clearly hearing low-level audio. The use of audio could be ineffective or even negatively impact performance, if that were the primary means of communicating the procedure. Use of headset with the IETM could mitigate those effects. If, on the other hand the user could benefit from a "hands free" environment or was working in a crowded space where seeing the screen was difficult, the use of audio could be of substantial benefit. In the classroom, audio will only be effective with headsets. MIL-M-87268 requires that the screen show printed text that exactly follows the audio.

b. Motion Video. Videos are various types of presentations involving continuous action (e.g., movie, animation, moving graphics) that can provide substantial benefits by providing the user with quick insight into a task by providing; detailed help on a complex procedure, helpful hints, refresher training, etc. There may be a tendency to include videos because they are "flashy" or simply because you can. However, they are very expensive to produce and integrate into the IETM. They can also be even more expensive to update. Consequently, caution should be exercised on how and when they are used. The Program should ask: Is this the best way to show this action? What additional benefit does the user get? How likely is it that this procedure will change? Will it change often? Who will fund the update to the video? Would sequential figures, graphics or photographs adequately convey the needed information in sufficient detail?

c. Expert System. Expert systems should be considered in areas where complex systems require, or can substantially benefit from, subject matter expertise in assisting in and improving diagnostic and maintenance procedures. Expert systems also can provide the ability to capture and broadly share technical support in cases where minimal levels of technical support are available.

d. Other Data Bases. Other logistic support data bases aboard ship should be considered as an optional link to the IETM when those data bases hold associated data that can be retrieved in a more efficient and timely manner to aid the user. Examples would be the linkage to Preventative Maintenance Subsystem (PMS) data, Consolidated Shipboard Allowance List (COSAL), etc.

e. Other TMs. Other digital TMs (e.g., companion TMs, Navy Ships TMs (NSTMs)) that provide additional information that supports the user in completing the task should be considered as an optional link to the IETM.

f. Special Applications. Optional links to other application programs that assist the user by gathering and presenting additional information in a more concise and understandable manner should be considered. For example, an application program might accept user or external data input, link to an algorithm in an external program that processes it, and tailors the output to the user's needs. It might display a single graph tailored to the user's criteria, rather than forcing the user to choose from a display of many graphs in the IETM.

g. Voice-Activated Commands. The Program should consider the potential benefits of using voice activated instructions to assist the user needing a "hands free" environment. This relatively mature technology would give the user the ability to say, "next step" or "figure" or "zoom left up" or "read warning" rather than punch keys. It could significantly add to productivity. Problems with the computer recognizing another voice, particularly with a different accent than the user's or even the user's voice with a cold are being overcome. The user would also have to be familiar with the commands to gain maximum benefits (e.g., "stop" will have no effect when the computer is expecting "halt"). Also, the same noise interference issues that apply to audio would apply here.

9.3 MOTION VIDEO/AUDIO BACK-UP

Some Programs using motion video will have requirements to produce both hard copy and IETM products from a single database. The motion video files must be augmented with sufficient still video or graphic material to allow the data base to effectively convey in print the same content displayed in the motion video.

As mentioned, MIL-M-87268 already requires that printed text accompany any audio data in the IETM. This is to allow those applications that are using the IETM data base for printing and display to contain the information to do both. This will also safeguard the user from those times that audio or video does not operate in the manner required. For Class 4/5 there may not be an equivalent set of data for the audio and video information (i.e., there was no previous information that the audio and video replaces or enhances). For most moving video, print screen is not an option unless some sort of "freeze frame" capability is also provided.

10.0 DEVELOPMENT OF IETM VIEW PACKAGE REQUIREMENTS

If view packages are required, the Program must define them in the procurement package. This process is described in Appendix H. View packages allow the preparing activity to emphasize topics found within a linearly structured (Class 3) file or produce a construct of objects presenting tailored information from an object oriented (Class 4) data base. Although view packages allow the use of object data bases and the tailoring of information from both Class 3 and 4 databases, the manner in which they are constructed differs greatly.

11.0 IETM TECHNICAL MANUAL IDENTIFICATION NUMBER (TMIN)

The Program shall ensure that each TM, whether in hard copy or digital format, is assigned a TMIN, as directed by NAVSEA Instruction 4160.3. Appendix I describes the IETM TMIN numbering process. The introduction of IETMs presents a condition where a single manual may have more than one data format (e.g., hard copy, Class 1 raster, and Class 2) in the inventory at the same time. The issue is how to distinguish between forms of the document to ensure that the user gets data in the right format. Appendix I also defines the Media and Format Suffix Code that will be used in conjunction with the TMIN to distinguish the various data formats and distribution media.

12.0 ELECTRONIC TECHNICAL MANUAL DEFICIENCY EVALUATION REPORTING (E-TMDER) PROCESS

Programs must determine the process and data format required to send TMDERs to NSDSA, the manager of ESTEPS (ESTEPS is the central Navy logistic management system for TMDERs among other items). Once received by NSDSA, TMDER identifying data is stored and tracked in ESTEPS, with the TMDER being forwarded to the cognizant activity. Programs must provide a way for those users who can send TMDERs electronically as well as those who do not have the capability to send TMDERs electronically. If sent by mail, the TMDER can be on floppy disk or a hardcopy print out. The contents of the TMDER is shown in Appendix L. Fleet infrastructure and satellite communication are rapidly developing to support on-line delivery of data. The capability to electronically send standard TMDERs to ESTEPS is essential to preserve control and maintain logistic support. Programs will have three methods for implementing E-TMDERs (Appendix L) and providing TMDER data from an IETM application:

a. Develop and electronically send a standardized E-TMDER data file (file format described in Appendix L) to NSDSA. The process of generating the data contained in this file can vary by IETM application;

b. Interface their IETM with the Government-provided Technical Information Deficiency Evaluation System (TIDES) program. This is the recommended method to generate E-TMDERs as it keeps the proliferation of TMDER reporting methodologies and development costs to a minimum. TIDES allows the IETM application to automatically pass, and/or the user to input, deficiency data into a standard program available to all IETM applications. A description of the data field formats and implementation instructions for TIDES are provided in Appendix L. The data generated into the TIDES program can be sent electronically to NSDSA; or

c. Generate the required TMDER data in hard copy and mail it to NSDSA.

13.0 CD VOLUME IDENTIFICATION LABELS

The Program shall ensure that the digital media and the items on the media be identifiable from a logistic management perspective. This information will be used in Fleet support products such as Index of Technical Publications, supply support, etc. For this reason, the Program must obtain a CD Volume Label identifying the CD-ROM. The Volume Label identification process is defined in Appendix I.

14.0 BUILDING CD-ROM DELIVERABLES

In the acquisition package, the Program must define the responsibilities of the contractor with respect to producing CD-ROMs. Where the CD is ATIS compatible, the Program will ensure that the words "ATIS compatible" are included on the face of the CD. The contractor either:

a. Produces a single CD-ROM disk (often called a "one-off") that is delivered to the Program who uses it to produce the quantity of CD-ROMs required;

b. Has the responsibility to produce the quantity of CD-ROMs required; or

c. Produces and delivers a magnetic tape that is provided in an agreeable format for the Government to prepare a "master" for use in production runs.

In any case, the Program has the responsibility to define the:

a. Labeling information to be placed on the CD-ROM (see Appendix J);

b. CD-ROM package (hard plastic cases, soft vinyl envelopes, etc.);

c. Paper insert information, if needed, often accompanies the CD-ROM package (see Appendix J);

d. READ.ME file required by Draft Nov '94 "Department of Defense CD-ROM Requirements and Guidelines" (see Appendix J); and

e. IETM.NDX file requirements, if required (see Appendix Q), that allow the ATIS software to list, and upon selection, retrieve, run, and display different formats of IETMs resident on CD-ROM.

15.0 DISPLAY HARDWARE, OPERATING SYSTEMS, AND NETWORKS TO BE USED ABOARD SHIP

The following guidelines are provided to develop IETM applications for use with an ATIS CD-ROM jukebox or stand-alones or portables PCs having different disk drive designations. To determine the requirements, the Program will:

a. Perform a Ship's Display Hardware Survey to identify what display hardware and LANs currently exist in the work space. This will identify other Programs that share the space and may be willing to share display hardware and costs.

b. Contact Navy Tactical Command Support System (NTCSS) SNAP Program Office if the SNAP LAN with 240 CD-ROM jukebox is to be used. This ship-wide fiber/copper network allows all SNAP terminals and PCs aboard ship to use ATIS software in displaying IETMs of all formats. A 240 CD-ROM jukebox is attached to the ship's network allowing access to CD-ROMs produced by various Programs. It should be noted that the terminals or PCs on the SNAP network vary in resolution and color (monochrome) display capability and may not be appropriate for viewing IETMs.

To develop an IETM to run using ATIS software as well as with the ATIS CD-ROM jukebox, the Program must:

a. Define the minimum display hardware performance for standalone and portable IETM displays. This includes such items as screen resolutions and sizes, memory, processing speeds, LAN compatibility, telecommunications, etc. to be used aboard ship and on shore. Performance criteria can impact the selection of IETM display software as well as the manner in which the IETM is displayed (e.g., foldouts);

b. Determine interface requirements with display hardware (Appendix K)

c. Require that IETMs be displayable on DOS platforms, unless they are being developed as a part of a System to be displayed on the System terminals. If the latter is true, the Program must identify whether users who are not System holders will need data contained in the IETM and, if so, how that data will be presented;

d. Direct that the IETM application be able to:

- Run on all Window DOS platforms,
- Installed without modification of the existing AUTOEXEC.BAT or CONFIG.SYS files (any changes to these files should be contemplated only under extreme circumstances and only pursued with the approval of the ATIS and the NCTSS program offices),
- Designate the path to the IETM data, irrespective of drive letter designations (unless dedicated display hardware is to be used),
- Install and run from a prescribed directory on the hard drive; and

e. Standardize IETM color requirements and hardware display capabilities within the intended operating environment for user hardware.

16.0 ENVIRONMENTAL CONDITIONS AND IETM DISPLAY HARDWARE

The Program must identify any special environments in which the display hardware will be used. Conditions may include: all weather conditions, night time operations, exposure to steam, water, heat, dirt, grease, etc., hands-free capability, long hours of operation, etc. Special IETM display hardware requirements and quantities should be identified to the contractor. The contractor should also be required to identify any specific high cost drivers to the Program for evaluation of need and potential revision to IETM requirements.

17.0 DISPLAY HARDWARE MAINTENANCE AND SUPPORT

Programs must provide guidelines for developing their IETM display maintenance and support plans. IETM display and other hardware have the same availability requirements and support considerations as other equipment. The following is a recommended approach to this support:

a. Establish a rotatable pool, using the General Purpose Electronic Test Equipment as a model. Ships will be outfitted with the required number of IETM display devices and an additional number of units will be held at central activities to be issued as replacement. Non-operational units will be repaired and reissued with repair costs charged to the ship. Quantities of required and additional IETM display devices are to be determined by the Program;

b. As no on board repairs are anticipated, no on board spares are required and no Allowance Part List (APL) will be prepared. Allowance Equipage Lists (AEL) will be developed to show allowed quantities of attaching hardware, tools, batteries, cables, cases, etc. per ship;

c. Permanently label portable PCs with:

- the ship's work space the display hardware is to be used in (not storage location),
- cognizant maintenance activity to be used when returning the display hardware for repair; and

d. Programs shall use a 3 year technology obsolescence factor in forecasting future budget requirements in upgrading existing display hardware and software.

Using the information developed above, the Program acquiring or converting to IETMs can estimate the costs involved in implementing IETMs into the Fleet. This, with the cost of acquiring or converting the IETM data, and authoring/display software will provide the Program with a total cost of IETM implementation.

Attachment 1 to Appendix D IETM Concept of Operations For the Sagittarius System

Sample

1.0 SYSTEM INTRODUCTION

Sagittarius is a sophisticated engagement system capable of supporting a wide variety of configurations, including various ship class combat system, Land Based Test Site, Training, an airborne configuration with potential use by all US Military and foreign military services. IETM data will be maintained and updated by the IETM contractor and/or ISEA.

2.0 SYSTEM ATTRIBUTES

2.1 COMPLEXITY OF THE SYSTEM

Sagittarius is comprised of a sophisticated, processor-controlled equipment set that is capable of supporting multiple configurations. However, this equipment incorporates self-test and operator controlled test and fault isolation features that simplify troubleshooting and fault isolation. The maintenance concept is "remove and replace." Consequently, there is no requirement for highly complex maintenance guides and a lower level of IETMs might be acceptable. Accordingly, a Class 3 type IETM has been selected for Sagittarius use.

2.2 CONFIGURATION VOLATILITY

Sagittarius is being designed and developed as Common Equipment Sets that have two baseline configurations; that is, a shipboard and an airborne configuration. Due to the differences inherent in airborne and shipboard configuration requirements, two IETMs will be produced. The Common Equipment Set concept minimizes the number of configurations that must be considered in the IETMs and reduces IETM change requirements. Structured update planning will also decrease minor differences among ship classes amount and frequency of IETM change requirements.

2.3 CLASSIFICATION AND SECURITY

Although some system parameters and hardware bear a high security classification level, the IETM will not contain classified data. Where necessary, it will reference documents containing the appropriate classified data.

2.4 EXPECTED SERVICE LIFE

Expected service life of the Sagittarius System is anticipated to be on the order of 20 years with technological updates occurring on a three-to-five year basis.

2.5 NUMBER AND DEPLOYMENT OF SYSTEMS

The US Navy will deploy over 200 Sagittarius Systems. Location of equipment varies by Ship/Hull. Other service and foreign military requirements cannot be forecast a this time.

IETM Display Devices (one in use and one backup) will be required to support each Sagittarius System, for a total, based on expected Sagittarius Systems deployment, of 348 IETM Display Devices. In addition, it may be found necessary to provide data printing capability, therefore, cost of providing graphic capable printers should be anticipated. Reference the Sagittarius System fielding schedule.

FY	97	98	99	00	01	02	03	04	05	06	07
IETMs	2	8	12	11	10	17	20	36	36	35	29

Initial IETM authoring and viewing software licensing costs may be anticipated. Additional licenses for new software to upgrade capabilities can be anticipated at three-to-five year intervals based on technology advances.

2.6 NUMBER OF IETM USERS

The IETM will serve as the primary maintenance tool and source of technical information concerning the Sagittarius System for:

1. Two Shipboard Maintenance Technicians per System.
2. Engineering Support Personnel for the Fleet Technical Support Centers, Atlantic/Pacific.
3. In Service Engineering Agent (ISEA) Engineering Support Personnel.
4. Contractor Field Engineering Support Personnel
5. Naval Training Command Schools Personnel and Students.

IETM data will be maintained and updated by the IETM contractor and/or the ISEA.

2.7 QUANTITY OF DATA

The Sagittarius System is an initial procurement of a technical manual to be constructed from an electronic IETM data base derived largely from electronic LSA/LSAR data bases. The fact that the Sagittarius System is comprised of a small equipment set and that the two basic configuration baselines share some commonality, limits the volume of technical data.

2.8 QUALITY OF DATA

The Sagittarius System TM is as an initial procurement technical manual not based on scanning and/or re-authoring of legacy hard copy technical manual data. Initial product authoring costs must be borne. However, product data quality is expected to be high without additional quality improvement re-authoring costs.

2.9 CONSOLIDATION OF SUBJECT MATTER

The first release of the IETM is to contain maintenance information only. Later releases of the IETM will provide electronic OPNAV 4790/2K submission capability once SNAP supports the automated input of 2K information.

Expert System and integrated training information will not be included in the IETM. The capability of the equipment's incorporated self and operator controlled test and fault isolation features allows for relatively simple remove and replace procedures to be performed.

The Airborne IETM and the shipboard IETM will be supported by separate IETM databases. This is due to the significantly different operational requirements and the inability of the contractor's authoring/maintenance system to support a single database that produces two unique IETM products.

2.10 MAINTENANCE LEVELS

Organizational level maintenance to be supported includes fault isolation, overhaul, corrective maintenance (remove and replace), and scheduled test and inspection procedures. The equipment's incorporated self and operator controlled test and fault isolation features allow the IETM to present simple, quick to perform procedures.

2.11 TRAINING LEVELS

Due to the planned ease of maintenance and integrated diagnostic features, there are no requirements to include training information in the IETM. Fleet Training Command Center (FTCC) will receive the preliminary IETM for integration into their existing paper based training curriculum. FTCC will provide IETM operation and use in addition to the standard curriculum. Training is forecasted to last 8-10 weeks.

2.12 MANNING REQUIREMENTS

The Sagittarius System automatic fault diagnostic capabilities will enable the IETM to present quick and simple maintenance procedures. Shipboard manpower surveys indicate no additional manpower is required.

2.13 EXISTING GOVERNMENT AND CONTRACTOR INFRASTRUCTURE

The Sagittarius System and contractor currently do not have IETM authoring tools in place. The Sagittarius System will coordinate with the contractor in assuring that the selected IETM authoring software will produce and support SGML data and the features required of the IETM. It is expected that a total of 20 CD-ROM drives will be required and procured to prepare the Sagittarius System Program Office and ISEA for display of the IETM. FTCC will provide the Sagittarius System Program Office with their plan and resources required to implement the IETM in their curriculum.

Contractor and Sagittarius System Program Office/ISEA are able to communicate and send electronic deliverables over Internet.

2.14 IETM IMPLEMENTATION SCHEDULE

The Sagittarius System IETM is to be implemented on 10 ships/training sites/aircraft by June 1998. Approximately 30 months are allowed to implement the IETM. The IETM

implementation schedule includes developing a Comprehensive Technical Manual Plan, conducting a Technical Manual Guidance Conference, and determining, to proceed with IETM development based on the plan and guidance conference results.

Approximately six months are allowed to develop a Comprehensive Technical Manual Plan and conduct a Technical Manual Guidance Conference. As part of the plan development, available authoring and viewing systems will be reviewed and selected. About four weeks are allowed to disseminate/review the Comprehensive Technical Manual Plan and to conduct the Technical Manual Guidance Conference. The purpose of this conference is to discuss and reach government/contractor agreements upon desired plan changes, and make a determination whether or not to proceed with Class III type IETM implementation. Around 24 months are then available for data base and actual IETM development and in-process reviews.

2.15 URGENCY OF INFORMATION UPDATE

Priority changes will be disseminated to the Fleet user in the most expeditious manner possible. When safety or health related, methods of dissemination could include naval message, speedletter, or engineering technical bulletins, dependent upon the nature and urgency of the change. A process for direct updating of shipboard IETMs will be developed.

For less urgent, large volume changes, hard copy supplement to the IETM may be used on a temporary basis until the IETM is updated via a scheduled or, dependent upon the requirement, an unscheduled change. Unscheduled change requirements and change methodology are seen as subject to case-by-case determination.

2.16 SECURITY

Although the IETM will contain sensitive information, it will not contain classified information. Access to IETM data will be restricted by a log-in process which, at a minimum, requires the user to enter a password.

2.17 DISPLAY HARDWARE, OPERATING SYSTEMS, AND NETWORKS TO BE USED FOR ATIS COMPATIBILITY ABOARD SHIP

Currently, network drops are not available in the vicinity of combat and/or weapon system equipment spaces. Use of devices such as the SNAP network CD-ROM jukebox inherently create IETM data downloading device access problems, conflicting user requirements, and mutual interference that create at least a potential for equipment maintenance disruption.

Future shipboard LAN development may provide amore suitable IETM user Infrastructure, for the immediate future, however a CD-ROM compatible notebook PCs are the most feasible means of providing this infrastructure. The notebook PC provides the portability critical to effective use of the IETM where it is required, adjacent to the equipment undergoing test, troubleshooting, fault isolation, and repair.

2.18 ENVIRONMENTAL CONDITIONS AND IETM DISPLAY HARDWARE

The IETM display hardware is expected to be used in a high noise level environment, exposed to dirt and grease, and be subjected to long hours of operation. In addition, it may be expected to be subject to accidental droppage and ship's motion.

