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AN ANALYTIC TRAINING EFFECTIVENESS ANALYSIS FOR A CTEA UPDATE

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INTRODUCTION

A program is underway to develop operator and organizational maintenance training devices for the Firefinder training system. Firefinder is a radar system currently under development consisting of the mortar locating radar AN/TPQ-36 and the artillery locating radar AN/TPQ-37. The Training Devices Requirement (TDR) and Specifications documents for Firefinder have been finalized and a contract to build the proposed training devices is being let. An initial Cost and Training Effectiveness Analysis (CTEA) was performed early in the program*. Considerable additional task analysis and cost data have since become available, making it desirable to update the initial CTEA.

The TEA portion of the update was performed by the Army Research Institute Fort Benning Field Unit (ARI-Benning) and forms the Annex of this memorandum. The methodology used and illustrated in the Annex is an analytical one which results in comparisons and relative training effectiveness values for the two alternative training concepts. This methodology may be of interest to others performing a TEA at an early stage of system development when empirical performance data cannot be obtained.

OBJECTIVES

The objectives of the Firefinder TEA update were to:

*Better define and compare the instructional support capabilities of the proposed training devices (PTD) and actual equipment trainer (AET).

*Identify the need for training equipment (either AET or PTD) per operator and organizational maintenance task.

*Identify those tasks which could be trained on the PTD.

*Determine the relative training effectiveness of the PTD, as compared to the AET, for the appropriate subset of tasks.

*A Cost and Training Effectiveness Analysis of Alternative Concepts for AN/TPQ-36 Training. U.S. Army Training and Doctrine Command, ATSC, Fort Eustis, Virginia. Batelle Columbus Laboratories, Columbus, Ohio. August 16, 1976.

METHOD

Analytic methods used are described in the update itself (Annex).

RESULTS

The results of the Firefinder TEA update were:

*The training equipment requirements per task were identified.

*The training equipment requirements of all operator tasks and the majority of the maintenance tasks will be met by the PTD and/or AET.

*The instructional support capabilities of the PTD were found to be better than those of the AET.

*The judged overall relative training effectiveness (RE) of the operator PTD is 1.1, while the judged RE of the organizational maintenance PTD is 1.2.

*A small cluster of computer maintenance tasks was identified for which the PTD will not provide training and the AET is not judged to be entirely effective.

CONCLUSIONS

The conclusions of the Firefinder TEA were:

*The PTD are judged to be more training effective than the AET for those purposes for which they are intended.

*The need for an additional part task trainer for computer maintenance training should be investigated.

ANNEX

THE PIPEFINDER TRAINING EFFECTIVENESS ANALYSIS (TEA) UPDATE

Prepared by ARI-Benning as an update to the initial CTEA: A Cost and Training Effectiveness Analysis of Alternative Concepts for AN/TPQ-36 Training. U.S. Army Training and Doctrine Command, ATSC, Fort Eustis, Virginia. Batelle Columbus Laboratories, Columbus, Ohio. August 16, 1976.

Those portions of the text with a vertical line on the left margin are the modifications to the original text developed by ARI-Benning.

CHAPTER 4

ESSENTIAL ELEMENTS OF ANALYSIS

1. IDENTIFICATION OF ESSENTIAL ELEMENTS OF ANALYSIS

a. There are five essential elements of analysis for this study:

(1) What are the advantages and effectiveness of training devices in general?

(2) What are the alternative concepts for satisfying the training requirements for the AN/TPQ-36?

(3) Does the Best Technical Approach (BTA) to training devices realize the advantages of training devices identified above? What are the advantages and disadvantages in using actual equipment for training?

(4) What are the training equipment requirements per task? Do the proposed training devices (PTD) and/or AET, as currently defined, appear to satisfy all requirements for training equipment?

(5) Is the alternative which includes the PTD (Concept A) more cost and training effective than actual equipment training (Concept B)?

b. The first four EEA's will be addressed in this chapter, followed by a description of the alternative concepts and measures of training effectiveness. The final question is addressed in Chapters 7 and 8.

2. DISCUSSION

a. In answering the first question (EEA), we may note that a wide variety of training devices and aids are currently being used to effectively

meet the training needs on many different types of Army equipment.[8] These devices range from simple part-task familiarization trainers to complex computer-driven simulators. Many studies have documented the training effectiveness of such devices. For example, the Army Operational Test and Evaluation Agency (OTEA) concluded that current training hardware effectively trained gunners for the Dragon Missile System.[9] They observed that performance quickly improved after one firing. Field performance correlated with training performance. In the evaluation of the Cobra Armament Program, OTEA concluded that a significant improvement of gunner performance can be obtained through greater use of training devices.[10] The problems inherent in using tactical equipment for training and for maintaining proficiency in TACFIRE are discussed in Reference 11.

b. Training devices can be used for many different purposes. For example, training devices can be used:

(1) For initial skill acquisition or to maintain the proficiency of skills already acquired.

(2) As the sole source of training support, or combined in various ways with hands-on experience on the actual equipment.

(3) To teach all tasks (or all critical tasks) on a particular system, or only for training certain tasks (i.e., a part-task trainer).

(4) For individual training or for team training.

(5) To train a wide variety of tasks ranging from simple procedures (e.g., turning on a piece of equipment), through more complex

tasks (e.g., troubleshooting electronic equipment), to very complex psychomotor skills (e.g., flying a helicopter).

c. Some of the general advantages of training devices over use of actual equipment for training are:

(1) Repetition. Training devices can be designed to allow for frequent repetition of tasks (e.g., replacement of circuit boards) which are not possible using actual equipment. Tasks associated with critical problems and/or situations which occur infrequently with actual equipment (e.g., a particular failure) or which occur infrequently in noncombat conditions (e.g., ECM) can be practiced.

(2) Feedback. A significant aspect of training is immediate feedback of performance information to the trainee. This is especially important during skill acquisition. Training devices can provide this feedback in a timely and efficient manner. Performance information is often not available when employing actual equipment in training, or the information may only become available to the trainee (and instructor) after some delay. Delayed feedback is very ineffective in training.

(3) Training Records. Training devices can provide records of each trainee's progress in skill/knowledge acquisition. Such records are extremely useful to instructors and training managers in monitoring individual and group progress, diagnosing training deficiencies, and determining remedies for any deficiencies which may appear. Training records are important in individualizing and self-pacing of instruction.

(4) Multiple Trainees. Training devices often allow several trainees to be trained at the same time. Usually only one trainee at a time can operate or maintain actual equipment. Although other trainees can observe the activities, the effectiveness of this procedure relative to hands-on practice is questionable.

(5) Safety. Training devices can be designed so that dangerous tasks on real equipment (e.g., maintenance of high voltage power supplies) can be practiced on the training device without danger to man or equipment.

(6) Ease of Modification. Hardware and procedures often undergo modifications after being introduced in the field, based on experience gained through use. If actual equipment is used in training, then the equipment must be modified each time there is an engineering change in the real equipment. It is usually easier to modify or change a training device. This frequently involves only a change in a front panel, or in software.

d. The second EEA relates to alternatives for satisfying the training requirements. There are two concepts being analyzed and evaluated in this study. Concept A consists of an operator training device with 6 operator stations, and organizational maintenance training device with 6 operator stations and 6 maintenance stations, and four complete AN/TPQ-36 radar systems. Concept B consists of fifteen complete AN/TPQ-36 radar systems. Each of these concepts is described more completely in Chapter 5.

e. The third EEA relates to the advantages of the BTA for training devices as compared to the use of actual equipment for training.

