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Research Product 89-04

# Draft Functional Specification and Data Item Descriptions for FOG-M Embedded Training Subsystem

US ARMY
MATERIEL COMMAND
PM TRAINING DEVICES

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Manned Systems Group
Systems Research Laboratory

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

# U.S. ARMY RESEARCH INSTITUTE
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## NOTICES

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Dorothy L. Finley, Contracting Officer's Representative

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This research product presents an embedded training (ET) functional specification for a conceptual design of the FOG-M, as part of an ongoing effort to develop ET for a demonstration FOG-M system.  The specification is presented in MIL-STD-490B2 format in order for it to compose a critical item development specification for ET functional requirements.

Also included in the research product are two Data Item Descriptions (DIDs): Embedded Training Requirements Report, and Embedded Training Design Report.  These are adapted from MIL-T-29053B(TD)-associated DIDs to reflect unique ET documentation requirements.

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# Draft Functional Specification
# and Data Item Descriptions for FOG-M
# Embedded Training Subsystem

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This report documents the results of an effort to develop a functional critical item specification for the Embedded Training (ET) subsystem of the Fiber Optic Guided Missile (FOG-M) system. Also reported here are Data Item Descriptions (DIDs) developed to be included with a contract State of Work for the development of the FOG-M ET subsystem.

Section 1 presents a functional specification for the FOG-M ET subsystem. This specification is presented in MIL-STD-490, B2, which specifies the format for a critical item development specification, as would be included with a FOG-M system Prime Item Development Specification.

Section 2 presents two DIDs developed to support existing specifications and DIDs in MIL-T-29053B, Requirements for Training System Development. MIL-T-29053B and MIL-STD-1379B, Contract Training Programs, and their companion DIDs were extensively reviewed for applicability to an analysis of the requirements and component design of embedded training. While both standards are general enough to imply that embedded training would be considered and reported during the total evolution of a training system, it is prudent to augment them to ensure that specific and unique embedded training issues and constraints are addressed.

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DRAFT FUNCTIONAL SPECIFICATION AND DATA ITEM DESCRIPTIONS FOR FOG-M
EMBEDDED TRAINING SUBSYSTEM


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SECTION 1

FOG-M ET SUBSYSTEM FUNCTIONAL SPECIFICATION

# REQUIREMENTS FOR FOG-M EMBEDDED TRAINING SUBSYSTEM DEVELOPMENT

## 1.0 Scope

### 1.1 General

This document establishes the performance, design, development, and test requirements for the design and development of the Embedded Training (ET) subsystem critical component of the Fiber Optic Guided Missile (FOG-M) system. Within this document, the ET subsystem is considered to be an integral component of the FOG-M system. Thus, this document shall be used in conjunction with the prime item development specification for the FOG-M system.

The item described in this document is the ET subsystem component of the FOG-M system. The purpose of the ET subsystem of the FOG-M is to provide sustainment, initial skills, and transition training for Army personnel having an 11H MOS. The ET subsystem includes the following capabilities.

      a. Visual image storage and random access.
      b. Missile simulation.
      c. Video seeker simulation
      d. ET specific software.

Figure 1 illustrates the functional relationships between FOG-M and ET subsystem conceptual components. The broken line on the diagram isolates the ET subsystem conceptual major components.

The ET subsystem shall support all of the training requirements of the FOG-M system as derived from an ET training requirements analysis.

Utilization of the FOG-M subsystem shall occur under the following conditions, with or without an instructor present:

      a. Pre-deployment. ET shall be operational at the base camp to present any training available via the ET subsystem.

      b. Launch Site. While training is possible, it is not anticipated that training will be scheduled in combat settings.

During training, the FOG-M ET subsystem components simulate the presence and behavior of a dynamic FOG-M system missile. To accomplish this, the ET subsystem shall incorporate and support the following performance requirements.

The FOG-M ET subsystem shall be fully embedded into the hardware and software of the FOG-M prime system. The physical configuration of the ET subsystem shall be essentially transparent to the gunner.
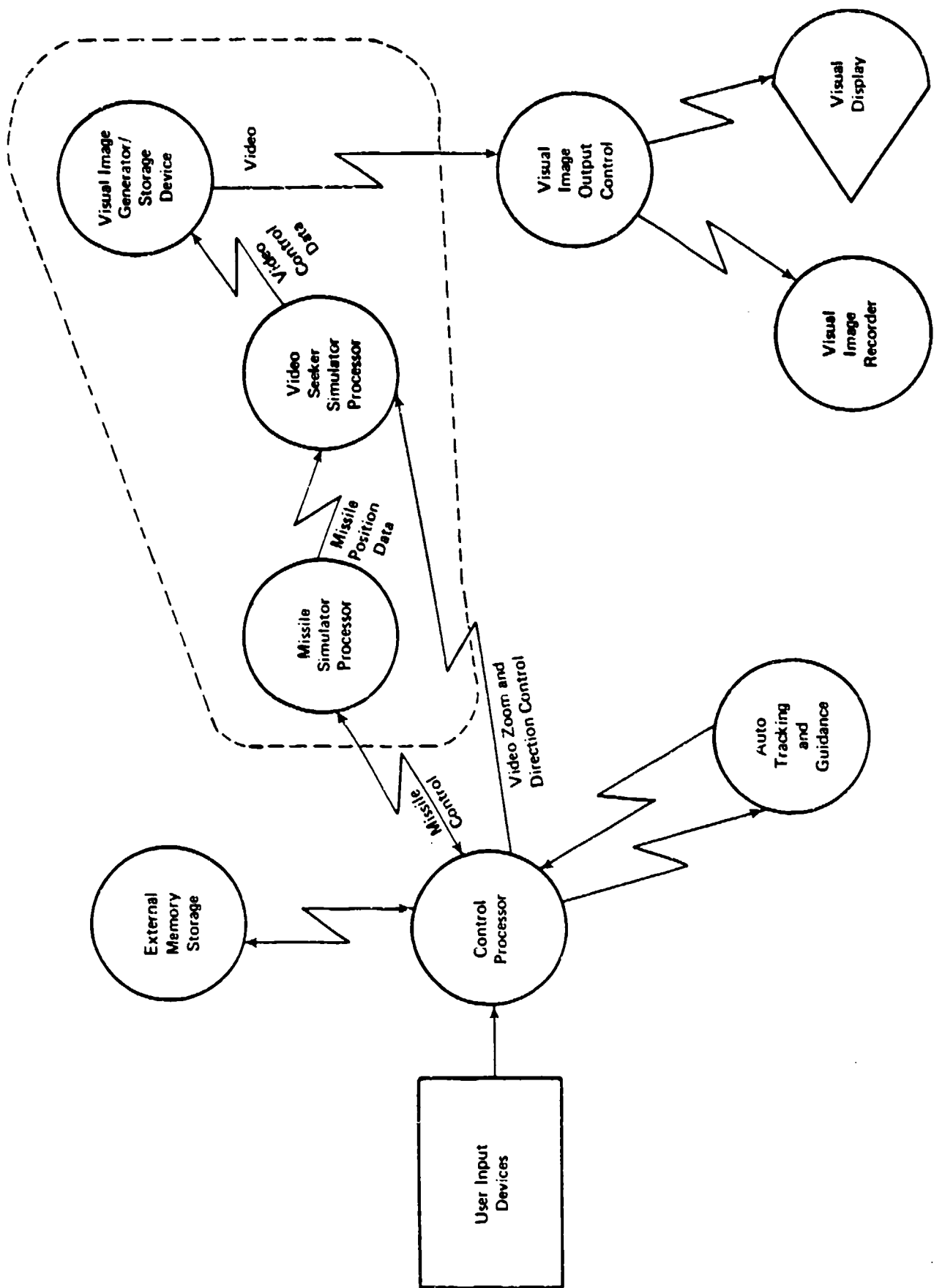
Figure 1. Conceptual FOG-M ET System