2.19 DISPLAY HARDWARE MAINTENANCE AND SUPPORT

Use of IETMs to support maintenance of Combat System electronic equipment's is an evolving technology. Consequently, there is little experience to rely upon for display hardware maintenance and support guidance.

For the moment, and assuming that CD-ROM compatible notebook PCs are the display hardware medium, one notebook PC for data display use and one notebook PC for back-up use is felt to be sufficient for a small electronic equipment employing not more than two maintenance technicians. When a notebook PC becomes inoperative, it can simply be replaced via a suitable commercial source.

Appendix E Selecting Appropriate IETM Functionality

The process model, Figure 8, depicts the decisions needed to determine the IETM type and functionality that will best support a system or equipment and its end users.

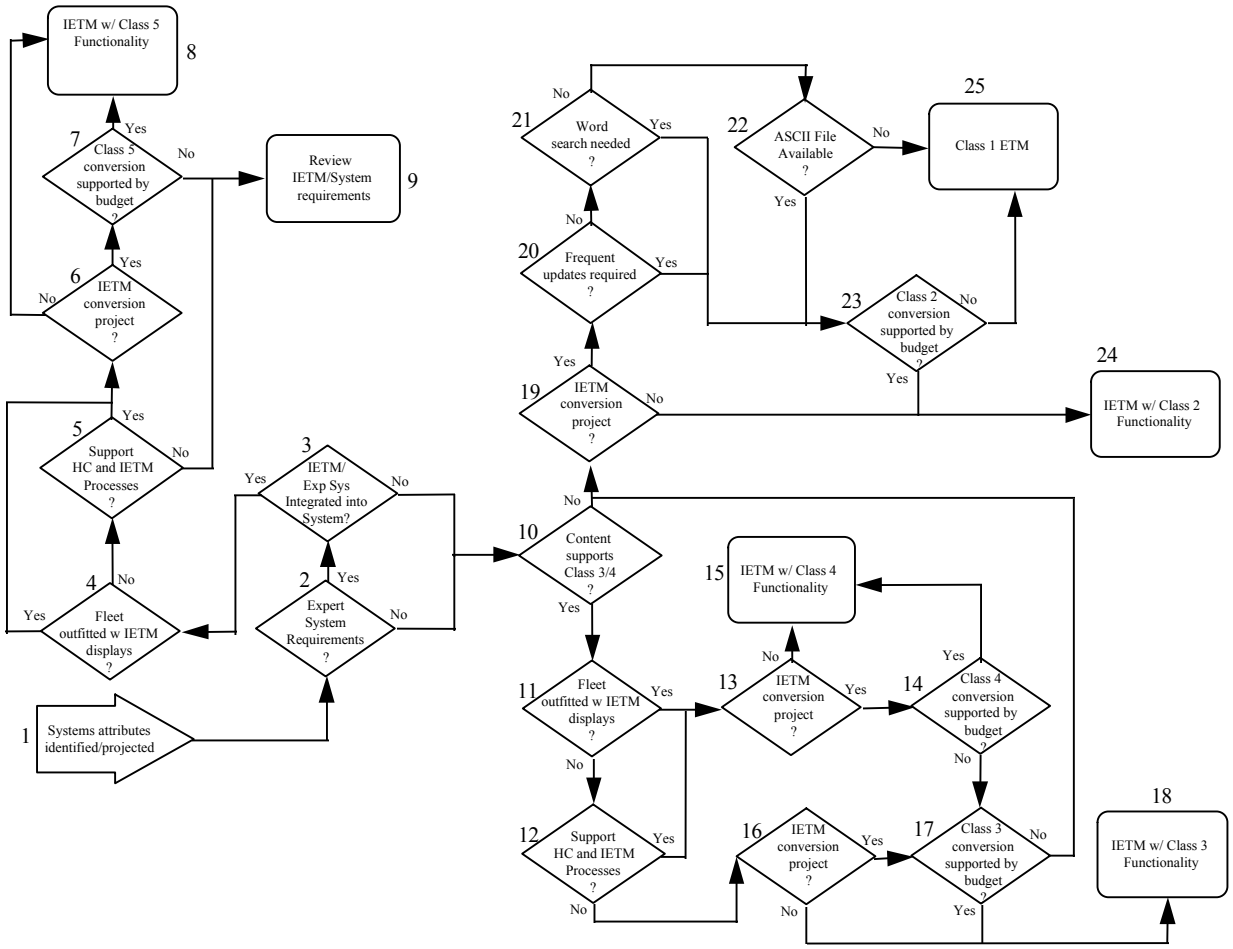

Figure 8 - Process Model for Determining IETM Class

Step 1:	The Program identifies or projects the attributes of the System or equipment as they relate to IETM, as the first step in developing the IETM CONOPS as described in Appendix D paragraph 1.2. This information is used in the Process model above.
Step 2:	Does the System require an expert system? Expert systems capture and broadly share technical support, where minimal levels of technical support may be available. They provide the user with subject matter expertise that expands user levels of knowledge and detail, augments skills, and improves diagnostic and maintenance procedure accomplishment for complex systems. Training and Foreign Military support requirements should also be considered when evalua ting expert system requirements. The following lists some examples of System characteristics that may require the use of expert systems:

- in a new design which has the diagnostics and processes are already clearly laid out and ready for incorporation of an expert system
- a highly complex system with complex troubleshooting, fault isolation procedures, etc. where the expert system keeps track of what has been done, what is next, other possibilities, etc.
- critical systems needing reduced time from diagnostics to repair (e.g., flight line download and processing, on-line sensors connected to the expert system)
- reduced maintenance cost from higher quality repair, reduced false return rates, "smarter" maintenance from system "learning," no "Easter-egging," more concise and accurate parts orders
- systems requiring supplemental training of all types

Step 3: Is the IETM and/or the expert system required to be integrated into the System? Some Systems have the operating systems available that can support the processing of IETM viewing software. This efficient use of computer processing capability minimizes the computer components required to support the IETM. If integration of IETM and/or expert system is not a requirement, Class 5 functionality can be achieved through an independent system such as CIWS (see Chapter 2-4.4.2), where an expert system, external from the System it supports, references an IETM with Class 1-4 functionality is also external to the System. If the IETM does not need to be integrated, it can have a linearly structured data base as found in Class 1-3 IETMs, which would allow the entire TM to be printed, allowing hardcopy to be used until such time as the Fleet is outfitted with display hardware. The IETM display infrastructure must also consider any potential training and Foreign Military display support requirements.

Step 4: Is the Fleet outfitted with display hardware, and are the display hardware maintenance processes in place to support these displays.

Step 5: If the Fleet is not or has no current plans to be outfitted with the IETM display hardware needed, the Program may adopt a less capable strategy that allows for continued production of fully formatted TMs. Alternately, it may on an interim basis support two files and publishing processes, one that produces a full formatted, hard copy TM and the other that supports a complex IETM. This approach buys time while US Programs and potential Foreign customers ready their respective infrastructure, ships, and training activities for IETMs. It is, however, a very costly process that may result in the loss of continuity between the two versions of the TM, causing future problems.

Step 6: Is the IETM application a new acquisition or conversion of existing legacy TMs?

Step 7: Table 2-2 lists general cost associated with the conversion of legacy TMs into Class 4/5 IETMs. The cost of conversion to Class 4/5 applications are still evolving. Management decisions on the granularity and level of indenture needed will also significantly impact these costs. These relatively high conversion costs for Class 4/5 IETMs are offset by substantial savings that will be achieved in maintaining the data base.

In addition to the system or equipment attributes discussed in Appendix D, the following factors should be considered or emphasized:

- periodicity of updates - more frequent and a higher volume of updates will result in substantially more savings (cost avoidance) as compared with hard copy and other IETM update processes.
- configuration volatility - object data bases are very efficient in managing data in support of multiple configurations of systems , complex or integrated systems, etc.; for fairly static systems, the advantages are less significant.
- quantity of legacy data involved in support of the system - if a large amount of legacy data exists (e.g., greater than 500 pages), there is typically a large amount of repeated data (e.g., warnings, cautions, notes, procedures, descriptions, etc.). A large volume of redundant data can also typically be significantly reduced, but requires re-authoring to enable its full use. A n object oriented data base provides the most efficient method to store, maintain, update , and use this data.
- metrics - as there are only a few applications completed, the set of reliable metrics is still evolving. However, given that a system has a volatile configuration and a large quantity of data, it is thought that updates to IETMs can be accomplished at 25% of that incurred in updating hard copy TMs.
- maturation - given the newness of an object oriented data base strategy and the limited number of applications, t here are few Class 4/5 IETM tools curre ntly commercially available. While t his number continues to grow as the demand for them develops, there is concern that the number of Class 4/5 applications currently being implemented does not communicate a significantly strong demand. This is not necessarily negative, so long as there are several choices that provide increasingly improved products at reasonable costs.

Step 8: Create an IETM with Class 5 functionality.

Step 9: If the Class 5 conversion costs are not cost effective when considering their benefits over the life cycles, then the Program must reevaluate the IETM/System requirements and optimize them to met budgeting requirements. Programs should also consider implementing IETMs in a phased approach which helps lower cost impacts over time.

Step 10: Do the contents of the manual(s) and the attributes of the hardware system support Class 3/4 functionality? Several factors need to be considered to determine whether Class 3 or 4 functionality is the most cost effective in support of the System. The following factors should be considered and are discussed in detail in Appendix D:

- quality of the data
- complexity of the system /equipment
- consolidation of subject matter
- system maintenance levels
- configuration volatility
- manning requirements
- training levels
- contractor and gov't infrastructure

Step 11:	Is the Fleet outfitted with IETM display hardware? In particular, if the IETM is to be Class 4 (object database), "print screen" may be the only printing option. As all data will be conveyed via the display hardware, it is imperative that the Fleet have it and the support processes needed to maintain it in place. The IETM display infrastructure must consider any potential training and Foreign Military display support needs.
Step 12:	If the Fleet is not, or has no current plans to be outfitted with the IETM display hardware needed, the Program may adopt a less capable strategy that allows for continued production of fully formatted TMs. Alternately, it may on an interim basis support two files and publishing processes, one that produces a full formatted hard copy TM, and the other that supports a complex IETM. This approach buys time while US Programs and potential Foreign customers ready their respective infrastructure, ships, and training activities for IETMs. It is, however, a very costly process that may result in the loss of continuity between the two versions of the TM, causing problems.
Step 13:	Is the IETM application a new acquisition or conversion of existing legacy TMs?
Step 14:	Using the factors in Step 10, determine the costs and benefits of, and whether the budget will support a Class 4 IETM conversion process.
Step 15:	If Program budgets support the conversion effort, convert the legacy data into a Class 4 functionality IETM by creating an hierarchical structure within in object oriented DBMS and using MIL-D-87269.
Step 16:	Is the IETM application a new acquisition or conversion of existing legacy TMs?
Step 17:	If a Class 4 functionality is not required, or the Fleet will not be outfitted with display hardware in an appropriate time, or the Program cannot justify the support of two publishing processes - one to support IETM development and the second supporting the hardcopy TM process; then the Program should determine whether converting legacy TMs into an IETM having Class 3 functionality is cost effective and affordable. Any view packages requirements should also be determined (see Chapter 2-4.3.3 and Appendix H). View packages can emphasize specific subject matter content within the IETM and only present the user with data pertaining to the subject controlled by the view package. An IETM can have several view packages, each emphasizing a different subject (e.g. operator training, overhaul procedures, system overview). The user might also be able to select view packages for novice, intermediate, and expert that present or emphasize the data differently.
Step 18:	If view packages are needed and affordable, convert the legacy TM into a Class 3 functionality IETM.
Step 19:	Is the IETM application a new acquisition or conversion of existing legacy TMs? If it is a new acquisition, the minimum functionality that should be procured is Class 2 functionality.
Step 20:	Determine if frequent updates to the TM are required? If so, an IETM having Class 2 functionality is required.

Step 21:	Determine whether the ability to p erform "word searches" would significantly benefit the end-user. This benefit must be weighed against the cost to convert the hard copy (Table 2-2 in Chapter 2-6.7) into ASCII plus the cost of proofing the resultant ASCII file to assure that it accurately represents the hard copy. If it is determined as cost effective, an IETM having Class 2 functionality is required.
Step 22:	If an ASCII file of the legacy TM is available, the Program should convert the legacy data into an IETM having Class 2 functionality. The cost to convert existing ASCII files into IETMs having Class 2 functionality is well worth the gains of being able to use automated publishing system in updating the information, as well as giving better navigational features (word search, links, etc.) to the user of the IETM.
Step 23:	If Class 2 IETM cost of conversion can be supported, convert the data into an IETM having Class 2 functionality.
Step 24:	Convert the legacy data into, or acquire the IETM having Class 2 IETM functionality.
Step 25:	If Class 2 IETM cost of conversion cannot be supported, convert the legacy TM into a Class 1 IETM.

Appendix F Document Type Definition(DTD) Processes

1.0 NAVY CALS DTD REPOSITORY

The Navy CALS Coordination Office tasked David Taylor Model Basin (DTMB) (Headquarters, Naval Surface Warfare Center Carderock Division or CD-NSWC) as the central site for registration, testing, and distribution of Department of the Navy (DoN) DTDs (and FOSIs, where applicable) developed in compliance with MIL-M-28001 (or MIL-PRF-28001) and MIL-D-87269 SGML, the CALS specifications for technical publication data. DTMB has established the Navy CALS DTD Repository to:

- to minimize duplicative DTD investments;
- register DTDs and tag sets;
- perform technical testing and approval; and
- coordinate functional testing of Navy DTDs and FOSIs.

DTDs are complex SGML constructs that can be costly to develop. DTMB maintains an electronic repository of DTDs and SGML tags and constructs for re-use by Navy activities in implementing digital technical manual applications. CD-NSWC provides technical support to Navy activities for application of digital interchange technology and standards in support of the DoN CALS Program. CD-NSWC is the Navy custodian for the CALS data interchange specifications and has extensive experience in CALS interchange specifications for engineering data, technical manuals, and IETMs.

2.0 DTDs AVAILABLE FOR NAVY RE-USE

The following Navy DTDs can be retrieved from the Navy CALS DTD Repository:

- MIL-M-38784C - Manuals, Technical; General Style and Format Requirements
- MIL-M-81927 - Manuals, Technical; General Style and Format of (Work Package Concept).
- MIL-M-81928 - Manuals, Technical: Aircraft and Aeronautical Equipment Maintenance, Preparation of (Work Package Concept)
- MIL-M-81929 - Manuals, Technical: Illustrated Parts Breakdown, (Work Package Concept); Preparation of
- NAVSEA C2 - Naval Sea Systems Command Electronic Technical Manual "Gas Turbine", Class 2, DTD

FOSIs for the first two DTDs above are currently being refined for use with ArborText Adept Publishing Software. Once a FOSI has been successfully tested it will be made available for retrieval.

To facilitate easy and rapid distribution of information, the Navy CALS DTD Repository can be accessed via Internet, the World Wide Web (WWW), anonymous FTP, Email, and

U.S. Mail. Since installation of the Web in August 1994, the DTD Repository has received well over ten thousand accesses from DoD alone. The information provided on the CD-NSWC WWW Server includes:

- Approved Navy SGML DTDs and FOSIs
- Navy SGML Baseline Tag Set
- Navy CALS Reports and Technical Memoranda
- CALS Standards Information
- IETM Information (Standards and current research efforts)
- Links to other pertinent on-line repositories
- Information on emerging and de-facto standards

3.0 ACCESS TO THE DTD REPOSITORY

3.1 WORLD WIDE WEB (WWW)

The WWW provides the most "user-friendly" connection to the Repository. WWW pages guide the user through hyperlinks to desired information. The WWW Uniform Resources Locator (URL) address for the Navy CALS DTD Repository is:

http//navysgml.dt.navy.mil/repository.html

3.2 ANONYMOUS FTP

The DTDs installed in the Navy DTD Repository may also be retrieved via the "anonymous guest" FTP protocol. The pub directory contains the files associated with the Navy CALS DTD Repository. The Internet address for the FTP Repository is:

navysgml.dt.navy.mil (130.46.12.197)

3.3 EMAIL

Information in the Navy CALS DTD Repository may be requested by an Email message. The request will automatically be sent to the appropriate person and the requested information will be sent to you electronically. The Email address is:

webmaster@navysgml.dt.navy.mil

3.4 TELEPHONE OR MAIL

Requests may also be sent to DTMB either by phone or U.S. mail at:

- Advanced Information Systems Branch, Code 183
- Naval Surface Warfare Center
- Headquarters, Carderock Division
- Bethesda, Md. 20084-5000
- Telephone: (301) 227-3348

Appendix G Existing Ietm Infrastructure Assets

1.0 LICENSING IETM SOFTWARE

The Navy has incurred considerable costs to develop and implement IETMs in the Fleet. Use of the resulting knowledge and resources available would appear to be prudent in the current funding environment. This Appendix G will advise Programs on where to obtain information on the availability of subject matter experts and IETM software licenses. The Navy is required to license the use of each commercial software package used. Some typical examples of licensing agreements are single user, number of seats, network/site, and unlimited use. Licensing costs, terms, and restrictions for IETM software vary by vendor and sometimes by purchase. The agreements and limitations are very specific and may contain elements that are not satisfactory to all possible users of the data (e.g., no sale or release to or use by foreign firms or governments without prior specific approval of the software developer). Negotiation of licensing agreements in isolation may result in:

- A less than optimal agreement for the specific case or the Navy;
- Higher overall costs;
- Loss of other options or actions that may have been beneficial;
- Not achieving the best results for the specific case;
- Unnecessary conflict and restrictions on the use of ATIS; and/or
- an unfavorable accumulative effect where the Navy pays several times for the use of the same software on ATIS.

For those reasons, Programs are strongly encouraged to investigate available licenses, existing agreements and restrictions and other factors before entering into any unilateral agreements with software vendors.

2.0 SOFTWARE LICENSING CLEARING HOUSE

To avoid potential negative impact, a central clearing house for advice and assistance on and review and/or approval of leases is required. Where lease rights with a company already exist, the new requirements may just be add-ons. The additional volume may also take the Navy to a new level that will make more favorable alternate leasing options available for everyone. Based upon user and infrastructure guidance and requirements, this clearing house must have procurement and legal resources available to ensure that all aspects of the terms and conditions of the lease are considered. SEA 04TD has considerable experience in qualifying and licensing these tools for wide scale application. SEA 04TD has agreed to act as the software clearing house to begin to control that portion of the problem. Each Program, when looking to license IETM software tools which cost in excess of $20,000, should contact NAVSEA 04TD for advice and assistance in who to and how to license, in what is currently under license that may be able to be used by the Program, and in negotiating the license and costs.

CLASS	NOMENCLATURE	STATUS
1	TMS View Director	500 applications in Fleet. Provided with ATIS
2	TMS Master View	20,000 pages converted for PIMS. 20 viewers currently licensed. License for PHALANX Close-In Weapons System being negotiated
2	IADS	Government Owned
2	Adobe Postscript/ Alliant	3,000 pages converted by VLS. 15 conversion license available for PHD-NSWC use.
3	InfoAccess	Licensed for any TAD Program at PHD-NSWC.
3	Electronic Book Technology	Licensed for all Programs at PHD-NSWC.
4	AIMSS	Licensed for AEGIS Fire Control Radar Transmitter

Table G-1 - Licensing in Place

3.0 HARDWARE CLEARING HOUSE

The need for a clearing house for software is evident. The need for a hardware clearing house is equally evident. Space is generally at a premium on board ship. Having redundant equipment that performs essentially the same functions located in the same space is neither efficient nor cost effective. At present, Programs must send teams to the ships to inventory work spaces to determine what is already there and whether there is room for more. No activity has as yet volunteered to perform the display hardware clearing house functions.

