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US ARMY
MATERIEL COMMAND
PM TRAINING DEVICES

# Implementing Embedded Training (ET): Volume 10 of 10: Integrating Embedded Training Into Acquisition Documentation

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December 1988

**Manned Systems Group
Systems Research Laboratory**

**U.S. Army Research Institute for the Behavioral and Social Sciences**

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> This document provides the reader with the information and perspective necessary to incorporate embedded training (ET) considerations into acquisition documentation.

An overview of the Army systems acquisition process is presented, the relationships among the various documents of the acquisition process are described, and the relevant ET considerations at each phase, for each document, are specified. Detailed guidance for incorporating ET considerations and requirements into specific acquisition documents is provided. Recommendations are made for the development of Data Item Descriptions (DIDs) to address ET considerations. Specification documents to ensure that ET is given sufficient consideration throughout systems design and acquisition are included.

The document also provides recommendations and guidance for developing a Request for Proposal (RFP) for acquiring the ET component of a prime item system, including examples of statements addressing ET requirements for the State of Work (SOW) and System Specification sections of the RFP. Keywords.

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# Implementing Embedded Training (ET): Volume 10 of 10: Integrating ET into Acquisition Documentation

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This document is Volume 10 in a series produced by the Army Research Institute for the Behavioral and Social Sciences (ARI) and the Project Manager for Training Devices (PM TRADE). The series consists of 10 related documents that present guidance for combat and training systems developers, including Army Materiel Command (AMC) laboratories and other entities, Army acquisition personnel, Training and Doctrine Command (TRADOC) Combat Developers and Training Developers, and contractor organizations involved in system development or developing technological thrust areas under independent research and development (IR&D) programs.

This series of documents includes guidelines and procedures that support the effective consideration, definition, development, and integration of embedded training (ET) capabilities for existing and developmental systems. The 10 documents share the general title of Implementing Embedded Training (ET), with specific, descriptive subtitles for each document. They are as follows:

1. Volume 1: Overview presents an overall view of the guidance documents and their contents, purposes, and applications, including a discussion of the following:

    a. what the total training system concept, including embedded training, is;

    b. how training systems must develop within more general processes of materiel system development;

    c. how embedded training must affect this relationship; and

    d. what the content and uses of the remaining documents in the series are, as well as their relationships to the training systems development and acquisition processes, and how to use them.

2. Volume 2: ET as a System Alternative provides guidelines for the initial decision on whether ET should be further considered as a training system alternative for a given materiel system. It also includes guidance on considering ET as an alternative for systems under product improvement or modification, after fielding.

3. Volume 3: The Role of ET in the Training System Concept contains guidance for the early estimation of training system requirements and the potential allocation of such requirements to ET.

4. <u>Volume 4: Identifying ET Requirements</u> presents procedures for defining ET requirements (ETRs) at both initial levels (i.e., before initiating systems development) and for revising and updating initial ETRs during system design and development.

5. <u>Volume 5: Designing the ET Component</u> contains analytic procedures and guidance for designing an ET component concept for a materiel system, based on specified ETRs.

6. <u>Volume 6: Integrating ET with the Prime System</u> discusses considerations, guidance, and "lessons learned" about factors that influence the effective integration of ET into materiel systems.

7. <u>Volume 7: ET Test and Evaluation</u> presents guidance for defining the aspects of the ET component (test issues) to be addressed in prototype and full-scale system testing.

8. <u>Volume 8: Incorporating ET into Unit Training</u> provides guidance for integrating ET considerations and information into unit training documentation and practice.

9. <u>Volume 9: Logistics Implications</u> presents helpful information on key logistics issues that should be addressed in the context of ET integration with prime item systems.

10. <u>Volume 10: Integrating ET into Acquisition Documentation</u> provides guidance on developing the necessary documentation for, and specification of, an ET Component of a prime item during the Army's systems development and acquisition process. This document examines the Life Cycle System Management Model (LCSMM) and the Army Streamlined Acquisition Process (ASAP) and describes where and how to include ET considerations in the associated documentation. It also describes where and how to use the other volumes in the ET guidelines series to generate the information required for the acquisition documentation, and provides guidance in preparing a contract Statement of Work for an ET Component to a prime item system.


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IMPLEMENTING EMBEDDED TRAINING (ET): VOLUME 10 OF 10: INTEGRATING ET
INTO ACQUISITION DOCUMENTATION

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## INTRODUCTION

This document provides combat, materiel, and training systems developers and other users with the information and perspective necessary to incorporate embedded training (ET) considerations into acquisition documentation. This is the final volume of a series of documents which were developed based on knowledge gained from the following activities:

1. Survey of ET components in Army, Navy, and Air Force systems to identify what kinds of ET have been implemented, under what circumstances, and which were successful and why.

2. Survey of selected Army systems to identify the extent and nature of the potential for ET development and implementation in the Army.

3. Survey of current and projected technological capabilities for supporting ET implementations in systems.

4. ET development or evaluation activities on the Fiber Optic Guided Missile, Sergeant York, Howitzer Improvement Program, Upper Echelon Maneuver Control System-2, Armored Family of Vehicles, Forward Area Air Defense Non-Line-of-Sight, and All Source Analysis System. The interim requirements described in this volume are based on information and insights gained from these studies.

The first two sections of this document put ET development in context of the Army's systems development and acquisition processes, often referred to as the Life Cycle System Management Model (LCSMM, as described in DA Pamphlet 11-25) and the Army Streamlined Acquisition Process (ASAP). This document provides guidance on developing the necessary documentation for, and specification of, an ET component in a prime item development effort. A third Army acquisition process, the Non-Development Item (NDI) process, is similar in some respects to the LCSMM and ASAP. Most of the guidance provided in this volume will also be useful in supporting any necessary development and acquisition actions under an NDI acquisition program.

The first section, entitled Acquisition Process Overview, provides an overview of the Army systems acquisition process. It describes the relationships among the various documents completed during the acquisition process, and the relevant ET considerations at each phase and for each document in the process.

The next section of this document, entitled Documenting ET Development, contains more detailed information on each of the acquisition documents and specific guidance for incorporating ET considerations and

requirements into these documents.  The next section, entitled RFP Preparation and Procedures for ET Component Acquisition, provides recommendations for developing a Request for Proposal (RFP) for purchasing ET requirements studies and the acquisition of prime systems which will provide embedded training.  The final section, entitled Sample ET Inputs to RFP Statement of Work, System Specification, and Evaluation Criteria, provides examples of ET statements which could appear in an RFP for developing a system with an ET component.

Appendix A provides a description of the other ET guidelines produced in this series.  The guidelines provide the user with the procedures necessary to generate much of the information needed to address ET in acquisition documentation.  Thus, they are referenced throughout this volume.  This section provides the reader with a quick glance at each guideline and indicates the information that is generated by applying the procedures recommended in the guideline.

Appendix B, entitled ET Data Item Descriptions (DIDs), discusses the development of DIDs, identifies existing DIDs which can be tailored to address ET considerations, and presents proposed new DIDs which were developed by the authors.  Appendix C provides a summary of abbreviations and acronyms used in this document.


How to Use this Document

This document is designed to guide system developers in incorporating, or at least considering, embedded training capabilities within the development of prime materiel systems.  It provides guidance to the user to incorporate ET in two processes:

1.  Inputting ET considerations into acquisition documentation.

2.  Developing a Request for Proposal (RFP) for the procurement of an ET component of a prime system.

The user interested in how and where to address ET requirements and concerns in the various acquisition documents used by the Army should read the sections entitled Acquisition Process Overview; and Documenting ET Development.  The user already familiar with the acquisition process will still find the overview section informative and should review it before going directly to the section on documenting ET development, where the user can locate the acquisition document of interest, and review the ET considerations which should be included.  The user will also find information in "hat section on how to use the other volumes of this guidelines series to generate the required information for inclusion in the acquisition documents.

The user interested in updating existing DoD training system development documentation will find information on developing new DIDs in Appendix B, where new DIDs are proposed.

Procurement personnel tasked with developing an RFP that includes ET requirements analysis and development can use the section entitled RFP Preparation and Procedures for ET Component Acquisition to find pertinent discussion and guidance on the kinds of inputs that should be included in a comprehensive ET RFP. The RFP preparer can then turn to the examples provided in the final section, Sample ET Inputs to RFP Statement of Work, System Specifications, and Evaluation Criteria, for examples of RFP statements of ET requirements and a summary of general ET requirements presented in RFP format. The user can augment or tailor the sample statements with items or data specific to the user's acquisition.

## Definition of ET

ET is defined by the authors as that training which results from feature(s) incorporated into the end item equipment to provide training and practice using that end item equipment. The features may be completely embedded within the system configuration or may be executed by some form of appended (e.g., a video disc player) or plug in (e.g., a floppy disc) equipment. The feature(s) MUST include stimuli necessary to support training; they SHOULD include performance assessment capability, appropriate feedback, and record keeping.

# ACQUISITION PROCESS OVERVIEW

## Introduction

This section is an overview of the Army Streamlined Acquisition Process (ASAP), along with a brief summary of Embedded Training (ET) considerations. The next section, entitled Documenting ET Development, provides details on the makeup of documents produced in the acquisition process and the impact of ET on the contents of those documents. The ASAP was chosen for this illustration, rather than the Life Cycle Systems Management Model (LCSMM), since it is becoming the predominant acquisition approach used by the Army, at least in terms of the names of phases of the acquisition process that are used. A brief recapitulation of the differences between the ASAP and the LCSMM is provided in Figure 1.

## Anatomy of the ASAP and Relationships with ET

Figure 2 shows a timeline diagram of the ASAP. At the top of this figure, the major phases of the ASAP are indicated, along with major milestones in the process. The next row of Figure 2 describes the evolutionary status of the materiel system at each major phase of the ASAP. The third row indicates the ideal evolutionary development of an ET component, as related to system development and the ASAP. Here, the developmental phases of ET are described, in terms of the ET "products" that should be developed at each phase of the acquisition process.

The fourth row of the figure indicates the major acquisition process documents that are developed or updated in each phase of the ASAP. A brief description of each of the documents is provided later in this section. A detailed discussion of the impacts of ET on each of the documents is provided in the next section of this volume.

The last row of Figure 2, labeled "Comments," identifies ET-related processes and analyses which should be performed at each phase of the ASAP, to ensure appropriate and timely consideration of ET issues. These analyses contribute to the development of the ET "products" at each phase of the ASAP. They also provide information that ultimately feeds into the ET-related portions of acquisition documentation.

It is impossible to overstate the <u>importance of continuous inter-action and exchange of information among combat developers, training developers, materiel developers, system designers, and other users in attaining effective ET capabilities.</u> Needed ET analyses and studies

5

| LCSMM: | ASAP: | APPLICABLE GUIDELINES: |
|---|---|---|

**LCSMM:**

PROGRAM INITIATION

0

CONCEPT EXPLORATION

I

DEM-VAL

II

FSED

III

PRODUCTION AND DEPLOYMENT

**ASAP:**

REQUIREMENTS AND TECHNOLOGICAL BASE

JMSNS O&O PLAN

—

PHASE I STRAP

PROOF OF PRINCIPLE

ROC

I

STRAP

DEVELOPMENT AND PRODUCTION PROVE OUT

III

PRODUCTION AND DEPLOYMENT
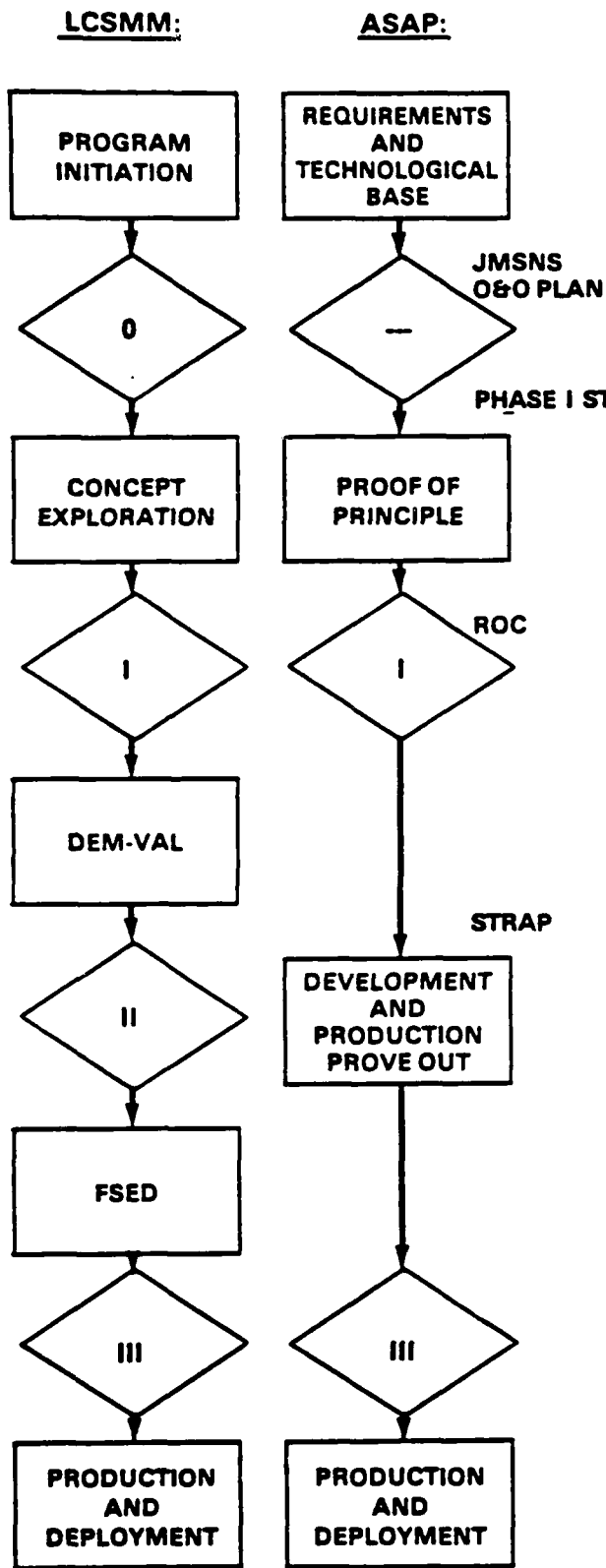
**APPLICABLE GUIDELINES:**

1. Interim overview
2. ET as a system alternative
3. Role of ET in training system concept
4. Identifying the ETR
5. Designing the ET component
9. Logistics implications
10. Inputs to acquisition documentation

4. Identifying the ETR
5. Designing the ET component
6. Integrating ET with the system
7. ET test and evaluation
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10. Inputs to acquisition documentation

6. Integrating ET with the system
7. ET test and evaluation
8. Incorporating ET into Army unit training
9. Logistics implications
10. Revisions to acquisition documentation

All guidelines to be used as applicable - for:

NDIs, P3Is, PIPs, ECPs and in post-fielding training developments

Figure 1.   System acquisition processes and the application of ET guidelines and procedures

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| Acquisition Cycle Phase (ASAP) | Mission Area Analysis | Requirements/Technology Base Development | Proof of Principle | Development and Production Proveout | Production/Deployment |
|---|---|---|---|---|---|
| **Material System Status** | Pre-concept | Concept → Breadboard | Breadboard → Brassboard | Brassboard → Prototype | Production Configurations |
| | | *(Program Initiation)* | | *(Milestone I/II)* | *(Milestone III)* |
| **Embedded Training Evolution** | ET Consideration Decisions | ET Consideration Decisions<br>Training System Concepts (incl. ET)<br>Preliminary ET Requirements<br>ET Design (Courseware Concepts)<br>ET Design (Hardware Concepts) | ET Consideration Decisions<br>ET Requirements<br>ET Design<br>ET Concepts Evaluation (In Crew Systems Testbed) | ET Requirements<br>ET Design<br>ET Evaluation (In Prototype Systems/User Testing) | Production ET Components |
| **Impacted Acquisition Documentation** | MADP<br>BDP<br>LRRDAP | SMMP<br>O&O Plan<br>JMSNS<br>Preliminary TDR<br>TEMP<br>ILSP<br>STRAP Phase One<br>TOOPRI<br>TBOIP<br>DTOE | SMMP Update<br>O&O Plan Update<br>CFP<br>TDR<br>TEMP Update<br>ILSP Update<br>STRAP<br>ROC<br>QQPRI<br>BOIP<br>TOE | SMMP Update<br>O&O Plan Update<br>TDR Update<br>TEMP Update<br>ILSP Update<br>STRAP Update<br>ROC Update<br>QQPRI Update<br>BOIP Update<br>TOE Update | |
| **Comments** | Training deficiencies identified in MAA may be possibly remedied by providing a retrofit ET capability to existing systems.<br><br>Materiel deficiencies identified in MAA may require new systems development. In each case, the potential for supporting training through an ET capability must be considered. | If ET is under consideration as a training system component at this stage, it should appear in training system concepts. Also, preliminary ET requirements (at a function or task level) should be derived. A preliminary ET design (courseware concepts) should be developed and evaluated for contribution to overall training system capabilities. The ET design should also consider hardware concepts, interactively. Integrating ET with prime system design must be kept in mind in this phase.<br><br>Derive soldier performance standards.<br><br>Identify test issues. | The role of ET in the training system concept should be firmly established at this phase. More detailed ET requirements (training objective level) should be defined. The ET requirements should be used to develop an ET design. The preliminary ET design and prototype courseware should be evaluated in a crew systems testbed (also used for evaluating crew systems interfaces, HFE impacts, etc.).<br><br>ET integration with prime system design must be assured. | ET requirements should be further refined (and evolve with the materiel system) at this phase. A prototype ET component should be developed concurrent with the prime system, and tested as part of user and technical tests of the total system. Experience in the ET component development and test should be used to design the production ET component.<br><br>ET articulation and integration with prime system design and development must be assured.<br><br>Test and evaluate ET. | The production ET component should be extensively evaluated during follow-on test and evaluation of the production system, particularly during low-rate initial production. Throughout the system life cycle, the ET component should be updated to reflect changes in training requirements associated with changes in prime item materiel, tactics, doctrine, and force integration. ET should be considered as an integral part of the total system during product improvement initiatives. |

Figure 2. Timeline diagram of the Army Streamlined Acquisition Process (ASAP)

must be conducted in a timely fashion in each phase of the acquisition process. The results and implications of those studies must be made known clearly to the materiel developer and the designer, so that appropriate capabilities to support ET can be designed into the materiel system. ET analysts and developers must also remain fully aware of the potential limitations upon what can be accomplished to support ET that derive from constraints on system design and character- istics. Experience in developing ET components has shown clearly that, when design goes forward without explicit consideration of what must be incorporated to support an ET capability, no ET (or at best, ineffec- tive and poorly executed ET) results. On the other hand, when clear and explicit ET requirements and support needs are defined and communi- cated to materiel developers and system designers at appropriate times, very good ET can be incorporated into materiel systems.


## Acquisition Documentation Overview


The following paragraphs briefly describe the acquisition documen- tation that is produced at each stage of the ASAP. The documents are discussed in approximately the order they are produced in each phase. Each document is identified and a brief statement of its purpose is provided. Further discussion of ET impacts on the documents is given in the next section of this document.


### Mission Area Analysis

Mission Area Analysis (MAA) is a process conducted periodically by each Army Branch (Infantry, Field Artillery, Armor, etc.) to identify deficiencies in current capabilities to meet and defeat the expected battlefield threat. Deficiencies that are discovered are evaluated, and the approach to overcoming the deficiency that is the most likely to be effective is identified. Approaches to reduce deficiencies include organizational changes, changes in training, doctrine or opera- tional changes, and the development of new or improved materiel system capabilities. Deficiencies requiring materiel development or modifica- tion solutions are described, corrective actions are defined, and development approaches are discussed in the Mission Area Development Plan (MADP). The MADP provides a time-phased roadmap of how the Branch or other proponent plans to correct each defined deficiency, using the selected approaches.

The MADPs for the various branches ultimately feed into develop- ment of the Battlefield Development Plan (BDP). The BDP provides an opportunity to utilize a technological or development thrust to assist multiple mission area development needs.

Development requirements that demand new or innovative technolog- ical or research and development solutions also feed into development of the Long-range Research, Development, and Acquisition Plan (LRRDAP). This plan specifies research and technology development needs which

must be addressed in order to meet materiel system capability require-
ments.