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## 1.2 Functional Characteristics

The physical configuration of the FOG-M system embedded training will essentially be transparent to the gunner. That is, the gunner shall utilize the FOG-M system equipment, mainly the gunner's console, either in or out of the transport vehicle, in exactly the same way as he would use that same equipment to perform operational activities. The ET subsystem shall be designed to function independent from an instructor or training system operator, and shall be configured to present gunner-selected lessons covering critical performance requirements which are vulnerable to rapid decay over short periods of time.

The design of the ET subsystem shall be such that the transition time between the training mode and the full capability operational mode of the weapon system shall be nearly instantaneous. In the training mode, the weapon system shall be rendered disarmed (i.e., incapable of launching missiles). An essential feature of any learning situation is that the gunner must respond, and then receive feedback about the adequacy of his response. The ET subsystem for FOG-M shall require gunner response to training materials that are presented, and shall assess and provide feedback as to the adequacy of those responses.

The primary constraints on the ET subsystem design for the FOG-M system shall be dictated by:

a. The characteristics of the actual FOG-M system itself. For example, if the actual system can have only three missiles in the air at one time, the training simulation shall be similarly constrained.

b. The FOG-M system employment. For example, if the tactical standard operating procedures of a particular FOG-M organization dictates that all missile flight plans be done by specialists other than the gunner, the training materials shall be configured to reflect that operational procedure.

c. Performance assessment criteria. For example, many gunner responses to FOG-M training simulations may have a broad range of correct answers at one stage of the missile flight, and correspondingly a more narrowly focused envelope of appropriate responses as the terminal phase is approached. In some instances, it may be impractical to instrument the system to detect some types of control manipulations and to distinguish them from others which are less appropriate. The intent, however, is to develop a training system which will be self-instructional, and selectively responsive to gunner-demonstrated strengths and weaknesses.

## 1.2.1 Courseware Characteristics

The selection of specific training to be presented at any particular time will be menu-driven. The gunner will be able to call up the ET menu and to select those modules or lessons that he will use at that particular time.

Within any particular lesson, the training will be sequenced linearly, with branching at points, items, or frames where particular responses can be identified to require differential treatment. In other words, within lessons, the training will be adaptive. The adaptions will be of several different kinds described later in paragraph 3.2.1.5.

## 1.2.2 ET Characteristics

The following are descriptive categories of those characteristics of the ET subsystem that, taken together, currently comprise the most effective ET subsystem for the FOG-M weapon system. These characteristics are not irrevocably fixed, however; they shall be modified to include new ET requirements or more effective ways for presenting embedded training.

A number of instructional features will be built into the ET subsystem for FOG-M. These features are designed to enhance learning and to tailor the content and nature of the training materials more closely to actual on-the-job performance requirements. These instructional features will be built into the training materials themselves or, in some instances, offered as selectable options that the gunner may or may not use. Most, if not all, of the anticipated instructional features of the FOG-M ET subsystem will be available using the controls and displays that are a part of the FOG-M weapons system. All training-unique inputs (i.e., those associated with establishing or configuring the training materials presented) will be prompted (aided) to eliminate or at least reduce the amount of learning necessary to use the ET subsystem.

## 1.3 Embedded Training Requirements Analysis

Prior to the design of the FOG-M ET subsystem, the contractor will conduct a complete ET Training Requirements (ETR) Analysis as detailed in A Procedure for Developing Embedded Training Requirements.

## 1.4 Embedded Training Design Procedures

Subsequent to completing the ETR analysis, the contractor will follow the ET design procedures as detailed in Procedures for Embedded Training (ET) Package Design.

## 1.5  Test and Demonstration Requirements

Test and demonstration of the ET subsystem of the FOG-M system
shall be conducted to ensure that all functional requirements presented
in this specification are met, and that hardware, software, and course-
ware components of the ET subsystem are completely functional as inte-
grated with the prime item system of which the ET subsystem is a part.
The following paragraphs present an outline of test and demonstration
requirements for the ET subsystem.  However, this outline shall not be
construed to limit the tests and demonstrations of operation and
performance of the ET subsystem solely to the issues described.  All
tests and demonstrations of the ET subsystem shall be conducted in such
a manner as to ensure that the requirements of this specification are
met with the ET subsystem as an integral part of the FOG-M prime item
system, rather than as a separate component subsystem.  The central
issue of all test and demonstration of the ET subsystem shall be to
ensure that the fulfillment of the embedded training requirements for
gunners is supported by the ET subsystem.

## 1.5.1  Hardware Test and Demonstration

Hardware test and demonstration shall be conducted to validate the
complete functionality and integration of unique and shared ET hardware
subsystem components with the FOG-M system and the comprehensive
support of ET functional requirements by the ET subsystem and compo-
nents shared with other FOG-M subsystems.  In addition to general tests
of functionality and integration of the ET subsystem with other FOG-M
system hardware components, the following specific criterion shall be
demonstrated, as a minimum:

The ET subsystem shall not interfere with any functionality or
capability of the FOG-M prime item system at large in any fashion,
except to disable missile firing during conduct of embedded training.
This requirement shall not be interpreted to mean that the ET subsystem
cannot or should not share hardware components with the FOG-M system at
large, in accordance with accepted engineering practice and other
requirements of the FOG-M prime item system.

