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DEVELOPMENT OF GUIDELINES FOR REVISING TRAINING PROGRAM DEFICIENCIES IN AIR DEFENSE TRAINING

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The development of a User's Guide for Revising Training Program Deficiencies for Army Air Defense Training is described. The guidelines were designed to complement the Training Effectiveness Evaluation (TEE) methodology which was developed during the first year of this research effort. The report consists of a description of the TEE system and of the literature in training program evaluation which was used as a baseline for this project. The content of the revision guideline is outlined.

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20. (continued)

The User's Guide for Revising Training Program Deficiencies presents a detailed set of 20 problems which could be discovered during a TEE. Each problem is associated with specific worksheets and questions for the TEE system. Specific solutions for correcting each deficiency are discussed.

DEVELOPMENT OF GUIDELINES FOR REVISING TRAINING PROGRAM DEFICIENCIES IN AIR DEFENSE TRAINING

BRIEF

Requirement:

To develop a methodology and user's guide for correcting deficiencies in Air Defense training packages that are discovered as a result of training effectiveness evaluations (TEEs).

Procedure:

The guidelines for revising training program deficiencies were designed in order to provide training analysts with solutions for correcting problems in training identified during a TEE. Using prior developmental work by the Army Research Institute Field Unit Fort Knox in the area of Training Program Evaluation as the baseline, this effort involved three steps:

(1) Identify discrepancies in training program processes and products on the basis of ratings to the questions included on the TEE;

(2) Trace discrepancies to their underlying causes; and

(3) Recommend specific modifications to processes and products which would increase training effectiveness.

The issues addressed by the Revision Guidelines directly correspond to the training program components incorporated in the TEE. The TEE methodology provides a mechanism for analyzing training processes (e.g., how training is conducted), which was the focus of the earlier Harless Guidelines, and also for evaluating training products (e.g., the design of instruction), which had not been a part of training evaluation methodology. The Revision Guidelines provide specific solutions for correcting problems in these areas.

In format, the guidelines follow the general scheme used by the job aid for modifying training programs (Research Product 81-17; Kristiansen, 1981). A total of 29 problem headings were categorized under four subdomains of training, which were (1) Training Environment, (2) Presentation, (3) Practice/Demonstration, and (4) Testing. Each problem was defined, related to specific TEE worksheets and questions, and discussed in terms of the specific actions needed to correct it.

Findings:

The TEE methodology and companion revision guidelines represent a broader and more complete evaluation methodology than was previously available for identifying and correcting shortcomings in Army Air Defense packages. The TEE system is fully documented in the TEE User's Guide, and was shown to be applicable to Air Defense training processes and products during a preliminary validation. The Revision Guidelines, while they have not been tested empirically, correspond closely to the TEE in subject content matter.

Utilization of Findings:

The methodologies developed for evaluating and revising training program components can potentially contribute to the more effective use of training by specifying deficient areas and the means for correcting discrepancies. When applied to ongoing Air Defense training packages or training for operational tests (OTs), they provide an important input to design considerations and the conduct of training.

TABLE OF CONTENTS

Section		Page
I	INTRODUCTION.	1
	Background.	1
	Purpose and Scope	2
II	DEVELOPMENT OF GUIDELINES FOR TRAINING PROGRAM REVISION	4
	The TEE Methodology	5
	The Baseline for the Revision Guidelines.	6
III	DESCRIPTION OF THE REVISION GUIDELINES.	12
IV	SUMMARY AND CONCLUSIONS	16
V	REFERENCES.	18
APPENDIX	Short Forms of the Master List Questions	

Section I

INTRODUCTION

Background

Currently the Army is engaged in the development and/or fielding of four new Air Defense systems - STINGER, ROLAND, SGT YORK, and PATRIOT. The design and implementation of these systems offers great potential for increasing the Army's capability to provide effective Air Defense. Recognizing that the new weapons will only be as effective as the soldiers who man them, however, the Army requires that programs and material to train or retrain soldiers to these system be implemented concurrently with the fielding of each system. TRADOC Reg 350-7 [Not referenced] provides Army policy governing a systems approach to training. It prescribes in generic terms the minimum requirements of what must be done to insure the systematic evaluation, analysis, design, development, and implementation of training programs and training support materials. The TRADOC model for a systems approach to training incorporates the same concept as the Interservice Procedures for Instructional Systems Development model, commonly known as the ISD model, but is purposely expressed in a non-linear fashion to demonstrate the continuing nature of a systems approach and the interdependence of its process. It also allows for entry at any point as the result of evaluation.