4.0 IETM SUBJECT MATTER EXPERTS

The following personnel can be used by contractor and Programs alike in seeking advice in the issues and processes involved in considering the advantages and disadvantages of the features of each of the listed IETM software packages.

CLASS	NOMENCLATURE	STATUS	PHONE
1	TMS View Director	Andy Kelly SEA 04TD	
2	TMS Master View	Chester Ellswick NSWC-Louisville	
2	IADS	Rich Gramly, Army	
2	Adobe Postscript/Hercules	Jim Moses, PHD-NSWC	
3	Infoaccess	Marty Cohen CD-NSWC-SSES Jim Moses, PHD-NSWC	
3	Electronic Book Technology	Marty Cohen, CD-NSWC-SSES	
4	AIMSS	Ramona Braun, PHD-NSWC Dan Seemiller, PHD-NSWC	

Table G-2 - Subject Matter Experts Available

Appendix H Development Of Ietm View Packages

1.0 DEFINITION

View Packages allow the user to be presented with different subject matter emphasis; i.e., a different sequence of complete or partial topics than found by viewing a linear database (Class 2/3) from start to finish. Although view packages allow the tailoring of information from both Class 3 and 4 databases, the manner in which they are constructed differ greatly. A view package applied to a Class 3 IETM makes it "appear" that textual and graphic information is being rearranged in the linear database. In essence, Class 3 view packages may display the different sets of complete or partial information found within the linear database that emphasize a particular subject required by the View Package.

View Packages of Class 4 IETMs produce a construct of objects (a subset of the object oriented database) that present the subject emphasis required of the view package.

The subject emphasis of View Packages must be defined by the acquiring Program. The steps to define a View Package follow.

2.0 DEVELOPMENT OF AN IETM VIEW PACKAGE

When developing a View Package, the following steps should be followed:

- Define View Package purpose (e.g., to present configuration specific information to the user, provide different user expertise levels (expert or novice), executive overview, etc.).
- Classify the View Package in terms of types of information presentation involved (e.g., procedures, fault isolation, description, parts data, or any combination of types of information) that would be most effective in enabling the View Package to satisfy its purpose and intended use.
- Class 3 View Packages will use those required and optional linkages that are in place in the linear database. Class 4 View Packages shall comply with the optional linkage requirements.

Appendix I Management and Tracking of IETM Identifying Data

1.0 LOGISTIC INFORMATION MANAGEMENT OF IETMS ON MEDIA

SEA 04 has directed NSDSA to be the central NAVSEA coordination point for the management of the logistic information for media. NSDSA must be contacted to obtain media identification number (Volume Identification Number and Stock Number) and Media and Format Suffix Codes, in addition to any TMIN for any new IETM being produced. Appendix G describes the process for obtaining this information. Enhanced Ships Technical Publication System (ESTEPS), managed by NSDSA, is the repository for reference information regarding media and the IETMs that reside on them. The Point of Contact for this matter is Carrie Ganzman Code 5B62 at (805) 982-3141.

2.0 TMIN NUMBERING

NAVSEA Instruction 4160.3 directs that each TM, whether in hard copy or digital format, be assigned a TMIN. The introduction of IETMs presents a condition where a single manual may have more than one data format (e.g., hard copy, Class 1 raster, and Class 2) in the inventory at the same time. This raises several issues that will be briefly discussed.

a. Content Rules. The TMIN describes a unique set of technical content. Where the technical content of two or more sets of data is essentially the same (i.e., the data cover the same equipment or system, to the same level of detail, and use the same approach to performance of maintenance, etc.), and the primary difference between sets is data format and/or media, a single TMIN will be used to identify all sets. This means that a hard copy variant, raster variant, and Class 4 variant of the same TM will all have the same TMIN. It is understood that the Class 4 variant may have supplemental audio and video aids, but that these enhancements clarify and expand the original information, not change it.

b. Alternate media. Use of the TMIN to define the specific CD or other delivery media is not allowed. Paragraph 3.0 defines the Media and Format Suffix Code that will be used in conjunction with the TMIN to distinguish the various data formats, view packages, and media.

c. Bundling for user convenience. Some Programs take several manuals and put them together on the same CD to simplify the user interface. Where these manuals remain independent documents (i.e., the text and other material is not combined into a single document, the individual manuals are updated separately, etc.), the individual manuals must retain their individual TMINs. Assignment of a TMIN to distinguish between collections of bundled data where the content from each TM remains separated and independently identified is not allowed. If this bundle becomes unique and causes unique updates to the individual manuals, then the individual manuals require new TMINs.

d. Combined technical manuals. Where the information from several TMs have been combined together into a single document and the original source of data is no longer distinguishable, a new TMIN is required.

e. Combined subject material. Where subject matter (e.g., maintenance, training, supply) are combined into a single data base to serve multiple user groups, a new TMIN with a special acronym is appropriate and a special TM acronym has been assigned. "EMA" standing for "Electronic Manual All", is an acronym for IETM that shall be assigned as the TM acronym (i.e., MMO, MMA, etc.) to those digital TMs that integrate all legacy hard copy TMs on multiple subjects.

3.0 ASSIGNMENT OF MEDIA AND FORMAT SUFFIX CODE

Each set of IETM data, as distributed, will contain its respective IETM viewing software. With no single Navy IETM viewer, many viewers will be used. From a logistic management standpoint, it is important to be able to identify the type of media used to distribute the IETM, the formats included and viewers needed, etc., to ensure that Fleet users are properly served. The following describes the suffix information that will supplement the original TMIN assignments. TMIN S9445-AB-MMO-010 will be used for these examples:

- For all existing or new hardcopy TMs the TMIN number would remain: S9445-AB-MMO-010
- For hard copy legacy data converted to any form of IETM or any form of newly acquired IETM the TMIN would be associated with a suffix code and take the combined form: S9445-AB-MMO-010-XY
- Where X identifies Digital Media as:
  - C = 5 $^1/_4$" CD-ROM
  - F = Floppy Disk
  - M = Magnetic Tape
  - W = Write Once Read Many
  - ? = other designations for new media technologies as they become available
- Where Y identifies data retrieval software:
  - A = ATIS Raster
  - B = ADOBE
  - C = InfoAccess
  - D = WordPerfect
  - E = EBT
  - ? = others as needed

This document numbering system will allow simultaneous parallel tracking of hardcopy and digital TMs, and allow both to be tied to a ship hull and CD. Different Change and Revision levels can readily be tracked against hardcopy and digital TM. This multi-configuration tracking capability is especially valuable if the digital TM is available in several digital media at different configuration levels. The TMINs Guide will have to be updated accordingly.

4.0 RETRIEVAL OF CD-ROM APPLICABILITY FROM ESTEPS

NSDSA maintains CD-ROM life cycle data for NAVSEA and SPAWAR in the CD-ROM Query Subsystem of ESTEPS. The CD-ROM Subsystem allows users to search for CD-ROM applicability using several search criteria; that is by:

a. Ship Hull Number for a list of the CD Volume ID Numbers that apply;

b. CD Volume ID Number for a list of those Ship Hull Number(s) to which it applies;

c. CD Volume ID Number for a list of those TM(s) that reside on that CD;

d. Activity that produces the CD-ROMs; and

e. TMIN for a list of those CD Volume IDs on which it is found.

5.0 VOLUME ID AND STOCK POINT ASSIGNMENT REQUESTS

The Volume ID number uniquely identifies the CD and ensures that the correct CD is being read. CD-ROM developing activities will receive the next available Volume ID Number by contacting NSDSA and supplying the requested information on the CD-ROM Volume ID Request Number Form (attached). The next sequential number is automatically assigned to the requesting activity after the Unit Identification Code (UIC) has been entered. The requested data for this screen is shown below. NSDSA will obtain Stock Numbers from the Aviation Supply Office (ASO) and provide them to the requesting activity by letter. In addition, activities can request a Volume ID Number and Stock Number by following the guidance in paragraph 6.0 below and in the attached form. If this process is used, NSDSA will input the data into ESTEPS.

The identification of the media on which IETMs can be obtained may define the type of hardware needed to retrieve the data (3-1/2" disk, 5-1/4" floppy, CD-ROM, etc.). Future technology may make it possible to write this data on a range of distribution media selected by the user. New CD-ROM technology has just reached the commercial market. This will make CD-ROMs smaller and able to hold up to four times the amount of data currently contained in a CD. New media reader peripherals will proliferate the end-use environment. Whereas each Program historically only had one media - paper, each Program can now determine which digital media best supports its distribution, update, and installed display hardware requirements. However, until IETMs can be accessed in real time over the many developing Local Area Networks, it will be necessary to assure that the media on which the IETM is distributed is identified to ensure that the requirements for the media and the display hardware which will view it are coordinated.

Note: If the Media Request Form contains more than 9 TMs, requestor will send a DOS formatted disk containing TM data information in a standard word processing format (e.g., MS Word, Word Perfect). This will preclude manual entry of data at NSDSA. Format is provided on the Media Request Form.

6.0 ESTEPS DATA FIELDS REQUIRED TO TRACK MEDIA DATA

In assigning a CD Volume ID Number and Stock Number, the following data is obtained and entered into ESTEPS for tracking CD life cycle data:

a. Volume ID Number: Issuing Activity UIC followed by the next sequential number assigned by ESTEPS (e.g., N6339400010)

b. Revision Level: Alpha character reflecting configuration updates of the CD-ROM (e.g., N6339400010 Revision A)

c. Issue Date: Month and year the CD-ROM is to be issued (e.g., March 1995)

d. Distribution Statement: Distribution statement A, B, C, D or E

e. National Stock Number (NSN): Thirteen digit number issued by ASO (e.g. 1000-LC-009-9010). NSDSA will inform CD developers of the applicable NSN by letter

f. Stock Point: ASO or alternate that will stock the CD-ROM

g. Security Classification: Highest level of security classification

h. Title: Title reflecting CD content

i. Unit Identification Code (UIC): Standard Navy identification code for an activity (e.g., N63394 is the PHD-NSWC UIC)

j. Requesting Activity: Activity requesting Volume ID Number/Stock Number

k. Internal Office Code: Office code of the requester

l. Point of Contact (POC): Individual that can be contacted if questions concerning the CD-ROM arise

m. Telephone number: Commercial telephone number of the POC

n. DSN Telephone Number: Government telephone number of the POC

o. FAX Telephone Number: FAX telephone number of the requester

p. Baseline Distribution List Required: Indicate whether distribution list/mailing labels from NSDSA are needed

q. Data Authoring Software: Software needed to update file

r. Data Retrieval Software: Software issued to users on CD-ROM

s. System Field Value:

t. Family Field:

u. Technical Manual Number(s): A listing of all TM numbers contained in the CD-ROM, including:

- Revision Level for each TM on the CD
- Date of each TM on the CD
- Change Level of each TM on the CD
- Date of each change of the CD
- Data Retrieval Software Listing for each TM on the CD

7.0 DISTRIBUTION, MANAGEMENT AND CONTROL

ESTEPS/NSDSA provides the service, at no charge, of storing, maintaining, and printing when requested, the distribution list and labels in support of initial IETM media distributions. Contact NSDSA for details. Once initially distributed, the Program must determine whether to stock the medium that the IETM resides on in the Naval Supply system or to become the Alternate Stocking Point. If stored in the Naval Supply system, a quantity in access of the initial distribution will be forwarded to Naval Supply Systems Command (NAVSUP) for stockage and filling of Fleet and shore requisitions. NAVSUP qualifies requisitions and provides requisition status at no charge to the Program. The qualification process can be labor intensive where cash or Foreign Military requisitions are involved. NAVSUP provides this service at no charge to the Program. Programs deciding to be the Alternate Stocking Point for the IETM media, must be aware that they assume these requisition qualification and status responsibilities. Contact NAVSUP for further details.

If using the NSDSA mail label service to distribute electronic media, the Program must fill out the "Attention to Code" portion of the mail label to identify the type of computer receiving the distribution. This will ensure that each distributed media identifies one of the potentially multiple IETM displays aboard ship.

Programs may develop multiple sets of CD-ROMs that support different configurations or Classes of Ships. This makes the appearance of a singular IETM likely across multiple CD-ROM sets. Programs developing their IETMs and CD-ROM bundling strategies (placing of IETMs on CD-ROM) in this manner, are encouraged to become the Alternate Stocking Points for their CD-ROMs. The reason; the current supply requisitioning process can map the an IETM to one CD-ROM, but has no way of qualifying who the order came from and the appropriate CD (if it makes a difference) that should be distributed to fill the requisition.

MEDIA VOLUME ID NUMBER REQUEST

INSTRUCTIONS

1. For requests involving fewer than ten (10) documents per cd, complete parts ii, iii and iv, then:

FAX request to: (805) 982-3003, Attn: Carrie Ganzman, Code 5B32; or
Mail request to: Commander, Port Hueneme Division, Naval Surface Warfare Center, Attn: C. Ganzman, Code 5B32, 4363 Missile Way, Port Hueneme, CA 93043

2. For requests involving ten or more documents per cd:

a. Create a DOS formatted disk containing Part IV information in ASCII format
b. Complete Parts II and III of this request.
c. Mail the disk (containing Part IV info) and this request (containing Part II and III info) to the address shown above.

PART I: FOR NSDSA USE ONLY

VOLUME ID NUMBER: _____ DATE ASSIGNED: _____

STOCK NUMBER: _____

PART II: REQUESTER INFORMATION TODAY'S DATE: _____

1. ACTIVITY: _____ 2. UIC: _____

3. POC NAME: _____ 4. CODE: _____

5. PHONE: _____ 6. FAX: _____

PART III: CD INFORMATION

1. CD Title: _____

2. Revision/Version Number: _____

3. Date Of Issue (Proposed): _____ 4. Distribution Stmt: _____

5. Classification: _____ 6.ATIS Compatible: Yes ____/No _____

7. Proposed Distribution List Attached: Yes _____/No _____

8. Baseline Distribution List Required: Yes _____/No _____

9. Stocking Point Information:

A. UIC:_____

B. International Office Code: _____ C. POC: _____

D. Phone (Comm): _____ E. PHONE (DSN): _____

PART IV: DOC. ID/TM DATA

	DOC ID/TM NUMBER	REV	DATE	CHG	DATE	RETR'VAL SOFTWARE	SYSTEM FIELD	FAMILY FIELD
1								
2								
3								
4								
5								
6								
7								
8								
9								

FOR ADDITIONAL INFORMATION CONTACT:
Carrie Ganzman, PHD NSWC Code 5B32, Phone (805) 982-3141, DSN 551-3141, FAX (805) 982-3003, EMAIL ganzman_carrie@om.nswses.navy.mil or

Bob Uehlein, PHD NSWC Code 5B32, Phone (805) 982-2964, DSN 551-2964, EMAIL Uehlein_bob@om.nswses.navy.mil

Appendix J Building CD-ROM Deliverables

1.0 DISK LABELING

The following paragraphs provide disk labeling instructions for both classified and unclassified DoD-produced CD-ROM disks. Items marked 'Required' must be present on any DoD-produced CD-ROM disk. It is strongly recommended all information on the label be unclassified. See Figure J-1 for a sample unclassified label and Figure J-2 for a sample classified label.

1.1 DATA CLASSIFICATION

- Security classification: Required on disks containing classified information. The classification marking must be positioned at the top of the disk. The highest classification of any information contained on the disk must be placed on the label. The classification marking must be 18 point bold with a Sans Serif typeface. All other markings on the label must have a smaller point size than the classification marking.

- Other Protective Markings: Required on disks containing protected information (FOUO, etc.). These markings must be at least 12 point bold with a Sans Serif typeface.

1.2 HANDLING CAVEATS

Required on disks containing any information with handling caveats.

a. For disks containing Sensitive Compartmented Information (SCI) or Top Secret Code words (TSC), include SCI numbers or TSC numbers. (Example: SI-xxxxx/r or TSC-xxxxx/yr). The handling caveat marking must be directly below the data classification marking.

b. For disks containing information covered by Public law 93-579 "The Privacy Act of 1974", the handling caveat phrase 'Privacy Act Data, Sec. 552a, Title 5, U.S.C." must be directly below the data classification marking.

c. Access or use constraints (i.e., copyright, proprietary, limited distribution, etc.) should be prominently displayed on the label.

1.3 CLASSIFICATION COLOR RINGS

Required on disks containing classified information. A 1/4 inch wide color ring must be placed along the outside perimeter of the disk label. The following list provides the required ring color for the corresponding classifications.

a. Yellow (Sensitive Compartmented Information)

b. Orange (Top Secret)

c. Red (Secret)

d. Blue (Confidential)

1.4 Producing Organizations Name

Required on all disks.

1.5 Classification Authority

Required if disk is classified.

1.6 Declassification Date

Required only if applicable.

1.7 Producer Seal

Optional.

1.8 ISO 9660 and/or Compact Disk Data Storage Logos

Optional. Although not required, it is recommended that the ISO 9660 Logo be placed on a disk to indicate to the user that the disk is ISO 9660 compliant.

1.9 Title of Production or Disk Set

Required on all disks, including any disk set numbering schemes such as 1 of 3. etc.

1.10 Date Produced

Required on all disks.

1.11 Platforms Supported (e.g., Windows, DOS, UNIX, MAC, All)

Required if applicable.

1.12 Supplemental Data Formats Used

Required if any extended or supplemental Data formats are use (i.e., XA, MPC, MPC2).

1.13 Edition

Optional.

1.14 Volume Identification

Required on all disks. This must be identical to the ISO 9660 eleven-character volume label written in the header of the disk. Due to requirements for unique labels for mounting disks in CD-ROM Jukeboxes and on network system, producing organizations must use their UIC as the first six characters; the producing organization must manage/ensure disk uniqueness using the last five characters.

1.15 Identification Number for Disk (serial/copy #)

Required for accounting for top secret or code word disks, recommended for others:

a. For top secret or code word disk accountability: Required. Each producer must assign a unique serial number to each title or production release. Additionally, each disk must contain a copy number unique to the serial number.

b. For accountability of other disks: Recommended as needed. Identification Numbers can provide accountability for every disk produced.

1.16 CD-RECORDABLES

Both replicated and CD-Recordable disks must adhere to the requirements set in paragraph 3.0. If adhesive labels are used, they must be frangible (shreds if you try to remove it). CD-Recordable adhesive labels must be thin enough to not interfere to the CD-ROM drive and must be able to withstand humidity and heat in typical user environments. CD-Recordable label printers must have permanent, smear-proof inks.

Note: Letters correspond to paragraph 1.0. This is an example only. The only required locations are for the classified ring, disk classification, and handling caveats (see paragraphs 1.1, 1.2, and 1.3). Agencies may tailor the rest of the label layout.

Figure 9 - Sample Unclassified Label for DoD Produced CD-ROM Disk

Figure 10 - Sample Classified Label for DoD Produced CD-ROM Disk

2.0 DISK CONTENTS

2.1 VOLUME AND FILE STRUCTURE

ISO 9660: 1988 Information Processing - Volume and File Structure of CD-ROM for Information Interchange is the required volume and file structure for DoD-produced CD-ROMs.

2.2 RETRIEVAL VIEWING SOFTWARE

To run as a stand alone in an ATIS network or jukebox, retrieval software must be included on the CD.

2.3 IETM DATA FILE

The IETM data file must also be included on the CD.

2.4 INTERNAL "READ.ME" FILE

Every DoD-produced CD-ROM disk will have a flat ASCII file titled "READ.ME" in the top level (root) directory with the following format and information:

1. Units will be 80 characters or less, with a hard return (ASCII Carriage Return - Line Feed combination CRLF) at the end of each line. Description (such as "DISK TITLE:") will be used to introduce each new information block; description will be in all capital letters and begin in column one of their One. The associated data will be in upper and lower case.