## 1.5.2  Software Test and Demonstration

A software test and demonstration shall be conducted to validate
the complete functionality and integration of unique and shared ET
subsystem software components with other prime item system software
components.  The software test and demonstration shall also validate
the comprehensive support of ET functional requirements by ET unique
software components and software shared with other elements of the
prime item system.

General software test and demonstration requirements shall
parallel the requirements of the prime item development specification
fo· the FOG-M system.  In addition to such general requirements, unique
or shared ET software shall be demonstrated not to compromise any

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function or capability of the prime item system at large by its presence or execution, except temporary substitution for operational software components. Such substitution shall be conclusively demonstrated to terminate when the prime item system is placed in operational (as opposed to embedded training) mode.

### 1.5.3  Courseware Validation

Courseware shall be validated through performance of both formative and summative evaluation of the developmental courseware. These processes are described in the paragraphs which follow.

### 1.5.3.1  Formative Evaluation

Formative evaluation shall consist of technical content and instructional quality reviews of the developing software to ensure that the following criteria are met:

   a.  All instructional objectives which are identified during identification of FOG-M embedded training requirements are incorporated in the courseware.

   b.  Instructional sequencing and presentation of the courseware effectively satisfies terminal and enabling relationships among embedded training objectives.

   c.  Courseware and performance evaluation components of embedded training are completely consistent.

   d.  Instruction presented by the courseware is palatable and effective in conveying appropriate instructional objectives and promoting efficient training.

### 1.5.3.2  Summative Evaluation

Summative evaluation shall consist of trials of the completed courseware using representative members of the gunner population as identified during preparation of the FOG-M embedded training requirements. The trials of the courseware shall establish whether the following general criteria are met:

   a.  Training comprehensively and effectively conveys all instructional objectives designed into the courseware.

   b.  Appropriate and complete feedback to gunners and training managers is provided by the performance evaluation component of the ET Training subsystem.

   c.  Instructional sequencing supports the designed degree of instructional adaptivity and provides appropriate

instructional entry points for the various gunner populations for which the embedded training component is designed.

d. Implementation of the embedded training component is effected such that authorized modifications and updates to courseware can be readily and straightforwardly made, with no changes in computer programs (i.e., only changes in data upon which the embedded training software operates).

## 2.0 Applicable Documents

## 2.1 Government Documents

The following documents (issue in effect on the date of invitation for bids or request for proposal) form a part of this specification to the extent specified herein.

Specifications

Military

| | |
|---|---|
| MIL-I-45208 | Inspection System Requirements |
| MIL-T-29053B | Requirements for Training System Development |
| MIL-T-23991 | Training Devices, Military General Specification |
| To Be Determined (TBD) | Prime Item Development Specification for Fiber Optic Guided Missile (FOG-M) System (date TBD) |

Standards

Military

| | |
|---|---|
| MIL-STD-13 | Standards and Specifications, Order of Precedence for the Selection of |
| MIL-STD-454 | Standard General Requirements for Electronic Equipment |
| MIL-STD-470 | Maintainability Program Requirements (for systems and equipment) |
| MIL-STD-471 | Maintainability Verification/ Demonstration/Evaluation |
| MIL-STD-490 | Specification Practices |

| MIL-STD-721 | Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors, and Safety |
| MIL-STD-756 | Reliability Prediction |
| MIL-STD-781C | Reliability Tests; Exponential Distribution |
| MIL-STD-785 | Reliability Program for Systems and Equipment Development and Production |
| MIL-STD-965 | Parts Control Program |
| MIL-STD-1472 | Human Engineering Design Criteria for Military Systems, Equipment, and Facilities |

Publications

Military

| MIL-HDBK-472 | Maintainability Prediction |

## 2.2 Other Publications

| ARI Working Paper | A Procedure for Developing Embedded Training Requirements |
| ARI Working Paper | Procedures for Embedded Training (ET) Package Design |
| ARI Working Paper | Design Concepts for FOG-M System Embedded Training (ET) |
| ARI Research Note | FOG-M System Task and Training Requirements Analysis for Embedded Training (ET) |
| ARI Research Product | FOG-M System Embedded Training Demonstration Courseware Outlines |

## 3.0 Requirements

## 3.1 Critical Item Definition

The ET subsystem shall be a fully integrated component of the FOG-M prime item system. The ET subsystem shall utilize the FOG-M system hardware and software to provide sustainment, initial skills, and transition training. It shall be fully embedded into the FOG-M

system hardware and software, and transparent to the student. Figure 1 shows the functional relationships among conceptual ET subsystem components and between ET subsystem conceptual components and FOG-M system conceptual components.

### 3.1.1 Interface Definition/Integration Requirements

The FOG-M ET subsystem shall be fully embedded into the hardware and software of the FOG-M prime system with no components external to the prime system, except detachable and reusable media for the transfer and storage of courseware visual images and performance measurement tests. The physical configuration of the ET subsystem shall essentially be transparent to the gunner. The ET subsystem hardware compo-nents shall interface with the FOG-M system via the prime system compu-ter interface bus. Control processor utilization and memory capacity to support both prime system and ET functions shall be determined during detail design of the total system.

## 3.2  Characteristics

### 3.2.1  Performance

The ET subsystem shall support the training requirements of the FOG-M system which are identified in the FOG-M system training require-ments analysis and assigned for presentation through embedded training. The ET subsystem shall be operational with all "missile fire" functions automatically in "no fire" (fail safe) condition. "No fire" condition shall be maintained automatically upon reversion to the normal opera-tion condition unless stated otherwise in the FOG-M system prime item development specification.

The gunner shall have the capability to utilize the FOG-M system equipment, mainly the gunner's console, either in or out of the trans-port vehicle, in exactly the same way as he would use that same equip-ment to perform operational activities. The ET subsystem shall be designed to function independently from an instructor or training system operator, and shall be configured to present gunner-selected lessons covering critical performance requirements which are vulnerable to rapid decay over short periods of time.

During training, the FOG-M ET subsystem components shall simulate the presence and behavior of a dynamic FOG-M system missile. To accomplish this, the ET subsystem shall incorporate and support the following performance requirements:

    a.  Visual image storage and random access.
    b.  Missile simulation.
    c.  Video seeker simulation.
    d.  ET specific software.

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### 3.2.1.1 Visual Image Storage and Random Access

The ET subsystem shall have the capability to store visual images (e.g., videodisc frames, computer generated graphics) and retrieve randomly, and with an access speed sufficient to support all ET required software and courseware.

### 3.2.1.2 Missile Simulation

The ET subsystem shall have the capability to simulate FOG-M missiles in flight and under the control of the student/operator. Said simulation shall be implemented in a manner that will support the subsystem's courseware and simulation requirements.