ET considerations during MAA are limited to determination of
whether to retain ET as one potential component of the training system
for particular materiel system developments. Procedures and guidelines
for this decision are presented in Volume 2 of this series.


## Requirements and Technology Base Development

This phase of the ASAP precedes the formal decision (Program
Initiation) to enter a materiel development program. During this
phase, emphasis is placed on development of the technology base to
support required materiel system developments, and on developing
explicit requirements for the performance of the materiel system. A
detailed concept is developed for the proposed new system, and technol-
ogy demonstrations at the "breadboard" level may be conducted to
provide evidence that the required technology is ready for develop-
ment.

Numerous acquisition documents are produced in this phase. Many
of these documents are of a preliminary or tentative nature, and the
emphasis is on planning for the acquisition process.

One of the first documents developed in this phase is the System
MANPRINT Management Plan (SMMP). MANPRINT consists of six domains:
Manpower, Personnel, Training, Human Factors Engineering, Safety, and
Health Hazard Assessment. Training is one of the six MANPRINT domains
addressed in the SMMP. The SMMP describes how MANPRINT analyses and
issues will be addressed and resolved during the system development
process. The SMMP also brings together MANPRINT-related issues to be
resolved during the development process, and assigns initial responsi-
bility to various agencies for addressing MANPRINT issues. Development
of the SMMP is discussed in AR 602-2 and TRADOC/AMC Pamphlet 602-1 (for
full citations of documents, see the References section of this
document).

The SMMP feeds into development of the Organizational and Opera-
tional (O&O) Plan for the new system. The O&O Plan describes the capa-
bilities of the proposed new system, how it will be utilized in battle,
and the characteristics of organizations that will use it. The O&O
Plan is accompanied by numerous annexes, some of which describe antici-
pated characteristics of the training system supporting the new mater-
iel system, and requirements for training devices.

Following development of at least a draft-level O&O Plan, a
Justification for Major System New Start (JMSNS) may be prepared. The
JMSNS is required for systems having certain specified levels of R&D or
development and production costs, and for other systems that may be
designated by the Department of the Army or the Department of Defense.
The JMSNS describes the materiel deficiency to be addressed by the new
system, and characterizes the proposed solution in a number of ways.

This document also contains estimates of R&D and production costs, and estimated life-cycle cost for the system. Approval of the JMSNS initiates the formal development process for a new major system.

During this phase, a preliminary set of Training Device Requirements (TDR) documents may also be produced. The preliminary TDRs describe the characteristics and uses of training devices (as components of the training system) to support the new materiel system. At this point in the acquisition cycle, TDRs are normally only rough estimates of types of devices that are estimated to be required to support the new system. TDR development should ideally be supported by development of a training system concept for the new system, which includes consideration of the use of ET as a component of the training system. These TDRs become annexes to the Required Operational Capability (ROC), developed on a draft basis in this phase of the ASAP.

Numerous working and planning documents are also produced in this phase. They include the following:

1.  A preliminary Test and Evaluation Master Plan (TEMP). This plan outlines test issues for the new system, and describes the various user and technical test events that will be used to evaluate test issues. At this point, the TEMP may be specific regarding issues to be addressed in this phase, but less specific about test issues in later phases of the acquisition process.

2.  An initial Integrated Logistic Support Plan (ILSP). This Plan identifies the activities, analyses, and processes required to implement the Integrated Logistics Support (ILS) process, as well as the Logistics Support Analysis (LSA) process that supports the ILS process.

3.  A Phase 1 System Training Plan (STRAP). This plan outlines the types, locations, proposed duration, and support of training for each kind of operator, maintainer, and supporter for the system, to the extent that these can be determined at this phase of the acquisition cycle.

4.  Tentative Qualitative and Quantitative Personnel Requirements Information (TQQPRI) document. The TQQPRI, at this point, is a "best guess" at the characteristics of operators, maintainers, and support personnel required to support the system, in terms of Military Occupational Specialties (MOSs), skill levels, and numbers of people for each category.

5.  Tentative Basis of Issue Plan (TBOIP) document. This plan outlines the quantities in which prime and support equipment for the new system will be supplied to using units. At this point, the TBOIP is "best guess" information that is refined at later phases of the acquisition process.

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6. Draft Tables of Organization and Equipment (DTOE). This document outlines the numbers and types of personnel and equipment (of all sorts) that are projected for each type of using unit.

Ultimately, information from each of these documents, and their supporting analyses, feeds into preparation of the Required Operational Capability (ROC) document for the new system. The ROC (once updated in the next phase) is the principal governing document for the remainder of the acquisition process. In the ROC, the required and desired performance and support characteristics of the new system are specified at a relatively detailed level. Appendixes to the ROC outline supportability parameters for the new system, including manpower, personnel, and training (incorporating training devices and ET). Currently under discussion is whether or not ET should also be included as a performance characteristic of the system in the main body of the ROC text as well as in the appendixes.

ET considerations during this phase are more complex than at the MAA phase. *The consideration of whether to continue to include ET as a candidate training approach in the training system must be re-evaluated iteratively in this phase.* Whether or not it is decided to continue ET in consideration, a training system concept should be developed during this phase. If ET is still in consideration, the training system concept should outline the differential and interlocking roles of ET and stand-alone training devices in supporting training (see Volume 3 of this series).

Preliminary ET requirements should be identified in this phase (see Volume 4 of this series). Based on the preliminary ET requirements, a tentative ET design concept (Volume 5 of this series) should also be derived. The tentative ET concept should include both courseware concepts (what may be taught by ET and how it may be taught) and ET hardware concepts (how ET will be worked into the system and the soldier-system interface). ET concepts should be shared early and frequently with materiel developers and other entities involved in preliminary design studies, to ensure that ET considerations are included in their thinking about the new system.

## Proof of Principle

This phase of the ASAP is the first phase following the formal decision to proceed into the system development process. During this phase, the principal emphasis is to evolve technologies needed to meet system performance requirements, and integrate the technologies into a "brassboard"-level demonstration that system performance objectives can be met. Considerable emphasis at this phase is on technical performance of system elements. Emphasis must also be placed on supportability, including the human issues addressed by MANPRINT.

Only one completely new acquisition document is produced at this phase. This is the Concept Formulation Package (CFP). The CFP is

supported by a number of analytic efforts performed in this phase, including Trade-off Determination (TOD), Trade-off Analysis (TOA), Best Technical Approach (BTA), Cost and Operational Effectiveness Analysis (COEA), and Cost and Training Effectiveness Analysis (CTEA). The CFP describes the system concept(s) selected for development and their ramifications in terms of schedule, cost, effectiveness, manpower, personnel, training, and logistic support.

Practically all of the documents that were originally developed in initial or preliminary form in the previous phase are updated based on later and more detailed information at this phase. More detailed analyses are enabled by further evolution and design of the materiel system, and the results of these analyses are reflected in the updated documents. Documents that are updated in this phase include the SMMP, O&O Plan, TDRs, TEMP, ILSP, STRAP, ROC, QQPRI, BOIP, and TOE.

ET considerations at this phase include:

1.  Iterative re-evaluation of the decision to retain ET as a component of the total training system, in light of increased information about training requirements provided by materiel system design evolution;

2.  Identification of updated ET requirements based on evolving system design;

3.  Design of a preliminary ET component for test and evaluation; and

4.  Trial implementation and evaluation of ET concepts based on the ET design in a crew systems testbed (used also for evaluating soldier-system interfaces and assessing human factors engineering issues of the evolving system).

Again, ET requirements and design must be closely coordinated among combat developers, materiel developers, training developers, and system designers, to ensure that the design of the prime item system can accommodate characteristics needed to implement effective ET.


## Development and Production Proveout

During this phase, the materiel system's final design and development is completed, and prototype systems are tested in context of actual use in the combat (or other use) environment. Technical and user testing evaluate whether the system as designed is capable of meeting its operational and supportability goals. Significant emphasis is placed on support issues, including the MANPRINT domains and logistic supportability of the new system.

No completely new acquisition documents are produced in this phase. However, as with the previous phase, all documents are updated based on current information about, and analyses of, the evolving system.

ET considerations at this phase include updating ET requirements and design, and developing and testing a prototype ET component along with the system. Once again, close and frequent interactions between ET designers and system designers and materiel developers is required to ensure that ET integration with prime system design is effective.


## Production and Deployment

In this final phase of the ASAP, production systems are acquired and fielded. If user and technical tests of early production systems reveal deficiencies, some or all of the acquisition documents may be updated as a result of system design or utilization changes.

ET considerations center on ensuring that the design of ET courseware is current with the operational system's characteristics, and with assessing the performance of the ET component as fielded. Effective integration of the ET component with the remainder of the system must also be assured. If design changes to the prime item system occur, or if tactical or doctrinal changes take place that impact the ET courseware, ET must be updated to reflect these changes.

# DOCUMENTING ET DEVELOPMENT

## Introduction

Two Army models for system acquisition, the LCSMM and the ASAP, both require the same documentation. A third model, Non-Development Item (NDI) acquisition, which seeks to use existing systems, subsystems, or equipment with little or no development or modification, requires essentially the same documentation with the addition of a market survey. This documentation structures the acquisition process, and ET procured via this process. This section describes how to structure ET development through requirements documentation.

Seventeen LCSMM or ASAP acquisition documents are discussed:

|     |          |                                                           |
| --- | -------- | --------------------------------------------------------- |
| 1.  | MAA      | Mission Area Analysis                                     |
| 2.  | BDP      | Battlefield Development Plan                              |
| 3.  | O&O Plan | Organizational and Operational Plan                      |
| 4.  | JMSNS    | Justification for Major System New Start                  |
| 5.  | COEA     | Cost and Operational Effectiveness Analysis              |
| 6.  | CTEA     | Cost and Training Effectiveness Analysis                 |
| 7.  | BOIP     | Basis of Issue Plan                                      |
| 8.  | QQPRI    | Qualitative and Quantitative Personnel Requirements Information |
| 9.  | TEMP     | Test and Evaluation Master Plan                          |
| 10. | SMMP     | System MANPRINT Management Plan                          |
| 11. | AS       | Acquisition Strategy                                     |
| 12. | AP       | Acquisition Plan                                         |
| 13. | ROC      | Required Operational Capability                         |
| 14. | TDR      | Training Device Requirements                            |
| 15. | TDNS     | Training Device Needs Statement                         |
| 16. | ILSP     | Integrated Logistics Support Plan                       |
| 17. | STRAP    | System Training Plan                                    |

## ET in the LCSMM and ASAP Process

The ASAP process is discussed in the preceding section of this volume. This section presents each of the documents required by the LCSMM and ASAP processes, and states how each document must relate to ET. It also discusses how the ET guidelines can help in accomplishing ET-oriented tasks for each document. The documents discussed are listed in the introduction to this section. In the previous section, Figure 2 shows where each document fits in the overall acquisition process.

In the following discussion, each document is discussed in terms of:

1. The sections of the document that require direct reference to ET.

2. The type of information relevant to ET which will be required at each phase of the LCSMM. Different requirements sometimes arise as the document matures; this discussion enables these to be anticipated.

3. The source of information that guided the development of guidance in this section for completing the required document. This is included so that changes and improvements to source documents can be adopted as they are revised or modified. This section relies extensively on one document, AMC/TRADOC Materiel Acquisition Handbook (AMC/TRADOC Pamphlet 70-2). This document is explicit with respect to the content and format requirements of most LCSMM documents. Citations for all sources are presented in the References section of this document.

4. The ET guideline documents which are relevant in accomplishing the required tasks.

### Mission Area Analysis (MAA)

Content. Mission Area Analysis is an ongoing process undertaken by the seven Department of the Army (DA) mission areas and the 13 TRADOC mission areas. MAA is an analysis of how the proponent's missions will be accomplished. Problems are identified as shortcomings or deficiencies, and result in recommendations about possible solutions. Two of the alternatives are training and materiel development solutions. Volumes 2 and 3 are relevant to the consideration of ET as a potential solution to a mission deficiency. If possible, a preliminary (functional-level) needs assessment should be performed for both notional materiel system concepts for countering the threat and the man-function tasks and skills required to operate the system (regardless of how these tasks or skills might eventually be assigned to

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soldier or machine). This initial analysis should indicate whether the eventual system is likely to have a computer, and whether there are tasks or skills for which hands-on training (institutional or sustaining) is likely to be required. These analyses will provide the information enabling an initial estimate of whether embedded training is a viable candidate for use in the training system. Note that the notional system concepts and ET assessment are at this point a best guess based on available information and current assumptions. These do not either define or constrain the eventual materiel system or training system design.

Source of Information. AR 71-9.

Relevant Guidelines:

Volume 2  ET as a System Alternative

Volume 3  The Role of ET in the Training System Concept


## Battlefield Development Plan (BDP)

Content. The BDP is the capstone document of the MAA. It is prepared annually by TRADOC to summarize the MAAs, and is the basis for prioritization of Army Research, Development, and Acquisition (RDA) programs. Volumes 2 and 3 are relevant to the determination of how ET may provide a solution to a deficiency, or whether it should be considered for inclusion in a system procurement.

Source of Information. AR 71-9, AR 70-1.

Relevant Guidelines:

Volume 2  ET as a System Alternative

Volume 3  The Role of ET in the Training System Concept


## Organizational and Operational Plan (O&O Plan)

Content. Section 7 of the O&O Plan deals with system constraints which may limit an acceptable solution to the need. The particular constraints relevant to ET are: mobility; transportability; logistics support; training; MANPRINT; communications; and size and weight. Mobility, transportability, and size and weight are important especially if adjunct or strap-on ET is under consideration. Logistics support is relevant to a complex ET strap-on or severe demands on equipment incurred by ET. Communications becomes an issue if "netted" training (two or more systems working in a coordinated fashion, including linkage of their ET components) is envisioned via ET. MANPRINT considerations revolve around training effectiveness, system safety, and human factors associated with entering and exiting the ET mode and indicating that the training mode is in effect.

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The O&O Plan is developed during the Requirements and Technology Base Phase of acquisition. All issues must be flagged during this phase, before they become insoluble. Updates to the O&O Plan will reflect only the decisions and solutions adopted during the program, and probably do not require as much in-depth analysis and use of guidelines as the initial O&O Plan.

The O&O Plan uses information that is generated from use of Volumes 2, 3, and 9. Volume 6 can serve as an indicator of the types of constraints that will become manifest as a result of the ET component.

Source of Information. AMC/TRADOC Pamphlet 70-2, Section 3.

Relevant Guidelines:

Volume 2   ET as a System Alternative

Volume 3   The Role of ET in the Training System Concept

Volume 6   Integrating ET with the Prime System

Volume 9   Logistics Considerations


## Justification for Major New System Start (JMSNS)

Content. The JMSNS is specifically called for when, during the preparation of the O&O Plan, it becomes clear that the cost to fulfill a need will exceed $200 million in Research, Development, Test, and Evaluation (RDTE), $1 billion in procurement, or a DOD-level decision review will be required. The JMSNS describes a mission need; it does not specify solutions. This document is prepared only once, during the Requirements and Technology Base phase.

Several parts of the JMSNS should refer to the need for ET, if ET is considered a candidate. Part B, Mission and Threat, includes reference to shortfalls in existing systems. If one of these shortfalls is lack of adequately prepared troops to utilize the system, then modification to include ET, or a new system including ET, may be called for.

Part D, Technology Involved, should mention ET if it is envisioned for the new system, especially if it is an area of risk, which it may be, due to stimulus and simulation requirements.

Part E, Funding Implications, may have to factor in ET in terms of overall training program costs.

Part F, Constraints, should note the computer resource needs implied by ET, and the possible amelioration of some MANPRINT constraints due to the inclusion of ET.

Part G, Acquisition Strategy, should include contracting for the ET component at an earlier date than that which may be appropriate for the rest of the training component. ET should be incorporated into the initial support contracts to prepare the procurement package and then into the prime system development contract, or if a separate procurement, then these contracts should be issued concurrent with the prime system contract(s).

Volume 2 procedures need not be completed for the JMSNS. However, those analyses can serve as an indicator of the kinds of considerations that will be important in determining if ET is appropriate.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 3.

Relevant Guideline:

Volume 2    ET as a System Alternative


## Cost and Operational Effectiveness Analysis (COEA)

Content. A COEA is prepared by the TRADOC proponent during the Proof of Principle Phase. The COEA and CTEA are associated, and are part of the Concept Formulation Package (CFP). The COEA includes analysis and comparison of various alternative system concepts. The costs of these concepts are estimated and evaluated in the COEA. Two of the COEA concepts that should include reference to ET are the MANPRINT concept and the training support concept. Three volumes of ET guidelines (see below) can help in establishing concept alternatives. The decisions that are made in the COEA bear directly on whether ET is selected as a system alternative, and what it is expected to accomplish as part of the overall training system concept.

Part of the COEA will be the estimation of the logistics burden of the system, and the identification of logistics constraints, including those due to ET considerations.

Information derived from performing the work called for in Volumes 2 and 3 will assist training and MANPRINT concept formulation. Volume 9 is of value for its description of the ways in which ET may affect logistics.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 1G.

Relevant Guidelines:

Volume 2    ET as a System Alternative

Volume 3    The Role of ET in the Training System Concept

Volume 9    Logistics Implications

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## Cost and Training Effectiveness Analysis (CTEA)

Content. The CTEA is prepared in conjunction with the COEA, to compare training alternatives. A potential issue in conducting CTEA with ET as an alternative is that some of the training tradeoffs that conventionally occur during Proof of Principle or later must now take place earlier, otherwise it will not be possible to incorporate the ET component into the prime system. When ET is under consideration, then alternative training programs must be considered early in association with prime system considerations. Volumes 2 and 3 describe work that should be performed in conjunction with the CTEA. Volume 3 will aid in the specification of alternatives.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 1G.

Relevant Guidelines:

Volume 2    ET as a System Alternative

Volume 3    The Role of ET in the Training System Concept


## Basis of Issue Plan (BOIP)

Content. The BOIP is part of the BOIP and QQPRI package. This package is aimed at predicting the quantity of systems to be purchased, amount of support equipment, and numbers of support personnel and their skills. The BOIP states the levels at which items may be placed in an organization, the quantity of item per organizational element, and equipment and personnel changes required. There may be ET considerations that will affect the decisions about how many of an item to purchase. In fact, the item may not even be the prime system; the presence of ET may alter the number of associated training devices that will be acquired. It may (for example) be possible to purchase more prime systems (with ET) and fewer training devices. The BOIP may indicate how many of the prime item systems are to be equipped with ET (if not all are to be ET-equipped) or, if ET is to be in a strap-on configuration, how many ET units are to be provided.

Volume 3 analyses, and initial Volume 4 and 5 analyses, should be completed to provide inputs to BOIP formulation.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 14.

Relevant Guidelines:

Volume 3    The Role of ET in the Training System Concept

Volume 4    Identifying ET Requirements

Volume 5    Designing the ET Component

## Qualitative and Quantitative Personnel Requirements Information (QQPRI)

Content. The QQPRI is also part of the BOIP and QQPRI package. The QQPRI is more directly aimed at training and personnel considerations. In particular, the QQPRI contains a plan to provide adequate numbers of trained personnel to operate the systems, and states the implications for training and major items for training support.

The QQPRI presents a plan to provide trained personnel. This should include ET if it is a potential in the training system concept. Implications for training should be based on the results of Volumes 3 and 4 analyses, where the proper places to apply ET are established. Volumes 5 and 6 can be used for reference, to understand implications for training support. When the products from these latter volumes are actually produced, in the Proof of Principle and Development and Proveout Phases, they may become part of the QQPRI updates.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 14.

Relevant Guidelines:

Volume 3    The Role of ET in the Training System Concept

Volume 4    Identifying ET Requirements

Volume 5    Designing the ET Component

Volume 6    Integrating ET with the Prime System


## Test and Evaluation Master Plan (TEMP)

Content. The TEMP is produced by the materiel developer in cooperation with the Test Integration Working Group (TIWG), a committee whose responsibility is to ensure that the system meets stated requirements at all stages of evaluation. The TEMP defines and integrates test objectives, critical issues, and system characteristics; establishes evaluation criteria; and determines the sample size for each test.