2. The READ.ME file will have the following structure. All descriptions must be used, though the associated information is optional.

   a. TITLE:

      State verbatim the name by which the disk is known (including any disk set numbering schemes such as 1 of 3, etc.). Do not include any superfluous descriptions or qualifiers.

   b. EDITION:

      The version of the title

   c. VOLUME IDENTIFIER:

      This must be identical to the ISO 9660 eleven-character volume label written in the header of the disk. Due to requirements for unique labels for mounting disks in CD-ROM Jukeboxes and on network systems, producing organizations must use their Unit Identification Code (UIC) as the first six characters; the producing organization must manage/ensure disk uniqueness using the last five characters.

   d. ORIGINATOR:

      The name of an organization(s) or individual(s) that developed the data (see definition of contributed by). If the name of editors or compilers is provided, the name must be followed by '(ed.)' or '(comp.)' respectively.

   e. PUBLICATION DATE:

      The date when the disk was published or otherwise made available for release.

   f. SECURITY CLASSIFICATION:

      (Name of the security restrictions on the disk, use the highest classification of any information on the disk.)

   g. CLASSIFICATION AUTHORITY/SECURITY CLASSIFICATION SYSTEM-L4:

      (Name of the classification system. State/reference the actual classification authority or "Multiple Sources' if appropriate. Use 'N/A' for unclassified disks.)

   h. SECURITY HANDLING DESCRIPTION:

      (Additional information about the restrictions on handling the disk.)

   i. DECLASSIFICATION DATE:

(Provide the date the disk becomes declassified. This is either the last date the disk, or Originating Agency Determination Required (OADR) if appropriate. Use 'N/A' for unclassified disks.)

j. TIME PERIOD OF CONTENT:

Time period(s) for which the data on the disk is valid. Select one of the following methods:

- SINGLE DATE/TIME: method of encoding a single date and time.
- CALENDAR DATE: the year (and optionally month or month and day).
- TIME OF DAY: the hour (and optional minute or minute and second).
- MULTIPLE DATES/TIMES: means of encoding multiple individual dates and times.
  - DOCUMENT IDENTIFICATION :
  - CALENDAR DATE: as above.
  - TIME OF DAY: as above.
  - RANGE OF DATES/TIMES: means of encoding a range of dates and times.
- BEGINNING DATE: The first year (and optionally month or month and day) for which the data is valid.
- BEGINNING TIME: The first hour (and optionally minute, or minute and second) of the day for which the data is valid.
- ENDING DATE: The last year (and optionally month or month and day) for which the data is valid.
- ENDING TIME: The last hour (and optionally minute, or minute and second) of the day for which the data is valid.

k. OPERATING ENVIRONMENT/NATIVE DATA SET ENVIRONMENT:

State the minimum DOS version, Microsoft Windows version, UNIX version, Mac version that is required to operate this disk. In addition, state any other hardware/software requirements.

l. ACCESS CONSTRAINTS:

Restrictions and legal prerequisites for accessing the data. These include any access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the data.

m. USE CONSTRAINTS:

Restrictions and legal prerequisites for using the data after access is granted. These include any use constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the data.

n. ABSTRACT:

A brief narrative summary describing the CD product/data and its purpose.

o. ORDERING INSTRUCTIONS:

State specifically how to request copies of the CD.

p. FEES:

The fees and/or tariff for receiving the disk.

q. POINT OF CONTACT:

Contact information for an individual and organization that is knowledgeable about the data on the disk.

- CONTACT PERSON:
- CONTACT ORGANIZATION:
- CONTACT ADDRESS:
- CONTACT VOICE TELEPHONE:
- CONTACT FACSIMILE TELEPHONE:

r. MAINTENANCE AND UPDATE FREQUENCY:

State plans for product enhancements, schedule of updates, termination of product support or any other related information.

s. ORIGINATOR COMMENTS:

Provide any comments offered by the originator of the CD or products on the CD.

t. DOCUMENT IDENTIFICATION:

Use the number, title, date, and originator of each document or product found on the disk. (This and the following document abstract section can be repeating pairs).

u. DOCUMENT ABSTRACT:

Provide a brief narrative describing each document or product on the disk. (This field and the document identification field can be repeating pairs for every document product found on the disk).

v. END OF READ ME FILE

3.0 CD TESTING

For compatibility with ATIS systems, network, and jukebox, CDs should be tested at NAVSEA Logistics - Indian Head Detachment, prior to replication. Refer to Appendix B for point of contact.

4.0 DESTRUCTION OF CD ROMS

MIL-HDBK-9660 designates that CD-ROMs identified for destruction, that are classified Secret and below, be sent by registered mail to:

Director, National Security Agency
9800 Savage Road
ATTN l322-Building 9838
Ft George G. Meade MD 20755-6000

Appendix K IETM and Display Hardware Interfacing

The primary requirements are that the CD-ROM containing the application must have a 1 to 11 character volume label and there must be an IETM.NDX file in the root directory of the CD-ROM. The guidelines for generating the CD-ROM volume label and the description of the IETM.NDX file may be obtained from other Appendices in this document.

Just meeting these requirements however will not ensure that an application will work well within the ATIS environment. Because ATIS is intended to serve the functions of a networked technical library containing hundreds of CD-ROMs and having multiple users, all applications that run within the ATIS environment must cooperate with each other and share system resources. The following sections discuss the system resources and how applications are expected to use them. These sections are only guidelines because most applications will be using commercial software and there is no way to assure complete compliance. What is asked for is that all developers make a good effort to abide by these guidelines. Where a guideline is impossible to meet, the guideline may be ignored, but this should really be a case of 'impossible' not just 'somewhat difficult.'

1.0 RUN TIME ROOT PATH ASSIGNMENT

One attribute of an application that works well under ATIS is the ability to dynamically change CD-ROM location(s). This allows CD-ROMs to be easily moved from a jukebox to mapped network drives or to local drives as required by hardware or usage constraints. Without this ability the application might have to be re-installed prior to use or not be available at all because of a limited number of physical disks. To simplify moving CD-ROMs, ATIS locates each CD-ROM at the time a user needs to access it. Within the scope of the current discussion, the CD-ROM location will either be a local CD-ROM drive, a mapped network CD-ROM drive, or a CD-ROM jukebox. In all cases the application should be able to have the CD-ROM location specified at run time. The two ways this is currently done is to identify the CD-ROM location on the command line or to do it implicitly by setting the current drive and directory to the root directory of the CD-ROM. There are some special considerations when a jukebox is involved because the CD-ROM appears as a subdirectory of a network drive not as an independent drive. For example, the IETM.NDX in the root directory of CD-ROM N1234500001 will appear as J:\CDROM\N1234500001\IETM.NDX. If an application can only be configured to use a drive letter, it will require one of the limited mapped network drives. For some applications this could mean the application will not be available because of the number of mapped drives is limited. Mapped drives are generally allocated to high use or high priority applications. This is also true for any application that needs to determine the Volume ID of a CD-ROM using DOS system calls. For CD-ROMs loaded in the jukebox, SYS is generally returned when an attempt is made to get the CD-ROM Volume ID.

For the current applications that are running in the ATIS environment, the majority of changes have been to use partial paths in place of full paths. These partial paths when used in conjunction with a default drive and directory provide access to the required data files. The use of partial paths may make significant changes to the structure of the CD-ROM and to the install procedures. Coordinating changes to the CD-ROM structure, the install process, and the IETM.NDX file can be very complex since changes to one probably has an effect on the others. These changes should be tested with an ATIS system, with a jukebox if possible, to make sure they work. A visual review of the three items may be beneficial but their interactions are so complex that it is usually not sufficient to guarantee they will work correctly. If a jukebox is not available there are techniques that emulate one with a hard disk. NAVSEA Automated Data Systems Activity, SEAADSA, can be reached on the ATIS help line (DSN 354-4911 or 301 743-4911) to seek assistance in obtaining ATIS and/or emulating a jukebox.

Until first quarter 1996 there are other considerations that, for some applications, will have an effect on the usability of a jukebox. If this is the time frame for delivery of an application, the developer should contact SEAADSA to discuss these issues.

2.0 HARD DISK SPACE

Most applications will require some space on the hard drive and the IETM.NDX specification identifies the area an application should use. Specific limits on the amount of space that can be used are not provided because there is no single limit that would be appropriate for all applications. The amount of space that is available to an application is a trade-off between the total amount of free disk space and the response time the users wish to see from the application. To help users manage their systems, applications should abide by the following rules with respect to using local and network hard disks:

- Use only the subdirectories allocated to the application via the system field in the IETM.NDX file.

- Provide at least two installation options. One that uses the least amount of hard disk space required for the application to run and a second that uses the least amount of hard disk space that gives adequate performance using low-end equipment. If assistance is needed to evaluate the terms 'adequate performance' and 'low-end equipment' the NAVSEA 04TD POC is available.

3.0 SYSTEM CONFIGURATION RESOURCES

As noted above, a work subdirectory is provided for applications to prevent applications from interfering with each other. There is however ways in which an application can interfere with the operation of the host computer system. The following guidelines were developed to prevent or at least minimize the chances of that interference.

- No changes should be made to the AUTOEXEC.BAT, CONFIG.SYS, windows.ini, system.ini files.

- Version control must be used to update any Windows/DOS system files including DLLs and drivers.
- Except for Windows/DOS system files, no files should be placed in any directory other than the IETM.NDX system directory.

4.0 MISCELLANEOUS

The problem of simultaneous execution of two applications developed using different versions same program has not been completely investigated. To prevent problems or to anticipate them all developers and the sponsors who are interested in having their applications being made available from ATIS are requested to contact NAVSEA 04TD to see if there have been any application version problems and to see if application upgrades are available.

Appendix L Electronic TM Deficiencies Evaluation Reports (E-TMDER)

1.0 GOAL

The following information identifies the content and format of the E-TMDERs that are needed to:

a. continue central management of TMDERs by ESTEPS by the sending of standardized files;

b. provide a process that takes advantage of satellite and Local or Wide Area Networks (LAN/WAN) communication advancements; and

c. enable IETM Programs send files that include proprietary data that would be needed by the respective Programs to evaluate E-TMDERs.

Technology is rapidly advancing in different communication methodologies, making on-line transfers between ship and shore activities a practical reality. Standardized file formats are needed so that existing management systems can received and directly process needed Fleet feedback. The standard E-TMDER process has been developed to meet this need. There are several methodologies that a Program can implement in supporting TMDERs. They are described below.

2.0 INTERFACING TO GOVERNMENT PROVIDED TECHNICAL INFORMATION DEFICIENCY EVALUATION SYSTEM (TIDES)

2.1 OVERVIEW

TIDES is a Navy developed program that standardizes the interface to the user initiating an E-TMDER. The TIDES program is initiated by selecting the TIDES icon displayed in Program Manager of Micro-Soft Windows. TIDES allows the user to enter the required TMDER data as described above as well as allowing the user to identify and attach any associated files that could assist the Program in evaluating the TMDER.

2.2 AVAILABILITY

The TIDES executable program is available on the Naval Surface Warfare Center World Wide Web page at "www.nswses.navy.mil". TIDES can be freely distributed fleet wide without the need for licensing or individual site costs.

2.3 DATA FORMAT

To maintain data integrity during transmission and throughout the system, a standard data base format, MS ACCESS, was selected. It retains the entire E-TMDER as a single file, relational data base record.

2.4 LAUNCHING THE APPLICATION

TIDES was developed to work in the MS Windows environment with versions 3.1 or 3.11. To launch the program, simply locate the TIDES group in the Program Manager window and double click on the TIDES icon. Once you have launched the TIDES application you can automatically add new E-TMDERs to the data base. The existing E-TMDERs that have not been forwarded will appear in a list at the bottom of the TIDES form.

2.4.1 Attachments

The TIDES originator may wish to include reference material along with the written description and other TIDES data to enhance the TIDES report. With this in mind the TIDES interface was developed to allow the user to be able to electronically attach an unlimited (subject only to individual system resources) number of binary files (images, scanned hard copy, electronic bookmarks, etc.) to each report which can then be viewed by and tracked through the TIDES process.

2.4.2 Data Collection

TIDES has a labor-saving feature that retains the last data entered for the fields. Thus, the first time the TIDES application is run, most of the fields on the form (i.e. UIC, Work Center, Your Name, and Phone Number) will need to be filled in. The data in these fields will be retained for the next use and as much of this data remains relatively constant, creating an E-TMDER can be achieved with minimal effort. These fields can, of course, be changed at any time as needed.

2.4.3 Transportability

TIDES interface was developed to produce a single file onto a floppy which could then be sent via several vehicles to NSDSA and thereafter the Technical Manual Management Activity. Suggested vehicles thus far are SALTS electronic file transfers.

2.4.4 Review and Chop Cycle

Provisions were made for review and pre-approval by means of electronic signature of the TIDES data by the appropriate agents prior to submission.

2.4.5 The "Make Floppy" Button

The "make floppy" button will compact the E-TMDER data base currently in TIDES and save it to any path the user selects. The purpose of this function is to:

- route the E-TMDERs in the data base via floppy disk or other portable media, and
- allow transportation of the data base by portable media, to it's destination as an attachment to SALTS or E-Mail or even to US Mail as a print out.

3.0 GENERIC TMDER ASCII FILE CONTENT AND FORMAT

If TIDES is not an acceptable E-TMDER solution, then Programs have the option of implementing a flat ASCII file or a hard copy TMDER containing the data historically required. The following information pertains to both the digital standardized TMDER file sent electronically and hardcopy TMDERs sent via U.S. Mail. Only the content information, not formatting, applies to the hard copy TMDER process.

The E-TMDER is an ASCII file having the file name of "TMD####.TXT" where #### represents the sequential number of the TMDER file being sent that day. If the TMDER is being initiated from aboard ship, the #### found in the file name should be then same as the #### found in the last four digits of the Report Control Number described below. By standardizing the TMDER file format, IETMs solutions across Programs will be able to send TMDER data to a NSDSA, the central TMDER tracking activity. The standardized file also allows for different modes of transmittal, whether it be by floppy, satellite, or LAN/WAN communications. Each E-TMDER shall reference data on only one TM. After the core TMDER information, the Program can send additional data that helps the reviewing activity analyze the TMDER.

Each record of information is to be delimited by "carriage return/line feed" (ASCII character 13 and 10). The detailed file structure is as follows:

1. Report Control Number (RCN) is to be the first 14 character of the ASCII record of the electronic TMDER. Example: N63394-95-0016
   a. Characters 1-6 comprise the Unit Identification Code (UIC) of the reporting activity
   b. A dash character follows the UIC
   c. Characters 7-8 represent the last two digits of the calendar year.
   d. A dash character follows the calendar year.
   e. Character 9-12 represent the locally assigned control number obtained from the 3-M coordinator or some other unique sequentially assigned serial log.
2. Technical Manual Identification Number (TMIN) of the IETM.
3. "Volume/Part" of the publication, if applicable, shall follow. The Volume Part shall be in the format of "VOL##PART##". VOL and PART are all capitals. Where Volume or Part or both do not apply, this field can be omitted.
4. "Revision" of the publication, if applicable. The revision number shall be in the format of "REV##". REV being all capitals and ## being any number starting with "01".
5. "Date" the electronic TMDER was initiated in "DD-MMM-YY" format.
6. "Originator's Name and Work Center" must follow. This field shall be as long as needed.

7. Any additional information, data base, history session, screen dump, etc. can be appended to the end of this file

8. DSN or commercial phone number of the issuing activity.

9. The recommended changes (deficiency) of the IETM.

10. Any miscellaneous data such as: user navigation history data, screen copies, IETM computer display attributes (memory, errors codes, BIOS version, etc.) can be appended to the end of this record at the discretion of the IETM implementing activity. Formatting for the appended data must be specified by the acquiring Program. The appended information provides the Program with added information that is useful in analyzing and responding to the TMDER.

4.0 HARD COPY TMDER OUTPUT

Each IETM application must have the ability to print a hard copy document, having the core TMDER information listed below: (cite instruction #)

a. Report Control Number (RCN) - a tracking number to be assigned by the user issuing the TMDER. The RCN includes the UIC.

b. Technical Manual Identification Number (TMIN) of the IETM.

c. Volume/part number of the publication, if applicable.

d. Revision number of the publication, if applicable.

e. Date of the TM or change package.

f. Originator's name.

g. Work Center.

h. Date the TMDER was initiated.

i. DSN or commercial phone number.

j. TM deficiency description.

5.0 FORWARDING OF TMDER INFORMATION

Paper or electronic TMDERs on DOS formatted media, are to be sent to:

Paper: Commander, Naval Surface Warfare Center
Code 5B30
4363 Missile Way
Port Hueneme, CA. 93043-5007

Appendix M Overview of MIL-M-28001 SGML

1.0 OVERVIEW

Publishing in the Continuous Acquisition and Life-Cycle Support (CALS), also known as Computer-aided Acquisition and Logistic Support, environment requires accepting and processing SGML data (in accordance with MIL-M-28001) and graphics data (in accordance with MIL-STD-1840). Publishing CALS data will involve processes not used in traditional publishing. To understand the CALS publishing process, one must be familiar with the CALS standards and, in particular, MIL-M-28001 "Mark-up Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text" that specifies the digital interchange of technical publication text between contractors and the Government.

Developed by an ad hoc committee of industry and Government representatives, MIL-M-28001 is the DoD implementation of the international standard ISO 8879 "Standard Generalized Mark-up Language (SGML)". MIL-M-28001 was originally issued in February, 1988; versions A and B were issued in July, 1990 and June, 1993, respectively. At present MIL-M-28001 is limited to specifying the requirements for the digital data form of hard copy (paper) technical publications to facilitate their automated storage, retrieval, and interchange, and the processing of such technical documents from similar or dissimilar sources. Future versions of MIL-M-28001 will emphasize the document content rather than structure to provide more content tagging, and data base interfaces, as well as capabilities for hypertext constructs and applications.

MIL-M-28001B contains a "template" DTD that establishes a baseline tag set. The DTD that is included in MIL-M-28001B is to be used only as an example. SGML data should be supplied to the Government from a contractor based on a DTD written for a specific governing specification. The DTDs previously contained in MIL-M-28001A have been removed. MI-M-38784C, "Technical Manuals: General Style and Format Requirements," and other Military Specifications now provide or specify the actual DTDs for the appropriate technical publication. When other applications of technical publication automation are identified for which existing DTDs are inappropriate, new DTDs then will be developed. However, any new DTD must use the standard tag set defined in MIL-M-28001B, to the extent feasible, and must conform to the SGML environment of MIL-M-28001B.

2.0 SGML /MIL-M-28001 TUTORIAL

Some familiarity with SGML is needed to understand MIL-M-28001. ISO 8879 defines a method (a set of rules) and a "language" for document representation. SGML provides a formal mark-up procedure used to "tag" or identify elements in the document text. The result is machine processable and independent of system and output environment. SGML notation can be "parsed" (checked for valid syntax and structural conformance). SGML provides a coherent and unambiguous grammar and syntax ("language") for describing

both document content and "structure" - regardless of the type of document or the nature of the document's text.

One of the basic concepts of SGML is that the "content" of data (or the text of the document) is separate from the "form" of that data. The same data content can take on many forms. SGML regards the form (format) as a result of a formatting process performed on the data. SGML information usually is processed into two different output form - paper and electronic.

2.1 CONTENT

ISO 8879 considers "content" to be unformatted source data. In order for the source data to be processable, it must be "tagged" or in some way marked with respect to its content. The tagging rules are defined by the document DTD. Thus "content" is data (or text), tagged in accordance to the rules of a DTD. Content is completely independent of the formatted form of that document.

2.1.1 DTD

The definition of the document's structural components in terms of "elements" (such as paragraph, footnote, or title), "entities" (providing graphic or boilerplate data) and other components is called a DTD. A DTD defines the structure of a specific class of documents. DTDs can be developed for any class of documents including complex technical publications containing mathematical equations and graphic illustrations.

This "structural" approach to modeling documents can be modified by emphasizing data content as opposed to structure by tagging data with respect to other object types such as system component hierarchies ("system", "subsystem", "component", "part", etc.), which are useful in data base and hypertext applications. Thus, a DTD can describe either the structure and content of the document.