### 3.2.1.3 Video Seeker Simulation

The ET subsystem shall have the capability to simulate images presented by the FOG-M video seeker during missile flight. Said simulation shall be implemented in a manner that will support the ET subsystem's courseware and simulation requirements.

### 3.2.1.4 ET-Specific Software

The ET subsystem, or the FOG-M prime system, shall have the memory capacity and processing capability to support all ET-specific software and courseware in the training mode. The ET subsystem-specific software shall, as a minimum, provide the following:

    a. Computer aided instruction (CAI).
    b. Part-task training.
    c. Mission specific training.
    d. Scenario generation.
    e. Student performance measurement.
    f. Performance recording.
    g. Full mission simulation.

The selection of specific training to be presented at any particular item shall be menu-driven. The gunner shall be able to call up the embedded training menu and to select those modules or lessons that he will use at that particular time.

Within any particular lesson, the training shall be sequenced linearly, with branching at points, items, or frames where particular responses can be identified to require differential treatment. In other words, within lessons, the training will be adaptive. The characteristics of the ET-specific software and courseware are described in paragraph 3.2.1.5.

a. Tracking lessons shall be of three types. Each type represents a class of courseware tailored to meet specific objectives in creating and sustaining gunner proficiency:

1. CAI requiring specific gunner responses to presented training frames or training situations shall be used to build a base of required knowledges and relationships. The gunner will need these in order to become proficient at the kinds of overall dynamic responses he must make in planning and executing a missile attack.

2. Generic part-task training that is not mission specific shall be utilized to permit practice of manipulative skills requiring hand-eye coordination for tracking or controlling. Both the missile flight path in the manual mode and the seeker as it is used to produce the images necessary for target selection and lock-on require this tracking and controlling ability. In general, it is expected that these lessons will not be mission-specific and will not require full operational video quality on the visual display. During this isolated practice, the gunner will rehearse moving the crosshairs to designed locations on the visual display and controlling the feature imaging to coordinate desired missile flight path with appropriate feature view angles and pointing directions. Realistic practice utilizing this operations-quality simulation will permit the rehearsal of all phases of the gunner's control responsibilities in managing single and multiple missiles from launch to impact.

3. Mission context training will be utilized for full and part mission presentations. For embedded training scenarios, the visual display at the gunner's console shall be capable of producing operational quality video. This video shall depict all phases of the missile flight, as seen through a simulated feature presenting either video or infrared depictions (depending on the development of the fielded missile). The presented video shall be fully interactive (i.e., activation of controls at the gunner's console shall produce a realistically depicted reaction from the simulated missile). All gunner console controls shall be operative in the training mode, providing full control options, including zoom in and out, front contrast, etc. All presentations of missile feature imagery shall be in real-time. Instructional features are discussed more fully in 1.2.2.

   The presented feature imagery shall be capable of realistically portraying all appropriate factors that affect missile control in the actual system, including meteorological conditions such as precipitation, cloud or fog

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conditions, wind direction and velocity at flight alti-
tude, turbulence, and terrain features.

b.  Embedded training scenario exercises shall be generated to
    portray realistic terrain relevant to the specific assign-
    ments of the POG-M system (e.g., systems that are to operate
    in mountainous terrain will have scenarios depicting moun-
    tainous terrain conditions, etc.).  In actual operation,
    these geographic areas would be capable of being portrayed on
    the visual display using data in the digital map generator.
    The training scenario geography shall be capable of similar
    portrayal.  As in actual operation, the training exercises
    shall be capable of depicting missile flight from any point
    in the training database to any other point in that database
    that is within the missile flight envelope parameters (i.e.,
    within range and not restricted by terrain features that
    exceed the missile flight altitude capabilities).

c.  Performance assessment and testing shall be an integral part
    of the ET subsystem.  As previously mentioned, the training
    material will be built with alternative exposures in terms of
    difficulty, content, the nature and pace of the presentation,
    etc.  These alternative pathways through training might take
    the form of repeated or further expanded materials provided
    in the CAI mode on the basis of training performance, or of
    increases or decreases in the difficulty level of the
    scenario situations used for mission practice in the full
    simulation mode.  Thus, the adaptive training programs shall,
    to the degree possible, be configured to diagnose, to pre-
    scribe, and to present in such a way that the materials are
    responsive to gunner performance and progress.

    In addition, the ET subsystem shall record and retain the
    significant aspects of gunner performance so that the gunner
    or command personnel can selectively review the specific
    capabilities of any particular gunner, as captured by record-
    ings.  The recorded materials shall be tailored to the nature
    of the presentation (i.e., CAI, part-task, full task).  For
    example, for CAI lessons it may be that only particular
    scores on selected items which differentiate branching of the
    program will be retained, to provide a record of the type of
    refresher practice the gunner experienced.  In the part-task
    generic skills training mode, perhaps only scores reflecting
    the percentage of time the gunner was able to keep the cross-
    hairs on the moving target might be recorded, and perhaps a
    record of any significant persistent error--such as con-
    stantly overshooting--that the gunner exhibited might be
    kept.  For the full simulation scenarios, the on-screen video
    will be recorded, along with any significant audio reflecting
    communication aspects of mission performance.  Quantitative

measures shall be recorded where appropriate, along with
significant performance parameters such as the range at which
target lock-on was achieved, the number of different targets
selected and rejected, aborts in the terminal phase, etc.

The specific details of how the recordings will be retained
and reviewed shall be determined during detailed design
development. Records will exist in the operational system
and will be used in embedded training to provide performance
feedback to gunners as well as performance intelligence to
operational commanders.

d.  Full mission simulation will be provided to ensure integra-
tion of all the tasks taught via other methods. Several
alternative scenarios will be provided so that the gunner
will be ready for all tactical, terrain, and failure
possibilities.


## 3.2.1.5  ET Characteristics

The following are descriptive categories of those characteristics of
the ET subsystem which, taken together, currently comprise the most
effective subsystem for the FOG-M weapon system. These character-
istics are not irrevocably fixed; however, they shall be modified to
include new ET requirements or more effective ways for presenting
embedded training.

a.  A number of instructional features shall be built into the ET
subsystem for FOG-M. These features are designed to enhance
learning and to tailor the content and nature of the training
materials more closely to actual on-the-job performance
requirements. These instructional features shall be built
into the training materials themselves or, in some instances,
offered as selectable options that the gunner may or may not
use.

1.  The level of difficulty shall be modifiable. The train-
ing system shall adapt to the gunner's performance, or
the gunner may choose to try more or less difficult
versions of some particular lesson material.