The products resulting from Volume 4 and 5 analyses will help in determining the required TEMP elements. Specifically, they will help in establishing the appropriate methods of ET employment and test criteria. Volume 7 contains more specific instructions on how to go about the process of testing and evaluating ET. It covers alternative approaches to testing and how to integrate ET evaluations into the overall test plan.

The initial TEMP may contain only references to possible points of test, since ET may not be an established fact at the Requirements and Technology Base phase. However, by the Proof of Principle phase, ET

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testing must be integrated into the TEMP. Most important, the TEMP should provide for a series of formative evaluations of ET, because if the training proves to be faulty at a late stage of development, it may also prove to be very costly to modify.

Since T&E effectively completes each phase of the LCSMM and ASAP, leading to the milestone decision, the TEMP should call for a conceptual demonstration of ET at the end of the Requirements and Technology Base phase; a more complete demonstration at the end of the Proof of Principle, in which solutions to every potential problem area are demonstrated; and a complete Test and Evaluation (T&E) at the end of Development and Proveout.

Source of Information. AR 70-10, Chapter 6.

Relevant Guidelines:

Volume 4    Identifying ET Requirements

Volume 5    Designing the ET Component

Volume 7    ET Test and Evaluation


## System MANPRINT Management Plan (SMMP)

Content. The SMMP is the guiding document for the overall MANPRINT approach to a procurement. The SMMP contains the Target Audience Description (TAD) which describes the characteristics of the intended trainees. In particular, the SMMP can be used to ensure that ET is part of the TEMP. Two areas in which ET must be considered are the specification of MANPRINT issues and estimating the planned level of the MANPRINT analysis effort.

The SMMP includes six tabs with specific information. ET should be considered in: Tab A, Data Sources; Tab B, MANPRINT Milestone Schedule; Tab C, Task Descriptions; and Tab D, Questions to be Resolved. For Tab A, the T&E considerations discussed in Volume 7, task analyses discussed in Volume 4, and the training system concept discussed in Volume 3, should be noted. For Tab B, ET products must be called out. These can be found in Volumes 2, 3, 4, 5, 6, 7, and 8. For Tab C, task descriptions are the MANPRINT tasks, and ET development tasks should be noted. Volumes 2, 3, and 4 state the tasks which must be performed to decide on and implement ET; this will assist Tab C development. For Tab D, the question of suitability of ET must be raised and resolved using Volume 2 considerations.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 11.

Relevant Guidelines:

Volume 2    ET as a System Alternative

Volume 3    The Role of ET in the Training System Concept

Volume 4    Identifying ET Requirements

Volume 5    Designing the ET Component

Volume 6    Integrating ET with the Prime System

Volume 7    ET Test and Evaluation

Volume 8    Incorporating ET into Unit Training


## Acquisition Strategy (AS)

Content. The AS is required for every materiel acquisition pro-
gram, and is developed early in the Requirements and Technology Base
Phase. It is developed from the O&O Plan or JMSNS and is kept
up-to-date throughout the program. Acceptance of the AS indicates the
decision to proceed with acquisition, contracting, MANPRINT, support
after fielding, T&E, production, and so forth.

It is in the MANPRINT and T&E areas that ET should be considered
in the AS. The AS is the document that provides the impetus to make
official decisions about ET at specified points in the acquisition
process. The AS should call for the required studies and T&E to
support these decisions. If there is an early decision to include ET
in the training strategy, then this should be documented in the AS.

The guidelines noted below, Volumes 2, 3, 5, 7, and 9, are useful
to help the acquisition planner understand where ET decision points are
required and the kinds of data which are needed to support them.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 7.

Relevant Guidelines:

Volume 2    ET as a System Alternative

Volume 3    The Role of ET in the Training System Concept

Volume 5    Designing the ET Component

Volume 7    ET Test and Evaluation

Volume 9    Logistics Implications


## Acquisition Plan (AP)

Content. The AP is the detailed technical, business, and
management counterpart to the AS. It describes the actions needed to
accomplish the strategy.

The guidelines noted below will be important in three areas of the AP: specifying the capability or performance characteristics of the ET component; product descriptions; and describing the government's T&E program. These guidelines may be used by themselves for information purposes. Their products per se do not impact the AP.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 8.

Relevant Guidelines:

    Volume 3   The Role of ET in the Training System Concept

    Volume 5   Designing the ET Component

    Volume 7   ET Test and Evaluation

    Volume 9   Logistics Implications


## Required Operational Capability (ROC)

Content. The ROC is the definitive statement describing the materiel solution to a mission area deficiency. It includes the minimum requirements for every aspect of the overall solution. The ROC is not finalized until there is information from the Proof of Principle phase that a specific solution is viable to resolve the deficiency. By this time, all aspects of the solution should have been proven, including ET.

The ROC is concerned with the development and implementation of ET, rather than with decisions about whether or how to use it. The key areas of the ROC that must deal with ET are the training assessment that is part of the MANPRINT assessment, and the Training Device Appendix (Appendix 5). While ET is not a device, there is, at present, no other place in the ROC to describe training hardware requirements. There is discussion, however, that ET should be included in the main body of the ROC as a required system capability. At this time, ET is too new to have been integrated into any existing ROC. Also, there is the possibility that some ET functions may emerge as new device requirements during engineering development of a system, if tradeoffs preclude the capability to embed these functions in the system.

The MANPRINT assessment should deal with the results of the studies called for in Volumes 2, 3, 4, and 5. The ROC should draw upon an overview description of these results.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapters 4 and 5.

Relevant Guidelines:

    Volume 2:  ET as a System Alternative

Volume 3:   The Role of ET in the Training System Concept

Volume 4:   Identifying ET Requirements

Volume 5:   Designing the ET Component


## Training Device Requirements (TDR) and Training Device Needs Statement (TDNS)

Content. The format for a TDR is the same as that used to develop the Training Device Appendix to the ROC. This Appendix substitutes for a a Training Device Needs Statement (TDNS), which is otherwise the first iteration of the TDR for non-system training devices. As noted in the previous subsection, consideration is currently being given to including ET in the main body of the ROC as a system performance requirement characteristic. At this time, however, Appendix 5 to the ROC provides the forum to specify what the ET requirements will be.

The sections in Appendix 5 to the ROC justifying the training device (ET) need, describing the training strategy, and stating the constraints will utilize Volumes 2, 3, 5, and 6. The products from these guidelines will be important in developing this appendix.

The statement of the essential characteristics of the ET component in ROC Appendix 5 will rely on the information in Volumes 5 and 6 or the results of the analyses suggested there. Part of the ROC MANPRINT assessment is a training assessment, which will depend on the data from Volume 3 analyses and guidance from Volume 8. The technical assessment will use Volumes 3, 5, 9, and, most importantly, 6.

Source of Information. AMC/TRADOC Pamphlet 70-2, Chapter 5.

Relevant Guidelines:

Volume 2    ET as a System Alternative

Volume 3    The Role of ET in the Training System Concept

Volume 5    Designing the ET Component

Volume 6    Integrating ET with the Prime System

Volume 8    Incorporating ET into Unit Training

Volume 9    Logistics Implications


## Integrated Logistics Support Plan (ILSP)

Content. The ILSP is the requirements document that establishes the ILS program within the acquisition program. It begins as an

estimation of ILS requirements for the program, and is refined as those requirements become established. ET will be important in the following sections of the ILSP: system description; acquisition strategy; and ILS elements (i.e., training and training devices).

The training system concept, a product of Volume 3, is needed for the system description. For the acquisition strategy, the ILS planner should consider this same concept, along with the recommendations in Volumes 6, 8, and 9. In particular, integration with the prime system is a key issue. For training and training devices, considerations in Volumes 3, 5, 6, and 9 are important to establish configuration and hardware requirements, and to specify ET and training device roles in the overall training system. For computer resources support, guidance in Volumes 5, 6 and 9 is important to establish processing requirements.

Source of Information. Army Regulation 700-127.

Relevant Guidelines:

Volume 3    The Role of ET in the Training System Concept

Volume 5:   Designing the ET Component

Volume 6    Integrating ET with the Prime System

Volume 8    Incorporating ET into Unit Training

Volume 9    Logistics Implications


## System Training Plan (STRAP)

Content. The STRAP is the master training management plan for a new system. Every aspect of training is addressed, for every aspect of the system. Operation, support, and maintenance must be addressed, at all levels of training. For the purposes of the STRAP, ET must be noted whenever it is expected to provide the most effective approach for a given aspect of training.

The first section of the STRAP is the System Description. This description should include mention of ET if it is to be part of the training system. The second section of the STRAP is the Training Concept. This is the key place where the ET approach must be shown as an integrated part of the training concept along with devices and other supporting media or training delivery systems. Volume 2 and 3 considerations will be important, along with their products.

Section 5, Training Device Strategy, should include specific reference to ET, if applicable. Volumes 2 and 3 are again important, and Volume 4 analyses become important in subsequent iterations of the STRAP.

Section 6 of the STRAP is the Training Test Support Package, and requires use of Volume 7. It is most important that planning for ET testing begins early, because ET testing will require access to operational mockups or equipment that are often also in demand for other testing purposes. It will also be necessary to plan for any special personnel requirements, such as naive soldiers who are not assigned to the system development program.

STRAP Annex A is a description of institutional training. Volume 3 procedures are applicable in determining whether there is a place for ET in institutional training.

STRAP Annex B, Unit (Sustainment) Training, is almost certainly relevant to ET, if ET is part of the training concept. Specifically, Volume 8 should be consulted during the preparation of this part of the STRAP.

Source of Information. TRADOC Regulation 351-9.

Relevant Guidelines:

Volume 2   ET as a System Alternative

Volume 3   The Role of ET in the Training System Concept

Volume 4   Identifying ET Requirements

Volume 7   ET Test and Evaluation

Volume 8   Incorporating ET into Unit Training

RFP PREPARATION AND PROCEDURES FOR ET COMPONENT ACQUISITION

## Introduction

In this section, guidance is provided for the development of a Request for Proposal (RFP) for the Embedded Training (ET) component of prime item acquisitions. There are three sub-sections to this section in addition to this overview. First, there is a brief discussion of the primary acquisition documents which must be reviewed to gather some basic information about training-related requirements. The second sub-section describes the categories of information that should be included in an RFP. The final sub-section provides a description of the RFP structure and a discussion of the ET-related information that should be included in each section of an RFP for the acquisition of a prime item system that will include an ET component.

## Gathering Information for the RFP

The RFP must contain as complete and specific information as possible concerning the ET component to assure that potential contractors will be aware of the Government's requirements for ET. These requirements include functional constraints and capabilities of the ET, potential hardware and software requirements and constraints, ET-system integration requirements, and Test and Evaluation needs.

Information for the RFP comes from the O&O Plan, the SMMP, and, to a greater extent, the ROC. These documents describe the functional requirements of the prime system and cover the expected training requirements for the system. In preparing to draft the RFP, the ROC should be reviewed to identify stated training requirements and training system concept descriptions. In preparation for writing the RFP, the ROC requirements should be converted into specific hardware and software characteristics and specific actions required by the contractor. If the ET requirements are not completely specified in the ROC or referenced documents, then the RFP should specify the analyses which the contractor will be required to conduct to determine them.

## Information to Include in the RFP

There are eleven major categories of information that should be included in the RFP. These categories are:

1. A list of applicable documents;

2. A description of the prime system;

3. A description of the training audience;

4. General training requirements or concept for the ET component;

5. General characteristics of the ET component;

6. The functional sub-components of the ET component and their characteristics;

7. Support documentation for the ET component;

8. The tasks to be performed to fulfill the contract;

9. The interim deliverables;

10. The final deliverables; and

11. The evaluation criteria for the proposal.

Each of these categories is discussed in terms of the types of information to be included, or aspects of the ET component to be considered, in preparing an RFP.


## Document List

A list of applicable documents for the development of the ET component should appear in the RFP. These documents may include:

1. Critical Item or Prime Item Development Specifications that may have been written concerning the ET component and the prime system;

2. The O&O Plan;

3. The ROC; and

4. The ten (10) volumes of ET guidelines.

These documents may be used by the contractor for background as a response to the RFP is developed. The documents that pertain to training for the prime system may be included with a listing of documents concerning non-training issues.


## Description of the Prime System

A functional description of the prime system should appear in the System Specification section of the RFP. This description may be

integrated with either the RFP background or statement of problem sections, or it may be included as a separate functional specification.


## Description of the Users of ET

A statement concerning who the users of the ET component will be and their characteristics should appear in the RFP. There are several categories of users of ET. Each group will have specific needs that must be met by the ET component.

Trainees. Reference should be made to the trainee characteristics described in the MANPRINT Target Audience Description (TAD).

Training Managers. Another group of ET users is training managers. They will use the ET component in a very different way than the trainees. They will perform such tasks as setting performance parameters to be recorded, evaluating student performance, and producing performance reports. The training managers should be described in terms of their experience with similar training and prime systems.

Training Developers. Training developers are a third user group. They will require the capability to modify or create courseware. Thus they will need a training development capability compatible with the ET component. Since the training developers may not be experienced in the development of ET, their expected training development background should be described in the RFP.

ET Maintainers. Personnel who will be required to maintain the ET component are the final group of users. These people will require the capability to perform the following tasks:

1. Monitor the use of the ET component;

2. Change user access to the ET sub-components as necessary;

3. Install and uninstall the ET component or its sub-components on the system; and

4. Repair and maintain the ET component.

Descriptive information about these personnel should be included in the RFP.


## General Training Requirements or Concept for ET

The general training requirements or the general training concept for the ET component should be stated in the RFP. Aspects of the requirements or concept pertaining to the ET component include:

Collective, Crew, and Individual Training. If ET is expected to train personnel on either collective, crew, or individual tasks, only,

this should be stated in the RFP. If more than one type of task is to be taught, the RFP should indicate this.

Type of Training. The RFP should state the type(s) of training that ET is to accomplish: acquisition, sustainment, transition, or some combination of the three.

Location of Training. The site(s) where ET will be used for training should be stated. This location or locations could include the unit, the institution, or both.

New Equipment Training (NET) Requirements. The RFP should indicate whether or not ET will be used for NET purposes.

Types of Tasks to be Trained. A discussion of the types of tasks that ET will be expected to train should be included in the RFP. This discussion should focus on the task functions rather than the procedures involved in the performance of the tasks (e.g., launch, targeting, analysis, etc.).

## General Characteristics of the ET Component

There are some general characteristics of the ET component that should be specified in the RFP. These characteristics should apply to the acquisition of any item for which ET will be a component of the training system.

First, the ET component should be fully compatible with the prime system. This means that all ET-specific software must operate in concert with the software specific to the prime system. If hardware additional to that which is used for the prime system is required by the ET component, then the ET-specific hardware must be compatible with the prime system hardware and software interfaces.

Second, the ET component must not endanger personnel, equipment, or prime system data by allowing for incorrect operation by the users. The ET component must be designed to prevent the possibility of any accidents of this nature. Therefore, the ET component should be designed so that the user is aware at all times of the mode of operation (e.g., operations, maintenance, training) in which the system is running. The ET component must also contain protective mechanisms within its software such that damage will be prevented. For example, the ET component must include fail-safe mechanisms to prevent a weapon system from firing during the training session. (This does not preclude simulation of weapons firing or other events whose actual occurrence is prevented, however.)

In addition to the protection of personnel, equipment, and data, the ET component must not compromise the security of the system and its data. This means that some or all users may have to be restricted in their access to prime system data during their use of the ET component.

The data accessed will be determined by the nature and classification of the information, the type of task for which the ET component is being used, and the security clearances and category of the user (e.g., trainee, training manager, training developer, or ET maintainer) accessing the ET.

A fourth point is that the ET component must have minimal impact on the prime system's reliability, availability, and maintainability (RAM) characteristics. This requirement will impact the maintenance plan that the vendor will develop, in that the plan must include a means for determining ET impact on the prime system RAM so that remedial action may be taken once certain threshold levels of RAM parameters are reached.

Another major requirement of the ET component is that it be as fully integrated with the prime system as possible. The ET component should utilize the system hardware and software as much as possible. The requirement for integration also means that there should be minimal time required for transition from the operational mode to the ET mode or vice versa. In this way, operational readiness of the prime system can be assured, as well as promoting voluntary use of the ET by the soldier during non-critical times. However, this requirement for integration does not eliminate the possibility of strap-on or adjunct ET, so long as the training configuration is such that the transition time is acceptable given how the system will be used.

Finally, the ET component must be constrained by the characteristics and employment of the prime system. For example, courseware should never require trainees to use procedures that differ from analogous operational procedures.

## Functional Sub-Components of ET and Their Characteristics

The ET component may be thought of as being composed of several sub-components. The RFP should list these sub-components and describe their required characteristics. These characteristics will depend to some extent on the specific prime system for which training is provided. However, there are some characteristics that will be stable across most or all acquisitions; they are presented below.

Storage Sub-Component. The storage sub-component will require enough storage capacity for the passive storage of:

1. Training courseware;

2. Performance and evaluation data records for trainees;

3. Help facility to provide information about use of the ET component;

4. User identification information;

5. Interface software for peripherals as needed;

6. ET training management software;

7. The ET soldier-system interface software;

8. Training development software (if development can be done on ET delivery systems);

9. ET utility software; and

10. Communications software (if communications between the ET component and entities external to the system is a required feature).

Memory Sub-Component. The ET component will require a memory sub-component that has the capacity to run the ET software and the appropriate prime system application software required to support training.

Processing Sub-Component. A processing sub-component is needed that has adequate speed to respond to trainee actions in real-time.

Hardware Interface Sub-Component. A hardware interface sub-component must be included if it is determined that the ET component will utilize additional hardware beyond that which will be available with the prime system.

Software Interface Sub-Component. The software interface sub-component will be required for interfacing:

1. The ET management software to the prime system software;

2. The ET management software with courseware and records files;

3. The ET management software with courseware development software (if applicable);

4. The ET management software with communications software (if applicable);

5. Courseware with operating system applications files via the ET management software; and

6. Peripherals with the ET management software.

Soldier-System Interface (SSI) Sub-Component. The SSI sub-component will be required to:

1. Use the prime system's interface with the soldier;

2. Respond appropriately to the trainee, the environment, the prime system, and the other ET sub-components;

3. Indicate that the training mode is engaged and operating; and

4. Be in compliance with MIL-STD-1472 (Human Engineering Design Criteria for Military Systems, Equipment, and Facilities).

Display or Output Sub-Component. The display or output sub-component will present the training stimuli (and feedback) to the trainee, and appropriate displays to other user groups. Usually the display or output subcomponent will be integral to the prime system. However, there may be occasions when supplementary or different output devices will be required for presentations associated with the ET component. The reader is referred to Volume 5 of the ET guidelines for guidance on the selection of display device characteristics for the ET component. Guidance on decisions concerning the fidelity requirements for training stimuli is also supplied in Volume 5. In addition to appropriate implementation and fidelity, the display or output sub-component must be:

1. Compatible with the prime system; and

2. In compliance with MIL-STD-1472.

Input Sub-Component. The input sub-component will accept the user's inputs or actions into the system. Usually, this sub-component will consist of the input devices and software associated with the prime system; typically, the soldier's normal work station configuration. However, there may be situations when input devices used for the operation of the prime system must be augmented for use by the ET component. The implementation of the input subcomponent will depend on the types of tasks to be trained. Guidance for selection of input devices for ET appears in Volume 5 of the ET guidelines. Volume 5 also supplies guidance for determining the fidelity requirements for input devices. The input sub-component must also be:

1. Compatible with the prime system; and

2. In compliance with MIL-STD-1472.

ET Management Sub-Component. The primary function of the ET management sub-component is to allow the training courseware to be run on the prime system. The ET management sub-component provides for:

1. Security and protection of classified material;

2. Rapid switching between training and operational modes;

3. Protection of training data;

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4. Protection of the prime system and personnel, and against accidental misuse;

5. Stimulation of the prime system software as necessary by the courseware;

6. The support of all other ET sub-components; and

7. Training functions being driven by the prime system's operating system or executive software.

Training Sub-Component. The training sub-component is the heart of the ET component. Functionally, this sub-component presents training to the student in prime system tasks. However, there are additional characteristics that the training sub-component should manifest that are not system-specific. These general characteristics of the training sub-component may include:

1. Presents training for the identified audience;

2. Supports the identified training requirements;

3. Presents training for degraded modes of operation;

4. Presents training in operational maintenance;

5. Promotes a high level of system-learner interaction;

6. Manifests appropriate and accepted training methods;

7. Supports simulation and stimulation of the prime system's applications software, as applicable;

8. Records student performance in temporary and permanent files, the parameters for which are supplied with default values and are also modifiable by the training manager;

9. Produces appropriate feedback;

10. Utilizes specified input and output devices;

11. Utilizes training courseware developed by the training development sub-component;

12. Supports collective training, if required;

13. Supports the communications sub-component, if required;

14. Supports the production of student performance reports;

15. Supports the production of ET utilization reports;

16. Adapts to student performance; and

17. Supports presentation of courseware that is linear or with branching at points where particular responses are identified to require differential treatment.