(1) Reference 7 examined four concepts of technical approach (CTA's) for operator training and four CTA's for maintenance training. Use of AET was considered in each case (and tentatively rejected as not being cost effective). All operator and maintenance tasks were considered. The advantages and disadvantages of each concept were described. Reference 3 describes an analysis of training devices to satisfy AN/TPQ-36 and AN/TPQ-37 training requirements conducted by NTEC for ATDA. Based on these two studies, ATDA developed a BTA for training devices. The BTA is described in Appendix A and in Chapter 5.

(2) The BTA as presently defined incorporates all the advantages of training devices described in paragraph C, above. It will allow for extensive repetition of operational and organizational maintenance tasks. Critical problems which occur infrequently can be practiced. Feedback of performance and record keeping are possible due to the incorporation of a small computer in each device. The devices will allow the school to meet the TRADOC desired student to instructor ratios because they allow for up to six trainees per instructor. The devices will be designed for safety of operation and ease of modification.

(3) The use of actual equipment for training has several disadvantages for training when compared to a computer-driven interactive system simulating in good fidelity the actual hardware.

(a) Frequent repetition of certain tasks is not possible if actual equipment is used. These tasks include removing and adjusting circuit boards, and performing fault detection and fault isolation tasks. Frequent removal, adjustment, and replacement of circuit boards (which were not designed for such usage) will quickly result in bent or broken pins. Repetition of fault detection and fault isolation tasks requires the insertion by an instructor of specific equipment faults. The actual equipment has not been designed for fault insertions, and there is only a limited number of faults which can be inserted realistically and conveniently. This will limit maintenance training effectiveness. The USAFAS estimates that it will take an instructor, on the average, approximately 10 minutes to insert a fault in the actual hardware and an additional 5 minutes to remove the fault. This manual insertion of faults, therefore, will cut an hour's training time by 25 percent, and will quickly degrade the reliability of the equipment.

(b) Although the actual equipment provides limited feedback to the operator during initialization, it does not provide feedback in the operational modes, nor does it provide feedback to the organizational maintenance man for the performance of his tasks. Thus, feedback would have to be provided by an instructor observing every action of the trainee. An increased number of instructors are therefore required.

(c) Actual equipment does not provide records of trainee progress in skill/knowledge acquisition. These records would have to be provided by an instructor.

(d) Use of actual equipment will not allow the school to meet the TRADOC goal in student to instructor ratios, because an instructor will be required for each radar set.

(e) Actual equipment is not easy to modify, nor does it have the safety features of a training device. In addition, it is not as inherently reliable as a training device (because it is more complex, with more components) and its reliability and performance will degrade quickly (since it is being used in ways it was not designed for).

(4) Based on the above and some additional data it is possible to directly compare the proposed training devices (PTD) and AET with regard to their instructional function support capabilities. This is done in Table 1. The basis for the conclusions in Table 1 are:

Durability Training devices can be built to endure student handling - as noted above, actual equipments are not. As an example, the school MTBF for the Q4 is half what it is in the field. The components and design of the Firefinder systems are such that the durability issue is especially critical.

Training Time The amount of training time actually received per hour on the training media is affected by (1) how long it takes to set the media up per student problem and (2) media down time. The loss in training time on the AET to set up and remove problems is discussed in paragraph (3)(a). This loss augments the lost training time due to AET failures, discussed above. The net impact of these two

TABLE 1. A COMPARISON OF PTD AND AET INSTRUCTIONAL FUNCTION SUPPORT CAPABILITIES

	INSTRUCTIONAL FUNCTION SUPPORT CAPABILITIES			
TRAINING MEDIA	Durability	Training Time	Instructor: Student Ratio	Student Evaluation & Management
PTD	Good	Good	1:6	Good
AET	Poor	Poor	1:2	Poor

factors is that a training schedule using AETs only would have to be more than 25% longer, perhaps significantly more, to provide the same amount of training time.

Instructor:Student Ratios The estimated ratios are as listed. The ratio for AET is smaller due to both configuration problems and a lack of student monitoring capability.

Student Evaluation and Management In order to diagnose student problems and manage his progression, the instructor must use information regarding problem parameters and student performance (time, errors). The problems in handling this much data manually are such that the above ratio of 1:2 for the AET may be optimistic. The training device and its instructor station readouts, on the other hand, will be designed to facilitate student evaluation and management so that a minimum of a 1:5 ratio is realistically feasible.

f. The fourth EEA relates to an evaluation of the BTA and AET for providing training for all critical tasks on the AN/TPQ-36.

(1) The basic inputs to this analysis are the tasks which operator and organizational maintenance personnel must learn to perform. The questions to be addressed are: What is required by way of training equipment to learn to perform each task? and Do the PTD and/or AET satisfy these requirements?

(2) The tasks which were analyzed are a modified and partially validated set which derive from the lists and descriptions developed

by USAFAS as a step towards POI development. Of these tasks, only the operator and organizational maintenance tasks are included in this analysis. The DS/GS maintenance tasks are not considered as the PTDs are not being designed for DS/GS training.

The task list modifications resulted from a task analysis validation currently being conducted by ARI. The steps completed thus far in this validation process include reviews of the DEP TM 11-5840-354-12, attendance at an operator training course and maintenance demonstration, and interviews with DT and OT radar team personnel and USAFAS staff personnel. The modified lists of operator and organizational maintenance tasks are presented in Appendix A. They currently contain 53 operator tasks and 79 organizational maintenance tasks, or a total of 132 tasks.

(3) These tasks were first analyzed in terms of the TDR and the specification for the PTD to identify for which of the tasks the PTD is being designed or could be utilized in training. Those tasks which could be trained on the PTD were termed "PTD Specified". Those tasks which could not be trained on the PTD were termed "Not Specified".

(4) Each operator and organizational maintenance task was then analyzed to determine their training equipment requirements. As a result of the analyses each task was placed in one of the following five categories:

1. Non-system specific: The task and the training required for its performance are not unique to the AN/TPQ-36. An example of

tasks placed in this category is "conduct radio/telephone communications in accordance with accepted radio/telephone procedures."

2. No equipment required: Performance of the task tends to be specific to radar AN/TPQ-36. However, training of task performance does not seem to require AET or PTD, although the actual equipment may be useful. The task of "identifying and citing the functions of the operator's controls and indicators located on the trailer" fits this category.

3. Training equipment useful: Performance of the task tends to be specific to radar AN/TPQ-36. PTD or AET would be useful in training performance of the task. An example of tasks in this category is "installation of a map on the weapons location unit."

4. Training equipment required: Performance of the task is specific to radar AN/TPQ-36. Effective training appears to require PTD or AET. This category is exemplified by the task of "selecting the area to be covered by and entering a censor zone."

5. AET sufficient: Performance of the task tends to be specific to radar AN/TPQ-36. OJT or informal institutional AET appears to be sufficient for training task performance. An example of a task placed in this category is "prepare radar set AN/TPQ-36 for movement by garagoat."

(5) Results.