2.  It is anticipated that a great many different kinds of
feedback shall be made available to gunners, on the basis
of training effectiveness. Feedback may range from a
straightforward discussion of why a particular response
to a CAI item is inappropriate, to situations where the
video will be stopped, and some portion replayed or pro-
jected in stop-frame mode to highlight or illustrate a
particular performance error. Feedback shall be both
technical, in terms of the accuracy or appropriateness of

any particular response, as well as motivational (i.e., some type of praise for appropriate responses).

3. The speed of training material presentation shall be variable within some lessons or scenarios. In some instances, it will be appropriate to "freeze" the picture, and to highlight within it some set of cues that received an inappropriate response. In other types of training, the presentation speed may be allowed initially to decrease the difficulty of some particular activity, and then increased to build operational proficiency.

4. Color may be used in some CAI and in some generic tracking practice lessons to increase the acceptance and effectiveness of the training. Color shall not be used in full simulation scenarios since the presented video will faithfully duplicate the monochromatic imagery produced by the missile seeker.

5. The ET subsystem hall be able to display text and to overlay both text and graphic presentation, to utilize split screen presentation, and to highlight areas of the screen selectively through color, brightness, slashing, etc.

6. Within some lessons the gunner shall have the ability to skip forward or backward to preview or review material, thus adjusting for himself the point at which he enters or continues the particular training being used. This option shall be available to him only at times when its use can be productive in tailoring the library of training materials to the gunner's particular level of proficiency or current interest.

7. For certain modules, the gunner shall be allowed "free play." That is, he shall be free to launch and guide a missile, controlling the seeker and missile flight with the system acting as a full simulator. No correction or guidance shall be given until some terminal consequences such as an impact.

Most, if not all, of the anticipated instructional features of the FOG-M ET subsystem shall be available using the controls and displays that are a part of the FOG-M weapons systems. All training-unique inputs (i.e., those associated with establishing or configuring the training materials presented) shall be prompted (aided) to eliminate, or at least reduce the amount of learning necessary use the ET subsystem.

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b.  Job performance aid applications are a valuable benefit that
    the ET subsystem can contribute to the operational
    configuration of the FOG-M weapon system.  The contractor
    shall evaluate the potential benefits of utilizing the text
    and graphics capabilities in the ET subsystem; job
    performance aids, in the form of instructions, checklists,
    schematics, and other forms of documentation can be made
    directly available on the gunner's visual display to support
    various operational activities.  It is anticipated that any
    troubleshooting to be done as part of gunner maintenance on
    either the weapon system or the ET subsystem will be most
    effectively supported by job performance aid materials.

c.  An authoring system shall be used in the development and
    update of all courseware provided by the ET component.  Said
    authoring system shall, as a minimum, have the following
    functions:

    1.  Entering data and courseware development.
    2.  Reviewing courseware.
    3.  Editing courseware.
    4.  Updating courseware.
    5.  Presentation of courseware.

    Tailoring the ET subsystem to provide maximum job-relevant
    support to ongoing fielded operations of the FOG-M weapon
    system will require both the input of, and modifications to,
    specifically designed training materials.  Lesson materials
    such as computer programs and videodiscs will be produced at
    a centralized authoring facility and will be loaded into the
    ET subsystem in tape or disc form.  In addition to loading
    new or revised lesson materials in preprogrammed form,
    selected inputs of some types of data, such as revised
    performance criteria or revised target and target dynamics
    programming, may be possible using the gunner's console
    keypad.  Access to the ET subsystem programming shall be
    limited to specially trained and authorized personnel.

d.  Finally, the ET system shall be configured such that, when
    desired, an instructor or other observer shall be able to
    monitor the ongoing training and to provide "over the
    shoulder" feedback in addition to that provided by the
    training materials themselves.

## 3.2.2 Physical Characteristics

The physical characteristics of the following ET subsystem components shall be standard off-the-shelf items, unless otherwise specified in the Contract Statement of Work or Purchase Order:

     a.  Random Access Visual Image Generator.
     b.  Control Processor.
     c.  Missile Simulation Processors.
     d.  Video Seeker Simulation.
     e.  Mass Storage Device.

These components shall conform to the same durability and vulnerability factors as those specified for the FOG-M system. These components may be strap-on devices or fully integrated into the FOG-M system as determined during det٠il design and specified in the Contract Statement of Work or Purchase Order.

## 3.2.3 Reliability

Reliability shall be in accordance with MIL-T-23991, paragraph 3.3.

## 3.2.3.1 Reliability Program

The reliability program shall be established in accordance with MIL-STD-785. The reliability program shall be submitted to the Procuring Agency for approval. Said approved reliability program shall reflect the policies and procedures of management, to provide effective guidance and continuity, and shall become a basis for contractual compliance.

### 3.2.3.1.1 Qualitative Reliability

The ET subsystem shall include features that result in reliable and stable performance in the planned operational environment. The ET subsystem shall be so designed such that failure in one component of a system shall not cause failure in any other component. There shall be complete interchangeability between like components in the system. Reliability development procedures shall include as a minimum:

     a.  Review of system requirements so as to establish an accurate description of all parameters which may affect system performance.

     b.  Operational environment.

     c.  Evaluation of the proposed system design so as to ensure that all features specified herein have been incorporated in order to establish the stability of operation.

d. Estimation of inherent reliability as operational reliability.

e. Analysis of proposed design to obtain component reliability allocation and allowable failure rates of components.

f. Optimum use of redundancy throughout the system.

### 3.2.3.2 Quantitative Reliability

Since the ET subsystem is to be fully embedded in the prime item system, quantitative reliability factors shall be the same as those established in the prime item development specification for FOG-M, unless specific waivers are granted by the procuring authority for commercial off-the-shelf components required to implement embedded training capabilities.

### 3.2.3.3 Reliability Terms

All reliability terms used during the course of the reliability program shall be defined in MIL-STD-721. Reliability procedures prepared by the contractor shall be as specified in MIL-STD-756 or as otherwise specified and/or approved by the Procuring Agency.

### 3.2.3.4 Useful Life

The useful life of the ET subsystem shall be the same as that established in the prime item development specification for FOG-M, unless specific waivers are granted by the procuring authority for commercial off-the-shelf components required to implement embedded training capabilities.

### 3.2.4 Maintainability

The maintainability factors of the ET subsystem shall be the same as those established in the prime item development specification for FOG-M, unless specific waivers are granted by the procuring authority for commercial off-the-shelf components required to implement embedded training capabilities.

### 3.2.4.1 Maintenance Concept

The maintenance concept for the ET subsystem shall be established concurrent with maintenance allocation analyses performed for the FOG-M system at large, in accordance with applicable provisions of the prime item development specification, Statement of Work, or Purchase Order for the prime item FOG-M system.