Training Development Sub-Component. A training development sub-component (or courseware authoring system or language) should be included with the ET. However, this sub-component may not be a part of the ET that is integrated with the prime item system. For example, this sub-component could consist of an off-line authoring system that can also prepare courseware files for use by an ET component. See Volume 9 for some training development considerations related to ET. Although other characteristics specific to a particular procurement will also be required for this sub-component, this subcomponent should:

1. Support the development of new training or modification of existing courseware (post-fielding);

2. Support the devices specified for stimulus output and trainee input;

3. Support the development of training which includes the stimulation and simulation (as applicable) of the prime system's applications software;

4. Support the selection of student responses and criteria to be recorded and evaluated;

5. Support the production of student performance reports;

6. Support the communications sub-component, if applicable;

7. Support the production of ET utilization reports;

8. Support the development of training which is linear with branching at points where particular responses or are identified to require differential treatment; and

9. Allow for courseware development and production at any site selected by the government for this purpose.

Data Management Sub-Component. The ET component may be required to have the capability to produce reports on student performance and on training utilization. Data for these reports must be stored in various databases. Other data (e.g., student records that influence the choice of such ET characteristics as the difficulty of scenarios to be presented) should also be stored for internal use by the ET component.

These data should be retrievable as screen displays and reports. The data management sub-component will accomplish these functions.

This subcomponent should support procedures for establishing databases, generating reports, and storing, retrieving, modifying, and using records and databases of the following categories of data, as a minimum:

1. Student performance and evaluation records;

2. User identification records; and

3. ET utilization records.

Communications Sub-Component. The communications sub-component should allow for data transfer by Local Area Network (LAN) or other electronic modes as determined necessary to support the following:

1. Collective training;

2. Courseware transfer from the locus of development to the locus of utilization; and

3. Student and training records transfer from the locus of training utilization to other sites where such information will be processed or otherwise used.

Utility Sub-Component. The ET component must support several other functions that can be included in a utility sub-component. The utility sub-component might include:

1. A maintenance test program;

2. The capability to allow for the accessing and modification of user identification information;

3. The capability to allow access to the source code for all ET programs;

4. When appropriate, the capability to decompile or recompile all ET source code, and;

5. A self-test fault detection test on start-up to alert the user when the ET component is not functioning properly.

## Support Documentation for ET

The vendor will have to supply documentation to support the use of the ET component. This documentation will be required to provide instruction on the utilization of ET for the trainees, training managers, training developers, and ET maintainers. The following types of documentation may be required:

1. Student handbook: the student handbook should include instructions on how to initiate a training session and how

to use any special training features such as a help
function; a listing of all selectable training modules and
associated training objectives; diagrams indicating the
flow of instruction; and a discussion of the relationship
between ET and other components of the training system;

2.  Student supplementary materials:  if needed, materials
    required by the student to supplement ET should be
    provided;

3.  Instructor or training manager handbook:  the instructor or
    training manager handbook should include a listing of the
    training objectives of ET, procedures for integrating ET
    use with other training methods and media, procedures for
    monitoring student performance, procedures for setting
    performance assessment parameters, and procedures for
    records maintenance and report production;

4.  Courseware authoring manual:  the courseware authoring
    manual should contain a list of functions that may be
    performed using the authoring system, a list of the
    commands for performing the functions, and examples for use
    in developing courseware;

5.  Maintenance and repair manuals:  the maintenance and repair
    manuals should contain all the information needed for
    updating the ET software, inserting modified courseware,
    decompiling and recompiling files, changing user status,
    performing daily ET maintenance tasks, and troubleshooting
    and repairing the system; and

6.  Hardcopy of the nonproprietary uncompiled source code for
    ET-implementing software.  Note:  ET courseware (e.g., any
    content, parameters of scenarios, etc., subject to change)
    should never be allowed to be implemented in line-coded
    software.  This can cause great difficulty and expense in
    the courseware update process.


## ET Component Tasks

The RFP must contain a list of tasks that the vendor will be
required to complete in order to fulfill his contractual obligations.
The following paragraphs describe each of the tasks that the vendor
should be required to perform in order to produce the ET component for
the item being procured.  Several of these tasks must be performed in
an iterative fashion as the prime system proceeds through the concept,
development, and production stages.  The tasks that must be performed
iteratively are analytic ones that generate input to the decisions
concerning the prime system design for memory, processing, storage, and
interfacing.  The impact of ET upon the prime system must be consid-
ered, assessed, traded off, and accommodated in the system design from

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the outset of the acquisition process. Thus, the initial performance of these analytic tasks must be accomplished as early as possible in the development cycle for the prime system. As the design for the prime system evolves, these early analyses should be updated to reflect the evolution of system design. In this section, if a task should be performed at several points in the development of the prime system, it is pointed out in the discussion of the task.

Task 1.   Develop a Test and Evaluation (T&E) Plan.

The T&E Plan will be used as input to the Phase I Test and Evaluation Master Plan (TEMP) to be developed by the Government. As input to the TEMP, the T&E Plan should address the issues that are detailed in Volume 7 of the ET guidelines. To summarize some of the points covered in Volume 7, the T&E Plan should accommodate Continuous Evaluation (CE) that includes formative and summative evaluative activities for both ET courseware and software development. The plan should include a methodology for producing evidence of the training effectiveness of the ET design and courseware. There should also be a plan to produce evidence of an ET support capability by the prime system at all stages of prime item development. Additionally, the T&E Plan should describe a method for producing concrete evidence of the integration of the ET component and the prime system within the context of a brassboard system. The brassboard ET should be articulated to the prime system buses and interfaces; be driven by the prime system; and be compatible with the soldier-system interfaces of the prime system.

Note:  Because of the need for early and continuous consideration of ET in the system concept, design, and development processes, this task is placed in a non-traditional sequence in the suggested contractor task list. See Volume 7 of these guidelines for an extended discussion of the rationale for this placement.

Task 2.  Perform a training system analysis to determine the different components of the training system.

In this task, the contractor will determine the roles of the different components of the training system including ET. This task may require development of training presentation concepts under a Government-defined training strategy, and may also include the development of a recommended training strategy. This task should be performed iteratively, with the first performance occurring early in the system development cycle. The reader is referred to Volume 3 of the ET guidelines for guidance on early training system concept estimation, including ET.

Task 3.  Perform task analysis to identify tasks to be trained.

The tasks that will appear on the task list will represent all tasks that must be taught for the prime system. This task should be performed iteratively, with the contractor first performing the task early in the development cycle. Early iterations may be at a simple

gross-task level. However, later iterations must become more detailed and comprehensive as the system becomes better defined and training requirements can be identified with a higher level of confidence.

Task 4. Determine ET requirements (ETRs).

In this task, the contractor will apply procedures similar to those outlined in Volume 4 of these ET guidelines to the tasks identified for training (from Task 3 above), to identify tasks to be trained using ET. This task should be performed iteratively, as the design process for the prime system proceeds. The result of each iteration of this task is an ETR report.

Task 5. Develop a courseware concept for ET.

The contractor should develop a concept of the type of courseware to be presented via ET. The courseware concept may be developed under a Government-defined strategy for ET, or it may also include definition of an ET strategy. This concept should contain enough detail on the types of tasks to be trained and how they will be trained to inform the software development and hardware selection processes about the expected software, hardware, and processing needs of ET. The courseware concept will indicate to the software developers the types of "hooks" that must exist so that the training may be integrated with the prime system software, as well as providing rough estimates for memory, storage, and processing requirements. For example, if it is expected that simulation will be called for, or if ET will stimulate the prime system's software for training purposes, then the courseware concept should include this information.

Task 6. Develop a critical item specification for the ET component (if not done previously).

It is possible that this task will be performed prior to the issuance of the RFP, probably by a Government support contractor. If the specification has not been developed prior to the RFP, then the vendor should be required to produce it, using MIL-STD-490 (Specification Practices) to do so. The reader is referred to Volume 5 of the ET guidelines for procedures and guidance on designing an ET component concept, and to the document entitled Draft Functional Specification and Data Item Descriptions for FOG-M Embedded Training Design (Carroll, Harris, and Roth, 1986) for an example of this type of specification. The critical item specification must reflect the information presented in the courseware concept developed in Task 5.

Task 7. Develop a prime item development specification that includes both the prime system and the ET component (if not done previously).

Possibly this task will be performed prior to the issuance of the RFP, probably by a Government support contractor. If the specification has not been developed prior to the release of the RFP, then the

contractor should be required to produce it, using MIL-STD-490 (Specification Practices) to do so. It should be noted that the program management office or the preceding Special Study Group (SSG) has probably established a hierarchy of specifications for the system. The requirements stated in the RFP should be consistent with such requirements.

Task 8. Design the ET component.

This task requires, first, that the contractor determine training objectives from the list of tasks identified as ETRs in Task 4. After the training objectives have been determined, the contractor should apply procedures similar to those described in Volume 5 of these guidelines in order to develop the design for the ET component. This task should be performed iteratively in order to modify the ET component design as the design for the overall prime system is modified. The result of each iteration of this task is an ET Component Design Report.

Task 9. Determine the methods that will be used for the implementation of simulation and stimulation of the prime system's software by the training software.

In this task, the support requirements that were delineated in the courseware concept produced in Task 5 will be expanded. At all points during the development phase of the acquisition cycle, the prime and training software designs must articulate in order to produce an integrated system. Thus, the determination of the methods to be used to stimulate and simulate the prime system's software by the ET software must be a continuing process. This requires iteration of this task, articulated with Task 8 (above). The information for this task will come from the ET component design produced in Task 8, and data supplied by the software engineers designing the prime system. The result of this task will be a report.

Task 10. Determine student parameters to be sensed and recorded and the evaluations that will be made.

The determination of student parameters to be sensed and recorded by the training system will be based on the ET component design, as will the kinds and types of evaluation to be done on such data. The result of this task should be presented in a report. This task should be iterated with the same frequency as Task 8.

Task 11. Determine the methods by which student performance recording during interaction with the training will be implemented.

Decisions concerning how student performance will be recorded by the software, where the performance records will reside (temporary or permanent storage), and how these records will be utilized in the production of feedback, records, and reports will depend on constraints on the total system. Initial determination should be done as early in the development phase as possible and should evolve as the prime system

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does. Thus, this task may need to be performed iteratively (articulated with Task 8).

Task 12. Develop a software specification for the prime item, including the software associated with the ET component.

The software specification should be developed per MIL-STD-490 (Specification practices) and should contain the functional components of the both the prime system software and the ET-implementing software.

Task 13. Develop a hardware specification for the prime item and include hardware aspects associated with the ET component.

The hardware specification should be developed in accordance with MIL-STD-490. If the ET component requires hardware in addition to that integral to the prime system, the functions supplied by the ET-specific items should be included in the specification.

Task 14. Generate ET and support documentation.

The ET that is generated must have the functional characteristics and sub-components presented in this chapter and as specified by the specifications developed in Tasks 6, 7, 12, and 13. The contractor must also develop documentation to support the use of the ET.

Task 15. Test and Evaluate ET.

The contractor will be required to conduct test and evaluation of the ET component as determined by the Government. As previously mentioned, T&E for the ET component must be an on-going process, starting at the time of system development initiation and continuing through the final Quality Assurance tests performed on the delivered product. There are several types of evaluation that must be performed during the acquisition process for a system that will include ET. First, the prime system design must be evaluated for its capability to support the proposed ET. This evaluation must occur during the system concept and development stages. The ET software must be evaluated for its logic, performance, and efficiency as it is being implemented, and upon completion. The courseware must be tested, first as a proof of the training methods selected (pedagogical evaluation) and then, after implementation, of its training capability (i.e., its ability to improve soldier-performance on the tasks selected for training via ET) within the context of the general training requirements. The course-ware also requires constant quality assurance checks as it is being developed. The reliability and maintainability of the ET component must be assessed.

Obviously, the evaluation of ET occurs at several points during the acquisition cycle and will require many different methodologies to be used for T&E, including breadboard and brassboard development and testing. The types of evaluations that should be required, the timing of evaluations, and the methodologies that should be employed are

addressed in Volume 7 of these ET guidelines. The reader is referred to this volume for more detail than is presented here on the topic of T&E.

Task 16. Establish an ET Reliability Program.

The contractor should establish a reliability program for ET in accordance with MIL-STD-785 (Reliability Program for Systems and Equipment Development and Production). This reliability program may be subsumed under the reliability program for the prime system, or it may be separate. In either case, the program should include the following:

1. The features of the ET component that will result in reliable and stable performance of the ET component in the planned operational environment;

2. A review of system requirements to establish an accurate description of all parameters which may affect system performance;

3. A description of the operational environment;

4. An estimation of inherent reliability and operational reliability;

5. An analysis of the proposed design to obtain component reliability allocation and allowable failure rates of ET-specific components;

6. The optimum use of redundancy through the system; and

7. An evaluation of ET component reliability to determine if ET performs in accordance with the program and the pertinent specifications.

Task 17. Establish an ET Maintenance Program

The maintenance program should consist of a maintenance plan and concrete evidence of the maintainability of the ET component. The maintenance plan should address the following topics:

1. The maintenance concept for the ET component;

2. Prevention of negative impact on prime system RAM;

3. The quantitative maintainability factors associated with the ET component; and

4. The maintainability prediction technique used by the contractor.

In order to show the maintainability of the ET component, the contractor should conduct a test of the ET component's fault isolation capabilities and maintainability (as applicable).

## Interim Deliverables

The following is a list of interim deliverables that should appear on the Contract Data Requirements List (CDRL) and should be required in all ET acquisitions. The interim deliverables are as follows:

1.  Training System Analysis Report as specified by MIL-T-29053B, which indicates the role ET and other training media and methods will play in the training system (see related DID in Appendix 8).

2.  ET Courseware Concept Report that presents a description of the types of ET courseware to be developed and the general system support requirements for this courseware.

3.  Embedded Training Requirements (ETRs) Report as described in Volume 4 of these ET guidelines, that contains a listing of the tasks selected for ET. A draft DID for this report appears in Appendix B. This report will have to be produced iteratively during the design and development of the prime system.

4.  ET Component Design Report described in Volume 5 of these ET guidelines, that contains a detailed description of the design of the ET component. A draft DID for this report appears in Appendix B. This report will have to be produced iteratively during the design and development of the prime system.

5.  Report on implementation of ET simulation and stimulation of application software that includes the following information:

    a.  What prime system software will the ET component simulate or stimulate;

    b.  How ET will interface with the prime system software (what are the "hooks" in the prime software and the training software that allow for their interaction?),

    c.  How ET will control the prime system software; and

    d.  Under what circumstances will ET simulate or stimulate the prime system software.

6. Report on student parameters selected to be measured during training, why selected, and how measures will be evaluated and responded to.

7. Report on how ET will sense and record student input into the training, including training sessions in which ET will stimulate and simulate the prime software.

8. Training deliverables as specified by MIL-STD-1379 (Contract Training Programs).

9. Critical Item Specification as delineated in MIL-STD-490 (Specification Practices).

10. Prime Item Development Specification as delineated in MIL-STD-490.

11. Software Specification as delineated in MIL-STD-490.

12. Hardware Specification as delineated in MIL-STD-490.

13. ET Maintenance Plan as described under Task 17.

14. ET Test and Evaluation Plan as described in Task 1. The plan should include the following information, as a minimum:

    a. A method for the formative evaluation of courseware to assure that:

        1) all identified ETRs are incorporated into the courseware,

        2) instructional sequencing and presentation of courseware will satisfy terminal and enabling objectives,

        3) courseware and performance evaluation parameters are completely consistent, and

        4) the instruction presented by the courseware is palatable and effective in conveying appropriate instructional objectives and promoting efficient training (proof of the training concept);

    b. A method for the formative evaluation of the ET component software such that each software module is tested individually as developed and then in concert with the other software modules (both ET and prime system modules) with which it interfaces;

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c. A method for the summative evaluation of courseware such that:

1) the comprehensiveness and effectiveness of the training may be determined,

2) the appropriateness and completeness of feedback received by the trainees may be reviewed,

3) the appropriateness of the training adaptivity may be reviewed, and

4) ease of training modification can be assessed;

d. A method for the summative evaluation of the ET software such that all elements of the software are tested in concert (this may be accomplished with use of a brassboard ET system);

e. A method for the evaluation of all ET related documentation as to clarity, completeness, and ease of use; and

f. A method for testing all aspects of the ET component and the prime system to determine weaknesses and faults in the system so that pre-fielding remediation can occur.

15. ET Reliability Program as described in Task 16 and specified in MIL-STD-785 (Reliability Program for Systems and Equipment Development and Production).


## Final Deliverables

The final deliverables for the ET component consist of four types of items: hardware that may be required for the ET component; software; courseware; and paper-based documentation. As in the case of the interim deliverables, the DID requirements for the deliverables should be specified in the RFP. The reader is referred to Appendix B for more information concerning DID requirements for ET. The specific final deliverables for the ET component are the following:

1. All ET software (training development software, database management software, communications software, ET management software, interface software) on appropriate electronic media both as compiled executable code and non-proprietary documented source code.

2. ET courseware. NOTE: As for other frequently updated training, ET courseware should be specified to be in the

form of databases or data sets operated upon by software. ET courseware should <u>never</u> be implemented as line-coded software. Implementing ET courseware as line-coded software unduly increases the complexity and effort of performing updates to training.

3. ET utilization and support documentation as described earlier in this chapter, including:

   a. Student handbook;

   b. Instructor or ET manager handbook;

   c. Courseware developer handbook;

   d. ET maintenance and repair manuals; and

   e. Hardcopy of all non-proprietary source code.

4. Hardware devices as necessary to implement ET and supporting documentation for that hardware.

## Evaluation Criteria for Proposals

The RFP must contain a description of the evaluation criteria that will be used to assess proposals to the Government for the development of the prime item. There are seven areas of concern for the evaluation of proposals that include ET component development. These areas are beyond those issues that would normally be addressed in a proposal for prime item development. Each of these ET-specific criterion areas is addressed below, with guidance supplied for the proposal reviewer so that he or she may assess the contractor's proposal as it pertains to ET component development.

The first criterion area centers on the contractor's understanding of the problem. Contractors must demonstrate an understanding of the ways in which the prime system will be used and the training requirements for the system. Contractors must evidence an appropriate awareness of the role of ET in the overall training system for the prime system. Contractors should also demonstrate an understanding of the types of users of the ET component and the environment in which the ET will be utilized.

Second, the contractor must understand the requirements for interfacing the ET software and courseware with the prime system software. The contractor must indicate that the training system and the prime system development have to occur in a reciprocal and interactive manner. The contractor should also mention foreseeable problems that might occur in the integration of the ET component with the prime system; approaches for the solution of these problems should be specified.

The contractor must also propose suitable methods for determining the computing and storage requirements of the ET component vis-a-vis the prime system mission needs. Contractors should describe how they intend to assure that these requirements will be met without compromising the ET component's or the prime system's capabilities. It is likely that the trade-off process between ET and prime system mission capabilities will at times result in a reduced-capability ET component, relative to the initial ET capabilities projections. Given this likelihood, the contractor should also describe a contingency plan to ensure full training capability, even if some ET capabilities must be traded off.

A fourth area of concern that should be addressed in proposal evaluation is the contractor's awareness of the state-of-the-art in training devices and techniques, and of the various proven or emerging technologies that are available to support training. The contractor should also discuss methods for determining the hardware and software interfacing requirements of the ET component with the prime system, and any additional hardware that may be required for the delivery or authoring of ET courseware.