2.1.2 Instance

The SGML mark-up of a document (called a document's "instance") is produced by inserting tags into the document's unformatted text, following the rules of the DTD. The tags identify the text's elements (such as titles, paragraphs, tables, graphics, footnotes, etc.) as defined in the document's DTD.

SGML mark-up may be done either manually (ASCII text editor or SGML author/ editor tool) or by automated procedures. The "marked-up" document or instance can be "parsed" with respect to the document's DTD to determine if the document's structure conforms to SGML syntax and the rules of the DTD.

2.2 FORM

Data (content) can ultimately have many forms. For example, a tagged instance can be published as a document or displayed as an interactive manual on a screen. Pieces of data can be extracted and loaded into a data base or used in other documents.

The Output Specification (OS) in MIL-M-28001B provides a standardized method to describe the formatting options for CALS paper documents. At present, MIL-M-28001B considers only published documents. Future versions will consider other types of outputs, such as interactive electronic display and data base linkages.

It is currently easier and more cost effective for the SGML publisher to display SGML data in an electronic form. SGML information has been proven to be very adaptable for electronic display. It is more difficult to publish SGML information in hard copy. Paper publishing of SGML information relies upon the Formatting Output Specification Instances (FOSI) to describe the format; how the printed information will look and behave on a paper. FOSIs are very complicated to write with very little commercial interest in creating them. FOSIs are not required when procuring SGML tagged data for hard copy printing.

2.3 EXAMPLE OF A DTD

As explained above, a DTD defines a document's content and/or structure. It is a concise and rigorous definition, specified in machine processable SGML notation, of a certain type of document. The SGML tags used to mark up a document's text correspond to the elements defined in an appropriate DTD. A document marked-up with SGML tags with respect to a given DTD should be checked against that DTD to be sure that its mark-up conforms to the rules of that DTD. This process is called "parsing" and is done by special computer programs called “parsers".

The following is a simple example of a DTD. A certain type of document called a "technical manual" must have a title and must contain an introduction of at least one paragraph. Moreover, this technical manual must also contain at least one chapter and each chapter must have a title and contain at least one paragraph. These requirements can be stated in SGML notation as:

```
<!DOCTYPE TECHMANL [
<! ELEMENT techmanl -- (title, intro, chapter+) >
<!ATTLIST techmanl secure (uc|c|ts) #REQUIRED>
<!ELEMENT title - o (#PCDATA) >
<!ELEMENT intro - o (para+) >
<!ELEMENT chapter - o (title, para+) >
<!ELEMENT para - o (#PCDATA) >
]>
```

“<!DOCTYPE TECHMANL" begins a document type declaration, and indicates that a DTD will be defined for documents of type "TECHMAN". The actual DTD is contained within the open ("[") and close ("]") square brackets. The "DOCTYPE" declaration provides identification ("name") which instances may use to reference the DTD. The "ELEMENT" declarations define the technical manual elements and specify their structure or composition.

The declaration:

```
<!ELEMENT techmanl - - (title, intro, chapter+) >
```

defines the root element "techmanl" of this DTD. It specifies that the structure of the "techmanl" element consists of a title, introduction, and chapter subelements, in that order.

The "- -" or "- o" in the "ELEMENT" statements are the "tag minimization rules", which specify whether start-tags and end-tags are required in the marked-up text. It is often found that end-tags may be omitted. For example, the first of a chapter comes after the end of the introduction. Thus in the ELEMENT statement for "intro", the "-" means the start-tag is required and the "o" means the end-tag may be omitted.

The expression "#PCDATA", which occurs in the definitions of the "title" and "para" subelements, is an SGML keyword which means that "title" and "para" contain source data (authored text).

The "ATTLIST" declaration defines an element's "attributes" which are ways of modifying or specifying an SGML element's tag. For example, the "ATTLIST" declaration for "techmanl" specifies an attribute "secur" which is used to modify the "techmanl" tag with security information.

2.4 Example of a Marked Up Document

The following is an SGML markup of a simple technical manual with respect to the above DTD:

```
<techmanl secure="uc">
<title>SIMPLE TECHNICAL MANUAL
<intro>
<para>This is the required first paragraph of the introduction.
<para>This is the optional second paragraph of the introduction.
</intro>
<chapter>
<title>OVERVIEW
<para>This is the required first paragraph of the required first chapter.
<para>This is the optional second paragraph of the required first chapter.
<chapter>
<title>DETAILS
<para>This is the required first paragraph of the optional second chapter.
</techmanl>
```

The "secure" attribute modifies the "techmanl" tag specifies the document's security classification as unclassified ("uc"). The end-tags referred to above are those tags beginning with "</". Note that the DTD does not require the "</intro>" ("intro" end-tag); however, it is not incorrect to include it.

After creating a marked-up technical manual, the instance should be parsed against the DTD) to ensure that it follows the rules of the DTD. A parser first parses the DTD for conformance to SGML grammar and syntax, then it parses the marked-up technical manual (the "instance" of the DTD) to ensure that the rules of the DTD have been followed and the tags conform to SGML syntax.

Thus, for example, if an author forgot to include an introduction, the parser would flag this as an error.

Appendix N Overview MIL-D-87269 SGML

1.0 OVERVIEW

This section presents an overview of the data model of MIL-D-87269, known as the Interactive Electronic Technical Manual Data Base (IETMDB) for IETM data. A more comprehensive discussion of the MIL-D-87269 SGML model, as well as a more detailed guidance on implementation, is contained in the NSWC, Carderock Division, report, "Implementation Guide for MIL-D-87269, The Interactive Electronic Technical Manual Revisable Data Base Specification," Revision A, April 1995, CD-NSWC 18-95/01.

As noted in Section 2-3, the Class 4 and 5 IETM is characterized by the capability to provide technical information in a highly interactive manner, displaying only the information that is relevant to the current task or system configuration. The data structure that supports this type of frame oriented display is incorporated in the MIL-D-87269 model.

The objective of MIL-D-87269 is to provide a standardized data structure that allows for delivery of technical information in a manner that supports the functionality required of a Class 4 or 5 IETM. MIL-D-87269 incorporates the use of SGML to provide a standard method of information markup (See Appendix M).

The IETMDB proscribed by MIL-D-87269 is more than just a SGML DTD (See Appendix A) that describes the technical content associated with a technical manual. It is unique because in addition to allowing for the description of the content and structure of the technical information, it also provides a standard method to convey the logic and behavior required for display of the technical information. For example, using SGML to provide technical information suitable for printing a technical manual would only require tags that define the content and structure of the manual such as, section, chapter, para, etc. The layout of that information for the printed manual would be controlled by the style and structure of the final version, e.g. sections will contain chapters, which contain paragraphs, etc. All of the information is put in the printed book in linear predetermined sequence. In an IETM, the presentation of information is not sequential nor linear as it is in the paged, printed book format. The information to be presented on the screen is determined at display or run time by a variety of current existing conditions, such as what information was previously displayed, what maintenance steps have been completed, readings on the equipment under repair, etc. This interactive display of information based on real time evaluation of conditions is the logic or behavior that must be integrated with the technical content.

The second characteristic that distinguishes the IETMDB from other data definitions is its use of the ISO/IEC 10744 standard for Hytime. Hytime is a standard Hypermedia/ Time-based structuring language. Hytime is a refinement and enhancement to SGML that allows for a standard markup language for representing hypertext, multimedia, hypermedia, time-based sets of information. Since the IETMDB supports the delivery of technical information that will be presented using methods such hypertext and hypermedia, Hytime

SGML extensions provided a standard method for description of these functions in the IETM. Hytime uses SGML syntax and can therefore be processed by standard SGML software tools, however if the SGML tools do not incorporate the ability to act on the Hytime instructions, these instructions are ignored and do not render the data set invalid. This backward compatibility allows the IETMDB to be used regardless of whether all the functions of Hytime are required or incorporated.

2.0 IETMDB ACQUISITION CONSIDERATIONS

A complete understand of the IETMDB requires an in-depth knowledge of SGML, Hytime, and IETM delivery systems that is beyond the scope of this overview. However, there are several concepts incorporated in the MIL-D-87269 that should be understood in order to complete the IETM acquisition.

MIL-D-87269 consists of two distinct sections or layers that are used to define the IETMDB. One of the layers (known as the Generic) is the basis for building a specific acquisition using MIL-D-87269. The second layer (known as the content) will be different for each acquisition as it is specific to each IETM:

a. the Generic Layer contains the elements common to all MIL-D-87269 IETMDB that conforms to the standard models for creating the unique and specific Content Layer components required for an individual acquisition.

b. the Content Layer contains the elements required to represent the application-specific information presented by a specific IETM.

An IETMDB that is a conforming system is required to:

a. conform with the HyTime and IETMDB architectural forms proscribed by MIL-D-87269

b. consist of complete links made to external files, and

c. correct application of links.

For an IETMDB to be considered correct and conforming it must support a default behavior for all forms and element types specified in the Generic Layer. The methods by which these capabilities are achieved is not specified.

2.1 IETMDB GENERIC LAYER

The IETMDB Generic Layer provides mandatory requirements for the definition of IETMDB conforming DTDs. Both SGML and HyTime features have been used to implement the functionality of the IETMDB mechanisms.

The Generic Layer is not a DTD. It is a layer of constructs that can be used by any DTD and IETM application implemented in accordance with the requirements of MIL-D-87269. It is provided by referencing a SGML attribute defined as the "ietmdb-a" entity at the beginning of the application.

In the Generic Layer, the two requirements that are of importance to the acquisition manager are the use of "Architectural Forms" and the required SGML element types. The IETMDB architectural forms and the SGML element types required for the IETMDB are briefly discussed in the following sections.

2.1.1 Architectural forms

Architectural forms are a way of logically describing building blocks for an application without constraining the application-specific information that a developer might need to add. Only information that must be standardized for interoperability is defined rigorously.

Architectural forms enable the DTD designer to rapidly create a legal and safe "blueprint" or template for the hypermedia application. That design is the IETMDB DTD. Any instance of that design is an IETM.

Just as standard window styles and sizes are used by an architect to create a design for a house, architectural forms, element types and attribute specification lists of the Generic Layer of the IETMDB enable an IETMDB designer to create a Content Layer DTD that meets the needs of an specific IETM.

Only necessary components are rigorously defined, but the general needs for MIL-D-87269 implementors are flexibly supported to enable applications to tailor the design to the mission requirements. The designers of the IETMDB specification may add element types to the Generic Layer according to evolving requirements. The IETMDB specification can evolve independently of IETMDB applications, yet can continue to provide new capabilities for them as needs dictate.

MIL-D-87269 specifies five IETMDB architectural forms, or "functional node types":

- Node - the fundamental node type used to model an independent unit of information.
- Node-alts - a node type used to model alternative units of information.
- Node-seq - a node type used to model sequential presentation of units of information.
- If-node - a node type used to model a decision.
- Loop-node - a node type used to set sequential nodes to present repeatedly.

2.1.2 Nodes

Nodes are units of information for the human reader or for the IETM presentation system. Some nodes determine order or presentation, enable the selection of alternative versions of the same information, or set criteria for deciding if and how many times a unit is to be presented. A unit of information may be used by the processing system or the user. Each node contains information about a subject.

2.1.3 Links.

The relationships among nodes are expressed both through the hierarchy of the nodes as declared in the DTD, and by references made in some nodes to other nodes. These references are called "links".
The use of links permits alternative organizations of the information. The user can traverse the information in different orders depending on the type of link and sometimes conditions that must be met before that information is presented.

The ability to traverse the nodes in different orders depending on the need of the user of the information at different times is the strength of the IETM over conventional technical manuals. A simple example is when a technical manual describes different models of a single system in one TM. In conventional manuals, lists of effectivity are used to guide the technician to the repair and replace procedure appropriate for a given serial or version of the equipment. In the IETM, conditions can be recorded and used to determine which repair and replace node to present to the technician based on information such as the current version number. To the user of the IETM system, it appears as if the information is presented in a smooth and continuous flow. To the IETM system itself, conditions are continuously evaluated and decisions are made about which node to present next.

2.1.4 Maintenance of the Generic Layer

The Generic Layer is a mandatory component of the IETMDB specification. Application designers should not add or customize components in the Generic Layer as this weakens the layer as a mechanism for a standard exchange of interoperable files. It is just as easy and more effective to add these definitions to the Content Layer.

2.1.5 Required MIL-D-87269 SGML element types

The regular element types of the Generic Layer are SGML element types that conform in all ways to the requirements of ISO 8879. These element types are resources for use in any Content Layer as they define a base set of elements that any MIL-D-87269 application might need to support.

Link is an element derived from the "ilink" architectural form of the ISO/IEC 10744 HyTime standard and included in the Generic Layer. All implementors of IETMDB applications must use the same definition for a link element.

2.2 IETMDB Organizational Level Content Layer

MIL-D-87269 uses an Organization Level (O-Level) Technical Manual DTD to illustrate the default content layer, however it is not required to be used in its exact form in order to produce a conforming IETMDB. As outlined in Section 5, a DTD should be delivered to the government as defined in the CONOPS. This DTD would be based on the required elements of the generic layer of MIL-D-82769 and would provide for the content layer of the IETMDB. The O-Level DTD of MIL-D-87269 could be used as a guide but specific tailoring will be required by each IETM acquisition.

Appendix O ASN Memorandum on Use of Specifications

The content of the above memorandum has been recreated below:

MEMORANDUM FOR THE DISTRIBUTION LIST

Subj: NAVY IMPLEMENTATION OF DEPARTMENT OF DEFENSE POLICY ON SPECIFICATIONS AND STANDARDS REFORM

Ref: (a) Secretary of Defense Policy memo of 29 Jun 94

Encl: (1) Department of Navy Standards Improvement Program Policy

It is the Department of the Navy's intent to fully implement the principles of the Department of Defense acquisition reform initiatives. The purpose of this memorandum is to provide initial guidance for the immediate implementation of the new Secretary of Defense policy promulgated by reference (a), regarding the use of specifications and standards by all Navy programs.

The provisions of this policy guidance are outlined in enclosure (1), and are effective immediately. The provisions apply to all acquisition category programs and automated information systems programs for new systems, major modifications, upgrades to current systems, non-developmental items, and commercial items. In order not to disrupt on-going solicitations of contract negotiations, exemptions to this guidance may be authorized by the Milestone Decision Authority for contracts scheduled to be awarded by 1 January 1995. Further amplification is provided by enclosure (1). Acquisition Strategy Reports and Acquisition Plans shall address compliance with this new policy guidance.

To direct and coordinate this policy within the Navy, Mr. Timothy Douglass will serve as the Department's Acquisition Reform/Standardization Improvement Executive. He will also assist me in developing a master plan of action and milestones for the Navy Standards Improvement Program within 60 days of this memorandum, establishing a budget for common program requirements and developing attendant training. Each Systems Commander is requested to identify their Command Standardization Improvement Executive within fifteen days to oversee the implementation of the guidance within the Systems Commands, appropriate Program Executive Officers, and Direct Reporting Program Managers, and to work with the Acquisition Reform/Standardization Improvement Executive in developing/implementing the Navy Standards Improvement Program.

This initial guidance will be amplified in follow-up memoranda reflecting lessons-learned in implementing this significant departure from past practices. It shall remain in effect until such guidance is amended or incorporated in updates to Secretary of the Navy Instruction 5000.2A.

The Director, Naval Nuclear Propulsion, will determine implementation of the reference (a) policy for all matters pertaining to Naval Nuclear Propulsion pursuant to Public Law 98525 (42 USC Section 7158 note), and notify me of those implementation plans.

(Signed)
Nora Slatkin

Distribution:
ASN(FM)
ASN(M&RA)

ASN(I&E)
CNO
CMC
COMNAVAIRSYSCOM
COMNAVSEASYSCOM
COMNAVSUPSYSCOM
COMSPAWARSYSCOM
COMNAVFACENGCOM
COMMARCORSYSCOM
OGC
OPA
CNR
COMSC
COMOPTEVFOR
MCTEA DC/S I&L HQMC (MC-LB)
PEO(SUB)
PEO(MIW)
PEO(USW)
PEO(TAD)
PEO(T)
PEO(A)
PEO(CU)
PEO(IAST)
DRPM(AEGIS)
DRPM(SSP)
DRPM(AAA)
DASN(AIR)
DASN(SHIPS)
DASN(MUW)
DASN(C4I)
DEPUTY(RAP)
DEPUTY(EFP)
DEPUTY(APIA)MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN , JOINT CHIEFS OF STAFF
UNDER SECRETARIES OF DEFENSE
ASSISTANT SECRETARY OF DEFENSE (COMMAND, CONTROL, COMMUNICATION, AND INTELLIGENCE)
GENERAL COUNSEL
INSPECTOR GENERAL
DIRECTOR, OPERATIONAL TEST AND EVALUATION
DIRECTORS, DEFENSE AGENCIES

Appendix P Draft SecDef Memorandum On Delivery Of Digital Data Products

The content of the above memorandum has been recreated below:

SUBJECT: Acquisition of Information in Digital Format

It is the policy of the Department to conduct business in the most efficient and cost effective manner as possible. The effective generation, exchange, management, sharing, and use of digital information to support our defense systems is a crucial part of improving the Defense acquisition process.

I realize that throughout the Department, many Program Managers have already begun to implement the necessary actions to move from a manual, paper-intensive operation to an integrated, highly automated acquisition and support process. To be completely effective, however, it is imperative that this migration be accelerated Department-wide. Therefore, I am mandating that all requirements for delivery of technical information after January 1996 stipulate digital/electronic formats.

Effective immediately, all Program Managers shall:

- plan for the on-line access to, or delivery of, defense system information in digital form.
- review all existing information relevant to weapon systems with an expected life cycle greater than ten years, at a minimum, to initiate the actions necessary, including contract changes, to convert that information to appropriate digital/electronic formats, using accepted national and international standards. This is required for systems with an expected life cycle of ten years, and must be considered for all others.
- request waivers for those acquisitions for which digital/electronic formats may not be feasible (older systems with limited life times). Simple or expandable items with minimal data may be effective in electronic form.
- requests for waivers must include justification based on full life cycle cost.

The Under Secretary of Defense (Acquisition and Technology) shall address these requirements in the next update to DoDD 5000.1 and DoDI 5000.2

Willian J. Perry

Appendix Q ATIS - CD-ROM Management Interface (IETM.NDX File)

1.0 GENERAL

The following procedure will provide a method for ETMs to work in conjunction with ATIS. The first topic discusses how to provide information to ATIS so that it can list the ETM in the ATIS library and when selected initiate the ETM for display. The execution of an ETM is controlled by the executable name, the command line parameters, and the default drive and directory. The IETM.NDX definition provides ways to change each of these items at run time. The second topic discusses limitations on what system changes an ETM can make to a target system. The basic answer is that except for a well defined portion of a hard drive nothing can be changed. This is because any other changes may interfere with the rest of the system.

1.1 CONTENTS

a. IETM.NDX FORMAT

b. Processing Overview

c. Examples

d. Document Management

e. Identifier Control

f. Processing Details/Program Design

g. IVNAV Processing

h. ETM Installation Limitations

i. Jukebox Requirements

1.2 COMMENTS

Please provide any comments or refer any questions to:

- NAVSEA 04TD3, Andy Kelly, (703) 602-8700 ex 220, DSN 332-8700

2.0 INTERFACE FILE - IETM.NDX FORMAT

The IETM.NDX file is in the root directory of the CD-ROM. One record per document entry point should be created. Each record consists of printable ASCII characters terminated by a carriage return / line feed. The data fields are comma separated with a backslash used as an escape character. The format for each record is as follows:

Note - The UPPERCASE NAMES represent a group of data fields which are further described.

line_format, entry_type, replace_act , system, family, DOCUMENT_ID_DATA, COMMAND_LINE_DATA

- line_format char (8) = IETM1

This field indicates that the record has the format described below. If anything in the format changes, this value will change. This includes changes to the DOCUMENT_ID_DATA, COMMAND_LINE_DATA or CLASSIFICATION_DATA field groups. This value would also change if other types of technical data such as CAD drawings and their display engine are included on CD-ROM and drawing identification data is needed on the line.