### 3.2.4.1.1 Quantitative Requirements

The quantitative maintainability factors of the ET subsystem shall be the same as those established in the prime item development specification for FOG-M, unless specific waivers are granted by the procuring authority for commercial off-the-shelf components required to implement embedded training capabilities.

### 3.2.4.2 Maintainability Prediction Techniques

The contractor's maintainability prediction technique shall be in accordance with MIL-HDBK-472.

### 3.2.4.2.1 Maintenance Test Programs

The contractor shall provide a software test program to verify the operation of the system processor, the instructor station, the student station, and all other training system components and peripheral devices. A system readiness test shall be loaded and executed to verify proper communication between all electronic components of the system hardware with minimal interaction. This complete set of tests shall require no more than 15 minutes for successful execution. The status of each hardware element shall be displayed on the system (or ancillary) Visual Display Unit (VDU) or optional printer as selected upon start up. Normal functioning shall be from the designated VDU and shall automatically access each subset with the additional capability that the instructor may request and execute any subtest in the cycle. Upon the completion of each subtest, a message shall be transmitted to the instructor's VDU or printer concerning the status of the test, either SUCCESS or FAIL. If a FAIL is transmitted, the failed path and signal function shall also be identified. Maintenance personnel shall have the option to proceed with the testing after noting the failure information or manually stepping through the program to determine the type and nature of the failure.

### 3.2.4.3 Commercial Equipment

When commercial off-the-shelf equipment is used, and the electronic equipment's module connectors are not keyed to prevent incorrect connection, the contractor shall place a color mark, using high durability paint, at one end of the module connector and its associated socket to identify proper insertion orientation for that module into the socket. Where dissimilar modules are adjacent to each other and utilize the same type of unkeyed connector, the color marking shall use a different color for each module in order to prevent cross insertions. Socket identifier shall be placed so as to be clearly visible to the "maintainer" during maintenance operations, and so placed as to indicate clearly the card slot or socket it identifies.

### 3.2.5 Environmental Conditions

The ET subsystem components shall be capable of operating under the exact same environmental conditions as the FOG-M system (see FOG-M prime item development specification).

### 3.2.6 Transportability

The ET subsystem shall conform to the transportability requirements of the FOG-M system as required by the FOG-M system prime item development specification.

### 3.3 Design and Construction

The design and construction of the ET subsystem shall conform to the design and construction specifications contained in the prime item development specification for FOG-M and to MIL-STD- 1472, unless specific waivers are granted by the procuring authority for commercial off-the-shelf components required to implement embedded training capabilities. These specifications shall be used in regard to the following: (1) materials, processes, and parts; (2) electromagnetic radiation; (3) nameplates and product marking; (4) workmanship; (5) interchangeability; (6) safety; and (7) human performance/human engineering.

### 3.3.1 Materials, Processes, and Parts

Materials, processes, and parts shall be in accordance with materials, processes, and parts specifications contained in the prime item development specification for FOG-M, with MIL-STD-965, and with other sections of this specification, unless specific waivers are granted by the procuring authority for commercial off-the-shelf components required to implement embedded training capabilities.

### 3.3.2 Electromagnetic Radiation

The system shall conform to electromagnetic radiation limits as specified in MIL-STD-454.

### 3.3.3 Nameplates and Product Marking

All components shall be labeled with nameplates containing their part numbers. Said nameplates shall be furnished by the contractor.

### 3.3.4 Workmanship

All components developed and produced for the ET subsystem shall conform to MIL-STD-454 in regard to workmanship. Particular attention

shall be given to the neatness and thoroughness of construction, marking of parts and assemblies, painting, machine screw assemblies, and freedom of parts from burrs and sharp edges.

### 3.3.5  Interchangeability

All parts, assemblies, and subassemblies having the same part number shall be directly and completely interchangeable with respect to installation and performance, regardless of sources from which obtained, without alteration and without selection for fit and performance.

### 3.3.6  Safety

Safety requirements for the ET subsystem shall be the same as those specified in the FOG-M system prime item development specification.

### 3.3.7  Human Performance and Human Engineering

The system shall conform to the requirements of MIL-STD-1472 and as specified herein.

### 3.4  Documentation

The ET subsystem specified herein shall have the following requirements for documentation:  (1) a detailed prime item development specification for the training system; (2) a specification of the ET-specific software; (3) a specification for the ET-specific hardware; (4) an operating manual for the electronic components of the system; and (5) a maintenance and repair manual.

### 3.4.1  Prime Item Development Specification

The prime item development specification shall be an interim deliverable during the development process of the FOG-M system to which this specification pertains.  Said specification shall delineate the ET-specific requirements as well as all requirements for the FOG-M device itself.  Said specification format shall be specified by MIL-STD-490, Section B1.

### 3.4.2  Software Specification

The software specification shall be required as an interim deliverable for the development of the FOG-M system to which this specification pertains.  Said software specification, utilizing this

specification, shall describe all of the software necessary for the system. Said specification format shall be specified by MIL-STD-490, Section B5.

### 3.4.3 Hardware Specification

The hardware specification shall be required as an interim deliverable for the development of the FOG-M system to which this specification pertains. Said hardware specification, utilizing this specification, shall describe all of the hardware necessary for the system. Said specification format shall be specified by MIL-STD-490, Section B1.

### 3.4.4 Operating Manual

Operating instructions for the ET subsystem shall be integrated, to the extent feasible, with overall operating instructions for the FOG-M system, as specified in the FOG-M prime item development specification. However, if commercial off-the-shelf components are incorporated in the ET subsystem, consideration shall be given to the use of manufacturers' operating manuals for such components, rather than preparing integrated documentation for the FOG-M system replicating such manuals. The contractor shall prepare recommendations regarding respectively (a) use of commercial item manufacturers' operating manuals for commercial off-the-shelf components and (b) integration of operating instructions for the ET subsystem with operating documentation for the FOG-M system at large, as a part of the Integrated Logistic Support effort for the FOG-M system. Such recommendations shall be provided to the procuring authority at **TBD** for review. The procuring authority will determine whether the contractor's recommendations will be adopted as presented, or adopted with specific modifications to be determined. Where commercial item manufacturers' operating manuals are utilized for specific components of the ET subsystem, reference to those documents shall be made in overall FOG-M system operating manuals and other documentation, as appropriate.