The contractor should also provide personnel resumes to demonstrate that personnel assigned to the ET development effort are experienced in all aspects of ET requirements analysis and design.

The contractor should present a plan for quality assurance, and a test and evaluation program that is consistent with the requirements described in Volume 7 of the ET guidelines. At a minimum, this plan should include:

1. A method for the formative evaluation of courseware to assure that:

   a. All identified ETRs are incorporated into the courseware;

   b. Instructional sequencing and presentation courseware will satisfy terminal and enabling objectives;

   c. Courseware and performance evaluation parameters are completely consistent; and

   d. The instruction presented by the courseware is effective in conveying appropriate instructional objectives and promoting efficient training (proof of the training concept).

2. A method for the formative evaluation of ET component software such that each software module is tested individually as developed and then in concert with the other software modules (both ET and prime system modules) with which it interfaces.

3. A method for the summative evaluation of courseware such that:

    a. The comprehensiveness and effectiveness of the training may be determined;

    b. The appropriateness and completeness of feedback received by the trainees may be reviewed;

    c. The appropriateness of training adaptivity may be reviewed; and

    d. Ease of training modification can be assessed.

4. A method for the summative evaluation of the ET software such that all elements of the software are tested in concert (this may be accomplished with use of a brassboard ET system).

5. A method for the evaluation of all ET-related documentation as to clarity, completeness, and ease of use.

6. A method for testing all aspects of the ET component and the prime system to determine weaknesses and faults in the system so that pre-fielding remediation can occur.

The contractor should discuss the components that will need to be addressed in the reliability plan that will be required by the contract. Discussions should take into account:

1. The qualitative reliability (features or design initiatives to improve system reliability) of the ET component; and

2. The quantitative reliability of the ET component.

Finally, the contractor should review the areas that his maintenance plan will address. Discussions should cover the following areas:

1. Maintainability factors for the ET component;

2. The appropriate maintenance concept for the ET component;

3. Maintainability prediction techniques he will use (these must be consistent with in MIL-HDBK-472, Maintainability Prediction); and

4. The development of utility maintenance test programs for the ET component.

## RFP Organization and ET Inputs

Since the inclusion of an ET component will impact MANPRINT and ILS issues, the development of the RFP should be coordinated with the System MANPRINT Manager, the ILS Manager, and the TRADOC System Manager, as well as the proponent combat developer and training developer. ET component requirements should be listed along with prime system requirements in the MANPRINT and ILS sub-sections of the following six RFP paragraphs:

1. The Executive Summary summarizes RFP requirements and conveys to industry upper level management the importance that the Army attributes to ET.

2. The Statement of Work (SOW) states the tasks to be performed by the contractor in fulfilling the requirements of the contract, as well as the contract deliverables. ET-related task requirements are stated here.

3. The System Specification states the prime system and ET component physical and functional characteristics, as well as verification criteria.

4. The Contract Data Requirements List (CDRL) and Data Item Descriptions (DIDs) state the report and other data or information requirements for specific tasks in the SOW, or data requirements of the system specification.

5. The Instructions to Offerors provides guidance to proposal writers, as well as specific instructions on the topics to be covered in detail in the technical proposal. Both the tasks to be performed and contract deliverables are also described this section.

6. The Proposal Evaluation Criteria section provides the criteria, and their relative importance, against which proposals will be evaluated by the Source Selection Evaluation Board (SSEB). It is here, more than anywhere else, that the government conveys to industry the importance that it attributes to the consideration and development of the ET component.

In the remainder of this section, we discuss general ET considerations in each of the RFP sections mentioned above.


## ET in the Executive Summary

This section gives the contractor an overview of the Army's requirements and priorities for the associated procurement. It is important to set the tone for ET in this section. The Army doctrine,

that ET must be considered as the first training alternative, should be stated here along with an indication of the relative importance of ET in the source selection process.

## ET in the Statement of Work

The Statement of Work (SOW) section of the RFP describes the requirements, stated in terms of minimal acceptable contractor performance, to be addressed in the contractor's proposal. An RFP written for the Development and Production Proveout Phase would likely require the contractor to conduct an ET requirements analysis, provide an ET component design description, and call for an ET evaluation in prototype testing. The formats for required technical data are described via Data Item Descriptions (DIDs); and delivery of data, usually in report form, is ordered via the Contract Data Requirements List (CDRL). ET requirements should be described as task statements in Paragraph 3: Requirements, of the SOW (see MIL-HDBK-245, Preparation of Statement of Work [SOW], for SOW organization and format). AMC Pamphlet 602-1, MANPRINT Handbook for RFP Development, recommends that MANPRINT be included in the RFP as a single subparagraph of Paragraph 3. ET tasks should be stated in the Training sub-section of the MANPRINT paragraph. A list of recommended ET tasks is presented in the "Sample Inputs for an ET SOW" subsection in this volume.

## ET in the System Specification

The system specification is prepared in accordance with MIL-STD-490A (Specification Practices). While the following discussion refers to the current MIL-STD-490A, the reader is cautioned that this document is undergoing revision and the paragraph numbers and titles, as well as content, may change. The following sections are pertinent to the ET component:

1. Paragraph 3.2.1 Performance Characteristics provides the soldier performance requirements that the designed system must achieve. While the ET component is an integral part of the prime system, it has unique characteristics and functional requirements such that it is better addressed as a Critical Item Specification (MIL-STD-490).

2. Paragraph 3.6, Manpower, Personnel, and Training, is where the requirement to consider ET as the preferred training alternative should be explicitly stated.

ET component characteristics and functional requirements which should be stated in the System Specification section of the RFP are presented in the next section of this report.

## ET in Contract Data Requirements List (CDRL) and Data Item Descriptions (DIDs)

In addition to stating the report and other data requirements for specific tasks in the SOW, and data requirements of the system specification, the CDRL also provides the schedule for, and quantity of, each contract deliverable.

The content and format of data reports are described in terms of standard Data Item Descriptions (DIDs). While many existing DIDs are general enough to implicitly cover the ET component, there is a need for a few new DIDs which explicitly address ET-related requirements.

Appendix B provides a discussion describing the three types of DIDs, and recommendations for new DIDs which would address ET requirements.

## Instructions to Offerors

Helpful hints and specific instructions on proposal topics might include references to useful government documents, in addition to the military standards and specifications normally included, and resources to assist in preparing the contractor's proposal. For example, it would be to the Army's advantage to make prospective bidders aware of the ET requirements and design analyses procedures presented in the ET guidelines series.

## Proposal Evaluation Criteria for ET Components

The RFP must contain a description of the evaluation criteria that will be used to assess proposals to the Government for the development of the prime item. There are seven areas of concern for the evaluation of proposals that include ET component development. These areas are beyond those issues that would normally be addressed in a proposal for prime item development. Each of these ET-specific criterion areas was discussed in the preceding section. Examples of criteria evaluation statements for an ET RFP are presented in the next section of this document.

This section provided a general discussion of ET inputs to the RFP. The next section provides more detailed examples of ET inputs to the two main RFP sections in which the ET requirements are embodied: the SOW and the System Specification.

SAMPLE ET INPUTS TO RFP STATEMENT OF WORK (SOW),
SYSTEM SPECIFICATION, AND EVALUATION CRITERIA


## Introduction


This section provides examples of ET inputs to the SOW, System
Specification, and Evaluation Criteria sections of an RFP for an Army
prime item materiel acquisition effort. These examples incorporate
general principles of ET design and acquisition, most of which are
described in the other volumes of the ET guidelines series, into
example RFP statements.

The first subsection provides examples of ET-related statements
that might be included in the training section of an RFP Statement of
Work. Examples are given to show how the information discussed in the
previous section may apply to prime system acquisitions.

The second subsection provides examples of the kinds of statements
that might be included in the System Specification section of an RFP.
This subsection also includes the functional sub-components and
characteristics that should be required of any ET component, regardless
of the prime system.

The final subsection recommends ET-related evaluation criteria
which could, and should, be included in Proposal Evaluation Plans
(PEPs), and summarized in an RFP.


## Sample ET Inputs for an RFP Statement of Work


As mentioned earlier, the contractor tasks required for the ET
component should be included in the training section of the MANPRINT
subparagraph of Paragraph 3: "Requirements" of the SOW.

The SOW must contain a list of tasks that the contractor will be
required to accomplish. The following paragraphs describe each of the
tasks that the contractor should be required to perform in order to
produce the ET component for the prime item being procured. Several of
these tasks will have to be performed in an iterative fashion as the
prime system proceeds through the concept, development, and production
stages. The tasks that may have to be performed iteratively are
analytic ones that generate input to the decisions concerning the prime
system design for computer memory, processing, storage, and interfac-
ing. The impact of ET upon the prime item must be considered,
assessed, and accommodated in the prime item design from the outset of

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the development process. Thus, the initial performance of these analytic tasks must be accomplished as early as possible in the development cycle for the prime system. As the design for the prime system evolves, these early analyses should be iterated or updated to reflect further definition of and any changes in the prime item design.

The following are example write-ups for the 17 ET-critical tasks described previously. They are recommended for inclusion as contractor task requirements in the Statement of Work section of the prime item RFP.

Task 1: Develop an ET Test and Evaluation (T&E) Plan. The T&E Plan will be used as input to the Test and Evaluation Master Plan (TEMP) developed by the Government. It is to be contractor executed and reported on with Government oversight. As input to the TEMP, this document shall address all pertinent issues, such as those detailed in Volume 7 of the ET guidelines series. The T&E Plan shall accommodate Continuous Evaluation (CE) that includes formative and summative evaluative activities for both ET courseware and software development. This plan shall include a methodology for producing evidence of the training effectiveness of the ET design and courseware. There shall also be a plan to produce evidence for an ET support capability by the associated prime item system at all stages of development. Additionally, the T&E Plan shall describe a method for producing concrete evidence of the integration of the ET component and the prime item within the context of a brassboard system. The brassboard ET should be articulated to the prime item buses and interfaces; be driven by the prime item; and be compatible with the soldier-system interfaces of the prime item.

Task 2: Perform training system analysis to determine the different components of the training system. In this task, the contractor shall determine the roles of the different components of the training system. This task will include the selection of the components that will comprise the training system. This task may need to be performed iteratively, with the first performance occurring early in the system development cycle. The bidder is referred to Volume 3 of the ET guidelines for guidance on early ET and training system concept formulation.

Task 3: Perform a task analysis to identify or refine tasks to be trained. The tasks that will appear on the task list will represent all tasks that must be taught for the prime item system. This task shall be performed iteratively, with initial performance of the task early in the development cycle. As changes are made in the design of the prime item, the task analysis shall be modified to reflect these changes.

Task 4: Determine ET requirements (ETRs). The contractor shall apply procedures similar to those outlined in Volume 4 of of the ET guidelines series to identify or refine the tasks to be trained via ET from those tasks identified for training in Task 3. This task shall be

performed iteratively, as the design process for the prime item system proceeds. An ETR report shall be produced for each iteration of this task.

Task 5: Develop a courseware concept for ET. The contractor shall develop a concept of the type of training which will utilize ET. This concept shall contain enough detail on the types of tasks to be trained and how they will be trained to inform the software development and hardware selection processes about the expected software, hardware, and processing needs of ET. The courseware concept shall indicate to the software developers the types of "hooks" that must exist so that the training may be integrated with the prime system software, as well as providing at a minimum rough estimates for memory, storage, and processing requirements. For example, if it is expected that simulation will be called for, or if ET will stimulate the prime item's software for training purposes, then the courseware concept shall include this information.

Task 6: Develop a critical item specification for the ET component. The critical item specification shall reflect the information presented in the courseware concept developed in Task 5. (It is possible that this task will be performed previous to the issuance of the RFP.) If the specification has not been developed prior to the RFP, then the contractor shall be required to produce it, in accordance with (IAW) MIL-STD-490. The bidder is referred to Volume 5 of the ET guidelines for procedures and guidance on designing an ET component concept, and to the document, Draft Functional Specification and Data Item Descriptions for FOG-M Embedded Training Design (Carroll, Harris, and Roth, 1986) for an example of this type of ET specification.

Task 7: Develop a prime item development specification that includes both the prime item and the ET component. The contractor shall develop a Prime Item Development Specification for the prime item system including its ET component IAW MIL-STD 490. (This task may have been performed prior to the issuance of the RFP.)

Task 8: Design the ET component. This task requires, first, that the contractor shall determine training objectives from the list of tasks identified as ETRs in Task 4. After the training objectives have been determined, the contractor shall apply procedures similar to those presented in Volume 5 of the ET guidelines series to develop the design for the ET component. This task shall be performed iteratively beginning in the system concept development phase and extending into the production and deployment phase, in order to modify the ET component design as the design for the overall prime item system is modified.

Task 9: Determine the methods that will be used for the implementation of simulation and stimulation of the prime item software by the ET software. In this task, the support requirements that were delineated by the courseware concept produced in Task 5 shall be expanded upon. At all points during the development phase of the

system acquisition process, the prime and ET software designs shall articulate in order to produce an integrated system. Thus, the determination of the methods to used to stimulate and simulate the prime software by the ET software shall be a continuing process. The information for this task shall come from (at a minimum) the ET component design produced in Task 8 and data supplied by the software engineers designing the prime item.

Task 10: Determine student parameters to be recorded and the evaluations that will be made. The determination of student parameters to be sensed by the ET system shall be based on the component design and training objectives.

Task 11: Determine the methods by which student performance recording during interaction with the ET component will be implemented. Decisions concerning how student performance will be recorded by the software, where the performance information will reside (temporary or permanent storage), and how this information will be utilized in the production of feedback, records, and reports will be dependent on constraints on the total system. Initial determination shall be done as early in the development phase as possible and shall evolve as the prime item does. Thus, this task shall be performed iteratively.

Task 12: Develop a software specification for the prime item, including the software associated with the ET component. The software specification shall be developed IAW MIL-STD-490 and shall contain the functional components of the both the prime item software and the ET software and courseware.

Task 13: Develop a hardware specification for the prime item to include hardware aspects associated with the ET component. The hardware specification shall be developed IAW MIL-STD-490. If the ET component requires hardware in addition to that needed by the prime item, the functions supplied by the ET specific items shall be included in the specification.

Task 14: Generate ET and its support documentation. The ET that is generated shall have the functional characteristics and sub-components as specified by the specifications developed in Tasks 6, 7, 12, and 13. The contractor shall also develop documentation to support the use of ET.

Task 15: Test and Evaluate ET. (The contractor will be required to conduct test and evaluation of the ET component, as determined by the Government). Test and Evaluation (T&E) for the ET component shall be an on-going process, from the time of system conception to the final Quality Assurance tests performed on the end items delivered. There are several types of evaluation that must be performed during the acquisition process for a system that includes ET:

1. The prime item design shall be evaluated for its capability to support the proposed ET. This evaluation shall occur during the system concept and development stages.

2.  The ET software shall be evaluated for its logic, perform-
    ance, and efficiency as it is being implemented and upon
    completion.

3.  The courseware shall be tested, first, as a proof of the
    training methods selected (pedagogical evaluation) and
    then, after implementation, for its training capability, to
    demonstrate that the training delivered meets the training
    objectives in terms of soldier performance requirements.
    The courseware shall also undergo constant quality
    assurance checks as it is being developed.

4.  The reliability and maintainability of the ET component
    shall be assessed. The evaluation of ET shall occur at
    several points during the acquisition cycle, and will
    require many different methodologies to be used for T&E,
    including breadboard and brassboard development and testing
    (see Volume 7 of the ET guidelines series for a discussion
    of the types of evaluations, the timing of evaluations, and
    examples of evaluation methodologies).

Task 16:  Establish an ET Reliability Program. The contractor
shall establish a reliability program for the ET IAW MIL-STD-785
(Reliability program for systems and equipment development and
production). This reliability program may be subsumed under the
reliability program for the prime item or it may be separate. In
either case, the program shall include the following:

1.  The features of the ET component that will result in
    reliable and stable performance in the planned operational
    environment;

2.  A review of the ET component system requirements so as
    establish an accurate description in all parameters which
    may affect system performance;

3.  A description of the operational environment;

4.  An estimation of inherent reliability as operational
    reliability;

5.  An analysis of the proposed design to obtain component
    reliability allocation and allowable failure rates of ET-
    specific components;

6.  The optimum use of redundancy through the system; and

7.  An evaluation of ET component reliability to determine if
    ET performs in accordance with the program and the
    pertinent specifications.

Task 17:  Establish an ET Maintenance Program. The maintenance
program shall consist of a maintenance plan and concrete evidence of

the maintainability of the ET component. The maintenance plan shall address the following topics:

1.  The maintenance concept for the ET component;

2.  Prevention of negative impact on prime item RAM;

3.  The quantitative maintainability factors associated with the ET component; and

4.  The maintainability prediction technique used by the contractor.

In order to show the maintainability of the ET component, the contractor shall conduct a test of the ET component's fault isolation capabilities and maintainability. To present evidence of the system's maintainability, the total time required to perform each day's preventative maintenance tasks shall be treated as one task.

The tasks described in this section are designed to ensure that the ET component is developed concurrently with the prime system. It is only through early and iterative ET requirements identification and concurrent, interactive ET and system development that an effective ET-prime system integration can be achieved.

Sample Inputs for the ET Component
in the RFP System Specification

The paragraphs in this subsection provide guidance for completing the ET component specification and examples of statements of ET-related requirements that might be included in the System Specification section of a prime item system RFP. The recommendations and examples are presented in the form of a Model System Specification in order to illustrate their application in system specification format.

Title (Title of prime item) EMBEDDED TRAINING COMPONENT

1.0 Scope

This (Volume, Section, Paragraph, or Annex [choose the appropriate term]) of the Statement of Work (SOW) addresses the functional constraints and capabilities of the (name of prime system) Embedded Training (ET) component, the potential hardware and software constraints, ET-prime system integration requirements, and Test and Evaluation needs.

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1.1 Introduction/Background. Provide a general description of the relevant elements or functions of the prime system and the ET component.

1.1.1 Function Description of Prime System. Refer to the System Specification for a description of the functional characteristics of the prime item system that are relevant to ET functions or integration requirements. Describe the relationships between prime item system elements or functions and related ET component functions.

1.1.2 Description of the Training Audience. Refer to the Target Audience Description (TAD) for a description of the composition and aptitudes of the intended training audience.

1.1.2.1 Training Managers. Describe the instructors' or training managers' experience with similar training and prime systems.

Example: "Training managers will use the ET component to perform such tasks as inserting simulation scenarios, setting performance parameters to be recorded, and evaluating student performance. The training managers in charge of the (name of prime system) ET component will be experienced instructors with at least three years experience in instructing trainees on training simulators for the (name of prime system), but will have had no experience managing training on an ET component."

1.1.2.2 Training Developers. Describe the training developer's training development background.

Example: "The training developers will all be experienced in developing courseware for simulators, other training devices, and conventional training delivery media and methods. However, they will not be experienced in the development of ET. They will require a training development capability compatible with the ET component which provides the capability to create or modify courseware."


2.0 Applicable Documents

2.1 Military Specifications

2.2 Military Standards

MIL-STD-490 (Specification Practices)

MIL-STD-1379 (Contract Training Programs)

MIL-STD-1472 (Human Engineering Design Criteria for Military Systems, Equipment, and Facilities)

## 2.3 Other Publications

Organizational and Operational (O&O) Plan;

Required Operational Capability (ROC); and

ET Guidelines:  Implementing Embedded Training (ET):

Volume 1 of 10:  Overview

Volume 2 of 10:  ET as a System Alternative

Volume 3 of 10:  The Role of ET in the Training System Concept

Volume 4 of 10:  Identifying ET Requirements

Volume 5 of 10:  Designing the ET Component

Volume 6 of 10:  Integrating ET with the Prime System

Volume 7 of 10:  ET Test and Evaluation

Volume 8 of 10:  Incorporating ET into Unit Training

Volume 9 of 10:  Logistics Implications

Volume 10 of 10:  Integrating ET into Acquisition Documentation

List Critical Item or Prime Item Development Specifications that pertain to the ET component and the prime system (if available).