The Air Defense community has expressed the need for methodologies to evaluate the training programs for these systems during the operational test (OT) phase of the developmental cycle. These needs focused on three specific concerns.

1. Methodologies for conducting training effectiveness evaluations (TEE) of Air Defense training packages during the OT phase;

2. Materials and Methods for performing training effectiveness testing (TET) of Air Defense training devices during the validation, verification and system integration phases; and

3. Methodologies for applying feedback information from TEE's and TET to improve training packages and devices.

The Army Research Institute has undertaken to address each of these needs through support of research in the development of materials, methodologies and procedures for conducting TEEs and TETs. Specifically, the development of a TEE methodology was addressed by research performed by Calspan Corporation's

Advanced Technology Center under the technical direction of ARI's Field Unit at Fort Bliss (ARIFUFB). This effort, performed under Contract Number MDA903-80-C-0579 during the period August 1980 - October 1981, is documented in the Year 1 final report Development of Guidelines for Conducting Training Effectiveness Evaluation of Air Defense Training (Fishburne, Rolnick, & Larsen, 1981).

The first year's effort entailed development of methodologies for evaluating training packages during OT that was consistent with Instructional Systems Development (ISD) procedures and designing procedures for the structural observation and assessment of the training process. The development of the TEE and resultant outputs (e.g., TEE materials and User's Guide) are discussed below in greater detail.

The second year of the research focused on the third need identified by the Air Defense community noted above, namely, the development of a methodology for applying the results of a TEE in the improvement of training programs. In addition, the user's guidelines for conducting TEE's were revised and refined. The efforts and products of Calspan's research are documented in this report.

Purpose and Scope

The overall objectives of the research were (1) to update and revise existing methodologies for evaluating Army Air Defense packages and (2) to develop a set of guidelines for revising training discrepancies identified by a TEE. The purpose of the first year's research was to validate and refine the Harless Guidelines (1980) for training program evaluation. As reported in the first year's report, the researchers conducted a preliminary validation of the Harless Guidelines. Based on the findings, the TEE Guidelines were developed to broaden the earlier evaluation job aid by incorporating product and courseware evaluation.

The purpose of the second year research was to extend the TEE methodology to include the revision process. The primary assumption underlying the effort was, simply, that evaluation is pointless unless action is

taken to correct the deficiencies and discrepancies revealed by that process. Based on earlier work in training program revisions, notably, the Seville methodology (Spears, Maxey, and Roush, 1980) and Kristiansen's (1981) job aid for modifying training, the approach was taken to trace symptoms of discrepancies in training products and procedures directly to their causes and to specify detailed recommendations for modifying them. The effort is broader than earlier methodologies with respect to the detail of specific solutions and the scope of deficiencies addressed, especially in the areas of product and courseware revision. The major deliverable from this effort is a set of guidelines for applying feedback information from a TEE in order to improve training packages.

Section II

DEVELOPMENT OF GUIDELINES FOR TRAINING PROGRAM REVISIONS

A number of sources were used in the development of the Guidelines for Revising Training Program Deficiencies. Since the revision guidelines were designed as a companion manual to guidelines for conducting TEEs for TEE analysts, to be initiated in response to a TEE, the detailed problems and associated solutions directly correspond to the domain covered by the Guidelines for conducting a TEE.

Many of the documents referenced in TEE development were useful in both the conceptual and technical aspects of the developmental process during the TEE development phase. These were used to provide standards for rating the adequacy of training products and procedures. During the development of the Revision Guidelines, these sources provided the basic material for specifying the solutions.

In addition, the issues addressed by the Seville Revision Methodology (Spears, Maxey & Roush, 1980), Kristiansen's (1980) working paper in training program evaluation (TPE) modification, and especially the content and structure of Kristiansen's (1981) job aid for modifying ineffective or inefficient training programs, directly influenced the final form of the guidelines.

The TEE Methodology

As background for the development of the Revision Methodology, it is important to understand the basic components and procedures involved in a TEE. A complete description and rationale for TEE is contained in the final report for the first year (1981).