The results of the analyses described in paragraphs (3) and (4) above are presented in Table 2. The individual categorizations assigned

TABLE 2. NUMBER OF TASKS PER PTD SPECIFICATION CATEGORY AND PER TRAINING DEVICE REQUIREMENT CATEGORY*

		TRAINING REQUIREMENT				
TASKS	SPECIFICATION	Non-System Specific	No Equipment	Training Equipment Useful	Training Equipment Required	Informal or OJT AET
Operator	PTD Specified	0	2	13	16	0
	Not Specified	4	4	2	0	11
Organizational Maintenance	PTD Specified	0	0	6	15	5
	Not Specified	1	5	2	10	33

*One operator and two organizational maintenance tasks were excluded from analysis because their specification could not be determined.

per task are presented in Appendix A. Data in Table 2 indicate the following:

1. Training equipments were judged to be useful or required for training 31 (or 60%) of the operator tasks and 33 (or 43%) of the organizational maintenance tasks.

2. Eleven (or 21%) of the operator tasks and 38 (or 48%) of the organizational maintenance tasks could be sufficiently trained through the AET in either an institutional or on-the-job setting.

3. The PTD for the operator, A17E11, would satisfy the training requirements for 29 (or 94%) of the 31 tasks for which training equipment is judged useful or required.

4. The PTD for organizational maintenance personnel, A17E12, would satisfy the training requirements for 21 (or 64%) of the 33 tasks for which training equipment is judged useful or required. Of the 12 out of these 33 tasks for which the PTD was judged not to provide training, but where a training device would be useful or required, a review of Appendix A indicates that the majority of these fall into one major area: maintenance of the AN/UYK-15 computer.

(5) Conclusions.

The answers to the first question, What are the training equipment requirements per task? are provided by Appendix A. The answers to the second question, - Do the PTD and/or AET, as currently defined, appear to satisfy all requirements for devices? - are provided

in Table 2. Two conclusions can be reached. One is that the device requirements for all operator tasks and the majority of the organizational maintenance tasks will be met by the PTD and/or AET, as currently defined. The other is that there are 10 organizational maintenance tasks for which training equipment was judged to be required, but for which the organizational maintenance PTD, as currently specified, is not suitable. Since the majority of these tasks involve the AN/UYK-15 computer, a part task computer trainer may be an appropriate add-on. This will be discussed further in Chapter 6, Training Effectiveness.

CHAPTER 5

DESCRIPTION OF ALTERNATIVE CONCEPTS

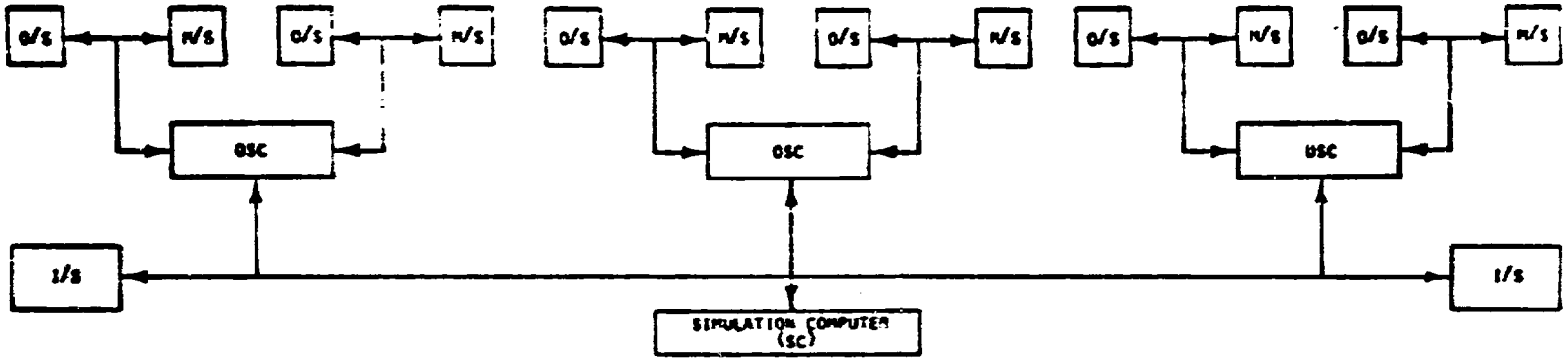
1. GENERAL. As mentioned earlier, two alternative concepts for training operator and maintenance tasks for the AN/TPQ-36 Mortar Locating Radar are under consideration. One is to train the radar operators and maintenance personnel (organizational level only) on the actual equipment. The other is to provide maximum simulation of equipment involving man-machine interface in which the simulation will be computer driven to provide interface, stimuli (cues), and responses as available with the real equipment. In the latter, the T/Ds will represent with necessary fidelity the features of the operational radars which are required for training operator and maintenance tasks. These two alternative concepts are considered because it has been speculated that the complexity and sophistication of the AN/TPQ-36 radar may make the operational equipment too expensive to procure and operate in quantities large enough for use as actual equipment trainers. Also, the limited accessibility to tactical equipment configurations in shelters might hamper effective training.

2. CONCEPT A. TRAINING DEVICES (T/D's) AND ACTUAL EQUIPMENT. This alternative would employ: one operator T/D, with 6 operator training stations, and requiring only 2 instructors; and one maintenance T/D, accommodating the same number of instructors with 6 maintenance training stations and 6 operator training stations. This configuration for the operator T/D

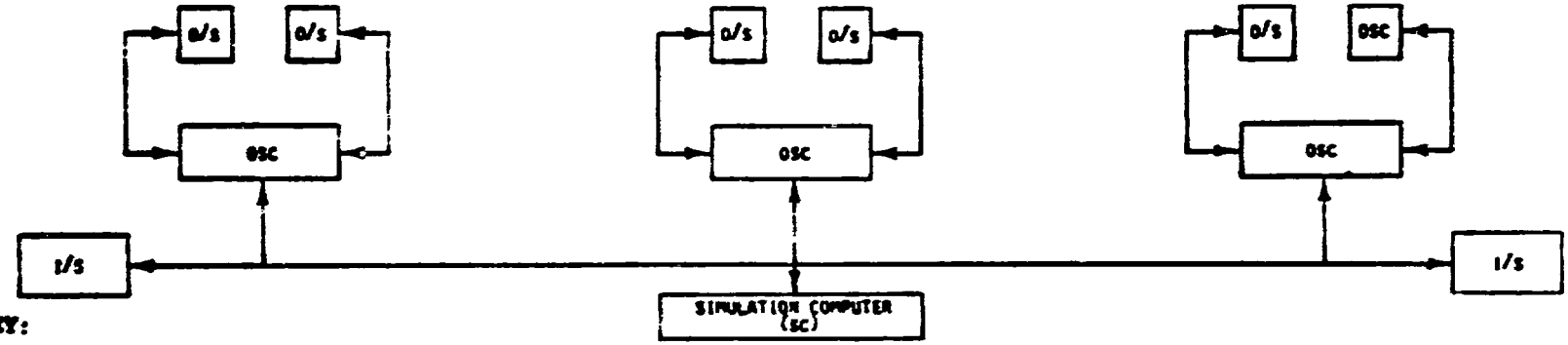
and the maintenance T/D is described in more detail in Appendix A and shown in Figure 1. Four AN/TPQ-36 radar sets would accompany the T/D's to provide for training of tasks for which the T/D's are not suitable. The use of the T/D's and AET in operator and maintenance training is as follows.

a. Operator Training. The two training devices of Concept A provide 12 operator training stations. Two trainees can work at each station, thus providing training for up to 24 operator trainees at one time. Only two instructors are required, however, four could participate if desired. More than the minimum number of instructors might be desired if trainees were at different stages of training due to turnbacks (remedial training). The student to instructor ratio would be between 6:1 and 12:1. The three radar systems in the field can provide training in emplacing and march ordering of the equipment for 15 operators (3 crews of 5 men each) at one time.

b. Maintenance Training. The maintenance training device of Concept A provides 6 organizational maintenance training stations. Two trainees can work at each station, thus providing training for up to 12 organizational maintenance trainees. Only one instructor is required, however, two could participate. A variety of realistic faults could be quickly inserted, and trainee test and diagnostic procedures monitored. Training on tasks requiring the transmitter or antenna (e.g., antenna boresight telescope alignment) and training on preventive maintenance tasks would be accomplished using the actual equipment in the field.