## 3.0 Requirements

3.1 General Characteristics.  State the general characteristics of an ET component.

Example:  "The ET component shall be fully compatible with the (name of prime system) and shall have the following characteristics (Note:  The following are examples):

1.  All ET-specific software shall operate in concert with (name of prime system) software.

2.  All ET-specific hardware shall be compatible with the (name of prime system) hardware and software interfaces.

3.  The ET component shall be as fully integrated with the prime system as possible.  The training shall utilize the inherent mission system hardware and software to the maximum extent possible.  Transition from the operational mode to the ET mode

or vice versa shall require less than (insert time limit) to accomplish. However, this requirement for integration shall not preclude the possibility of strap-on or adjunct ET, as long as the training configuration is such that the transition time is acceptable for the system, and that the ET component utilizes as much inherent Soldier-System Interface (SSI) and other system hardware as possible, with the addition of any required training-specific adjunct interface equipment.

4. The ET component shall not compromise the security of the system and its data. Thus, all users shall be restricted in their access to prime system data during their use of the ET component. The data accessed shall be determined by the nature and classification of the information, the type of task for which the ET component is being used, and the clearance and category of the user (e.g., trainee, training manager, training developer, or ET maintainer) accessing the ET.

5. The ET component shall have minimal impact on the prime system's Reliability, Availability, and Maintainability (RAM). This requirement will impact the maintenance plan that the contractor will develop in that the plan shall include a means for determining ET impact on the prime system RAM so that remedial action may be taken once RAM parameters fall below specific, defined RAM index criteria.

6. The ET component shall be constrained by the characteristics and employment of the prime system. For example, courseware shall embody procedures strictly analogous to operational procedures for system utilization in accordance with applicable doctrine and system operational documentation.

7. The ET component shall not endanger personnel, equipment, or (name of prime system) data; it shall not permit unsafe operation while in training mode. The ET component shall be designed to prevent the possibility of accidents of this nature. The ET component shall be designed so that the user is aware at all times of the mode of operation (i.e., ET vs operational) in which the system is running. The ET component shall include fail safe mechanisms to prevent a weapon from being fired during any training session."

3.1.1 **ET Component Functional Requirements.** State the functional requirements of the ET component.

3.1.2 **ET Sub-Component Functional Requirements**

1. **Storage Sub-Component.** State the storage requirements for the storage sub-component.

   Example: "The storage sub-component shall provide enough capacity for the passive storage of:

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a. Training courseware;

b. Performance and evaluation data records for trainees;

c. Help facility to provide information about use of the ET component;

d. User identification information;

e. Interface software for peripherals as needed;

f. ET training management software;

g. ET soldier-system interface software;

h. Training development software;

i. ET utility software; and

j. Communications software."

2. <u>Memory Sub-Component</u>. State the ET computer memory sub-component requirements.

   <u>Example</u>: "The ET component computer memory (may utilize some or all memory used for normal system operations) shall have the memory capacity to run the ET software and the appropriate prime system application software as part of the training session."

3. <u>Processing Sub-Component</u>. State the ET sub-component computer processing requirements.

   <u>Example</u>: "The ET processing sub-component shall have adequate speed to enable the trainee to practice tasks in real time."

4. <u>Hardware Interface Sub-Component</u>. State any hardware interface requirements.

   <u>Example</u>: "A hardware interface sub-component shall be included, if it is determined that the ET component will utilize hardware beyond that within the operation-configured prime system."

5. <u>Software Interface Sub-Component</u>. State the ET software interface requirements.

   <u>Example</u>: "The software interface sub-component shall provide for interfacing:

   a. The ET management software to the prime system software;

b. The ET management software with courseware and records files;

c. The ET management software with courseware development software (if applicable);

d. The ET management software with communications software (if applicable);

e. Courseware with operating system applications files via the ET management software; and

f. Peripherals with the ET management software."

6. Soldier-System Interface (SSI) Sub-Component. State the ET SSI sub-component requirements.

Example: "The SSI sub-component shall provide the capability to:

a. Use the prime system's interface with the soldier;

b. Respond appropriately to the trainee, the environment, the prime system, and the other ET sub-components;

c. Indicate that the training mode is engaged and operating; and

d. Be in compliance with MIL-STD-1472."

7. Display or Output Sub-Component. State the ET component display or output requirements, if they are different than those of the prime system.

Example: "The ET component shall use the (name of prime system) displays for training purposes."

8. Input Sub-Component. State the ET component input requirements, if they are different than those of the prime system.

Example: "The ET component shall use the (name of prime system) input devices for training purposes."

9. ET Management Sub-Component. State the ET management software requirements.

Example: "The ET management software sub-component shall provide for:

a. Security and protection of classified material;

b. Rapid switching between training and operational mode;

c. Protection of training data;

d. Protection of the prime system, personnel, and against accidental misuse;

e. Stimulation of the prime system software as necessary by the courseware;

f. The support of all other ET sub-components; and

g. Training functions being driven by the prime system operating system or executive."

10. Training Sub-Component. State the ET training sub-component requirements.

Example: "The training sub-component shall have the following characteristics. It shall:

a. Present training for the identified audience;

b. Support the identified training requirements;

c. Present training for degraded modes of operation;

d. Present training in operational maintenance;

e. Provide a high level of system-learner interaction;

f. Manifest appropriate and accepted training methods;

g. Support simulation and stimulation of the prime system's applications software;

h. Record student performance in temporary and permanent files, the parameters for which are supplied with default values and are also modifiable by the training manager;

i. Produce appropriate feedback;

j. Utilize the selected input and output devices;

k. Utilize training developed by the training development sub-component;

l. Support collective training, if required;

m. Support the communications sub-component;

n. Support the production of student performance reports;

o. Be adaptive to student performance; and

p.  Support courseware that is linear or with branching at
points where particular responses are identified to
require differential treatment."

11. Training Development Sub-Component. State the ET training
development requirements.

Example: "A training development sub-component (or courseware
authoring system or language) shall be included with the ET
component. This sub-component shall:

a.  Support the development of new training or modification of
existing courseware (post-fielding);

b.  Support the devices selected for training output and
trainee input;

c.  Support the development of training that includes the
stimulation and simulation of the prime system's
applications software;

d.  Support the selection of student responses to be recorded
and evaluated;

e.  Support the specification of student performance reports;

f.  Support the communications sub-component;

g.  Support the production of ET utilization reports;

h.  Support the development of training that is linear or with
branching at points where particular responses are
identified to require differential treatment; and

i.  Allow for courseware development and production at any
site selected by the government for this purpose."

12. Data Management Sub-Component. State the ET data management
requirements.

Example: "The ET component shall have the capability to
produce reports on student performance and on training utili-
zation. Data for these reports shall be stored in various
databases. Other data shall also be stored for internal use
by the ET component. These data shall be retrievable as
screen displays and reports. The data management sub-
component will accomplish these needs. This sub-component
shall support procedures for establishing databases;
generating reports; and storing, retrieving, modifying, and
using records and databases of the following categories of
data, at a minimum:

a. Student performance and evaluation records;

b. User identification records; and

c. ET utilization records."

13. <u>Communications Sub-Component</u>. State the ET communication requirements.

Example: "The communications sub-component shall allow for data transfer by Local Area Network (LAN) or other electronic mode(s) as determined necessary to support the following:

a. Collective training;

b. Courseware transfer from the locus of development to the locus of utilization; and

c. Student and training records transfer from the locus of training utilization to other sites where such information will be processed or otherwise used."

14. <u>Utility Sub-Component</u>. State the ET utility programs requirements.

Example: "The ET component shall support several other functions that can be included in a utility sub-component. The utility sub-component shall include:

a. A maintenance test program;

b. The capability to allow for the accessing and modification of user identification information;

c. The capability to allow access to the source code for all ET programs;

d. The capability to decompile and recompile all ET source code; and

e. A self-initiating fault-detection test on ET start-up with capability to alert the ET user when the ET component is not functioning properly."

3.2 <u>Training Requirements</u>. State the general training requirement concept for the ET component.

Example: "The ET component shall provide (acquisition and/or sustainment) training for individual operator trainees for the (name of prime system) (name of operator positions). Acquisition training will be conducted at <u>(name of Fort)</u>, while sustainment training will be conducted primarily in the unit."

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3.2.1 New Equipment Training (NET) Requirements. State whether or not the ET component will support the New Equipment Training Plan (NETP) for the system.

Example: "The ET component shall provide support for the NETP for the (name of prime system)."

3.2.2 Types of Tasks to be Trained. Describe the types of tasks for which the ET component will be required to provide training.

Example: "The ET component shall have the capability to provide training on the following (name of prime system) tasks: system initialization, target acquisition (with radar and optical sight), Identify Friend or Foe (IFF) assessment, missile launch, damage assessment, and system checkout functions."

NOTE: Include a statement in the specification the precludes the implementation of ET courseware, as opposed to ET-implementing software (that drives stimulus presentation or senses trainee inputs) from being implemented in line-coded software. Require that courseware be implemented as data files or databases compatible with the ET-implementing software.


4.0 Support Documentation

List and describe support documentation the contractor is to produce.

Example: "The contractor shall supply documentation to support the use of the ET component. This documentation is required to provide instruction on the utilization of ET for the trainees, training managers, training developers, and ET maintainers. The following types of documentation shall be provided by the contractor:

1. Student handbook: the student handbook shall include instructions on how to initiate a training session, a listing of all executable lessons and associated training objectives, diagrams indicating the flow of instruction, and a discussion on the relationships between the ET and other components of the training system.

2. Student supplementary materials: if needed, materials required by the student to supplement ET shall be provided;

3. Instructor and training manager handbook: the instructor and training manager handbook shall include a listing of the training objectives of ET, procedures for integrating ET with other training media and methods, procedures for monitoring student performance, procedures for setting performance assessment parameters, and procedures for records maintenance and report production;

4. Courseware authoring manual: the courseware authoring manual shall contain a list of functions that may be performed using the authoring system, a list of the commands for performing the functions, and examples for developing courseware;

5. Maintenance and repair manuals: the maintenance and repair manuals shall contain all the information needed for updating the ET software, inserting modified courseware, decompiling and recompiling files, changing user status, performing daily ET maintenance tasks, and troubleshooting and repairing and ET-unique hardware components; and

6. Hardcopy of the nonproprietary uncompiled code for ET-implementing software. Also, both electronic and hard copies of all ET courseware shall be provided."


## ET Component Evaluation in the Proposal Evaluation Plan


This subsection provides an example of the types of ET-specific evaluation criteria that should be considered for inclusion in the Proposal Evaluation Plan (PEP) for a prime item RFP.

The following are examples of ET-related statements which might be included in a PEP:

1. Understanding the problem. How well does the contractor demonstrate an understanding of the ways in which the prime system will be used, and the related training requirements for the system? Does he demonstrate an understanding of the types of users of the ET component, and the environments in which the ET will be utilized?

2. Understanding of ET-prime system software integration issues. Does the contractor demonstrate an understanding of the requirements for interfacing the ET software and courseware with the prime system software? Does he foresee problems that might occur in the integration of the ET component with the prime system, and offer sound approaches for the solution of such problems?

3. Assessment of ET impact on prime system computing and storage requirements. Does the contractor propose suitable method(s) for determining the computing and storage requirements of the ET component vis-a-vis the prime system, and describe how he intends to assure that these requirements will be met without compromising the ET component or the prime system? Are methods for trade-off determination relevant to ET capabilities and functions specified, and contingency plans provided to ensure full training capability if ET functions cannot be integrated into the prime system?

4. **Assessment of ET component hardware and software interface requirements.** Does the contractor describe a sound methodology for determining the hardware and software interfacing requirements of the ET component with the prime system and any additional hardware that may be required for the delivery or authoring of the ET courseware?

5. **Quality assurance and test and evaluation plans.** Does the contractor present a sound and comprehensive plan for an ET-oriented quality assurance and test and evaluation program? Minimally, this plan should include:

   a. A method for the formative evaluation of courseware to assure that:

      1) all identified ETRs are incorporated into the courseware,

      2) instructional sequencing and presentation courseware will satisfy terminal and enabling objectives,

      3) courseware and performance evaluation parameters are completely consistent, and

      4) the instruction presented by the courseware is palatable and effective in conveying appropriate instructional objectives and promoting efficient training (proof of the training concept);

   b. A method for the formative evaluation of ET component software such that each software module is tested individually as developed and then in concert with the other software modules (both ET and prime system modules) with which it interfaces;

   c. A method for the summative evaluation of courseware such that:

      1) the comprehensiveness and effectiveness of the training may be determined,

      2) the appropriateness and completeness of feedback received by the trainees may be reviewed,

      3) the appropriateness of training adaptivity may be reviewed, and

      4) ease of training modification can be assessed;

   d. A method for the summative evaluation of the ET software such that all elements of the software are tested in concert (this may be accomplished with use of a brassboard ET system);

e.  A method for the evaluation of all ET-related documentation as to clarity, completeness, and ease of use; and

f.  A method for testing all aspects of the ET component and the prime system to determine weaknesses and faults in the system so that pre-fielding remediation can occur.

6. **Inclusion of ET in reliability plan.** How well does the contractor discuss how the ET component will be addressed in the reliability plan that is required by the prime system contract? This discussion should take into account the qualitative reliability of the ET component.

7. **ET component maintenance plan.** How well does the contractor's maintenance plan adequately address the following areas:

a.  Maintainability factors for the ET component;

b.  The appropriate maintenance concept for the ET component;

c.  Maintainability prediction techniques he will use (these must be consistent with MIL-HDBK-472); and

d.  The development of utility maintenance test programs for the ET component.

8. **Proposed project personnel.** Does the contractor propose personnel who are experienced in all areas of ET requirements analysis and design?

This section provided guidance and examples for including ET requirements in the SOW and System Specification portions of an RFP, and in PEPs for particular procurements. These examples and recommendations are provided for illustrative purposes. However, they embody the requirements and design considerations that evolved out of extensive research and the development of procedures for determining ET requirements and design characteristics. As such, principles and procedures described herein are applicable and desirable for all ET acquisitions. While the specific considerations of system requirements and constraints will be driven by each unique acquisition, the guidance provided here, as well as in the other volumes of this series, will help to ensure that important ET requirements are considered early-on in system development contracts, and effectively integrated into the prime item system.

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# APPENDIX A

## DESCRIPTION OF ET GUIDELINE DOCUMENTS

The guideline documents in this series of ten volumes (Implementing Embedded Training (ET)) are extensive procedural guides. For each guideline, this appendix presents: the acquisition phases at which the guideline will be of use; a brief overview of the guideline; a statement of the outcomes each generates, in terms of their importance to the LCSMM and ASAP; and a list of LCSMM and ASAP documents for which the guideline is relevant. Table 1 is a matrix of LCSMM and ASAP documents by guidelines with an entry at every point at which a guideline is relevant to the LCSMM and ASAP document.

The guidelines are written in terms of activities to undertake and products to complete. This is a correct approach, but the ET developer must realize that ET and system development are processes, not events. At early stages the guideline products may be sketchy and uncertain, and some of the products may be ill-defined. For example, early task analyses are almost always based on comparability analysis, rather than on engineering plans for the new system. At each stage of development some consideration must be given to the refinement of past products to reflect current system status.

The eight guidelines discussed in this Section are:

Volume 2   ET as a System Alternative

Volume 3   The Role of ET in the Training System Concept

Volume 4   Identifying ET Requirements

Volume 5   Designing the ET Component

Volume 6   Integrating ET with the Prime System

Volume 7   ET Test and Evaluation

Volume 8   Incorporating ET into Unit Training

Volume 9   Logistics Implications

## Volume 2:  ET as a System Alternative

This is the first guideline to be used in ET development (Volume 1 presents an overview of ET and an introduction to the series). Its goal is to determine whether ET is a viable and desirable training alternative. This decision should be made at each of the four development phases, but is fairly firm by the end of Proof of Principle, since part of this phase should be a proof of principle for the ET component.

Table 1

LCSMM and ASAP Documents and Applicable ET Guidelines

| LSCM and ASAP Document | Guideline Volume Number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Mission Area Analysis (MAA) | X | | | | | | | | |
| Operational and Organizational Plan (O&O) | X | X | | | | | | | |
| Justification for Major System New Start (JMSNS) | X | | | | | | | | |
| Cost and Operational Effectiveness Analysis (COEA) | X | X | | | | | | | |
| Cost and Training Effectiveness Analysis (CTEA) | X | X | | | | | | | |
| Basis of Issue Plan (BOIP) | | X | | | | | | | |
| Qualitative and Quantitative Personnel Requirements Information (QQPRI) | | X | X | X | | | | | |
| Test and Evaluation Master Plan (TEMP) | | | X | X | | X | X | | |
| System MANPRINT Management Plan (SMMP) | | X | X | X | X | X | | X | |
| Acquisition Strategy (AS) | X | X | | X | | X | | | |
| Acquistion Plan (AP) | X | X | | | | | | | |
| Required Operational Capability (ROC) | | X | X | X | | | X | X | |
| Integrated Logistic Support Plan (ILSP) | | | | | X | | | X | |
| Training Device Requirement (TDR) | X | X | X | X | X | X | | | |
| Training Device Needs Statement (TDNS) | X | X | | X | | | | | |
| Request for Proposals (RFP) | | | | | X | X | | | X |

Volume 2 assists in answering four major questions:

1. Are there policy decisions that dictate the use of ET for acquisition training for the system?

2. Do many of the proposed system's tasks require frequent sustainment training?

3. Is the development of an ET component feasible in this system?

4. Is it likely that ET will be a cost effective training alternative for the system?

A look at Table 1 shows that the early LCSMM, ASAP, or NDI decisions can make extensive use of this guideline.

Outcome:

1. A decision about whether or not to continue to consider ET as part of the system.

Volume 3:  The Role of ET in the Training System Concept

This guideline is useful in the early estimation of training system requirements for operators and maintainers.  It is aimed only at hands-on training for individuals and crews.  Outputs from Volume 2 are helpful in using Volume 3.  The procedure consists of nine steps:

1. Identify likely crew and maintainer positions for the new system.

2. Identify functional performance requirements for all positions.

3. Assign each functional performance requirement to particular crew members or maintainers.

4. Develop soldier-system interface equipment suite concepts for each crew position.

5. Classify each functional performance requirement in terms of:  performance difficulty; perishability; criticality; and whether hands-on use of equipment is a primary requirement.

6. Identify the functional performance requirements that require training, are candidates for ET, and need sustainment or collective training.

7. Identify non-ET alternative training approaches for various training situations.

8. Evaluate the information and develop the training system concept.

9. Document the findings.

This guideline has broad applicability, but a short period of utility. The associated decisions should be complete by the end of the Requirements and Technology Base Phase. The other guideline documents are primarily used at the Requirements and Technology Base phase and later.

Outcome:

1. A training system concept for training hands-on tasks.


## Volume 4:  Identifying ET Requirements

Once the decision has been made to include ET, the next step is to document the requirements for ET. This guideline has four phases, resulting in two products. The phases are:

Phase 1.  Task characterization.

Phase 2.  Detailed task analysis.

Phase 3.  Identify ET requirements and assess feasibility and implementation approaches.

Phase 4.  Document findings.

Outcomes:

1. Full task analysis including jobs, missions, mission phases, tasks, conditions and standards of performance, and performance objectives hierarchy.

2. Embedded training requirements (tasks and training objectives suitable for ET).

The first product is developed incrementally throughout the development cycle. The ET developer cannot expect to have a full task analysis early in system development. Volume 4 should be applied at least in the Requirements and Technology Base Phase and again in the Proof of Principle Phase. Even later iteration of these procedures may be necessary if there are significant system design or utilization changes in later phases of the acquisition process.

The effort required to perform this work is substantial, but it can be seen that the guideline only clarifies for ET what actually

should be done for any training system development using some form of the *Systems Approach to Training* (SAT). Only the second product is unique to ET. If SAT is used, as it should be, for the rest of the training development, then ET analyses will be a minor add-on.


## Volume 5:  Designing the ET Component

ET component design consists of six phases. For the purposes of integration with the LCSMM or ASAP, these six phases result in three products. This guideline deals with the integration of many bits of information. To accomplish this integration, the ET designer is urged to create a database, if possible, on a computer. The phases are:

Phase 1.  Review the ET requirements resulting from application of guideline Volume 4 and create a design database. The requirements are given a training priority at this time.

Phase 2.  Identify the presentation (stimulus) requirements for each ET objective.