- entry_type char (12)

This field is used to differentiate between inventoriable and non-inventoriable technical manuals.
The field is divided into two parts by an underbar which must always be there:

- TM_ - inventoriable technical manual
- TM_GROUP - non-inventoriable entry that identifies a group of inventoriable technical manuals
- TM_ELEM - non-inventoriable subelement of an inventoriable technical manual

This field could be used to identify tactical manuals, navigation manuals, training manuals, or commercial CD-ROMs. This field could also be used to identify the menu pick used to access the documents. Thus, the technical and tactical documents could have separate menu picks that help the user to more quickly find a needed document.

- replace_act char (8)

Replacement Action
Value =1 - Replace older IETM doc_id with the newer IETM doc_id using date. UNKNOWN date is always older.
Value =2 - Always add IETM document, never replace. (IETM always replaces raster manual with same doc_id)

- system char (8)

All documents that have the same system field value must be able to run in the same directory. The system field is used to name a directory that the document developers can be guaranteed will not be used by other developers.

The directory is ietmdir\system. The ietmdir value is provided by the IETMDIR environmental variable and the system value is provided by the system name. The values used for system are controlled because the activity that uses a system name must guarantee that all IETMs that use this system name will work in the same environment. All

documents with the same system must have the same family. It is implied but not required that two developers must not share the same system name because they would have to ensure that their documents using the same system name would not interfere with each other. Control of these values is described in 6.0 below.

- family char (8)

The family field identifies documents that use the same display engine. For IV.EXE it could be IV and for GREADER.EXE it could be GREADER. This value defines a directory that can be used by the family. The directory is ietmdir\family. The ietmdir value is provided by the IETMDIR environmental variable and family is provided by the family name. Control of these values is described in 6.0 below.

- DOCUMENT_ID_DATA = doc_id, revision , date,title,change_history,CLASSIFICATION_DATA

  - doc_id char (64)
  - revision char (8) Place holder for revision, data will be placed in database but is currently not used.
  - date char (8) YYYYMMDD or UNKNOWN
  - title char (254)
  - change_history char (254)

    ⇒ For the original, the change history is a string of length zero. This is indicated by consecutive commas with no intervening space.

    ⇒ For a document with changes, the change history is a comma separated list of change levels in their insertion order.

    ⇒ If a change is not a regular change (RAC 1 vice CHANGE 1), the change label is included with the level separated by a space. Thus CHANGE 1, CHANGE 2, RAC 1, CHANGE 3 would be 1,2,RAC 1,3. As noted below this would be entered in the file as 1\,2\,RAC 1\,3 to indicate that these commas do not separate data fields.

- CLASSIFICATION_DATA = classification,restrictions,releases,sci_level,diglyph,codeword

These fields are intended only to provide a place to store the classification information from a document. ATIS does not use this information to limit access to the document or to provide security markings for the document. It is the developers responsibility to determine how to use these fields. The classification field is the only one that must have a value.

  - classification char (1)= U,C,S,T must have a value
  - restrictions char (254)

⇒ The restrictions field identifies all restrictions that apply to the document. Examples of the type of values which shall be used are:

NATO, NOFORN, PROPRIETARY, FOUO, NO CONTRACT.

⇒ Values shall be:
- alphabetically sorted
- separated by blanks with duplicates removed
- have blanks within values replaced by an underbar

⇒ If the five values listed above were to apply to a document, this field would have the following value:

FOUO NATO NO_CONTRACT NOFORN PROPRIETARY.

♦ releases char(254)

⇒ The releases field identifies to whom (which country or countries, etc.) this document may be released. Examples of the type of values are:

NATO, GERMANY, CANADA, CONTRACTOR.

⇒ Values shall be:
- alphabetically sorted
- separated by blanks with duplicates removed
- have blanks within values replaced by an underbar

⇒ If the four values listed above were to apply to a document, this field would have the following value:

CANADA CONTRACTOR GERMANY NATO.

♦ sci_level,diglyph,codeword

⇒ These fields will be NULL (,,,) but are kept as place holders. They will not be in the database.

- COMMAND_LINE_DATA = default_executable_file,command_line_arguments, default_directory, default_selection

♦ default_executable_file char(128)

⇒ This defines the first part of the command line that is used to display a document if it is not overridden by an INI entry.

♦ command_line_arguments char(128)

⇒ With the processing noted below this field is combined with an executable file to form the command line that is executed to display the specified document. The portion of the command line that specifies the initial page to be displayed should be replaced by <SEL>. The entry point for each document should be the table of contents since the desired manual has already been selected via ATIS. The value

that specifies the initial page to be displayed is placed in the default_selection field.

- default_directory char(128)
  - ⇒ This defines the drive and directory that is to be the current drive and directory when the command line is executed.
- default_selection char(128)
  - ⇒ This is the default value of the <SEL> string if no other is specified. This should display either the title page or the table of contents of the selected document. This is intended to be that portion of the command line that specifies the initial page to be displayed.

3.0 PROCESSING OVERVIEW

The purpose of the IETM.NDX data is to enable ATIS to generate the equivalent of the Command Line and Working Directory entries that are associated with a Program Manager icon. This is a five step process as follows:

- Generate the Working Directory String.
- Generate the Executable String.
- Generate the Selection String.
- Generate the Command Line Arguments.
- IETM Execution.

An overview of each of these steps including a discussion of the string replacement process and the predefined target strings is provided below.

3.1 STRING REPLACEMENT

To provide the flexibility needed to change at least the CD-ROM drive letter, ATIS uses iterative string replacement during the generation of the command line and working directory strings. Angle brackets (<,>) are used to identify stings that are to be replaced. Thus if the string: <VOL><XXX>BIN\GREADER was the default executable string, the <VOL> and <XXX> would have to be replaced before the string could be used. The value assigned to <XXX> could contain other string replacement targets, so ATIS is required to replace strings until there are no replacement targets in the string. The processing details define when ATIS assumes there is an error and exits from the replacement loop. The examples used in this section do not address the use of backslash as an escape character. The details of this are covered in the processing details section.

3.2 PREDEFINED REPLACEMENT VALUES

To allow the command line and working directory string to include run time values, predefined target strings have been defined. The complete list is defined in the processing details section. Some of the more important values are <IETMDIR>, <SYS>, <FAM>, <VOL>, <EXE>, <WORK>, and <SEL>.

The first four have relatively static values.

- <IETMDIR> is the value of the IETMDIR environment variable.
- <SYS> is the system value from the IETM.NDX line.
- <FAM> is the family value from the IETM.NDX line.
- <VOL> is the path to the root directory of the CD-ROM that contains the IETM.NDX file. For a CD-ROM in drive t, <VOL> would have a value of t:\ .

The last three have values that can be changed by run time values and INI files. The resolution of these values are discussed in the following paragraphs.

3.3 WORKING DIRECTORY

The <WORK> replacement target defines the working directory. This string is evaluated using the following process.

If WORK= is defined in the [<SYS>] section of the <IETMDIR><SYS>\<SYS>.INI file, use that value and perform string replacement until no targets are left. If the replacement ended normally, use that value for <WORK> and the working directory string. If WORK= was not defined or if the replacement process ended abnormally, perform the following processing.

If WORK= is defined in the [<FAM>] section of the <IETMDIR><FAM>\<FAM>.INI file, use that value and perform string replacement until no targets are left. If the replacement ended normally, use that value for <WORK> and the working directory string. If WORK= was not defined or if the replacement process ended abnormally, perform the following processing.

Use the default directory value from IETM.NDX and perform string replacement until no targets are left. If the replacement ended normally, use that value for <WORK> and the working directory string. If the replacement process ended abnormally, a null string is used.

3.4 EXECUTABLE

The <EXE> replacement target defines the executable portion of the command line. This string is evaluated using the following process.

If EXE= is defined in the [<SYS>] section of the <IETMDIR><SYS>\<SYS>.INI file, use that value and perform string replacement until no targets are left. If the replacement ended normally, use that value for <EXE> and the executable string. If EXE= was not defined or if the replacement process ended abnormally, perform the following processing.

If EXE= is defined in the [<FAM>] section of the <IETMDIR><FAM>\<FAM>.INI file, use that value and perform string replacement until no targets are left. If the replacement ended normally, use that value for <EXE> and the executable string. If EXE= was not defined or if the replacement process ended abnormally, perform the following processing.

Use the default executable value from IETM.NDX and perform string replacement until no targets are left. If the replacement ended normally, use that value for <EXE> and the executable string. If the replacement process ended abnormally, a null string is used.

3.5 SELECTION

The <SEL> replacement target defines the portion of the command line that identifies the initial page to display. This string is evaluated using the following process.

If a selection value is provided in the call to ATIS, use that value and perform string replacement until no targets are left. If the replacement ended normally, use that value for <SEL>. If SEL= was not defined or if the replacement process ended abnormally, perform the following processing.

Use the default selection value from IETM.NDX and perform string replacement until no targets are left. If the replacement ended normally, use that value for <SEL>. If the replacement process ended abnormally, a null string is used.

3.6 COMMAND LINE ARGUMENTS.

The command line arguments are generated by using the command line arguments value from IETM.NDX and performing string replacement until no targets are left. If the replacement ended normally, that value is used for the command line arguments. If the replacement process ended abnormally, a null string is used. Similar to the processing for <WORK> and <EXE>, when a replacement target that has not been seen is found, the system and family INI files are checked.

3.7 IETM EXECUTION

When all string generation has been completed, ATIS changes the default drive and directory to the values specified by the working directory string (<WORK>). The executable string (<EXE>) and command line arguments are concatenated and the result is executed. The working directory is then restored.

4.0 EXAMPLES

This section will use an example IETM.NDX line and describe the command line and working directory generation process.

The IETM.NDX line is:

IETM1,TM_,LM2500,GREADER,S9234-AD-MMO-040,UNKNOWN, VOLUME 4 PROP GAS TURBINE\, MOD LM2500\, VOL 2 PT 2,,U,,,,,,<vol>GREADER\\greader.exe,-c <ietmdir><sys>\\A6520303.INI maingas2.gui

<sel>,<vol>,SYS\\TOC\\TOC4\\TOC4P0.GUI

The values extracted from this line are:
system=LM2500
family=GREADER
default executable file=<vol>GREADER\\greader.exe
command line arguments=-c <ietmdir><sys>\\A6520303.INI maingas2.gui<sel>
default directory=<vol>
default selection=SYS\\TOC\\TOC4\\TOC4P0.GUI

The AUTOEXEC.BAT file contains the following line: SET IETMDIR=c:\ietm\

4.1 EXAMPLE 1

With the CD-ROM in drive t and no system (c:\ietm\lm2500\lm2500.ini) or family (c:\ietm\greader\greader.ini) INI file the string generation process is as follows:

a. No WORK entry is defined in a family or system INI file so the default directory entry of <vol> is used. <vol> is a predefined target string that has the value of the CD-ROM root directory, so its value is t:\.

b. No EXE entry is defined in a family or system INI file so the default executable file entry of <vol>GREADER\\greader.exe is used. Using the <vol> values as above and removing escape backslashes, the executable file string has a value of t:\GREADER\greader.exe.

c. The command line arguments entry is -c <ietmdir><sys>\\A6520303.INI maingas2.gui <sel>. The <ietmdir> target has the value of the ietmdir environment variable so its value is c:\ietm\. The <sys> target has the value of the system entry from IETM.NDX so its value is LM2500. The <sel> target has the value of the default selection entry from IETM.NDX so its value is SYS\\TOC\\TOC4\\TOC4P0.GUI.

   Replacing the targets in the command line with their values and removing escape backslashes, the command line arguments string has the value of -c c:\ietm\LM2500\A6520303.INI maingas2.gui SYS\TOC\TOC4\TOC4P0.GUI

d. To execute the IETM, ATIS sets the default drive and directory to t:\ and executes the following command:

   t:\GREADER\greader.exe -c c:\ietm\LM2500\A6520303.INI maingas2.gui SYS\TOC\TOC4\TOC4P0.GUI.

This runs GREADER.EXE from the CD-ROM but uses the data in c:\ietm\LM2500.

4.2 EXAMPLE 2

With the CD-ROM in drive s and a system INI file (c:\ietm\lm2500\lm2500.ini) but no family
c:\ietm\greader\greader.ini) INI file the string generation process is as follows:

a. The system INI file (c:\ietm\lm2500\lm2500.ini) is as follows:

   [lm2500]

   exe=<ietmdir><fam>\\greader.exe

b. No WORK entry is defined in a family or system INI file so the default working directory entry of <vol> is used. <vol> is a predefined target string that has the value of the CD-ROM root directory, so its value is s:\.

c. The EXE entry is defined in the system INI file and its value is <ietmdir><fam>\\greader.exe. Using the <ietmdir> value of c:\ietm\ and the <fam> value of GREADER, and removing the escape backslashes, the executable file string has a value of c:\ietm\GREADER\greader.exe.

d. The command line arguments entry is -c <ietmdir><sys>\\A6520303.INI maingas2.gui <sel>. The <ietmdir> target has the value of the ietmdir environment variable so its value is c:\ietm\. The <sys> target has the value of the system entry from IETM.NDX so its value is LM2500. The <sel> target has the value of the default selection entry from IETM.NDX so its value is SYS\\TOC\\TOC4\\TOC4P0.GUI.

   Replacing the targets in the command line with their values and removing escape backslashes, the command line arguments string has the value of -c c:\ietm\LM2500\A6520303.INI maingas2.gui SYS\TOC\TOC4\TOC4P0.GUI

e. To execute the IETM, ATIS sets the default drive and directory to s:\ and executes the following command:

   c:\ietm\GREADER\greader.exe -c c:\ietm\LM2500\A6520303.INI maingas2.gui SYS\TOC\TOC4\TOC4P0.GUI.

This runs the GREADER.EXE on the hard drive and uses the data in c:\ietm\LM2500.

5.0 DOCUMENT MANAGEMENT

The doc_id is the primary field used for managing IETMs within ATIS. The date and change_history fields are used for secondary identification. During import ATIS uses the doc_id to delete any existing document line that has the same doc_id as the document line being imported.

The doc_id is also used to identify the document entry point, making it available as a reference for external programs and the other ATIS modules. date or change_history, if provided, are used in conjunction with the doc_id to identify a requested document.

The doc_id therefore must have controlled values. If two different IETMs use the same value for different documents, ATIS treats one as a replacement for the other.

6.0 IDENTIFIER CONTROLLER

The IETM.NDX file uses the following three fields for identification purposes: system, family, and doc_id.

For ATIS and the IETMs to work correctly the values used for these fields are controlled by TBD. The point of contact for obtaining or registering specific values for these fields is TBD.

7.0 PROCESSING DETAILS /PROGRAM DESIGN

This data will be processed twice: once during import when the data is entered into the database and a second time when the command line is generated to display a document.

7.1 DATA BASE IMPORT PROCESSING RULES:

a. Each input line is terminated by a carriage return / line feed and must contain only printable ASCII characters.

b. Commas (,) are used separate the data fields. If a data field contains a comma, it must be preceded by a backslash (\).

c. For all fields, except the COMMAND_LINE_DATA fields, the escape backslashes are removed before the data is stored in the database. For the COMMAND_LINE_DATA fields the escape backslashes are not removed from the data stored in the database. The backslashes are removed by scanning the data string from left to right. If the scanned character is not a backslash it is added to the output string. If the scanned character is a backslash the character following the backslash is added to the output string. Scanning is resumed at the character following the character just added to the output string. A single backslash at the end of a string is removed.

7.2 COMMAND LINE GENERATION PROCESSING RULES:

a. Angle brackets (< >) are used to delimit the objects for string replacement. For example, /dir=<homedir> indicates that <homedir> will be replaced by another string during command line generation. If a COMMAND_LINE_DATA data field contains an angle bracket that is not to be used for string substitution it must be preceded by a backslash (\). All replacement strings are treated as uppercase (e.g. <HOMEDIR> and <homedir> have the same replacement value).

b. The working directory is generated by performing the string replacement process on <WORK>. If the result of evaluating <WORK> was an error or a null string the evaluation of the COMMAND_LINE_DATA default directory entry is used in its place. The string replacement process is performed until there are no more replacement targets. This value is then used as the replacement for <WORK>.

c. The executable file name is generated by performing the string replacement process on <EXE>. If the result of evaluating <EXE> was an error, a null string, or a non-existent file the evaluation of the COMMAND_LINE_DATA default executable file entry is used in its place. The string replacement process is performed until there are no more replacement targets. This value is then used as the replacement for <EXE>.

d. The command line is generated by concatenating <EXE>, a space, and the command line arguments. The string replacement process is performed until there are no more

replacement targets. After the command line is generated the backslashes are removed as in step 3 of the database import processing.

e. Backslashes are removed from the working directory as in step 3 of the database import processing.

f. The string replacement process that is performed to generate the working directory, executable file, and command line is as follows:

- The string is scanned from left to right until a target right angle bracket is found. The preceding target left angle bracket is found. The string between the angle brackets is the target string which is evaluated and the target string along with the target angle brackets is replaced by the results of the target string evaluation. If the preceding target left angle bracket could not be found an error message is generated. A target angle bracket is an angle bracket immediately preceded by an even number of consecutive backslashes. Zero is treated as an even number.

- The target string evaluation process is as follows:
  - <IETMDIR> = The IETMDIR environment variable (e.g. C:\ATISRUN\IETM\) <VOL> = the drive and path needed to access the CD-ROM root directory(i.e. S:\ if it is in drive S. For a Celerity jukebox this would be something like J:\CDROM\LLLL\ where LLLL is the CD-ROM volume id) of the CD-ROM from which the data was imported. The CD-ROM must have an IETM.NDX file in the root directory. If the volume is not available, the call will be aborted. <VOLxxx...xxx> = the drive and path needed to access the CD-ROM root directory(i.e. S:\ if it is in drive S. For a Celerity jukebox this would be something like J:\CDROM\LLLL\ where LLLL is the CD-ROM volume id) of the CD-ROM which xxx...xxx as its volume id. The CD-ROM must have an IETM.NDX file in the root directory. If the volume is not available, the call will be aborted.

  <LINEFORMAT> = the line_format.
  <SYS> = the system name.
  <FAM> = the family name.
  <SEL> = the select value specified by the TMLIST Display command. If no select value was specified, the default selection is used.
  <WORK> and <EXE> see 2 and 3 above.
  <NULL> = null string of length zero.
  <SPACE1> ... <SPACE9> = One to nine spaces.
  <USER> ATIS users name.
  <PASS> ATIS password

- All other target strings are evaluated using INI files. There are two types of INI files: family and system with the system INI file being searched first. The system INI files are <IETMDIR><SYS>\<SYS>.INI. The family INI files are <IETMDIR><FAM>\<FAM>.INI. The section is [<FAM>] or [<SYS>] depending the type of INI. For example, if the system is LM2500 and the family is GREADER, <XXX> would be evaluated by searching

C:\ATISRUN\IETM\LM2500\LM2500.INI for XXX= in section [LM2500]. If nothing was found the evaluation process would continue by searching C:\ATISRUN\IETM\GREADER\GREADER.INI for XXX= in section [GREADER]. If this also failed an error is returned.

- Errors return a null result.
- The scheme used for INI files assumes that separate directories will be used for each family and that they'll have a common root. All definitions could have been put in ATIS.INI but that file is already getting large and this would significantly increase its size. There would also be a problem of getting it updated during the install procedure. The scheme described has the advantage of making each install independent except for other CD-ROMs in the same system which all have the same developer. Combining the family INI data into a single INI file has the advantage of fewer INI files but also has the problem of how to combine the results of independent installs. Before a decision is made a design limit on the number of systems and families should be developed.
- If there are going to be 20 families with 50 systems each, the directory structure should have a family layer otherwise there will be 1000 directories in the IETM directory. Recommend that this be done now but a deep directory structure increases the length of command lines that include full pathnames. This limits how much can be put in the command.
- The replacement process is iterative with string length limit of 1024 and a iteration limit of 100. Thus if a string that is generated during a replacement step is longer than 1024 characters the process will terminate with an error. Or if after 100 iterations there are remaining target strings the process will terminate with an error. Also if there were no target left angle brackets encountered before the first target right angle bracket the process will terminate with an error.