### 3.4.5 Maintenance and Repair Manual

Maintenance and repair instructions for the ET subsystem shall be integrated, to the extent feasible, with overall maintenance and repair instructions for the FOG-M system, as specified in the FOG-M prime item development specification. However, if commercial off-the-shelf components are incorporated in the ET subsystem, consideration shall be given to the use of manufacturers' maintenance and repair manuals for such components, rather than preparing integrated documentation for the FOG-M system relicating such manuals. The contractor shall prepare recommendations regarding respectively (a) use of commercial item manufacturers' maintenance and repair manuals for commercial off-the-shelf components and (b) integration of maintenance and repair instructions

for the ET subsystem with maintenance and repair documentation for the
FOG-M system at large, as a part of the Integrated Logistic Support
effort for the FOG-M system. Such recommendations shall be provided to
the procuring authority at **TBD** for review. The procuring authority
will determine whether the contractor's recommendations will be adopted
as presented, or adopted with specific modifications to be determined.
Where commercial item manufacturers' maintenance and repair manuals are
utilized for specific components of the ET subsystem, reference to those
documents shall be made in overall FOG-M system maintenance and repair
manuals and other documentation, as appropriate.


## 3.5  Logistics

### 3.5.1  Maintenance

Maintenance of the system shall be as specified in paragraph 3.2.4
and its subparagraphs herein.


### 3.5.2  Supply

To be determined.


### 3.5.3  Facilities and Facility Equipment

N/A


## 3.6  Precedence

In the case of conflict between this specification and referenced
documents, the requirements defined herein shall take precedence. When-
ever procurement documents do not explicitly specify standards and spe-
cifications to be used, the requirements of MIL-STD-13 shall apply.


## 4.0  Quality Assurance Provisions

### 4.1  Quality Assurance

The objectives of the quality assurance provisions specified herein
are to provide assurance to the Procuring Agency that all specification
requirements are met and all potential problem areas are identified at
the earliest possible stage  to allow for correction. The contractor
shall be responsible for all Section 3 and Section 5 requirements speci-
fied herein, as well as for all specifications and manuals developed in
conjunction with the system specified herein. The Procuring Agency
reserves the right to attend and observe any reviews or inspections
conducted at the contractor's location.

### 4.1.1 Responsibility for Tests

The contractor shall assume responsibility for the conduct of all tests of the ET subsystem necessary to assure compliance with the requirements of this specification and other specifications referenced herein.

### 4.2 Quality Conformance Inspections

Quality conformance inspections shall be in accordance with MIL-T-23991 and the following requirements:

### 4.2.1 Reliability Demonstration

A reliability demonstration shall be conducted at the contractor's facility. Said reliability demonstration shall be conducted in accordance with the requirements of MIL-STD-781C and the government approved Reliability and Demonstration Plan to be provided by the contractor under the provisions of the Contract, Statement of Work, or Purchase Order. The purpose of the demonstration will be to ascertain whether or not the ET subsystem performs in accordance with the requirements set forth in paragraph 3.3 herein. The following additional criteria shall apply as necessary:

    a. Test Plan XXIC, Test Level A-1 of MIL-STD-781C shall be utilized to demonstrate.

    b. The failure criteria of paragraph 7.0 of this specification are applicable.

    c. The duty cycle to be maintained throughout the demonstration shall be typical of normally scheduled training operations, within the training modes of the system.

    d. The concept of classifying failures by a "weighting factor" shall not be allowed.

### 4.2.2 Maintainability Demonstration

The maintainability test shall be a demonstration of the facilities to isolate system faults as specified in paragraph 3.4 herein. The test procedures shall be included in the Student and Instructor Station Test and Demonstration Plan. This test shall be conducted at the contractor's facility by contractor personnel following the government's device acceptance tests. The tests actually demonstrated shall be selected by the contractor and approved by the Procuring Agency and shall be in accordance with MIL-STD-471, Appendix A, Test Method 8. To demonstrate maintainability, the total time required to perform each day's preventative maintenance tasks during the demonstration period

shall be treated as one task. A minimum sample size of 30 tasks (30 days' preventive maintenance) are required.

### 4.2.3 Safety

A safety evaluation shall be conducted to determine that all personnel, equipment, and environmental hazards have been eliminated. A visual inspection shall be performed to determine that all requirements, as a result of the safety evaluation, have been incorporated into the equipment. Inability to meet the specification requirements shall constitute a failure.

### 4.2.4 Software

Software testing shall be performed during both the in-process and the formal inspection.

### 4.2.4.1 Software Function Tests

During in-house inspection, each computer program function shall be individually tested and verified. Tests shall include logic testing and volume testing. Logic testing shall include testing program logic, interfaces, and unusual mixtures of data sequences. Volume testing shall determine if specific application programs can handle the amount of data required under operational conditions. During formal inspection, software tests shall be in accordance with test specifications and test procedures.

### 4.2.4.2 Software Integration Testing

Software integration testing shall be accomplished during both in-process and formal inspections. Software integration testing shall be conducted to determine that the linkages and interfaces among computer program components are correct and interact properly. Software integration testing shall verify that throughout the system, system response times and memory capacity are within the stated requirements.

### 4.2.5 Instructional Quality Assurance

The instructional adequacy, completeness, accuracy of technical content, fidelity of simulation, adaptivity, and palatability of all instructional elements incorporated in or presented by the FOG-M ET subsystem shall be established through conduct of an instructional quality control program. This program shall incorporate both formative (developmental) and summative (performance) evaluation activities, in accordance with accepted Instructional Systems Development (ISD) methodology, as outlined in MIL-T-29053B(TD). As a minimum, the criteria

listed in sections 1.5.3.1 and 1.5.3.2 of this specification shall be met by the instructional materials, prior to acceptance by the procuring authority. An instructional quality control program meeting the requirements of MIL-T-29053B(TD) shall be established and conducted by the contractor to ensure that these criteria are met by the instructional elements provided by the ET subsystem.

## 4.3 Examinations

The ET subsystem shall be examined to verify conformance to the following requirements of this specification:

- a. Materials, parts, and processes.
- b. Display techniques.
- c. Performance of components.
- d. Safety.
- e. Electrical requirements.
- f. Dimensions.
- g. Weight.
- h. Nameplates and product markings.
- i. Documentation.
- j. Workmanship.

## 5.0 Preparation and Delivery

N/A

SECTION 2

FOG-M ET SUBSYSTEM DATA ITEM DESCRIPTIONS

# DATA ITEM DESCRIPTION

| | |
|---|---|
| **1. TITLE**<br><br>Embedded Training Requirements Report | **2. AGENCY**      **NUMBER**<br><br>AMC          UDI-H-XXXXX |

**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 suitable for inclusion in an embedded training (ET) package.

**4. APPROVAL DATE:**

**5. OFFICE RESPONSIBLE:**

**6. DDC REQUIRED:**

**8. APPROVAL LIMITATION:**

**7. APPLICATION/INTERRELATIONSHIP**

The identification of tasks and/or 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. Preliminary embedded training requirements determination takes place during system requirements definition, to support analysis of embedded training as a potential training system element. Refinement of preliminary embedded training requirements analysis takes place during hands-on media determination for the training system at large during the instructional systems development process, or, in certain cases, where ET is the only training alternative to be considered.