Phase 3.  Compile the above information from an objective-by-objective listing into a set of hardware and software requirements for the ET component. This includes the determination of performance measurement and feedback requirements.

Phase 4.  Select training features for the ET component. These are the hardware and software requirements that are needed based on either training objectives presentation requirements or based on support or integrating requirements (e.g., data management).

Phase 5.  Integrate the concept and perform trade-off studies.

Phase 6.  Produce an ET functional specification.

### Outcomes:

1.  The output of Phase 1 is an ET prioritization for each training objective.

2.  Phases 2, 3, and 4 result in the recommendations for hardware and software engineering requirements (the design concept) for the component.

3.  Phases 5 and 6 yield the functional specification for ET and the trade-off studies leading up to that specification.

The ET prioritization for each training objective is isolated as the first product because it can be completed fairly early and provides

a rationale for early estimates about characteristics of the ET component. This product will be useful during the production of a number of documents for the Requirements and Technology Base Phase.

The second product is essentially the iterative completion of the analysis and objectives hierarchy, with special inputs for the application of ET as a training tool. This information will be especially useful in the TEMP, SMMP, and TDR documents.

The third product is of importance at the beginning of Development and Proveout in that it structures the procurement of ET.

## Volume 6: Integrating ET with the Prime System

This guideline supports Volume 5. It contains design principles, lessons learned, and other suggestions and cautions for the process of ET design. The major thrust of this volume is to help the ET developer ensure that ET considerations are included at the proper points in system development. Volume 6 deals with the practical problems of causing the actual development to occur. This includes establishing and maintaining a close and continuing relationship between the ET training developer and the system hardware and software developers.

An important aspect of Volume 6 is its indication of how prime system requirements interact with ET requirements. There are determinations that must be made in each of these parallel lines of development at crucial points. Failure to make these determinations often results in default decisions that reduce the practicability of ET. This reinforces the need for a detailed training developer-materiel developer analogue as mentioned above.

## Volume 7: ET Test and Evaluation

This guideline provides a general approach and an outline of specific procedural guidance for the test and evaluation (T&E) of ET during each stage of system development. Critical T&E issues are identified and discussed. These issues include:

1. Providing inputs to the TEMP and subsequent test plans.

2. Achieving ET design integration.

3. Assessing ET design impacts on the operational system configuration.

4. In-plant ET testing.

Outcome:

ET test and evaluation is integrated into the overall T&E plan for system development.

## Volume 8: Incorporating ET into Unit Training

The primary advantage of ET as a training approach is that training stays with the system in the field and can be used for sustainment. This guideline discusses this important area and tells how to integrate ET into training guides used by commanders and trainers at the unit level for both individual and collective training.

This guideline presents both general direction and specific instructions. It discusses ET integration into the following documents:

1. Individual Training and Evaluation Program (ITEP) training guides.

2. Army Training and Evaluation Program (ARTEP) Mission Training Plans, Drill Books, and other unit training documentation.

3. Embedded Training Component (ETC) Operator's Manual; this is a proposed new document that tells how to conduct individual and collective training using the ET component.

Volume 8 also discusses initial, proficiency, sustainment, and expert level training.

This guideline will be of importance throughout the ET development process. Early on, it will be useful for indicating the steps that must be taken to ensure integration of ET into unit training. If ET is to be integrated into the ARTEP process, then special features may have to be incorporated into the ET component. Later, this guideline gives practical direction on how to generate the unit-oriented documents needed for application of ET.

Outcomes:

1. ET integrated into ITEP guides.

2. ET integrated into ARTEP guides.

3. User manuals.


## Volume 9: Logistics Implications

This guideline identifies the special implications of including embedded training in a system from the perspectives of the logistician, combat and materiel developers, and contractor teams. It shows that the logistical developments, and the processes to be followed to support a system which is to include ET, are not likely to be very different from those for a system without ET.

This guideline defines the ways in which training developers and logisticians must interface, in terms of what questions the logisticians must ask and what kinds of answers the training developers must provide.

The guideline proposes that the major implications for ET for logisticians consist of two basic categories:

1. Development of appropriate usage (and thus wear and tear) factors for the system equipment (including the ET component) so that logisticians can contribute to the development of the Operational Mission Summary and Mission Profiles, and calculate MTBF and other factors.

2. Development of appropriate kinds and levels of post-fielding logistical support, including hardware spares, software support, and training courseware support to provide continuing training system as well as operational system support.

This guideline addresses these two categories of logistical requirements as they are affected by inclusion of embedded training. It provides some direction as to what the logistician has to ask of the training developer, and about what answers must be provided to ensure support for the total system, including the ET component.

# APPENDIX B

## ET DATA ITEM DESCRIPTIONS (DIDs)

### Introduction

The focus of this Appendix is the development of Data Item Descriptions (DIDs) to address the inclusion of ET as a component of a training system. First, a general discussion of DIDs, and their role in the development and acquisition process, is presented. This discussion includes:

1. A description of the purpose of the DIDs.

2. The different types of DIDs.

3. The relationship between DIDs and source documents.

In the second subsection, two DIDs which may be modified in order to accommodate the inclusion of an ET component are presented. Possible modifications of these DIDs, to create type III DIDs, are presented.

The third subsection identifies new DIDs that are needed to accommodate the data that must be prepared when ET is a component of a training system. Three new DIDs are suggested. Until they become formalized within the library of official DIDs, they will also be Type III DIDs. These DIDs provide instruction in the preparation of the following reports:

1. Training System Concept Report.

2. Embedded Training Requirements Report.

3. Embedded Training Component Characteristics Report.

Drafts of these DIDs are presented at the end of this section.

### Data Item Descriptions, A General Discussion

A Data Item Description (DID) is a document that contains the preparation instructions for an associated item appearing on the Contract Data Requirements List (CDRL) authorized for a specific contract. As such, a DID delineates for the contractor the type and format of the data to appear in the deliverable. DD Form 1664 is used for the presentation of a DID. The reader is referred to DOD-STD-963A (Preparation of Data Item Descriptions) for a complete discussion on DID preparation.

There are three types of DIDS. A Type I DID describes the preparation instructions for technical data. Technical data are defined as recorded information of a scientific or technical nature. Technical data include items such as collected observations, research or analytical results, and engineering drawings. Technical data do not include computer software, or financial, administrative, or managerial data. These latter types of data are prepared according to instructions presented by Type II DIDs. Type I and Type II DIDs are designed to be applicable to many contracts and, thus, are very general in nature. Sometimes, however, a data item which is specific to a contract and not covered by any existing DID must be produced. The Type III DID covers the need for a DID for one-time use in a single acquisition.

The source documents which are associated with Type I and II DIDs are often developed to be applicable to a wide range of situations, rather than referring to a specific contract. Thus, the DIDs must also be of a very general nature (except in the case of Type III DIDs mentioned earlier). A Type I or II DID must also be comprehensive to allow "tailoring" of the DID for a specific contract. "Tailoring" refers to the process whereby the Contracting Officer deletes, but does not augment or otherwise modify, some of the data requirements from an approved DID to meet the needs of a specific contract.

Many of the existing Type I and Type II DIDs are general enough to cover ET considerations, but do not presently include ET-related statements. These DIDs can be augmented to address ET. The resulting "new" DID, however, must be presented as a procurement-specific (i.e., Type III) DID, since the rules for tailoring Type I and Type II DIDs only permit deletions. The creation and use of Type III DIDs will be necessary until new Type I and Type II DIDs are developed which address ET requirements and considerations. The second and third subsections of this Appendix present recommended Type III DIDs for ET procurements.

In order to create Type III DIDs that will reflect the integration of ET into the training system, ET must be addressed in three major areas of DID information, as presented on DD Form 1664. First, the purpose of the specific DID should reflect the fact that ET data will be collected.

The next area for addressing ET concerns the application of other documents in conjunction with the DID, and the DID's relationship to any source documents. If there are ET guidance documents that pertain to the development of the data described in the DID, they must be referenced in the DID. For example, if a particular volume of this series is to be used in the preparation of data, the volume must be referenced. In addition, if a source document stipulates a task that results in ET data, the source document which describes the data and their preparation must be referenced in the DID by its document number and the paragraph number pertaining to the task.

The third major area of DID information where ET considerations will be addressed is the preparation instructions for the Data Item. It is in these instructions where the greatest impact occurs, unless the existing instructions are at a level of generality at which all types of training system data are included. The changes required for the preparation instructions depend on the purpose of the specific DID.

An extensive examination of DIDs that pertain to all aspects of training system development and system acquisition was performed. From this review, it was determined that, currently, many existing DIDs are sufficiently general in nature to allow inclusion of ET data and considerations. However, there are two DIDs pertaining to training system development which, if modified, would provide for the development of an ET component for a training system. As noted earlier, Type I and II DIDs cannot be modified except through deletions. The modifications suggested here are for the purpose of creating Type III DIDs to provide for ET in specific acquisition efforts. These DIDs are presented below by reference to the DID number, title, and associated source document. The recommended inclusions are presented in **bold type**.

**NOTE: The example modified DIDs in this Appendix are <u>not</u> necessarily complete with respect to the source DIDs that they are drawn from. In particular, paragraphs in Block 10 of the example DD Forms 1664 have in some cases been omitted for brevity. Consult the basic source DIDs before attempting to develop data requirements based on these examples, to ensure that complete requirements are included in the DIDs for a specific acquisition.**

In addition to modifying existing DIDs to create Type III DIDs for ET, three additional DIDs were created. Draft versions of these recommended new DIDs are presented at the end of this section.

# DATA ITEM DESCRIPTION

| 2 TITLE | 1. IDENTIFICATION NUMBER |
|---|---|
| Suggested: Problem Analysis Report (Type III DID) | UDI-H-XXXX (Modification of UDI-H-25710B) |

**3 DESCRIPTION/PURPOSE**

.The Problem Analysis Report (PAR) documents an analysis to be conducted at the beginning of or prior to performance of training system development projects. This analysis focuses on project requirements and anticipated problem areas.

| 4 APPROVAL DATE (YYMMDD) | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
|---|---|---|---|
|  |  |  |  |

**7. APPLICATION/INTERRELATIONSHIP**

This report documents an analysis that shall be applicable to all contracts impacting existing training systems, except those pertaining exclusively to the production of specific media, training materials, or training devices. The objective of the analysis is to provide the data necessary to develop a valid work plan (Training Development and Support Plan) and to form the basis for effective project procurement and management.

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
|  |  |  |

**10. PREPARATION INSTRUCTIONS**

    10.3.2.6 <u>Training equipment, operational equipment, and facilities</u>. This section shall provide descriptions of the following training equipment, media, and facilities that provide useful support, or feasibly could provide support to the curriculum categories described in 10.3.2.5 above.

(a) <u>Training devices</u>: Types, locations, numbers, capability assessment, deficiencies, and planned modifications and procurements.

.(b) **<u>Embedded training capability</u>: <u>Characteristics, capabilities assessment, deficiencies, and planned modifications.</u>**

(c) <u>Operational equipment items</u>: Types, number available, utilization rates, and availability.

(d) <u>End item equipment</u>: Availability in terms of training requirements and schedules.

(e) <u>Audiovisual equipment</u>: Types, count, capability, reliability, and maintainability.

(f) <u>Academic media</u>: Type (films, sound slides, videotapes, etc.), subject content, and adequacy in terms of curriculum requirements.

(g) <u>Media support capabilities</u>: Facilities and maintenance capabilities in terms of specific types or categories of media or training equipment maintained.

**11. DISTRIBUTION STATEMENT**

(h) <u>Photo, printing, illustration, graphic production capabilities and facilities</u>: Support quality, timeliness, coordination requirements, and funding requirements.

(i) <u>Training facilities</u>: Type, size, and number (classrooms, learning centers, briefing rooms, etc.).

10.3.2.7 <u>Existing curriculum deficiencies and training problems</u>. This section shall provide an assessment of the existing curriculum. Specific assessment items shall include:

(a) Task listing completeness.

(b) Correspondence of learning objectives to task listings.

(c) Correspondence of test items to learning objectives.

(d) Student mastery of learning objectives.

(e) Instructional efficiency and manageability.

(f) Student motivation and course acceptance.

(g) Program evaluation process efficiency in performing required course revisions and updates.

In addition, this section shall describe all significant training problems identified during the problem analysis (PA). Identified problems shall be grouped by categories, e.g., performance measurement, instructor training, **embedded training**, simulator deficiencies, etc., and presented in an order of known or estimated criticality to the overall training program. Where possible, descriptions shall be presented for causes of known or reported problem areas and associated symptoms or program impairments.

In the event new requirements are scheduled or anticipated that will significantly impact training program conduct, efficiency, or support-ability, they shall be listed in this section. Typical examples of new requirements are:

(a) Major weapon system modifications.

(b) New subsystems.

(c) Major engineering changes.

(d) New tactical missions.

# DATA ITEM DESCRIPTION

**2. TITLE**
Suggested: Embedded Training and/or Training Device Functional Description Report (Type III DID)

**1. IDENTIFICATION NUMBER**
UDI-H-XXXX (Modification of UDI-H-25718B)

**3. DESCRIPTION/PURPOSE**

This report provides a functional description of new **embedded training (ET) component and/or training device** recommended to support training on an existing or emerging system. **An ET component** and/or Training Device Functional Description Report shall be prepared for each new device recommended.

**4. APPROVAL DATE (YYMMDD)**

**5. OFFICE OF PRIMARY RESPONSIBILITY (OPR)**

**6a. DTIC APPLICABLE**

**6b. GIDEP APPLICABLE**

**7. APPLICATION/INTERRELATIONSHIP**

The functional descriptions shall result from hands-on media selection in which each hands-on objective is assigned to **an embedded training implementation and/or** one or more types of training devices. Training requirements for objectives assigned to ET and each type of device shall be evaluated to determine functional descriptions for each type. The functional descriptions shall be used to develop engineering specifications.

**8. APPROVAL LIMITATION**

**9a. APPLICABLE FORMS**

**9b. AMSC NUMBER**

**10. PREPARATION INSTRUCTIONS**

10.2 The **Embedded Training and/or Training Device** Functional Description Report shall be one end product of hands-on media selection as specified in Section 3.11.2 of Specification MIL-T-29053B(TD), Requirements for Training System Development.

10.3.1 <u>Introduction</u>. This section shall present a brief overview of the purpose and expected application of this document. It shall contain a brief overview of the salient features of the proposed **ET component** and/or trainer.

10.3.2 <u>Description of procedures</u>. This section shall contain a description of the procedures used to develop functional descriptions of the device from the training requirements of objectives to be trained in the **ET component** and/or training device. The description shall explain each of the steps followed, decision questions asked, and a rationale for the procedures used.

10.3.3 <u>Functional characteristics</u>. This section shall provide a description of the characteristics of **the ET component** and/or training device, including its capabilities and physical configuration of the training device **and physical components of the ET component** shall be included and shall depict the overall configuration and details of controls and displays which are ET component or trainer-specific. This section shall define:

**11. DISTRIBUTION STATEMENT**

(a)  The specific requirements for the ET component
     and/or training device in terms of numbers and types of
     trainee stations, instructor and operator consoles,
     training procedures, training modes of operation,
     environmental variables, and tactical environment to be
     simulated.

(b)  The specific performance parameters of the ET com-
     ponent and/or training device, such as own-ship
     sensors, numbers and types of targets, altitudes or
     depths, number of problems, numbers and types of
     signals, weapons, tolerances, and areas of training
     criticality, such as complex concepts, dexterity, time
     frames, stress, maximum ranges, and distractions.

(c)  The specific performance capabilities of the ET
     component and/or training device, such as degree of
     automation, student scoring, critique, debriefing, and
     evaluation.  The type data required at, and the capabil-
     ities of, the instructor station shall be identified.

(d)  The degree of realism of trainee station displays, panel
     layout, accuracy of readout information, motion
     characteristics, etc., to meet the training objectives.

(e)  Trainee equipment required and degree of simulation for
     each system or subsystem of the device to include:

     (1)  Itemizing operational systems or subsystems being
          simulated or activated.

     (2)  Identifying specific controls, instruments, indi-
          cators, etc., and specifying degree of simulation.

     (3)  Identifying specific failures and malfunctions to
          be simulated and introduced into the ET
          component and/or training device.

10.3.4  Constraints.  This section shall describe the physical
characteristics of the weapon system, its computer memory capacity
processing capabilities that impact the design of the ET component
and/or the physical characteristics of the training site and the
peculiarities of the training situation which will affect the engineer-
ing design of the trainer.  It shall state constraints of the following
types and others as appropriate:

     (a)  Whether a permanent or portable installation (system
          integrated or strap-on approach for an ET component)
          is required and why.

(b) Whether the device must be designed for ready disassembly or reassembly because of training site entry limitations, etc.

(c) The availability of power, air conditioning, and transportation.

(d) The environmental conditions which will affect the **ET component** and/or training device, such as dust, vibration, humidity, hot or cold, and wind.

(e) Any unusual requirements for electromagnetic interference and electromagnetic compatibility (EMI and EMC) protection.

(f) Any other unusual facility or plant requirements.

(g) Personnel hazards which could be associated with the **ET component** and/or training device.

10.3.8 <u>Device support</u>. This section shall describe the integrated logistics support (ILS) plan which will support the **ET component** and/or training device at the training site. It shall include, as a minimum, the following:

(a) Maintenance plan describing the organization and levels required to maintain the **ET component** and/or training device.

(b) Publications required for operation and maintenance of the **ET component** and/or training device and other support, such as graphic aids, films, and schematics.

(c) Personnel plan describing requirements for operation and maintenance of the **ET component** and/or training device.

(d) Training courses required for operation and maintenance of the **ET component** and/or training device.

(e) Supply support requirements.

(f) Contractor technical service requirements.

10.3.9 <u>Evaluation plan</u>. This paragraph shall establish a plan for a fleet project team to evaluate the **ET component** or trainer relative to the requirements of the functional characteristics. The limitations and parameters of the functional characteristics will be the guide in the evaluation. The training evaluation is intended to evaluate the effectiveness of the device in contributing to the solution of the training situation.

## Recommendations for Additional DIDs

In addition to the DIDs that were modified to create Type III DIDs, it was determined that three additional DIDs should be created. These would also be Type III DIDs until made into Type I DIDs. It is suggested that DIDs for the preparation of the following reports should be created:

1. Training System Concept.

2. Embedded Training Requirements.

3. Embedded Training Component Characteristics.

Draft versions are presented here.

# DATA ITEM DESCRIPTION

| 2 TITLE | 1. IDENTIFICATION NUMBER |
|---|---|
| Training System Concept Report | UDI-H-XXXX |

**3 DESCRIPTION / PURPOSE**
This report shall present a description of the training system concept determined to be suitable for the training of tasks associated with a new system. This description of the training system concept is presented as part of the identification and assignment of media for hands-on training of tasks associated with a new system. The description of the training system must be completed prior to the development of training materials for any potential hands-on training.

| 4 APPROVAL DATE (YYMMDD) | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
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**7 APPLICATION / INTERRELATIONSHIP**

7.1 This DID contains the format and content preparation instructions for the data product generated by the specific and discrete tasks requirements as delineated in the contract.

7.2 This DID is for one-time use for solicitation (state solicitation number).

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

**10 PREPARATION INSTRUCTIONS**

10.1 REFERENCE DOCUMENTS:

    (a) MIL-T-29053B(TD), Military Specification: Requirements for Training System Development.

    (b) Army Research Institute Research Product Implementing Embedded Training (ET): Volume 3 of 10: The Role of ET in the Training System Concept, 1987.

10.2 Unless otherwise stated in the solicitation, the effective date of the document(s) cited in this block shall be listed in the issue of the DoD Index of Specifications and Standards (DoDISS) and the supplement thereto specified in the solicitation and will form a part of this Data Item Description (DID) to the extent defined within.

10.3 This report shall present the procedures used to develop a training system concept for a new system. General procedural guidance for the development of a training system concept provided in MIL-T-29053B(TD) shall govern this process, and shall be augmented by procedures similar to those presented in Implementing Embedded Training (ET): Volume 3 of 10: The Role of ET in the Training System Concept.

**11 DISTRIBUTION STATEMENT**

10.4 The contents and format of this report shall include the following sections and subsections, as a minimum.

10.4.1 Section 1: <u>Procedures for Developing the Training System Concept</u>. This section shall include as a minimum:

(a) An overview subsection describing the system for which training system analyses are being performed.