MAINTENANCE TRAINER



OPERATOR TRAINER

KEY:

- I/S - INSTRUCTOR STATION
- M/S - MAINTENANCE STUDENT STATION
- O/S - OPERATOR STUDENT STATION
- OCS - OPERATOR STATION COMPUTER
- SC - SIMULATION COMPUTER

FIGURE 1. LAYOUT OF TRAINING DEVICE CONCEPT

3. CONCEPT B: ACTUAL EQUIPMENT TRAINING. The second concept considers only operational AN/TPQ-36 radars to be employed as training devices for operator and organizational maintenance tasks. In such a case, it is estimated that fifteen radar sets would be needed. These would be set aside as follows: (a) six would be used for operator training; (b) five would be used for maintenance training; (c) three would be used to conduct crew resident training in emplacement, alignment, and displacement (march order), and (d) one would be reserved for direct/general support maintenance, officer, and Primary Technical Courses. The last four sets would be located outside in a real-life environment, whereas the first 11 sets would be inside in a classroom environment.

The 11 radar sets to be used inside would be modified for classroom use. The operator station, computer, and data processing equipment would be removed from the shelter to provide more space for trainees and an instructor. Equipment in the antenna trainer would also be removed to improve accessibility. Each radar set would be provided with a unit trainer, which will simulate target signatures for the system.

The use of the AET in training is as follows:

a. Operator Training. The six radar sets used for classroom operator training in Concept B could provide training for 12 operator trainees at one time. Six instructors would be required. Fifteen trainees can be accommodated by scheduling evening training shifts, by

using additional (maintenance training) radars, or by placing more trainees at each operator station. The student to instructor ratio would be only 2:1.

b. Maintenance Training. The five radar sets used for classroom maintenance training in Concept B could provide training for 10 maintenance trainees at one time. Five instructors would be required. Performance of fault detection and fault isolation tasks would be limited, and would require additional training time. These tasks are among the more critical tasks of the organizational maintenance man.

CHAPTER 6*

TRAINING EFFECTIVENESS

1. BACKGROUND**. In comparing training alternatives, an index of relative worth (RW) is computed from the relative training effectiveness (RE) and relative cost (RC) values:

$$RW = \frac{RE}{RC}$$

where: $RE = \frac{\text{Effectiveness of Alternative}}{\text{Effectiveness of Base Case}} = \frac{E_A}{E_B}$***

and $RC = \frac{\text{Cost of Alternative}}{\text{Cost of Base Case}} = \frac{C_A}{C_B}$

RW and RE values greater than 1.0 indicate the alternative is the better choice from effectiveness and worth standpoints. RC values of less than 1.0 indicate the alternative is the best choice from a cost standpoint.

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*This Chapter 6 replaces both Chapters 6 and 7 in the original text.

**This paragraph is derived from TRADOC PAM 71-8, Analyzing Training Effectiveness, page III-15.

***The alternative divided by the base case is the correct formulation if a larger MOTE denotes better. If a smaller MOTE is better, e.g., time to complete task, then the base case divided by the alternative is an appropriate formulation.

2. AVAILABLE MOTEs. The Measures of Training Effectiveness (MOTEs) used to assess the RE must be the best available measures of the actual or predicted training effectiveness for each training alternative. Two general types of measure can be used, dependent upon the stage of equipment and training system development. These are analytical MOTEs and empirical MOTEs. Analytical MOTEs are judgmental assessments of the training capability of each alternative based on a thorough analysis of all available information about each alternative. Rating scales can be used to judge the relative effectiveness of each alternative for training each required task or group of tasks. Obviously, the validity of such analytic MOTEs is highly dependent upon the completeness and detail of data available for analysis. Detailed information about each training alternative, the tasks to be learned, and the conditions under which they are to be performed must be included in the analysis to yield valid analytical MOTEs.

Empirical MOTEs are measures of actual trainee performance on a criterion event after having completed training under one of the training alternatives. Performance data are collected on each of several appropriate MOTEs and used to compute the RE per training alternative. The several MOTEs may represent different performance criteria (e.g., speed, accuracy, completeness) on different tasks or mission phases.

The set of MOTEs (empirical or analytical) are combined to form a single effectiveness value for each training alternative. The combination yields analytically- or empirically-based (or composite)

effectiveness values through averaging; or, if the relative importance of the MOTEs is agreed upon, through differential weighting.

The analytical MOTEs must be used if empirical MOTEs are not yet available on all the important aspects of mission performance. When performance data become available, empirical MOTEs should replace, or be combined with, the analytical MOTEs.

At the current stage of Firefinder training device development, no empirical MOTEs can be used, since performance data are unavailable. Thus analytical MOTEs were developed and applied to allow estimates of RE for the training alternatives. The analytical judgments of RE must be verified through empirical measures when the training alternatives have reached later stages of development and performance measures can be taken.

3. INFORMATION USED IN THE TRAINING EFFECTIVENESS ANALYSIS. Information on the training equipment for Firefinder includes the TDR and the training devices Specifications. Information about Firefinder Operator and Maintenance task requirements have been collected through the task list validation process being conducted by ARI for USAFAS. This data collection has included visits to DT I (Aberdeen, Md.) and attendance at the Operator Training Course and Maintenance Demonstration at Hughes. The preliminary training manuals (DTM) have also been used as a basic information source.

4. ASSUMPTIONS.

a. Programs of Instruction for Concept A would be developed to capitalize on the availability of training devices and actual hardware.

That is, those critical operator and organizational maintenance tasks which cannot be fully mastered using either training devices or actual hardware alone will be practiced on both training devices and actual hardware.

b. Training devices will provide for repetition of tasks, self-pacing by trainees, feedback to trainees and instructors, and trainee record-keeping.

c. Programs of Instruction for Concept B would be developed based on a limited practice of certain tasks and feedback provided by instructors.

d. The relative effectiveness of the two approaches should be measured in terms of tasks required to perform on the actual equipment. In this case, operator and organizational maintenance tasks for radar AN/TPQ-36 serve as a basic framework for the analysis.