**9. REFERENCES:**

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

(b) Army Research Institute Working Paper A Procedure for Developing Embedded Training Requirements, 1986 September 1

(c) Data Item Description UDI-H-25715B, Objectives Hierarchies Report

**10. PREPARATION INSTRUCTIONS**

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

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 provided in section 3.11 of MIL-T-29053B(TD) shall govern this process and shall be augmented by ET-specific considerations for this analysis by procedures presented in _A Procedure for Developing Embedded Training 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 the following as a minimum:

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

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

(c) A description of the procedures used to identify operator 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 that require hands-on training for system maintenance, servicing, and repair.

(f) A description of the procedures used to identify maintenance, 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: _Embedded Training Requirements Listing_. This subsection shall include a comprehensive listing of all hands-on tasks and/or training objectives that 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 objective included in the task or objective listing. Codes shall be developed as for an objectives hierarchy per paragraph 10.5 of UDI-H-25712B. If mission and mission phase breakdowns have been used to develop the task or objectives listing, 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 objective, to include a concise statement of the behavior(s) required to complete the task or 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 code, 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 as Appendix D to this data item.

(e) Crewmembers (Maintainers) Involved--statement(s) describing the crewmember (or maintainer) 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) (maintainers) 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 assigned during performance of step 3.1 of the procedures in <u>A Procedure for Developing Embedded Training Requirements</u>.

(g) Objective Classification--a numeric code representing the classification of each task or objective according to the taxonomy presented in Table 1 (Step 3.2) of <u>A Procedure for Developing Embedded Training Requirements</u>.

(h) Perishability Rating--the alphabetic code for task or objective perishability assigned during performance of Step 3.3 of the procedures in <u>A Procedure for Developing Embedded Training Requirements</u>.

(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, according to the criteria presented in Step 3.4 of the procedures in <u>A Procedure for Developing Embedded Training Requirements</u>.

(j) Implementation Code--the alphabetic code assigned to each Embedded Training-nominated task or objective during evaluation of Embedded Training feasibility and implementation approaches during performance of Step 3.5 of the procedures in <u>A Procedure for Developing Embedded Training Requirements</u>.

(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 or objectives are included in the Embedded Training requirements analysis, then separate listings shall be provided for operations and maintenance tasks or 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: <u>Cross-Reference</u>. A cross-reference of identical tasks or objectives shall be 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 shall appear in the left-hand column of the cross-reference listing. The identification codes of all tasks or objectives 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: <u>Data Source Codes</u>. 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: <u>Conditions of Performance Codes</u>. 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 identification 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 not 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. If submission in this form is required, a suggested database structure and formats for developing hardcopy reports may be found in Appendix C of <u>A Procedure for Developing Embedded Training Requirements</u>.

| DATA ITEM DESCRIPTION | | |
|---|---|---|
| **1. TITLE**<br><br>Embedded Training Design Report | **2. AGENCY**<br><br>AMC | **NUMBER**<br><br>UDI-H-XXXXX |
| **3. DESCRIPTION/PURPOSE**<br><br>This report shall present the detailed embedded training component design characteristics. | **4. APPROVAL DATE:** | |
| | **5. OFFICE RESPONSIBLE:** | |
| | **6. DDC REQUIRED:** | |
| **7. APPLICATION/INTERRELATIONSHIP**<br><br>Embedded training (ET) component design procedures, and functional description will follow a complete embedded training requirements analysis and objectives classification. These design procedures must be compatible with existing, accepted Instructional Systems Development (ISD) techniques, and take into imposed by embedded training capabilities into the prime item design. | **8. APPROVAL LIMITATION:** | |
| | **9. REFERENCES:**<br>(a) MIL-T-29053B(TD)<br><br>(b) Army Research Institute Working Paper <u>A Procedure for Developing Embedded Training Requirements</u>, 1986 September 1 | |

**10. PREPARATION INSTRUCTIONS**

10.1  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 supplements thereto specified in the solicitation and will form a part of this Data Item Description (DID) to the extent defined within.

10.2  This report shall be based upon and support the total training system functional description, as specified in Section 3.11.2.1 of Specification MIL-T-29053B(TD), Requirements for Training System Development.

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

10.3.1  <u>Description of procedures</u>.  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 description shall explain each of the design steps followed, and present rationale for the procedures used.

10.3.2  <u>Functional description</u>.  A functional description of the embedded training component.  Included in this description will be (as a minimum):

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

(b) The type of training the embedded training system will provide (sustainment/initial skills/or transition training).

(c) A description of the target student population, including any applicable MOS designators.

(d) A definition of the interface/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, including the training mode access/exist 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, as a minimum:

(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) A 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 that 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 that will affect the engineering design of the prime system. It shall state, as a minimum, 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 and reassembly because of training site entry limitations, etc.

(c) The environmental conditions that 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/ electromagnetic compatibility (EMI, EMC) protection.

(e) Any personnel hazards that 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, days per week, and 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) The identification of any expected periods of unusually high or low embedded training utilization.

(d) The identification of system operational modes required (if any) during embedded training. (Must the system be operationally on-line, in standby, etc.? Can embedded training be performed on a "maintenance-down" system? If so, 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) 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.

# APPENDIX A

## PERSONNEL AND TRAINING

There should be two types of personnel who shall have access to the system: (1) users and (2) maintainers. There shall also be two types of training, for use and for maintenance.

## Personnel

Users. The system shall support access by instructors and students or operators authorized to use a particular instantiation of the system specified herein. Users shall have access to the system for training purposes as specified herein.

Maintainers. Maintenance personnel specifically trained and authorized for maintenance of any instantiation of a system specified herein shall have access to said system for maintenance purposes.

## Training

User Training. User training shall be minimal. Displays presented to a user shall be self-explanatory with regard to any action required by the user. All other training shall be determined by the Contract or the Statement of Work (SOW).

Maintenance Training. Maintenance personnel shall receive a training course supplied by the contractor. Said training course length, detailed content, and format shall be determined by the contractor and approved by the Procuring Agency. Course contents shall include, but not be limited to, the following:

1. All scheduled maintenance procedures.

2. All installation procedures.

3. All troubleshooting procedures.