(b) A description of the procedures used to develop the training system concept.

10.4.2 Section 2: <u>Crew and Maintainer Positions Listing</u>. This section shall include a listing of all likely crew positions, with descriptive titles, for the new system, as well as a generic maintainer position, as a minimum (specific maintainer position listings are desirable).

10.4.3 Section 3: <u>Soldier-System Interface (SSI) Equipment Suite Concepts</u>. This section shall include descriptions of probable equipment items or functional equipment elements present for each SSI for the system.

10.4.4 Section 4: <u>Annotated Functional Performance Requirements (FPRs) by Position Listing</u>. This listing shall include, as a minimum, the following information in tabular form:

(a) Each FPR--a descriptive title for each functional performance requirement.

(b) Crew or Maintainer Positions associated with FPR--a descriptive title assigned to the list of FPRs.

(c) Performance Difficulty Classification of FPR--an alphanumeric code of either HIGH, MODERATE, or LOW assigned to each FPR.

(d) Perishability Classification of FPR--an alphanumeric code of either HIGH, MODERATE, or LOW assigned to each FPR.

(e) Mission Criticality Rating of FPR--an alphanumeric code of either HIGH, MODERATE, or LOW assigned to each FPR.

(f) Hands-on Classification of FPR--an alphanumeric code of either Y or N is assigned to each FPR.

(g) Training Type Classification of FPR--a statement of the type or types of training required by the FPR, including initial, sustainment, individual, and collective.

(h) Hands-On Training Support Alternatives for FPR--a statement of the alternative or alternatives appropriate for the training of the FPR.

10.4.5  Section 5: <u>Training System Concept</u>.  This section shall include, as a minimum, a list of preferred and alternative hands-on training approaches and recommended mixes of training approaches by FPR, for each FPR identified as requiring hands-on training.

10.5  NOTE CONCERNING DATABASES AND MAGNETIC DATA

The FPRs and associated annotations required by this Data Item Description may be required by specific provisions of Contract Data Requirements Lists (CDRLs) to be submitted on magnetic media produced by a computer database management system (DBMS).

11.  DISTRIBUTION STATEMENT

# DATA ITEM DESCRIPTION

| 2. TITLE | 1. IDENTIFICATION NUMBER |
|---|---|
| Embedded Training Requirements Report | DI-ILLSS-8XXXX |

**3. DESCRIPTION/PURPOSE**

This report shall present a description of the portion of training system media alternatives determination that concerns the identification of tasks and training objectives which are suitable for inclusion in an embedded training (ET) package. The identification of tasks and training objectives for inclusion in an ET package is conducted as a part of or in parallel with the identification and media assignment of hands-on-trained tasks for the training system at large.

| 4. APPROVAL DATE (YYMMDD) | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. OTIC APPLICABLE | 6b. GIDEP APPLICABLE |
|---|---|---|---|
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**7. APPLICATION/INTERRELATIONSHIP**

7.1  This DID contains the format and content preparation instructions for the data product generated by the specific and discrete tasks requirements as delineated in the contract.

7.2  This DID is for one-time use for solicitation (state solicitation number).

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

**10. PREPARATION INSTRUCTIONS**

10.1  REFERENCE DOCUMENTS:

(a)  MIL-STD-1379D, Military Standard:  Military Training Programs.

(b)  Army Research Institute Research Product, Implementing Embedded Training (ET):  Volume 4 of 10:  Identifying ET Requirements, March 1988.

10.2  This report shall present the procedures used to identify and classify the Embedded Training Requirements (ETRs) as a part of the total training system development process, and the results of the application of those procedures.  General procedural guidance for hands-on training requirements identification and media determination augmented by ET-specific considerations can be found in Implementing Embedded Training (ET):  Volume 4 of 10:  Identifying ET Requirements.

10.3  The contents and format of this report shall include the following sections and subsections, as a minimum.

10.3.1  Section 1:  Procedures for Determining Embedded Training Requirements.  This section shall include as a minimum:

**11. DISTRIBUTION STATEMENT**

(a) An overview subsection describing the system for which train-
ing system analyses are being conducted, and identification
and description of the operator (and, if applicable, main-
tainer) positions considered in the analysis.

(b) A description of the procedures used to identify tasks or
training objectives which require hands-on training for
system operation.

(c) A description of the procedures used to identify operator and
maintainer tasks or training objectives as candidates for
inclusion in embedded training and classify those tasks or
objectives as to appropriate implementation approaches within
an ET package.

(d) A description of how subject matter expertise resources were
used in the identification of ETRs.

Option 1 ([e] and [f] added to [a] through [d], which are not
optional). Option 1 shall be invoked only in the case where both
operations and maintenance tasks or objectives are considered for
inclusion in ET. Normally, operations tasks or objectives are
considered for inclusion in embedded training, but, in some cases,
maintainer tasks may also be considered.

(e) A description of the procedures used to identify tasks or
training objectives which require hands-on training for
system maintenance, servicing, and repair.

(f) A description of the procedures used to identify mainte-
nance, service, and repair tasks or training objectives as
candidates for inclusion in embedded training and classify
those tasks or objectives as to appropriate implementation
approaches within an ET package.

10.3.2  Section 2: <u>Embedded Training Requirements Listing</u>. This
subsection shall include a comprehensive listing of all hands-on tasks
and training objectives which are evaluated for potential inclusion in
embedded training, as well as the results of various steps in the
analysis. All hands-on tasks or objectives for system operation (and,
if applicable, maintenance) shall be included in this analysis. This
listing shall contain, as a minimum, the following elements in tabular
format:

(a) Task or Objective Identification Code--a unique code for each
discrete task or learning objective included in the task or
objective listing. Codes shall be developed as for an
objectives hierarchy. If mission and mission phase break-
downs have been used to develop the task or objectives list-
ing, codes for missions and mission phases shall be included,

at levels above those of the highest-level tasks or objectives, to preserve the hierarchial structure of the listing and to maintain an audit trail from the original listing through this analysis.

(b) Task or Objective Title--descriptive title of the task or learning objective. If mission and mission phase breakdowns have been used to develop the task or objectives listing, the titles of each mission and mission phase shall also be included, associated with the appropriate identification codes.

(c) Conditions of Performance--statement(s) describing the conditions under which the task or objective is performed. Concise codes may be used to represent this data element; however, if such codes are used, an explanatory listing of the codes, together with full statements of the performance conditions represented by each code used, shall be provided as Appendix C to this data item.

(d) Standards of Performance--statement(s) describing the standards to which the task or objective must be performed under operational conditions. Precise values of measurement dimensions for performance are not required, but complete identification of the dimensions along which performance should be assessed for the task or objective shall be provided. Concise codes may be used to represent this data element; however, if such codes are used, an explanatory listing of the codes, together with full statements of the performance standards represented by each code used, shall be provided.

(e) Crewmembers and Maintainers involved--statement(s) describing the crewmember (and maintainer, if appropriate) positions involved in performing the task or objective. Concise codes may be used to represent this data element; however, if such codes are used, an explanatory listing of the codes, together with identification of the crewmember(s) (and maintainer[s]) represented by each code used, shall be provided as Appendix E to this data item.

(f) Criticality Rating--the alphabetic code for task or objective criticality [see Reference (b)].

(g) Objective Classification--a numeric code representing the classification of each task or objective according to an established taxonomy [see Reference (b)].

(h) Perishability Rating--the alphabetic code for task or objective perishability [see Reference (b)].

(i)    Embedded Training Nomination--a Y (yes) or N (no) code
       indicating whether or not the task or objective was nominated
       as a candidate for inclusion in Embedded Training.

(j)    Implementation Code--the alphabetic code assigned to each
       Embedded Training-nominated task or objective [see Reference
       (b)].

(k)    Data Sources--an identification code referencing the
       information sources utilized to develop task or objective
       data and to conduct the Embedded Training Requirements
       analysis.  Concise codes shall be used to represent this data
       element.  An explanatory listing of the information source
       codes, and the information sources referred to by each code,
       shall be included in Appendix B to this data item.  The code
       Sx, where x refers to a particular number, shall be used to
       refer to specific Subject Matter Expert (SME) resources
       (either specific persons or organizations) used in conducting
       these analyses, identification of which shall be included in
       the explanatory listing in Appendix B.

If both operations and maintenance tasks and objectives are included in
the Embedded Training requirements analysis, then separate listings
shall be provided for operations tasks and objectives and maintenance
tasks and objectives, and identified as such.  The presence of only
operator-performed Preventive Maintenance Checks and Services (PMCS)
tasks in addition to operator or operations crew tasks shall not
constitute a requirement for separate maintenance task or objectives
listing.

10.3.3  Appendix A:  Cross-Reference.  A cross-reference of identical
tasks and objectives shall be prepared and included as Appendix A to
this data item, in tabular form.  The identification code of the first
instance of each replicated task or objective in the listing, and the
descriptive title of that task or objective, shall appear in the
left-hand column of the cross-reference listing.  The identification
codes of all tasks and objectives which are identical to each "first
instance" task or objective shall be presented in the right-hand column
of the cross-reference listing, in the order in which they appear in
the hierarchial identification code scheme, beginning on the same line
as the code for the "first instance" task or objective.

10.3.4  Appendix B:  Data Source Codes.  This appendix shall contain a
listing of data source codes and identification of the data source
represented by each code, as required in 10.3.2(k) above.

10.3.5  Appendix C:  Conditions of Performance Codes.  This appendix
shall contain a listing of conditions of performance codes and
identification of the conditions represented by each code, as required
in 10.3.2(c) above.  This appendix shall not be required if conditions
of performance codes are not used in the listing.

10.3.6 Appendix D: <u>Standards of Performance Codes</u>. This appendix
shall contain a listing of standards of performance codes and identifi-
cation of the conditions represented by each code, as required in
10.3.2(d) above. This appendix shall not be required if standards of
performance codes are not used in the listing.

10.3.7 Appendix E: <u>Operator (Maintainer) Identification Codes</u>. This
appendix shall contain a listing of codes used to identify operator
crewmembers (maintainers) involved in performance of each task or
objective and identification of the crewmember (maintainer) position(s)
represented by each code, as required if crewmember (maintainer) codes
are used in the listing. If both operations crewmember and maintainer
listings are provided, then separate presentation of codes for operator
and maintainer listings shall be provided in this Appendix.


10.4  NOTE CONCERNING DATABASES AND MAGNETIC MEDIA

The task and objectives listings required by this Data Item Description
may be required by specific provisions of Contract Data Requirements
Lists (CDRLs) to be submitted on magnetic media produced by computer
database management (DBMS) systems.


11.  DISTRIBUTION STATEMENT

# DATA ITEM DESCRIPTION

| 2 TITLE | 1. IDENTIFICATION NUMBER |
|---|---|
| Embedded Training Component Characteristics Report | UDI-H-XXXX |

**3 DESCRIPTION / PURPOSE**

This report shall present the detailed embedded training component design character-istics. Embedded training (ET) component design procedures, and functional descrip-tion, will follow a complete ET requirements analysis and objectives classification. These design procedures must be compatible with existing, accepted Systems Approach to Training (SAT) techniques, and take into consideration constraints imposed by ET capabilities in the prime item design.

| 4 APPROVAL DATE (YYMMDD) | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. OTIC APPLICABLE | 6b. GIDEP APPLICABLE |
|---|---|---|---|
| | | | |

**7. APPLICATION / INTERRELATIONSHIP**

7.1   This DID contains the format and content preparation instructions for the data product generated by the specific and discrete tasks requirements as delineated in the contract.

7.2   This DID is for one-time use for solicitation (state solicitation number).

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

**10. PREPARATION INSTRUCTIONS**

10.1   REFERENCE DOCUMENTS:

    (a)   MIL-T-29053B(TD)

    (b)   Army Research Institute, Working Paper, Implementing Embedded Training (ET): Volume 5 of 10: Designing the ET Component, March 1988.

10.2   This report shall contain, as a minimum, the following:

10.2.1   Description of Procedures. A description of the procedures used in designing the embedded training component. Embedded training system design must facilitate the training of objectives identified as candidates for embedded training. The descrip-tion shall explain each of the design steps followed, and present rationales for the procedures used.

10.2.2   Functional Description. A functional description of the embedded training component. Included in the description will be:

    (a)   The embedded training system name (if applicable).

    (b)   The type of training the embedded training system will provide (e.g., sustainment, initial skills, and transition).

**11. DISTRIBUTION STATEMENT**

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(c) A description of the target student population, including any applicable occupational specialty (i.e., MOS, AFSC, NEC) designators.

(d) A definition of the interface and integration requirements, indicating whether the embedded training system will be fully embedded, adjunct, or strapped-on the primary system.

(e) A listing and description of the training modes (e.g., knowledge training, skill acquisition scenarios, full mission scenarios, etc.), including the training mode access and exit characteristics and time.

10.3.3 This report will define the training application of the embedded training component in relation to the total training system. This will include:

(a) A list and description of the missions to be trained.

(b) A description of the embedded training environment(s).

(c) A list and description of the lessons which will be presented.

(d) A list and description of the exercises and scenarios presented by the embedded training component.

(e) A description of the strategies employed to present lessons, exercises, and scenarios.

(f) A list of the primary equipment which will be stimulated by the embedded training component.

(g) A description of the embedded training component stimulation characteristics (it is suggested that this be presented as a table).

(h) A list of the instructional features of the embedded training system.

(i) A description of each of the instructional features.

(j) A list of all of the hardware items to be utilized in the embedded training component (it is suggested that this be a table)--each item listed shall be identified as either fully embedded, adjunct, or strapped-on; the allocation of function between training use and system operational use shall be presented as a percentage.

(k)  description of the software characteristics of the embedded
     training component including a list and description of: (1)
     the stimulation and simulation programs, (2) the
     instructional features programs, and (3) the support
     programs.

(l)  Any additional information which can enhance the functional
     description of the embedded training system.

10.3.4 <u>Constraints</u>. This selection shall describe the physical
constraints of the embedded training system which will affect the
engineering design of the prime system. It shall state the following
types of constraints:

(a)  Whether a fully embedded, adjunct, or strapped-on embedded
     training configuration is required, and why.

(b)  Whether the embedded training component must be designed for
     ready disassembly or reassembly because of training site
     entry limitations, etc.

(c)  The environmental conditions which will affect the embedded
     training component (or affect the overall prime system as a
     result of integration), such as dust, vibration, humidity,
     temperature, and wind.

(d)  Any unusual requirements for electromagnetic interference and
     electromagnetic compatibility (EMI and EMC) protection.

(e)  Any personnel hazards which could be associated with the
     embedded training component.

10.3.4 <u>Availability and utilization</u>. This section will describe the
goals for embedded training component utilization. It shall include:

(a)  The number of hours per day or days per week or weeks per
     year the embedded training component is required to meet the
     overall training curriculum.

(b)  The average life expectancy (e.g., approximately 5 years
     before required major modernization, etc.).

(c)  Identification of any expected periods of unusually high or
     low embedded training utilization.

(d)  Identify system operational modes required (if any) during
     embedded training (must system be operationally on-line, in
     standby, etc., or can embedded training be performed on a
     "maintenance-down" system? If so, specify how).

(e) Are there some portions of the primary system more heavily utilized during embedded training, and if so, do these components require special design.

(f) Identify similar prime systems and embedded training components presently in use, where appropriate, and related "lessons learned" which will substantiate the utilization forecast.

10.3.5 **Reliability**. This section shall state the reliability mean-time-between-failure (MTBF) design goals and/or requirements of the embedded training component.

10.3.6 **Maintainability**. This section shall state the goals and/or requirements for maintainability in terms of mean-time-to-repair (MTTR) for the embedded training component.

10.3.7 **Embedded training component support**. This section shall describe the integrated logistics support (ILS) requirements of the embedded training component and will support the total training systems ILS plan. It shall include, as a minimum, the following:

(a) A maintenance plan input, describing the organization and levels required to maintain the embedded training component.

(b) Publications required to operate and maintain the embedded training component.

(c) A personnel plan describing the requirements for operating and maintaining the embedded training component.

(d) Prerequisite training courses required for operation and maintenance of the embedded training component.

(e) Supply support requirements.

(f) Contractor technical service requirements.

(g) Requirements for and characteristics of post-deployment support for ET.


11. DISTRIBUTION STATEMENT

# APPENDIX B

## LIST OF ACRONYMS

| | |
|---|---|
| AFSC | Air Force Specialty Code |
| AMC | U.S. Army Materiel Command |
| AP | Acquisition Plan |
| ARI | U.S. Army Research Institute for the Behavioral and Social Sciences |
| ARTEP | Army Training and Evaluation Program |
| AS | Acquisition Strategy |
| ASAP | Army Streamlined Acquisition Process |
| BDP | Battlefield Development Plan |
| BOIP | Basis of Issue Plan |
| BTA | Best Technical Approach |
| CDRL, CDRLs | Contract Data Requirement List(s) |
| CE | Continuous Evaluation |
| CFP | Concept Formulation Package |
| COEA | Cost and Operational Effectiveness Analysis |
| CTEA | Cost and Training Effectiveness Analysis |
| DA | Department of the Army |
| DBMS | Database Management System |
| DID, DIDs | Data Item Description(s) |
| DoDISS | DoD Index of Specifications and Standards |
| DROC | Draft Required Operational Capability |
| DTOE | Draft Tables of Organization and Equipment |
| EMC | Electromagnetic Compatibility |
| EMI | Electromagnetic Interference |
| ET | Embedded Training |
| ETC | Embedded Training Component |
| ETR, ETRs | Embedded Training Requirement(s) |
| FOG-M | Fiber-Optic Guided Missile |
| FPR | Functional Performance Requirement |
| IAW | In Accordance With |
| ILS | Integrated Logistics Support |

| | |
|---|---|
| ILSP | Integrated Logistic Support Plan |
| IR&D | Independent Research and Development |
| ISD | Instructional Systems Development |
| ITEP | Individual Training and Evaluation Program |
| JMSNS | Justification for Major System New Start |
| LAN | Local Area Network |
| LCSMM | Life Cycle Systems Management Model |
| LRRDAP | Long-Range Research, Development, and Acquisition Plan |
| LSA | Logistical Support Analysis |
| MAA | Mission Area Analysis |
| MADP | Mission Area Development Plan |
| MANPRINT | MANpower and PeRsonnel INTegration |
| MOS, MOSs | Military Occupational Speciality(ies) |
| MTBF | Mean Time Between Failures |
| MTP | Mission Training Plan |
| MTTR | Mean-Time-to-Repair |
| NDI | Non-Development Item |
| NEC | Naval Enlisted Classification |
| NET | New Equipment Training |
| NETP | New Equipment Training Plan |
| O&O | Organizational and Operational (Plan) |
| PA | Problem Analysis |
| PEP | Proposal Evaluation Plan |
| PMCS | Preventive Maintenance Checks and Services |
| PM TRADE | Project Manager for Training Devices |
| QQPRI | Qualitative and Quantitative Personnel Requirements Information |
| RAM | Reliability, Availability, and Maintainability |
| R&D | Research and Development |
| RDA | Research, Development, and Acquisition |
| RDTE | Research, Development, Test, and Evaluation |
| RFP, RFPs | Request for Proposal(s) |
| ROC | Required Operational Capability |
| SAT | Systems Approach to Training |
| SME, SMEs | Subject Matter Expert(s) |

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|---|---|
| SMMP | System MANPRINT Management Plan |
| SOW | Statement of Work |
| SSG | Special Study Group |
| SQT | Skill Qualification Test |
| SSEB | Source Selection Evaluation Board |
| SSI, SSIs | Solider-System Interface(s) |
| STRAP | System Training Plan |
| T&E | Test and Evaluation |
| TAD | Target Audience Description |
| TBOIP | Tentative Basis of Issue Plan |
| TDNS | Training Device Needs Statement |
| TDR | Training Device Requirement |
| TEMP | Test and Evaluation Master Plan |
| TG | Trainer's Guide |
| TIWG | Test Integration Working Group |
| TOA | Trade-Off Analysis |
| TOD | Trade-Off Determination |
| TOE | Tables of Organization and Equipment |
| TQQPRI | Tentative Qualitative and Quantitative Personnel Requirements Information |
| TRADOC | U.S. Army Training and Doctrine Command |