8.0 IVNAV PROCESSING

a. The IVNAV process:
   - Change the current drive and directory to the working directory,
   - Execute the command line,
   - Restore the current drive and directory.

b. An option will be provided that displays the result of the string replacement process. This is to help debugging any problems.

c. Database. The main database table needed to support the file is:

   ⇒ Line_format char(8)

   ⇒ System char(8)

   ⇒ Family char(8)

- ⇒ Doc_id char(64)
- ⇒ Date char(8)
- ⇒ Title char(250)
- ⇒ Change_history char(254)
- ⇒ Classification Id number*
- ⇒ Default_executable_file char(128)
- ⇒ Command_line_arguments char(128)
- ⇒ Default_directory char(128)
- ⇒ Default_selection char(128)
- ⇒ MediaId char(11) CD Volume Id
- ⇒ UniqueId number *

*ATIS Generated

9.0 ETM INSTALLATION LIMITATIONS

Developers, without knowing what everybody else is doing, tacitly assume that their product is the only product being used. As more ETMs become available, there is a greater chance that the way they are run will interfere with other ETMs or with ATIS. In order to prevent this from happening, the ETMs must meet the following requirements before they can be run on an ATIS capable system. These requirements limit how an install procedure may change the target system and also limit what a ETM can assume is available when it executes. The ETMs can cause problems just by being installed on a system even if they are not imported into ATIS. These requirements are very limiting and may not be met by any existing ETMs. In this case we need to waive the requirements, but have the potential problems identified so other steps can be taken to prevent the problems from occurring.

a. A local directory will be defined for each ETM or group of ETMs and this local directory is the only place on the disk that may be changed. The root for these local directories will be defined by the IETMDIR environment variable. The local directory path is constructed by concatenating the value IETMDIR (which ends in a backslash) with the registered system name.

b. Two different retrieval engines must not use the same executable name. Two different versions of the same retrieval engine must "behave." This means that, if the software license permits using a new version in place of an old version, a newer version must correctly work with data produced for an older version. This will then require the new version to be defined as the current executable for a family of retrieval engines. If the use of the programs is restricted to certain documents, then the executable name must be different and the must act as different programs.

c. A minimum software environment will be defined that at a minimum addresses: FILES, BUFFERS, environment variables, available Windows fonts, and available memory - conventional, extended, and expanded.

d. The AUTOEXEC.BAT or CONFIG.SYS files shall not be changed automatically nor can an ETM require any changes except those needed to meet the minimum software environment mentioned in c. This is primarily to prevent changes to the path and environment variables. Allowing programs to change the path can produce problems by making the path too long or by changing what directories are searched and the order they are searched. In either case programs that used to work may now fail because the path was changed. Likewise, adding and changing environment variables can cause problems by using environment space or by changing values needed by other programs. Because it is impossible to know the setup for every system on which an ETM will be installed, there is no way to define what would be permissible changes.

e. Neither the install procedure nor the program shall change WIN.INI or any INI files not in the local directory. This prevents WIN.INI from growing to where it slows down execution speeds and it can make uninstalling an ETM easier. This requirement will probably need changes to the retrieval engines because the programs make the changes to WIN.INI. Private INI files that are in the local directory can be used but that requires the program to search for them. This also prohibits adding any fonts.

f. The ETM documentation must include instructions for backing out changes so a system can be restored to its pre-installed state. Either:

   - The ETM is executable off the CD-ROM and does not require any local storage, or,
   - The ETM requires local storage but this local storage will only be in the local directory mentioned in a and will not exceed TBD Mb. The local storage refers to both the permanent storage used for installing the programs and any temporary storage used during program execution.

g. This requirement prevents an ETM from storing files all over the user's disk, from requiring a specific drive and/or directory, and from requiring an inordinate amount of space. This also restates the requirements in a, d, and e by not allowing any changes except in the local directory. Another effect of the requirement is to make it more difficult for programs to find private INI and Data Link Library (DLL) files, because these files will not be in a Windows directory or on the path. There are ways to work around the problem of finding the files but they require program changes in the retrieval engine. One exception would be global DLLs like those needed for Object Linking and Imbedding (OLE) 2. These should be considered as operating system files and will have to be placed in Windows directories. The only problem will be that the install programs will have to check versions before replacing any existing DLLs.

10.0 JUKEBOX REQUIREMENTS

10.1 USE OF JUKEBOXES WITH IETMS

With the expected growth in the number of ETMs, it would simplify things if they could be run from a jukebox. The Celerity NLM jukebox software offers a chance of supporting an ETM but only with some limitations on the ETM. There is also a chance that CD-ROMs might be accessed as mounted volumes on a Novell network or by universal naming convention (UNC) on a Windows NT network. The following requirements are based on ATIS using all three methods to access CD-ROMs.

a. The ETM cannot require the root directory of the CD-ROM to be accessible as the root directory of a drive letter. The root directory of the CD-ROM in a jukebox will most likely be accessed using a multi-directory path such as J:\CDROM\XXXX. Mounted volumes and UNC do not use drive letters.

b. The DOS functions FindFirst and FindNext will not work for the jukebox CD-ROM directories. To find if a file exists the file must be opened.

c. The program must use the _lopen, _lread, _llseek, and _lclose Windows functions. These were the functions needed to access mounted volumes on a Novell network and they also work in the other two configurations.

d. The ETM cannot not rely on determining the volume id of the CD-ROM.

e. The concept of a default directory may not work with the UNC or mounted volumes because they don't use a drive letter. Because of this, internal path references will have to be relative to the root directory which must then be include as a command line argument. There is also a chance that executing a program from a mounted drive might not be possible.

10.2 "SELECTIVE BUILD" OPTION FOR NON-RASTER IMAGE CDS

10.2.1 Background

The Celerity Systems Inc. (CSI) "Selective Build" feature is a tool for jukebox administrators. This feature allows improved management of system resource use of jukebox unfriendly applications. These are defined as applications, or data bases that were not designed with an eye towards the unique advantages and disadvantages afforded by jukebox technology. While it is possible to overcome the disadvantages using various driver software options, it often comes at the expense of significant file server resources. CSI. acting upon the request of NAVCOMTELSTA and Newport News Shipyard personnel implemented the new selective build option to address these system resource issues. With the Selective Build option, administrators can significantly reduce the amount of overhead resource costs associated with the use of stand-alone applications in a jukebox environment.

10.2.2 What Are Build Options?

When a CD is inserted into the jukebox, the jukebox driver software must take a look at the CD in order to acquaint the file server with the jukebox contents. Obviously, if a user wants to access a CD in a jukebox, the system must know some information about what is in the jukebox. The process of scanning and cataloging CD information to the file server is referred to as "building". Build "options" refer to the amount and type of information that is looked at by the driver software and stored on the file server. The default build options are as follows:

Resources Used	Build Option	Information written to the file server.
Least	nodir	CD volume id. (volid)
	nofile	volid, entire directory structure (but no file information)
	nosize	volid, directory structure, and all filenames (no file size information)
Most	standard (full build)	volid, directory structure, filenames, file sizes. Essentially the entire CD structure is duplicated on the file server.

Jukebox friendly applications like ATIS, use the nodir option, and as such take minimal system resources away from other networked applications. Before the selective build option, administrators were forced to use the nosize or standard options in order for non-raster applications to work properly. With the advent of the selective build, administrators can mix and match build types. For example, a CD can be built using the nodir option, but the administrator can then perform a nosize build on a selected file, or a group of files matching a wild card file mask. To make things even simpler, an administrator can store these selective build directives as a build profile, essentially creating user defined build types.

10.2.3 Implementation

In the following example for IETM CDs, we wish to build most of the CD with the nosize option, but build index files using a full build type.

1. Using a text editor, open or create the text file SYS:\SYSTEM\VCDMAN.BLD on the file server.

2. Starting in column 1, type a bracketed section header called IETM.

   [IETM]

3. On the next line, again from column 1, type the default build type. In this example the default is nosize.

   default=nosize

4. On a separate line each, we want to specify a file mask for index files to full build.

```
Full=*.idx
Full=*.ndx
```

5. Save and close the file. (See example below)

6. On the file server, at the vcdman screen, execute the command to read the file we just created:

```
vcdman> readbuildfile
```

7. Assuming we are using slot 25 on jukebox #1, we insert the IETM CD into the jukebox as follows:

```
vcdman>  insert 1 25
```

8. Now build the CD using the IETM profile:

```
vcdman> build 1 25 IETM
```

9. That's all there is to it.

Appendix R Quality Assurance and Control (QA/QC)

1.0 INTRODUCTION

The following paragraphs are direct extracts from sections 4 and 5 of the Technical Manual Contract Requirement (TMCR). They represent the QA and QC requirements that are automatically generated by the TMCR process. (Note that the paragraph numbers vary from those found in the TMCR, but that the sequencing of information is the same).

2.0 RESPONSIBILITY FOR INSPECTIONS

The contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. In the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the TMCR where such inspections are deemed necessary to ensure that supplies and services conform to prescribed requirements.

2.1 RESPONSIBILITY FOR COMPLIANCE

All items shall meet all requirements of sections 3 and 5 of the TMCR. The inspection set forth in the TMCR shall become a part of the contractor's overall inspection system (quality assurance program). The absence of any inspection requirements in the TMCR shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, except where prohibited; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

2.2 TECHNICAL MANUAL QUALITY ASSURANCE (TMQA) PROGRAM

The contractor shall establish a TMQA program in accordance with the requirements of this TMCR to ensure the development of technically accurate and complete TMs. A QA program developed as a result of material generated by the requirements of this TMCR will be reviewed by the procuring activity for acceptance. The contractor's QA program shall encompass the accountability for and development of quality control functions required for the management of the following TM program elements:

a. Source data collection

b. Intermediate product

c. Graphics and illustrations

d. Validation

e. Internal coordination

f. Records

g. Verification support

h. Final product

2.2.1 QA Responsibilities

The contractor shall be responsible for the complete, accurate, and fully documented implementation of the Quality Assurance Program (QAP), in accordance with the Quality Assurance Program Plan (QAPP), and for product and process quality.

2.2.2 QA Program Organization

The preparing activity's QA program organization shall have well defined responsibility, authority, and the organizational freedom to identify and evaluate QA problems and to recommend and initiate solutions.

2.2.3 Technical Manual Quality Assurance Program Plan

The preparing activity shall prepare a plan which shall describe the scope and approach of the TMQA program. The plan shall reflect the following elements and the requirements in section 4.0 of the TMCR.

a. Organization - the preparing activity's Quality Assurance (QA) organization and its functional relationship to the TM development and production organization(s). The authority, autonomy, and responsibilities of the QA organization

b. Quality reviews - the preparing activity's methods employed to monitor and review product development processes and products.

c. Quality records - the quality related records generated by TM development and production processes and by contractor QA reviews.

d. Corrective action - the preparing activity's methods for ensuring that corrective and preventive actions are properly implemented and effective.

e. Data base control - the preparing activity's control of the data base shall conform to the requirements of section of the TMCR

f. Task identification matrix or equivalent - utilization of the task identification matrix or equivalent in TM development.

g. Control of subcontractors and vendors - the methods employed by the preparing activity to ensure quality of data/products from subcontractors and vendors,

h. Milestone dates - the preparing activity's proposed schedule for meeting TMQA requirements.

i. Sampling plans shall conform to the requirements of section of the TMCR.

j. Classification of defects development shall conform to the requirements of section 4.0 of the TMCR.

k. Procedures for updating the plan to cover changes/new elements.

2.2.3 Record And Documentation Compliance

Contractor compliance with the requirements of 2.5 through 2.9 below will be determined by the accuracy, currency, and completeness of records as specified in the contract, the QAPP, and The TMCR. Objective evidence shall be demonstrated by the retrieval of specific information from records and their accuracy, currency, and completeness at the time of the request by the Government.

2.3 IETM Quality Assurance Program (QAP)

The contractor shall establish a QAP in accordance with the requirements of the TMCR, to ensure the preparation of technically accurate and complete IETMs. Terminology shall follow MIL-STD-109, except where superseded by the terminology of this document. Quality assurance procedures for all related software developed in accordance with MIL-STD-498 shall conform to the requirements of DoD-STD-2168. The QAP shall encompass the accountability for and development of QA functions related to the following IETM program elements:

a. Source data management
b. Intermediate product management
c. Evaluation of draft material
d. Participation in QAPIs
e. Participation in In-Process Reviews (IPRs)
f. Graphics control
g. System software documentation and control
h. Data base integrity maintenance
i. Authoring system capability
j. Validation
k. Record-keeping
l. Documentation of contractor operating procedures
m. Verification support
n. Final product preparation
o. Sampling procedures authorized,
p. Technical Manual (TM) tracking of provisioned item changes

2.3.1 Function and Structure of Contractors QA Organization.

The QAPP shall describe the functional relationships and the structure of the QA organization.

2.3.1.1 Function of the QA Organizations

The contractors QA organization shall have the responsibility for implementation, administration, and conduct of the QA program and shall function as the point of contact between the contractor and the Government in all matters related to QA. (See MIL-Q-87270 Appendix A.)

2.3.1.2 Structure of the QA Organization

The QAPP shall describe the contractor's QA organization (e.g., structure and approximate size during the proposed course of QA effort). This description shall indicate how the contractors QA personnel are organized to retain their independence from personnel responsible for IETM generation, so as to be able to carry out their QA responsibilities in an objective manner.

2.3.2 Description of the Authoring System

The authoring system must possess certain minimum capabilities in order to effectively produce an IETM. Where the contractor proposes use of an authoring system that does not provide the following capabilities, the QAPP shall describe how the capabilities in question will be provided:

a. Support technical manual planning and control.

b. Capture data from a wide variety of computerized data bases, including text, graphics, and tables.

c. Create and change Technical Information (TI), including text, graphics (both vector and bit-map), and tabular data and the ability to merge these information elements into a single composite element.

d. Provide the author with access to files in the system data base (the Interactive Electronic Technical Manual Data Base or IETMDB) so that the author can prepare the IETM.

e. Provide prompts to the author so as to propose proper sequences of writing, to identify omissions in pre-established plans, and to identify faulty authoring logic.

f. Provide the author with a view of his finished product in a form identical to that which will be viewed by the end user (as established by comparison with the display on a Government furnished Electronic Display Device (EDD) of the type employed by the end user).

2.3.3 Word List

The contractor shall describe in the QAPP his approach to, and identify software for comparison of, authored text with a Government approved word list. The contractor shall describe his plan for identifying and obtaining Government approval for use of words considered necessary that are not on the Government approved word list. The QAPP shall also include the contractors recommendations for the "System-Specific" Word List that will supplement the "Common" and "Technological Area" word lists that will be identified in the QAPP.

2.3.4 Electronic Display Device (EDD)

The QAPP shall affirm the contractor's intention to use a Government furnished EDD (incorporating the operating system and associated software provided) for quality reviews, pre-validation, and validation.

2.3.5 Written Operating Procedures

Contractor personnel, subcontractors, and vendors involved in IETM generation shall operate in accordance with written operating procedures. Portions of these procedures that relate directly to product quality shall be cited in the QAPP, identified by name, number, and date (See MIL-Q-87270 Appendix A, 30.2). Such procedures shall be originated, revised, and controlled within the framework of the overall QAP and shall periodically be reviewed, evaluated, and updated as required (see 2.3.14 below). Current operating procedures shall be made available for Government inspection (see 2.5). A plan for controlling and updating such procedures shall be presented in the QAPP.

2.3.6 Contractor Quality Reviews

The QAPP shall describe the proposed quality review procedures for each individual type of IETM deliverable (each IETM specified by the CDRL) to ensure compliance with its contractual specifications (see 2.6 through 2.8). Where a given process (e.g., validation of procedural information) applies to several deliverables, the procedure need be presented only once, but may be referred to as often as necessary. The QAPP shall also explain procedures for maintaining records of defects found and corrective actions taken.

2.3.7 Source Data Management Plan

The QAPP shall describe plans to assure that the most current source data are made available, controlled, and used for IETM generation. (See MIL-Q-87270 Appendix A.)

2.3.7.1 Logistic Support Analysis/Logistic Support Analysis Record (LSA/LSAR)

The QAPP shall include a statement that the QA effort will assure direct communication between information developed by the LSA, when available, the LSAR (as described in MIL-STD-1388-2), and the IETM authoring system; and that the LSAR and other source data is carefully followed in constructing the IETM, i.e., that the IETM is consistent with LSAR source data elements.

2.3.7.2 Drawings.

The QAPP shall include measures proposed by the contractor to assure the effective use of design and manufacturing drawings for the IETM generation without the necessity to completely redo the drawings.

2.3.8 Control of Subcontractors And Vendors

The QAPP shall describe the approach by which the contractor shall ensure that IETM products prepared by subcontractors and vendors satisfy all contractual requirements. (See MIL-Q-87270 Appendix A.)

2.3.9 Sampling Inspection Plan.

The QAPP shall describe the overall sampling inspection plan.

2.3.10 Validation Approach Summary

The QAPP shall contain a validation approach summary covering the approach the contractor intends to use for validation. This summary shall outline the intended methodology upon which the contractor intends to base the validation plan. The summary shall indicate the planned use of a Government furnished EDD to validation (as well as for other quality review functions).

2.3.11 Verification Support Approach Summary

When verification support is contractually required, the QAPP shall summarize the contractors proposed approach to support the Government's verification effort for each IETM deliverable involved, and the contractors intended approach to preparation of the detailed verification support plan.

2.3.12 Classification of Defects (CD)

The CD table associated with the contractor sampling plans shall be made available during the Guidance and Quality Planning Conference. The CD shall be patterned after the CD listed below for product evaluation. The contractor and the Government may jointly classify additional defects applicable to the specific products being procured.

a. Major defects (incorrect, incomplete, missing)
    - Maintenance procedures;
    - Values and tolerances;
    - Illustrations, schematics, wiring diagrams;
    - Part numbers;
    - References and indices;
    - Safety - notes, cautions, warnings;
    - Technical content (source dates/hardware comparison);
    - Classified matter (incorrect identification/handling);
    - Charts and tables; and
    - An excess of any one or combination of the following: unfamiliar words, inconsistent vocabulary, long sentences, long paragraphs, non-informative headings, organization not based on immediate needs of the user, and complex or unclear illustrations.

b. Minor defects (incorrect, incomplete, missing)
    - typographical errors;
    - SM&R codes; and

- Style and format (writer's guide errors)

2.3.13 Implementation of the QAPP

The Government will furnish written notice of the acceptability of the contractor's QAPP. The QAP, as approved by the Government through review of the QAPP and as jointly reviewed at the guidance and quality planning conference (see 2.4), shall be fully implemented by the contractor.

2.3.14 Changes to QA Procedures

Any changes to QA procedures initially incorporated in the QAPP, which result from changes in IETM delivery schedules or revisions to QA methodology or any other changes considered desirable for assuring a more effective product, shall be put into effect by the contractor after incorporation into the QAPP, and after the QAPP change has been approved by the Government by notification from the Procuring Contracting Officer (PCO). Updating of written operating procedures, where procedural changes are not made (see 2.3.5), does not constitute a change as described in this paragraph.

2.4 Guidance And Quality Planning Conference

A guidance and quality planning conference shall be conducted to ensure the contractor's understanding of applicable specifications, contract requirements, formal instructions, established policies, and program requirements. Anticipated QA problems will be identified and resolved at this conference. The contractor shall explain the proposed QAP at the guidance and quality planning conference, showing how the QAP meets all of the requirements of the TMCR and how the QAP will function to assure a quality product. The contractor shall also explain the CD table during this conference. Attendance shall include all key Government and contractor personnel who will be involved in the QA Program. Agreed upon modifications developed at the guidance and quality planning conference will be incorporated into the QAPP and the final version of the QAPP shall be delivered to the Government no later than 45 days after the guidance and quality planning conference or the Conference, convened by the contractor, shall be held within 45 days of contract award.