The design of TEE methodology involved the identification of the purposes and scope of evaluating training effectiveness, and the development of a methodology and a set of job aids for conducting the TEE. The Calspan effort focused on building an assessment tool on the baseline established by the Harless Guidelines (1980). Examination of the Guidelines indicated that they were adequate with respect to the process evaluation component, the conduct of training, but did not address several components considered important in a broader approach to training evaluation. Foremost was the exclusion of a product evaluation methodology, involving an analysis of training design based on training documentation. Therefore, the Instructional Quality Inventory (IQI) (Wulfeck et al., 1978; Ellis et al., 1978, 1979; Fredericks, 1980) was used as a basis for developing the TEE product evaluation component.

Development of the TEE procedures also followed the general structure of the Harless Guidelines, but with several important differences. A master list of 94 evaluation questions was developed to identify performance discrepancies and to enable comparison of training products to specified standards. The major advantage of the list of questions is its flexibility for allowing a TEE analyst to select applicable areas for evaluation. The procedure for identifying discrepancies by comparing training components to specified standards also facilitates the revision process by providing a direct approach for tracing performance discrepancies to their probable causes. The Appendix of this report contains the short form of the Master Questions.

Other procedural considerations involved design of a systematic method for carrying out a TEE from its initial request and planning phase to the documentation of the TEE effort and preparation of the final report.

TEE training materials and job aids were designed to assist the TEE analyst and other data collectors. A user's manual for the conduct of a TEE (1981) and a separate data collector's handbook (1981) for assisting personnel were developed to facilitate the TEE process.

Baseline for the Revision Guidelines

For the most part, the conceptual and procedural approach for designing the Guidelines for Revising Training Program Deficiencies was defined in the process of developing the TEE system. Relevant issues, decision points, and coverage followed directly from the TEE itself, and indirectly from the materials used to design the TEE. However, as stated earlier, three sources contributed substantially to the concepts and procedures related to the Revision Methodology. These are (1) the Seville Project Report 80-8 Methodology for Correcting Deficiencies in Training Programs (Spears, Maxey & Roush, 1980); (2) Kristiansen's (1980) Training Program Evaluation. A Job Aid for Modifying Ineffective or Inefficient Training (Working Paper FKFU 80-8); (3) Kristiansen's (1981) A Job Aid for Modifying Ineffective or Inefficient Training Programs (Research Product 81-17).

The Seville project sought to extend the Harless Guidelines by developing procedures for correcting training deficiencies discovered in a TPE. Their major objective was to provide a set of guidelines or principles which could be used by training evaluators to direct the revision process. Although the focus was on the XM1 tank (as was the Harless Guidelines'), the researchers sought to make the guidance general enough to have applicability to any training program where skilled performance was involved. The scope of the project was to specify principles for correcting (a) deficiencies identified by the Harless Guidelines and traceable to specifiable instructional sources through systematic observation; and (b) those attributable to administration of training described in the Harless Guidelines as "non-skill related."

The methodology focused on systematic observation and analysis of instructional processes and their effects on the daily achievements of trainees.

Practice - the amount, type, and schedule - was postulated to be the underlying determinant of skill development and to provide opportunity for the constructive application of guidance and feedback. Fifteen principles concerned with practice, guidance and feedback, provide the conceptual framework for describing a good training program. These principles are as follows:

1. A person learns to do whatever he practices in the learning situation.

2. The total amount of practice should be sufficient to ensure stable criterion performance.

3. The length and frequency of practice sessions should be adapted to the task being taught, the experience of the learner, and the opportunities for performing the task in the future.

4. Progress should be made during practice.

5. The learner should be intensively involved during practice.

6. Guidance is needed when the learner cannot determine a correct action on his own.

7. Guidance should direct the learner's attention to individual cues and specific performance requirements.

8. Verbal knowledge from classroom instruction, text material memory aids, and job aids should be presented and their use practiced in ways that capitalize on their guiding value.

9. Guidance should not be used when it is not needed.

10. Self-guidance should be a specific goal in all training.

11. Feedback should be specific to the response.

12. Feedback should occur while the learner still remembers clearly what he did.

13. When the ongoing coordination of an action depends on continuous feedback from each part of the action, no delay in feedback can be tolerated.

14. Feedback should be provided in ways that help the learner see when he is making progress.

15. When errors are made, or when there is little or no progress in skill acquisition, the feedback should focus on correcting the difficulties, not punishing the learner.

Instructional deficiencies are evidenced through the systematic observation of the training process from the Harless Guidelines. These guidelines list more than twenty specific deficiencies in the Seville Report. These deficiencies are characterized by five aspects of trainer behavior which signal problems in the instructional system. These "symptoms" of instructional discrepancies are:

1. No hands-on practice is provided.
2. Trainees do not know what to do in the presence of relevant cues.
3. Performance shows undue variability from one trial to another.
4. Trainees are unduly slow in performing a task.
5. There is too much dependence on job or memory aids.