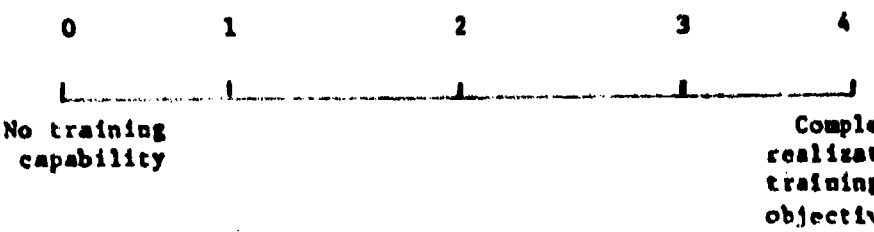
e. While effectiveness could be evaluated in terms of all tasks required for operation and organizational maintenance, comparison in terms of those tasks for which training equipment is required/desirable is especially critical since the cost/training effectiveness of the proposed devices compared to the effectiveness of baseline media (actual equipment) is the basic concern of the TEA.

5. ANALYSIS.

a. A subset of the modified operator and organizational maintenance tasks, as described in chapter 4, paragraph 2.f.(2), were analyzed to determine the capability of each alternative, PTD and AET, to train

performance of that task. The subset analyzed comprised those tasks for which training equipment had been judged in EEA 4 (see Table 2) to be useful or required.

This was not evaluation of training efficiency, or durability, etc., as considered under EEA 3 in Chapter 4. Rather it was an evaluation of the capability of each alternative to realize task training objectives per se. A five-point scale was used for the evaluation:



For each alternative for each task, the scale was used to evaluate training capability at each of three stages of training: (1) introductory training, (2) practice or demonstration of skills/procedures involved in task performance, and (3) development of skillful performance of the task.

The individual training effectiveness ratings per task are presented in Appendix B. There is a table for each of the cells in the Training Equipment Useful and Training Equipment Required columns in Table 2.

The ratings in Appendix B are summarized in Tables 3 and 4. Table 3 presents the mean training effectiveness ratings for the PTD. Aside from the exceptions noted in Table 3, the ratings are overall as would be expected: The PTD was rated most effective for training

TABLE 3. TRAINING EFFECTIVENESS SUMMARY OF THE PTD FOR THOSE TASKS WHERE TRAINING EQUIPMENT IS USEFUL OR REQUIRED

		TRAINING EQUIPMENT USEFUL			TRAINING EQUIPMENT REQUIRED		
SPECIFICATION	PERSONNEL	Intro	Demo/Pract	Skill Devel	Intro	Demo/Pract	Skill Devel
PTD Specified	Operator	1.9 (n=13)	3.8 (n=13)	3.8 (n=13)	2.0 (n=16)	3.9 (n=16)	3.9 (n=16)
	Organizational Maintenance	2.0 (n=5)	3.2 (n=5)	3.0 (n=5)	1.9 (n=14)	3.7 (n=14)	3.4 (n=14)
Not Specified	Operator	1.5 (n=2)	2.5* (n=2)	3.0* (n=2)	--- (n=0)	--- (n=0)	--- (n=0)
	Organizational Maintenance	0.0 (n=1)	2.0 (n=1)	--- (n=0)	1.2 (n=10)	1.1 (n=10)	1.1 (n=10)

* These ratings are unexpectedly high for the "Not Specified" category because the portions of the tasks not trainable on the PTD are very simplistic.

TABLE 4. TRAINING EFFECTIVENESS SUMMARY OF THE AET FOR THOSE TASKS WHERE TRAINING EQUIPMENT IS USEFUL OR REQUIRED

		TRAINING EQUIPMENT USEFUL			TRAINING EQUIPMENT REQUIRED		
SPECIFICATION	PERSONNEL	Intro	Demo/Pract	Skill Devel	Intro	Demo/Pract	Skill Devel
PTB Specified	Operator	1.9 (n=13)	3.8 (n=13)	3.8 (n=13)	1.8 (n=16)	3.2 (n=16)	3.5 (n=16)
	Organizational Maintenance	1.6 (n=5)	3.2 (n=5)	3.6 (n=5)	1.5 (n=14)	2.6 (n=14)	3.1 (n=14)
Not Specified	Operator	2.0 (n=2)	3.5 (n=2)	3.5 (n=2)	--- (n=0)	--- (n=0)	--- (n=0)
	Organizational Maintenance	0.0 (n=1)	3.0 (n=1)	--- (n=0)	1.2 (n=10)	2.1 (n=10)	3.0 (n=10)

the "PTD Specified" tasks and "Training Equipment Required" tasks. Table 4 presents the mean training effectiveness ratings for the AET. Of interest are the ratings given the ten organizational maintenance tasks in the "Training Equipment Required" x "Not Specified" subgroup. It was noted in Chapter 4 that the majority of these tasks pertained to AN/UYK-15 computer maintenance and that a part task trainer might be considered. The ratings in Table 4 indicate that the AET is not totally effective for these tasks and thus such a trainer does warrant consideration.

The relative effectiveness (RE) values of the PTD, as compared to the AET, are presented in Table 5. These values were computed from the mean ratings given in Tables 3 and 4 using the ratio: $\frac{PTD}{AET}$
The overall mean for the operator PTD, across those tasks for which it is currently being designed, is RE = 1.1. The overall mean for the organizational maintenance trainer is RE = 1.2.

4. CONCLUSIONS.

a. The operator PTD is judged to be more training effective than the AET (RE = 1.1) for those tasks for which it is either being purposely designed or could nonetheless provide training.

b. The organizational maintenance PTD is judged to be substantially more training effective than the AET (RE = 1.2) for those tasks for which it is either being purposefully designed or could nonetheless provide training.

c. Some consideration should be given to the potential payoff of an additional part-task computer maintenance trainer.

TABLE 5. RELATIVE TRAINING EFFECTIVENESS OF THE PTD

SPECIFICATION	PERSONNEL	TRAINING EQUIPMENT USEFUL			TRAINING EQUIPMENT REQUIRED			Grand Means
		Intro	Demo/Pract	Skill Devel	Intro	Demo/Pract	Skill Devel	
PTD Specified	Operator	1.0	1.0	1.0	1.1	1.2	1.1	1.1
	Organizational Maintenance	1.3	1.0	0.9	1.3	1.4	1.1	1.2
Not Specified	Operator	0.8	0.7	0.9	---	---	---	
	Organizational Maintenance	1.0	0.7	---	1.0	0.5	0.4	

APPENDIX A

OPERATOR AND ORGANIZATIONAL TASK LISTS WITH TRAINING EQUIPMENT SPECIFICATION AND REQUIREMENT CATEGORIZATIONS

TABLE A-1. LIST OF OPERATOR TASKS (Page 1 of 5)

TASKS	Specification[a]	Training Equipment Requirement
Operator Tasks		
1. Describe and locate the contents of DEP TM 11-5840-354-12 (current version).	N	2
2. Cite the capabilities, limitations, mission, and equipment of the AN/TPQ-36 radar set.	N	2
3. Describe operation of the radar set on the physical-description, block-diagram level.	N	2
4. Identify and cite the function of the operator's controls and indicators located in the shelter.	S	2
5. Identify and cite the function of the operator's controls and indicators located on the trailer.	S	2
6. Cite the safety precautions when working on a radar.	N	2
7. Return to the initization program.	S	4
8. Rewind the mag tape unit.	S	4
9. Display the time of day.	S	4

[a] Ss denote that PTD is specified or useful for training performance of the task. Ns signify that the device was not specified.

[b] Numbers indicate the training-requirement categories into which tasks were placed as follows: 1="Non-system specific"; 2="No special equipment required; 3="Training equipment useful"; 4="Training equipment required"; and 5="ART sufficient."