2.5 Government Inspections

The Government reserves the right to make any inspection (process or product) it deems necessary to assure that the IETM and its related elements meet contract requirements. The contractor shall support these inspections by providing access to all QA records and IETM documentation. The Government will notify the contractor of any discrepancies by PCO letter. The Contractor shall correct, or develop a plan to correct, these discrepancies in accordance with time lines provided by the PCO letter.

2.5.1 QA Process Inspection (QAPI)

The Government will conduct a series of scheduled QAPIs to establish that the QAPP is being properly followed, product quality reviews are being correctly implemented, defects are being identified, and appropriate corrective actions are being taken.

2.5.1.1 Initial QAPI

During the initial QAPI, in addition to other demonstrations or presentations which may be required by the Government, the contractor shall provide specific demonstrations of the following:

a. The use of the authoring system to be employed in generating the IETM, including a demonstration that the authoring system functions outlined in the QAPP are in working order and are being used in the IETM generation process. Relationship of the IETM authoring process to acquisition and use of relevant source data (particularly LSA/LSAR and drawings) shall be specifically addressed.

b. Use of the Government furnished EDD for QA reviews, validation, and post validation review. (If the GFE display device is not available at the initial QAPI, then the required demonstration shall be made at the first QAPI at which it is available.)

c. The approved word list comparison routines which the contractor intends to use during the IETM generation process. The three word lists themselves (e.g., Common, Technological Area, and System Specific) shall also be demonstrated.

2.5.1.2 Support and Presentation of Records for QAPIs

At all QAPIs, the contractor shall make available to the Government its QA records, to enable the Government to ensure that the QAPP is both implemented and effective. The Contractor shall also support the Government-conducted QAPIs by providing access to finished deliverables, Validated TI, and other in process TI, as required by the Government. Access to contractor generated TI material shall be provided for Government inspection by means of the Government furnished EDD cited in the QAPP (2.3.4)

2.5.1.3 Location

Government QAPIs will be conducted at the contractors facility and chaired by the Government IETM QA representative.

2.5.2 In-Process (Quality Product) Reviews

The Government may also supplement the QA process reviews (i.e., QAPIs) with in-process reviews (i.e., QA product inspections) to ensure that IETMs are being prepared in accordance with the contract and cited specifications. The Government and the contractor will jointly establish the frequency and timing of IPRs and the Government shall have final approval authority for the schedule. Additional IPRs may be required based on the contractor's or Government's evaluation of the IETM development process or criticality/complexity of the material covered. Safety and nuclear weapon procedures identified by the Government shall require a 100% IPR. The IPR schedule will be agreed upon at the guidance and policy planning conference and the Government approved IPR schedule shall be contained in the guidance and quality planning conference minutes.

2.6 INSPECTIONS AND QUALITY REVIEWS

During IETM development and production, the contractor shall perform inspections of the IETMs under preparation, and of all the constituent elements and processes, as described in the QAPP. These inspections shall be used to assess compliance with cited specifications

and with the IETM QAP. These inspections and reviews shall provide for corrective actions.

2.6.1 Contractor Quality Assurance Inspections and Records

The contractor shall maintain, and provide to the Government, upon request, records documenting all contractor process and product inspections. These records shall include:

a. Name of the operation or product inspected.

b. Date.

c. Names of inspectors.

d. Defects found.

e. Procedure or inspection leading to identification of defect.

f. Method of defect correction or explanation for no correction of defect.

g. Name of person(s) making correction,

h. Name of person certifying that products have been corrected or, when applicable, that operations have been modified and written procedures corrected as necessary,

2. 6.2 Review of Maintenance and Operating Procedures.

Quality review procedures shall assure that, as a minimum:

a. All input conditions for maintenance and operating procedures contained in the IETM are explicitly identified.

b. Steps contained in the maintenance and operating procedures use concise text and simple graphics to instruct the user.

c. Each task is cross referenced with (i.e., is provided with suitable links to, or calling procedures for) appropriate descriptive, troubleshooting, parts, and operational information.

d. Steps within a maintenance or operating procedure are presented sequentially and in their entirety.

e. Information that is not applicable is not displayed.

f. All warnings, cautions, and notes associated with a maintenance or operation action are presented so that the user is aware of all potential dangerous or damaging situations prior to initiation of the action.

g. Maintenance and operating procedures are suitable for presentation on an EDD.

2.7 VALIDATION.

The objective of validation is to ensure that the contractor has provided, for support of the equipment involved, accurate and adequate IETMs and, when required by the contract, and IETMDB. Validation shall be performed in accordance with an approved validation plan. The Government reserves the right to witness the validation. Validation shall be

accomplished on all deliverables and changes thereto. The validation process shall include the following steps:

a. Preparation and approval of a validation plan.
b. Engineering review and certification that IETMs and related TI are ready for validation (2.7.1)
c. Validation of IETMs and related TI (2.7.2)
d. Validation of the IETMDB (2.7.3)
e. Validation of any automated IETM compilation process (2.7.4)
f. IETM system validation (2.7.5)
g. Post-validation review (2.7.6)
h. Preparation of validation documentation (2.7.9)
i. Validation certification (2.7.10)

2.7.1 Engineering Reviews

The preparing activity shall conduct appropriate engineering reviews of the TI to ensure that it is safe, complete, logical, technically accurate, and comprehensible. (See MIL-Q-87270, Appendix A.) Based on this review, the contractor shall certify prior to validation that the TI permits efficient performance of the intended equipment-support functions for which the TI is designed and that the TI is ready for validation. All errors noted during this engineering review shall be corrected prior to validation. The Government shall be notified of the validation schedule prior to commencement of validation. The contractor shall maintain engineering review records.

2.7.2 Validation of IETMs and Related TI.

Validation of IETMs and related TI shall be accomplished in accordance with the validation plan.

2.7.2.1 Target Audience

The validation shall be performed by individuals who are of approximately the same education, experience, and skill level as the actual target audience for the IETM. Where it is not possible to obtain such personnel for validation, validation personnel shall at least exclude those who cannot be expected to provide a realistic test of the validity of the IETM (e.g., graduate engineers or those involved in authoring the IETM). The validators shall follow exactly the procedures set forth in the IETM and shall use a Government furnished EDD to establish a display mode identical to that involved in field use. An operational environment shall be used, if possible, or simulated, if practicable.

2.7.2.2 Security

The contractor shall refer to the applicable Security Classification Guide (SCG) or DD Form 254 during validation to determine whether any classified data have been included.

2.7.2.3 Support Equipment for Validation

The contractor shall identify any Government Furnished Equipment/Government Furnished Property (GFE/GFP) needed and notify the Government in time for contractual requirements to be met. The contractor shall provide all consumable and expendable items required to support validation. (See MIL-Q-87270, Appendix A,)

2.7.2.4 Validation Interruption

The Government's witnessing official may require that the contractor stop validation or revise and repeat validation steps if this official believes the contractor validation procedure is not adequate to substantiate the technical accuracy of the IETM. Any such temporary interruption of validation. Procedures or performance of revised or repeated validation steps under the terms of this provision shall be accomplished at no additional cost to the Government.

2.7.2.5 Validation of Procedural TI

Contractor personnel shall validate each step in every procedure using a Government furnished EDD, The procedure shall be presented in final form exactly as it will be displayed to the end used, with the same user interface capabilities. All procedures shall be shown to be in accordance with those listed in the LSAR.

2.7.2.5.1 Operating and Maintenance (O&M) Procedures

validation shall entail the actual performance by contractor personnel of all O&M procedures, including weapons loading, delivery, and cargo tie-down. Validation shall include revalidation of modified procedures and new procedures developed during modification program. Standard or special tools, test equipment, etc., as specified in the IETM, shall be used. In exceptional cases when damage to system/equipment or injury to personnel may occur, and if approved by the Government, validation of these instructions may be by simulation.

2.7.2.5.2 Criteria for Successful Validation of Procedures

The validator shall be able to perform the procedure successfully without assistance. If for any reason a validator fails to perform a procedure without assistance, the procedure shall be carefully analyzed for technical errors and incomprehensibility. If technical errors are found, corrections shall be made or alternative accurate TI shall be prepared and revalidated. If portions of the TI are incomprehensible to the initial target audience validator, the procedure may be accepted if four additional target audience validators perform the procedure without error, If the procedure is reworked, the material shall be reevaluated with a new validator. Minor corrections (which must be cited) may be made without revalidation.

2.7.2.6 Validation of Non-Procedural TI

The validation of TI items which are not of a procedural nature, such as descriptive text, wire lists, schematics, Illustrated Parts Breakdown (IPB) information, and the like, shall be accomplished by comparing them with the actual hardware; or, when this procedure is not possible, by comparing them with Government approved source data. This comparison shall be accomplished using a Government furnished EDD. All non-procedural TI shall

correspond to the actual equipment in all respects. All defects (errors) shall be corrected. Validation of descriptive TI, where some basis of comparison is used other than the actual equipment, shall be approved by the Government.

2.7.2.7 Validation of Troubleshooting Procedures

Validation of all established branches of the IETM troubleshooting (fault isolation) procedures shall be performed with the weapon system hardware to which the troubleshooting procedures apply. This part of the validation effort shall be performed in conjunction with (1) tabletop comparison with source data to ensure the accuracy and consistency of fault isolation paths, and (2) the IETM system validation (see 2.7.5).

2.7.2.7.1 Troubleshooting Procedures List

The contractor shall prepare a list of troubleshooting branches for every fault identified during the weapon system LSA or other Failure Mode and Effects Analysis (FMEA) or Failure Mode and Effects Criticality Analysis (FMECA) when a complete LSAR is not available and a complete list of fault simulations for use during validation of troubleshooting procedures. Upon approval by the Government, the troubleshooting procedures list shall be appended to the validation plan. The list will be used for selection by the Government of simulated faults for use in validation of the troubleshooting TI. The fault simulation list (see MIL-Q-87270, Appendix A) shall, as a minimum, contain:

a. Fault symptoms.

b. Fault simulations.

c. Condition to be inserted into the equipment to simulate the fault.

2.7.2.8 Validation of EOD And JNWPS Procedures

Explosive Ordnance Disposal (EOD) procedures are validated by the Naval EOD Technology Center (NAVEODTECHCEN), Indian Head, MD. The Government will arrange for validation of Joint Nuclear Weapons Publication System (JNWPS) technical information through the applicable nuclear system contractors.

2.7.2.9 Other Data

All other data (such as: Source, Maintenance, and Recoverability (SM&R) codes; illustrations; wiring data; and descriptive data contained in the IETM) shall be validated by comparison with current source data.

2.7.3 Validation of the IETMDB

When the IETMDB is included in the procurement contract as a deliverable, validation of the IETMDB shall be carried out procedurally in the same fashion as the validation of the several types of TI included in the IETM. (See also MIL-Q-87270, Appendix A.) Validation of the IETMDB shall establish that:

a. The IETMDB meets all specific requirements of:

- All information contained in the IETMDB is technically accurate, based on comparison of the data entities with actual system hardware, or (where approved by the Government) with other forms of source data. Where specific

data elements have previously been validated, and no changes have been made in them, no revalidation is required.

- All relationships (established data access links), as defined in the data element dictionary of the IETMDB, are in place, valid, and operable.

b. There are no open loops in the fault isolation tasks (i.e., that each task ends in a single resolution, and each retrieval string ends in successful isolation and repair of a discrete fault).

c. There are no unreferenced or inaccessible data entities in the system.

d. The IETMDB is capable of being used to construct individual IETMs to support the weapon system.

2.7.3.1 Changes to IETMDB

When the IETMDB is changed in any way after validation, the changed material and other portions of the IETMDB affected shall be revalidated. This process shall assure that all linkages previously established are still operable and valid; specifically, that no effect on the accuracy of any related information has been adversely affected by the change. In such a case, data entities, attributes, and relationships not affected need not be revalidated.

2.7.4 Validation of Automated IETM Assembly Processes

The contractor shall validate all contractor generated algorithms and software used for automated construction of individual IETM component, The validation shall ensure that the assembly processes correctly call out the proper configuration of data entities as required by the procedural needs of the user.

2.7.4.1 Validation of Automated IETM Compilation and Formatting Processes

The contractor shall validate the capability of any contractor generated programs used to extract information entities from an IETMDB and to format TI for display using a Government furnished EDD. If validation process has already established the technical accuracy of the IETMDB data used in such assembly processes (see 2.7.3), the IETMDB need not be revalidated during validation of the IETM assembly processes.

2.7.4.2 Demonstration of Automated IETM Compilation and Formatting Processes

The contractor shall validate the capability of any contractor-generated programs to extract appropriate (defined) information entities from the IETMDB, to compose these entities into coherent procedural or descriptive TI, and to format this TI for display to the end user using a Government furnished EDD. The validation procedure shall include a complete exercise of all TI sequences (procedural, descriptive, or fault isolation) contained in the IETM; i.e., shall validate the compilation process by validating the functionality of the compiled product.

2.7.5 IETM System Validation

The IETM system (EDD hardware, the IETM, and the EDD presentation software interoperability) validation shall be performed and corrective actions shall be taken to

correct any defects, prior to validation of the content and procedures of the IETM. The various utilities and special functions associated with the IETM system shall also be validated. This IETM system validation shall consist of two parts: a demonstration of the system, and system software tests.

2.7.5.1 IETM System Demonstration

The field version of the IETM system hardware and software shall be demonstrated to the extent required to establish its accuracy, capabilities, and compatibility with Government systems and contractual requirements. The extent of the demonstration shall be in accordance with a sampling plan included in the contractors validation plan. Specifically, the IETM system demonstration shall:

a. Be performed entirely on an EDD provided as GFE by the Government.

b. Demonstrate the system's compliance with applicable specifications and compatibility with Government systems.

c. Demonstrate maintenance tasks, displayed for a selected sampling of the various aircraft systems, in various levels of complexity.

d. Introduce a selected sampling of fault codes (and of simulated faults) to exercise the retrieval capabilities (linking) of the system.

e. Demonstrate all system utilities and special functions, including ad hoc user access to data.

f. Demonstrate the general visibility and readability of the IETM as displayed on the Government furnished EDD.

2.7.5.2 System Software Tests

The contractor shall develop a software routine capable of exhaustively testing the IETM system. This program shall be developed in accordance with MIL-STD-498 and MIL-STD-2168, and

a. shall, as a minimum: Check that all data access links and branches are valid and operable.

b. Ensure that there are no "open loops" in the fault isolation tasks (i.e., that each task ends in a single resolution, and each retrieval string ends in successful isolation and repair of a discrete fault).

c. Ensure that there are no unreferenced or inaccessible data in the system; and

d. Check that all special functions are fully operable.

2.7.6 Post-Validation Review

The contractor shall perform a post-validation review. This review does not apply to the IETMDB. This review shall assure that all discrepancies noted during validation (and any other contractor quality review) have been addressed prior to the certification and acceptance of the IETM. This includes review of remedial actions taken by the IETM

preparation group in response to the discrepancies recorded in the applicable validation records.

2.7.7 Validation Performance

Theory and principles of operation, system/component description, SM&R codes, schematic, and wiring data shall be validated against engineering source data. operating and maintenance procedures, including checkout, alignment, scheduled removal and replacement instructions, and associated checklists shall be validated against the system/equipment by actual demonstration. Malfunctions shall not be introduced into the system or equipment for the purpose of validation unless specifically required for certification of procedural tasks or system tests. Destructive malfunctions shall not be introduced into the system or equipment for any purpose.

2.7.8 Support Equipment

Government approved support equipment shall be utilized in the performance of validation. Simulation or substitution of support equipment shall be approved by the Government. It is the responsibility of the contractor to request Government furnished equipment in order to support the validation effort.

2.7.9 Validation Records

The contractor shall keep validation records for each item of TI validated. The contractor shall ensure that all applicable records are available to the Government throughout the life of the contract, that the records document full compliance with the TMCR, and that all TI is complete and validated. The contractor shall ensure that every procedure on the task list contained in the system LSAR, maintenance plan or other FMEA/FMECA, is included in the TI; that all procedures have both a pre-validation certification and a validation record; and that the final draft of all procedural TI conforms exactly to the validation records. Specifically:

a. Validation records for all TI shall show that all the TI is in conformance with the associated equipment.

b. The contractor shall certify that the final drafts of all IETM items are in compliance with the TMCR, including format, style, and user interaction requirements.

c. Records shall be maintained of the inspections, the signatures of the inspectors, identification of the deliverables inspected, discrepancies found, if any, corrections made as a result of validation, and certification that the deliverable fully meets the TMCR requirements. Any deviations shall be explained. The certifications shall list any exceptions to contract requirements, the document(s) authorizing the exception, the signature of the contractor representative, and the signatures of all Government witnesses present at the validation.

2.7.9.1 Validation Records for Procedural TI

These records shall include the name of the validator, his educational level, experience, and position classification, as well as the date, signature, identifying number, and configuration

of the procedural TI validated; method of correction used; and the signatures of both the person who made the correction (or other change) and the inspector who certified that all errors found were corrected, The records shall further include a copy of the procedure after any errors detected during validation have been corrected and incorporated, and the procedure successfully validated. Hand annotated corrections are acceptable providing that they are fully legible and understandable. When corrections are extensive, the material shall be reworked prior to recertification and revalidation.

2.7.10 Validation Certification

The contractor shall certify that the IETM delivered to the Government for verification has been validated. that all corrections have been made, and that all contract requirements have been met. The certification shall list any exceptions, the document(s) authorizing the exception, and the signature of all Government witnesses present at the validation.

2.7.11 Disposition of Validated Data

Corrections and significant comments resulting from validation shall be incorporated prior to the certification and acceptance of the TM.

2.8 VERIFICATION SUPPORT

Verification of IETM deliverables is performed on validated IETMs by the Government. When specified by the contract, the contractor shall support verification. Contractor support of verification shall consist of the following:

a. Technical support, as required.

b. Assistance in performing verification procedures,

c. Recording and disposition of verification comments.

d. Certification that all discrepancies and defects noted during verification have been corrected or resolved.

2.9 SAMPLING

Sampling of TI is authorized for QAPIs, but is not permitted for validation (except for the IETM system demonstration (see 2.7.4.1), nor for the post validation review (see 2.8). Any sampling plan prepared by the contractor, for QAPIs or any other critical operation inspections, shall be cited in the QAPP and approved by the Government.

3.0 PACKAGING

3.1 TECHNICAL MANUAL SCHEDULES AND STATUS REPORT

Schedules and Status Reports shall be packaged in the most economical manner that will provide adequate protection during shipping. Delivery shall be in accordance with the Contract Data Requirements List.

3.2 TECHNICAL MANUAL QUALITY ASSURANCE DATA

3.2.1 Validation Plan

Items shall be packaged in the most economical manner that will provide adequate protection during shipment in accordance with accepted industrial packaging procedures.

3.2.2 Validation Certification

The Validation Certification shall be packaged in the most economical manner that will provide adequate protection during shipment in accordance with accepted industrial packaging procedures. Delivery shall be in accordance with the Contract Data Requirements List.

3.2.3 Verification Incorporation Certification

The Verification Incorporation Certification shall be packaged in the most economical manner that will provide adequate protection during shipment in accordance with accepted industrial packaging procedures. Delivery shall be in accordance with the Contract Data Requirements List.

3.3 TECHNICAL MANUAL STANDARD

3.3.1 Interactive Electronic Technical Manual (IETM)

Unless otherwise specified by the procuring activity, items shall be packaged in the most economical manner that will provide adequate protection during shipment in accordance with accepted industrial packaging procedures. Delivery shall be in accordance with the Contract Data Requirements List.