Evidence of the presence for one or more of these symptoms suggests that the particular component of training under observation fails to adhere to one or more of the training principles listed above, and that the procedures need to be modified in line with the underlying principle.

The Seville Report also addresses deficiencies in training programs that are determined primarily by the training system design or administrative management practices. Five categories of shortcomings are reviewed: (1) Indications of Need to Redesign Training Programs; (2) Training Support and Facilitation; (3) Instructor Characteristics and Qualifications; (4) Management of Attitudes; and (5) Problems in Performance Testing.

- Indications of Need to Redesign Training Programs discusses 15 problems in training outcomes identified by the Harless report that involve general shortcomings in the design of a program. For example, the deficiency "Pertinent tasks are omitted from training" suggests that task analysis procedures were not initially followed, and therefore, imply that general revisions of the program are needed from top to bottom, requiring substantial administrative support and resources.

- Training Support and Facilitation covers 12 factors which signal an administrative neglect of training program quality, for example, through adverse ratios of trainees to resources (instructors, equipment, space), lack of facility communication or quality assurance practices, etc. Correction of problems requires administrative attention and resolve, and some may in addition necessitate additional resources.

- Instructor Characteristics and Qualifications addresses three problems, namely skill of the content area, skill in teaching, and attitude. Judicious use of human resource management principles can resolve specific problems.

- Management of Attitudes lists four problems involving negative attitudes or their underlying causes. Understanding attitude formation and incorporating positive motivational techniques and reward systems are discussed as solutions.

- Problems in Performance Testing deals with 16 Harless-identified problems in the testing component. Representative examples are "Mismatch between training and test conditions" and "Poor test administration." Careful test design and standardization procedures, and consideration of the systematic relations between training and testing are called for.

The Seville report provided an approach to training program modification which has widely influenced later researchers in the area. Either implicitly or explicitly, the principles and specific solutions documented in the methodology provided a conceptual baseline for guiding thought on correcting deficient training processes. The report emphasized practice as the critical component of training, reliance on identifying and correcting underlying causes of performance discrepancies, and most importantly, support of the systematic approach to training development. Its principal limitations, addressed by later research, include (1) lack of a clearcut methodology for the evaluator to directly bridge between the discovered deficiency and its correction, and (2) relative neglect of courseware deficiencies.

Kristiansen (1980) addressed the first of these constraints by developing a job aid for correcting training problem deficiencies which

listed 35 problems corresponding to specific documented deficiencies from a TPE; each problem was associated directly with one or more modifications to bring the training program in line with ISD specifications. This working paper served as the prototype in terms of its problem-solution format for his 1981 job aid and for the present guidelines.

Kristiansen's (1981) A Job Aid for Modifying Ineffective or Inefficient Training Programs (Research Product 18-17) is referenced by ARI as the baseline for the present project. The job aid is one of four to perform training program evaluations; its specific purpose is to assist training analysts in identifying solutions for problems in training processes discovered during a TPE.

Although Kristiansen (1981) follows the same general methodology as the earlier working paper, the scope of problems and solutions was greatly expanded in comparison to the working paper. Underlying the job aid is a generic approach to evaluation which assumes that training programs should incorporate a sequence of five activities:

1. Enabling knowledge
2. Demonstration
3. Part-Task Practice
4. Whole-Task Practice
5. Testing

The heart of the job aid is 21 problem areas which could potentially be encountered in training environments. Each problem describes one or more specific deficiencies identified by items from the Job Aid for the Structured Observation of Training (Research Product 81-16). In addition, specific fixes for the discrepancies are identified. Further, the problems are grouped under five major headings of training. The five categories and the problems discussed are as follows:

1. Training Environment
    a. Number of Instructors

b. Training Equipment
c. Training Site
d. Distractions
e. Training Duration

2. Lecture Events
   a. Training objectives and purpose
   b. Terminology
3. Demonstration/Practice
   a. Demonstration
   b. Practice
   c. Feedback
   d. Job Aids
   e. Progression of Training Events
4. General Observations
   a. Implementation of Training Plan
   b. Training Aids
   c. Instructor Performance
   d. Training Duration
5. Testing
   a. Test Instructions
   b. Test-training Match
   c. Test Realism
   d. Contamination
   e. Feedback

The Kristiansen (1981) job aid provided a strong basis for the present set of revision guidelines and much of the material has been incorporated in the present handbook. However, the job aid dealt explicitly only with training processes and needed to be extended to both the design of training and the quality of instructional courseware, following the efforts of TEE development. In addition, team and collective training was not a major consideration in this job aid. Although the guidelines are for correcting individual components, they are also relevant to collective training components. Specific consideration of team practice needs to be addressed. Further discussion of these points is contained in the first year's report.