TABLE A-1 LIST OF OPERATOR TASKS (Page 2 of 5)

TASK	Specification[a]	Training Equipment Requirement[b]
10. Enable the line printer to print all initialization data.	S	4
11. Stow the antenna for shutdown or maintenance.	S	4
12. Conduct radio/telephone communications in accordance with accepted radio/telephone procedures.	N	1
13. Perform generator starting and stopping procedures.	N	5
14. Perform radar set start procedures.	N	3
15. Perform radar set stop procedures.	N	3
16. Install a map on the weapons location unit.	S	3
17. Determine the highest and lowest terrain elevations on a map prepared for installation on the weapons location unit.	N	1
18. Operate and load the high speed line printer.	S	3
19. Perform the line printer performance test.	S	4
20. Load and execute the initialization program.	S	4

TABLE A-1 LIST OF OPERATOR TASKS (Page 3 of 5)

TASK	Specification[a]	Training Equipment Requirement[b]
21. Load the operational program.	S	4
22. Prepare radar set AN/TPQ-36 for operation under unusal climatic conditions.	N	5
23. Install and operate the portable air conditioner suitable for use with the AN/TPQ-36.	N	5
24. Remove, clean, and reinstall all air filters on the shelter and trailer.	N	5
25. Determine grid coordinates for a radar site that was not previously surveyed.	N	1
26. Determine the boresight reference angle for a radar site that was not previously surveyed.	N	1
27. Control and monitor the transmitter status remotely.	S	—
28. Select the area to be covered by and enter a priority zone.	S	4
29. Select the area to be covered by and enter a censor zone.	S	4
30. Delete a zone (either priority or censor).	S	4
31. Print the coordinates of zones stored in the computer.	S	3

TABLE A-1 LIST OF OPERATOR TASKS (Page 4 of 5)

TASK	Specification[a]	Training Equipment Requirement[b]
32. Display on the B-scope priority zones stored in the computer.	S	3
33. Display on the B-scope censor zones stored in the computer.	S	3
34. Conduct typical friendly contact operation sequences from entry (or change) of correct friendly fire parameters to transmission of TACFIRE messages.	S	4
35. Return the radar to the hostile mode of operation after having completed friendly fire missions.	S	3
36. Enable the line printer to print fire search control parameters.	S	3
37. Process a hostile target for transmission to TACFIRE through manual height adjustment techniques.	S	4
38. Process a hostile target for transmission to TACFIRE through use of COURSE and FINE adjustment switchlamps.	S	4
39. Display a hostile-fire location that had been permanently stored in memory.	S	3
40. Delete a currently displayed hostile-fire location, a single permanently stored location, or a range of permanently stored locations.	S	3
41. Enable the line printer to print all or selected hostile-fire locations that have been processed for storage.	S	3
42. Determine the height of a location displayed on a map on the weapons location unit.	S	3

TASK	Specification[a]	Training Equipment Requirement[b]
43. Enable processing of hostile-fire locations through target averaging.	S	3
44. Detect the occurrence of jamming through observation of the B-scope.	S	4
45. Determine the azimuth of a jamming source by enabling operation of the jam strobe.	S	3
46. Transmit a TACFIRE message.	S	4
47. Perform operator/crew maintenance in accordance with instructions in the current DEP TM 11-5840-354-12.	N	5
48. Prepare radar set AN/TPQ-36 for movement by gamagoat.	N	5
49. Prepare and remove the shelter from the gamagoat.	N	5
50. Perform instructions for installation of radar set AN/TPQ-36 from gamagoat.	N	5
51. Prepare radar set AN/TPQ-36 for movement by helicopter (external) and by aircraft (internal).	N	5
52. Perform the radar set AN/TPQ-36 installation from helicopter mode.	N	5
53. Prepare radar set AN/TPQ-36 for movement by railroad.	N	5

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS (Page 1 of 8)

TASKS	Specification[a]	Training Equipment Requirment[b]
Organizational Maintenance Tasks		
1. Execute the program load diagnostic troubleshooting procedure.	M	4
2. Load and execute the central processor confidence test.	S	4
3. Load and execute the memory computer confidence test.	S	4
4. Load and execute the IOC computer confidence test.	S	4
5. Load and execute the additional options computer confidence test.	S	4
6. Cycle a computer confidence test.	S	3
7. Load the off-line status tests according to the short load procedure.	S	4
8. Load and start the off-line signal processor fault isolation tests. Perform corrective actions indicated by failure messages.	S	4
9. Perform the weapons location unit fault isolation test, to include taking corrective actions in accordance with printouts/displays.	S	4
10. Conduct the line printer off-line fault detection test, to include taking the necessary corrective actions.	S	4
11. Conduct the beam steering unit off-line fault detection test, to include taking the necessary corrective actions.	S	4

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS (Page 2 of 8)

	TASK	Specification[a]	Training Equipment Requirement[b]
12.	Conduct the receiver-exciter off-line fault detection test, to include taking the necessary corrective actions.	S	4
13.	Load and start the transmitter power (output) off-line fault isolation test.	S	3
14.	In accordance with results of the transmitter power off-line fault isolation test, use the Transmitter Troubleshooting Diagram (DEP TM 11-5840-354-12, Oct. 76) to diagnose problems and identify necessary corrections.	S	4
15.	Conduct the phase detector off-line fault detection test, to include taking necessary corrective actions.	S	4
16.	Perform the clutter rejection without transmitter off-line fault detection test.	S	3
17.	Perform the clutter rejection with transmitter off-line fault detection test.	S	4
18.	Load and start the B-scope off-line fault detection test.	S	3
19.	Conduct the antenna stability off-line fault detection test, to include taking necessary corrective actions.	N	4
20.	Load and start the general maintenance off-line fault detection test.	S	4
21.	Select and execute the program functions that can be enabled through the general maintenance off-line fault detection test.	S	3

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS (Page 3 of 8)

TASK	Specification[a]	Devices Requirement[b]
22. Describe the UYK-15 Computer.	N	2
23. Demonstrate a working knowledge of digital fundamentals.	N	2
24. Demonstrate a working knowledge of digital fundamentals (binary math).	N	2
25. Demonstrate a working knowledge of digital fundamentals (octal math).	N	2
26. Demonstrate a working knowledge of the central processor unit of the UYK-15 Computer.	N	2
27. Demonstrate a working knowledge of how the input/output controller transfers data in and out of the UYK-15 Computer.	S	3
28. Demonstrate a working knowledge of the 333 random access memory unit.	N	3
29. Know the diagnostic troubleshooting procedures for the AN/UYK-15 Computer.	N	4
30. Perform the AN/UYK-15 Computer turn-on procedure.	S	3
31. Perform the AN/UYK-15 Computer central processor diagnostic troubleshooting procedure.	N	4
32. Perform the computer memory diagnostic troubleshooting operating procedure.	—	4

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS (Page 4 of 8)

TASK	Specification[a]	Training Equipment Requirement[b]
33. Perform the computer IOC diagnostic troubleshooting procedure.	M	4
34. Perform the computer additional options diagnostic troubleshooting operating procedure.	M	4
35. Perform the computer power protection and automatic recovery diagnostic troubleshooting operating procedures.	M	4
36. Perform the computer memory resume interrupt diagnostic troubleshooting operating procedure.	M	4
37. Use the power distribution diagrams to isolate power distribution problems.	S	4
38. Replace power supplies in the shelter power supply assembly.	M	5
39. Align power supplies in the shelter power supply assembly.	M	5
40. Replace line printer 1A1A105.	M	5
41. Replace line printer 1A1A105 belts.	M	5
42. Adjust the evenness and density of the line printer's printouts by aligning the hammers.	M	5
43. Replace B-scope 1A1A104.	M	5

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS (Page 5 of 8)

TASK	Specification[a]	Training Equipment Requirement[b]
44. Adjust the pattern displayed on B-scope 1A1A104 by aligning the B-scope.	N	5
45. Replace the power supplies in the synchronizer and beam steering assembly.	N	5
46. Replace blower 2A1A202A4B1 in the synchronizer and beam steering assembly.	N	5
47. Align power supplies in the synchronizer and beam steering assembly.	S	5
48. Replace items---metering circuit card, inverter regulator, and power supplies---in the transmitter low voltage subassembly.	S	5
49. Align power supplies in the transmitter low voltage subassembly.	S	5
50. Replace items--RF converter assembly, frequency multiplier assembly, oscillator assemblies, and power supplies--in the receiver-exciter assembly.	N	5
51. Align power supplies, DC balance, and gain balance in the receiver-exciter assembly.	S	5
52. Replace power supplies in the trailer assembly.	N	5
53. Align items in the signal processor.	S	5
54. Perform the AN/UYK-15 computer initialization diagnostic troubleshooting operating procedure.	N	4

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS

	TASK	Specification[a]	Training Equipment Requirement[b]
55.	Perform the AN/UYK-15 computer NDRO test program.	N	4
56.	In accordance with organizational preventive maintenance instructions, check all parts of the line printer for abnormal wear or damage and for proper mechanical and electrical functioning. Clean the line printer as perscribed.	N	5
57.	Visually inspect for and, if necessary, clean the transmitter amplifier for dust accumulation on voltage bushings and surrounding components.	N	5
58.	Inspect system cables for physical damage, cuts, breaks, and broken or loose connectors and connections.	N	5
59.	Inspect and, if necessary, clean or replace light fixtures in the shelter interior.	N	5
60.	In accordance with organizational preventive maintenance instructions, check and, if necessary, clean shelter blowers and filters.	N	5
61.	In accordance with organizational preventive maintenance instructions, check and, if necessary, clean trailer blowers and filters.	N	5
62.	In accordance with organizational preventive maintenance instructions, check and maintain the trailer tripod assembly.	N	5
63.	Check the antenna radome for cleanliness and, if necessary, clean it as prescribed in organizational preventive maintenance instructions.	N	5
64.	Check and maintain all system panels so that they are free from defective controls, faulty lamps, and dirt.	N	5

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS (Page 7 of 8)

TASK	Specifications[a]	Training Equipment Requirement[b]
65. Call direct support to test items as prescribed in organizational preventive maintenance instructions.	M	5
66. Record running time of limited life items, and notify site commander of which items should be replaced as prescribed in organizational preventive maintenance instructions.	M	5
67. Flush the core of the computer's memory.	M	4
68. Remove and replace shelter blower 1A1A101B1.	M	5
69. Remove and replace shelter blower fan 1A1A101B2.	M	5
70. Remove and replace the switchlamp for the peripheral device controller and the weapons location unit.	M	5
71. Remove and replace the mag tape electronic assembly.	M	5
72. Remove and replace the mag tape transport assembly.	M	5
73. Remove and replace the computer set processor assembly.	M	5
74. Remove and replace the computer set memory assembly.	M	5

TABLE A-2 LIST OF ORGANIZATIONAL MAINTENANCE TASKS (Page 8 of 8)

TASK	Specification[a]	Training Equipment Requirement[b]
75. Remove and replace telephone TA-43/PT.	M	5
76. Remove and replace telephone TA-312/PT.	M	5
77. Remove and replace radio set AN/VRC-47.	M	5
78. Remove and replace trailer blower 2A1A203A2B1.	M	5
79. Demonstrate knowledge of the electrical-mechanical skills, to include the following, required to perform maintenance tasks: - jumper I/O Channels - measure AC/DC voltage - replace assemblies - check fuses - replace cards - check for and, if necessary, replace units with electrical faults	M	1

APPENDIX B

PTD AND AET TRAINING CAPABILITY

RATINGS PER TASK

TABLE B-1. TRAINING CAPABILITY OF PTD AND AET: OPERATOR TASKS FOR WHICH THE PTD IS SPECIFIED AND TRAINING EQUIPMENT WOULD BE USEFUL.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Introduction	Demo/ Practice	Skill Devel	Introduction	Demo/ Practice	Skill Devel
16. Install a map on the weapons location unit.	2	4	4	2	4	4
18. Operate and load the high speed line printer.	2	4	4	2	4	4
31. Print the coordinates of zones stored in the computer.	2	4	4	2	4	4
32. Display on the B-scope priority zones stored in the computer.	2	4	4	2	4	4
33. Display on the B-scope censor zones stored in the computer.	2	4	4	2	4	4
35. Return the radar to the hostile mode of operation after having completed friendly fire missions.	2	4	4	2	4	4
36. Enable the line printer to print fire search control parameters.	2	4	4	2	4	4
39. Display a hostile-fire location that had been permanently stored in memory.	2	4	4	2	4	4

TABLE B-1. (Cont'd) TRAINING CAPABILITY OF PTD AND AET: OPERATOR TASKS FOR WHICH THE PTD IS SPECIFIED AND TRAINING EQUIPMENT WOULD BE USEFUL.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Intro-duction	Demo/ Practice	Skill Devel	Intro-duction	Demo/ Practice	Skill Devel
40. Delete a currently displayed hostile-fire location, a single permanently stored location, or a range of permanently stored locations.	2	4	4	2	4	4
41. Enable the line printer to print all or selected hostile-fire locations that have been processed for storage.	2	4	4	2	4	4
42. Determine the height of a location displayed on a map on the weapons location unit.	2	4	4	1	2	3
43. Enable processing of hostile-fire locations through target averaging.	2	4	4	2	4	4
45. Determine the azimuth of a jamming source by enabling operation of the jam strobe.	2	4	4	2	4	4

TABLE B-2. TRAINING CAPABILITY OF PTD AND AET: OPERATOR TASKS FOR WHICH THE PTD IS SPECIFIED AND TRAINING EQUIPMENT IS REQUIRED.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Intro-duction	Demo/ Practice	Skill Devel	Intro-duction	Demo/ Practice	Skill Devel
7. Return to the initization program.	2	4	4	2	4	4
8. Rewind the mag tape unit.	2	4	4	2	4	4
9. Display the time of day.	2	4	4	2	4	4
10. Enable the line printer to print all initialisation data.	2	4	4	2	4	4
11. Stow the antenna for shutdown or maintenance.	2	3	3	2	4	4
28. Select the area to be covered by and enter a priority zone.	2	4	4	2	3	3
29. Select the area to be covered by and enter a censor zone.	2	4	4	2	3	3
30. Delete a zone (either priority or censor).	2	4	4	2	3	3

TABLE B-2. (Cont'd) TRAINING CAPABILITY OF PTD AND AET: OPERATOR TASKS FOR WHICH THE PTD IS SPECIFIED AND TRAINING EQUIPMENT IS REQUIRED.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Introduction	Demo/ Practice	Skill Devel	Introduction	Demo/ Practice	Skill Devel
36. Conduct typical friendly contact operation sequences from entry (or change) of correct friendly fire parameters to transmission of TACFIRE messages.	2	4	4	1	2	3
37. Process a hostile target for transmission to TACFIRE through manual height adjustment techniques.	2	4	4	1	2	3
38. Process a hostile target for transmission to TACFIRE through use of COURSE and FINE adjustment switchlamps.	2	4	4	1	2	3
44. Detect the occurrence of jamming through observation of the B-scope.	2	4	4	2	2	3
46. Transmit a TACFIRE message.	2	4	4	1	2	3
19. Perform the line printer performance test.	2	4	4	2	4	4
20. Load and execute the initialization program.	2	4	4	2	4	4
21. Load the operational program.	2	4	4	2	4	4

TABLE B-3. TRAINING CAPABILITY OF PTD AND AET: OPERATOR TASKS FOR WHICH THE PTD IS NOT SPECIFIED BUT FOR WHICH TRAINING EQUIPMENT WOULD BE USEFUL.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Intro-duction	Demo/ Practice	Skill Devel	Intro-duction	Demo/ Practice	Skill Devel
14. Perform radar set start procedures.	1	1	2	2	3	3
15. Perform radar set stop procedures.	1	1	2	2	3	3

TABLE B-4. TRAINING CAPABILITY OF PTD AND AET: ORGANIZATIONAL MAINTENANCE TASKS FOR WHICH THE PTD IS SPECIFIED AND TRAINING EQUIPMENT WOULD BE USEFUL.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Intro-duction	Demo/ Practice	Skill Devel	Intro-duction	Demo/ Practice	Skill Devel
16. Perform the clutter rejection without transmitter off-line fault detection test.	-	-	-	-	-	-
13. Load and start the transmitter power (output) off-line fault isolation test.	2	4	3	1	2	3
6. Cycle a computer confidence test.	2	4	4	2	4	4
18. Load and start the B-scope off-line fault detection test.	2	0	0	1	2	3
21. Select and execute the program functions that can be enabled through the general maintenance off-line fault detection test.	-	-	-	-	-	-
27. Demonstrate a working knowledge of how the input/ output controller transfers data in and out of the UYK-15 Computer.	2	4	4	2	4	4
30. Perform the AN/UYK-15 Computer turn-on procedure.	2	4	4	2	4	4

TABLE B-5. TRAINING CAPABILITY OF PTD AND AET: ORGANIZATIONAL MAINTENANCE TASKS FOR WHICH THE PTD IS SPECIFIED AND TRAINING EQUIPMENT IS REQUIRED.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Intro-duction	Demo/ Practice	Skill Devel	Intro-duction	Demo/ Practice	Skill Devel
2. Load and execute the central processor confidence test.	2	4	4	2	3	4
3. Load and execute the memory computer confidence test.	2	4	4	2	3	3
4. Load and execute the IOC computer confidence test.	2	4	4	2	3	3
5. Load and execute the additional options computer confidence test.	2	4	4	2	3	3
7. Load the off-line status tests according to the short load procedure.	2	4	4	2	4	4
8. Load and start the off-line signal processor fault isolation tests. Perform corrective actions indicated by failure messages.	2	4	3	1	2	3
9. Perform the weapons location unit fault isolation test, to include taking corrective actions in accordance with printouts/displays.	2	4	3	1	2	3
10. Conduct the line printer off-line fault detection test, to include taking the necessary corrective actions.	-	-	-	2	3	4

TABLE B-5.(Cont'd) TRAINING CAPABILITY OF PTD AND AET: ORGANIZATIONAL MAINTENANCE TASKS FOR WHICH THE PTD IS SPECIFIED AND TRAINING EQUIPMENT IS REQUIRED.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Intro-duction	Demo/ Practice	Skill Devel	Intro-duction	Demo/ Practice	Skill Devel
11. Conduct the beam steering unit off-line fault detection test, to include taking the necessary corrective actions.	2	4	3	1	2	3
12. Conduct the receiver-exciter off-line fault detection test, to include taking the necessary corrective actions.	2	4	3	1	2	3
14. In accordance with results of the transmitter power off-line fault isolation test, use the Transmitter Troubleshooting Diagram (DEP TM 11-5840-354-12, Oct. 76) to diagnose problems and identify necessary corrections.	1	4	4	1	2	2
15. Conduct the phase detector off-line fault detection test, to include taking necessary corrective actions.	2	2	2	1	2	3
17. Perform the clutter rejection with transmitter off-line fault detection test.	2	4	4	2	4	4
20. Load and start the general maintenance off-line fault detection test.	2	4	4	2	3	3
37. Use the power distribution diagrams to isolate power distribution problems.	2	2	2	1	2	3

TABLE B-6. TRAINING CAPABILITY OF PTD AND AET: ORGANIZATIONAL MAINTENANCE TASKS FOR WHICH THE PTD IS NOT SPECIFIED BUT FOR WHICH TRAINING EQUIPMENT WOULD BE USEFUL.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Introduction	Demo/ Practice	Skill Devel	Introduction	Demo/ Practice	Skill Devel
28. Demonstrate a working knowledge of the 333 random access memory unit.	0	2	-	0	3	-

TABLE B-7. TRAINING CAPABILITY OF PTD AND AET: ORGANIZATIONAL MAINTENANCE TASKS FOR WHICH THE PTD IS NOT SPECIFIED BUT FOR WHICH TRAINING EQUIPMENT IS REQUIRED.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Intro-duction	Demo/ Practice	Skill Devel	Intro-duction	Demo/ Practice	Skill Devel
1. Execute the program load diagnostic troubleshooting procedure.	1	0	0	1	2	3
19. Conduct the antenna stability off-line fault detection test, to include taking necessary corrective actions.	2	2	2	1	2	3
29. Know the diagnostic troubleshooting procedures for the AN/UYK-15 Computer.	2	2	2	2	2	2
31. Perform the AN/UYK-15 Computer central processor diagnostic troubleshooting procedure.	1	1	1	2	3	4
33. Perform the computer IOC diagnostic trouble-shooting procedure.	1	1	1	1	2	3
34. Perform the computer additional options diagnostic troubleshooting operating procedure.	1	1	1	1	2	3
35. Perform the computer power protection and automatic recovery diagnostic troubleshooting operating procedures.	1	1	1	1	2	3
36. Perform the computer memory resume interrupt diagnostic troubleshooting operating procedure.	1	1	1	1	2	3

TABLE B-7. (Cont'd) TRAINING CAPABILITY OF PTD AND AET: ORGANIZATIONAL MAINTENANCE TASKS FOR WHICH THE PTD IS NOT SPECIFIED BUT FOR WHICH TRAINING EQUIPMENT IS REQUIRED.

TRAINING TASK	TRAINING MEDIA AND LEARNING STAGES					
	PTD			AET		
	Introduction	Demo/ Practice	Skill Devel	Introduction	Demo/ Practice	Skill Devel
54. Perform the AN/UYK-15 computer initialization diagnostic troubleshooting operating procedure.	1	1	1	1	2	3
55. Perform the AN/UYK-15 computer MDRO test program.	1	1	1	1	2	3