Section III

DESCRIPTION OF THE REVISION GUIDELINES

Problems and solutions are identified in the Guidelines for Revising Training Deficiencies by categorizing them under four broad training system components. This organization is largely similar to that used by Kristiansen (1981) and generally represents distinguishable, interdependent domains for assessing training. The broad topical areas are: (1) Training Environment; (2) Presentation; (3) Practice/Demonstration; and (4) Testing. Kristiansen also used a "General Observations" category; problems clustered under that heading which were incorporated into the TEE were reclassified under one of the four categories used here.

Within each of the broad headings, specific problems and their solutions are detailed in three steps that follow the methodology of Kristiansen:

Problem: the nature of the deficiency is defined in terms of the observable discrepancies of the training event.

Evidence: sources for problem identification are listed. These include the TEE worksheets which were used to document the deficiency and the specific TEE items related to the defined problem.

Recommendation for modifying deficiency. For each of the specific elements (TEE items), standards of adequate conditions and ways of achieving standards through program modification are addressed.

Many of the solutions are straightforward fixes (e.g., if the environment is too noisy, the solution involves reducing the noise level or taking other steps to insure that the noise does not interfere with accomplishing the objective). However, as noted by Kristiansen and others (Spears, et al. 1980), the transparency of many training problems and their solutions has apparently had little impact on making appropriate corrections. The guidelines are organized as follows:

1. Training Environment covers training deficiencies which appear to have a pervasive influence on many more specific aspects of the training system. Generally, the problems grouped under this category are symptomatic of deficiencies in administrative responsibility (e.g., Spears et al., 1980) and may require more global administrative intervention to be modified. Problem areas (with their related TEE Questions) include the following:

a. Training site (TEE Questions 85, 86 also under 1g, 87, 88) addresses environmental conditions including space, noise, lighting and temperature.

b. Implementation of Training Plan (Questions 82, 83, 84) details deficiencies and contamination of the actual content of training vis-a-vis lesson plans and instructor guidelines.

c. Number of Instructors (Question 81) considers the effect of instructor/trainee ratio on adequate guidance and feedback activities.

d. Training duration (Questions 90, 92) deals with the length of time devoted to the training course and with rest periods.

e. Attitudes and Motivational Techniques (Questions 27, 28, 89) address potential solutions to attitudinal and motivational deficiencies.

f. Equipment (Question 93) relates to proper functioning of training devices.

g. Distractions (Question 86) address interruptions in training events such as equipment breakdowns, instructor absences, and visitors.

2. Presentation encompasses a number of issues that are related to the adequacy of the plan for training, the lecture format, and the details of getting information across to trainees. Many of the problems addressed in this category have been labelled instructional deficiencies (Spears, et al., 1980) and are similar to those grouped in Kristiansen's Lecture category. The problems under Presentation include the following:

a. Prerequisites (Questions 29, 30) address incoming skills and knowledges required of trainees.

b. Training objectives (Question 31) considers whether the objectives of training were presented to the student at the beginning of each lesson.

c. Course Administration Directions (Questions 79,80) deals with the completeness and realistic demands of conducting lesson plans.

d. Adequacy (Questions 32, 33, 34, 35) refers to the completeness of the basic presentation components presented during lectures for facts, concepts, procedures and rules.

e. Sequencing (Questions 75, 76) deals with the order of objectives within lesson plans and also the order of lesson plans in a course.

f. Clarity and comprehensibility (Questions 69, 70, 71, 72, 91, 94) considers the problems and solutions related to spoken and written instructional materials, including the identification, technical quality, and ease of understanding.

g. Examples (Questions 37, 38, 39, 40, 41) addresses the deficiencies and corrections for examples and includes their adequacy, sequence, and the use of non-examples.

h. Media (Questions 77, 78) covers the appropriateness and adequacy of training devices such as equipment, slides, and text for conveying the information in lesson plans.

i. Visuals (Questions 73, 74) refers to the use and adequacy of pictures in enhancing instruction.

3. Practice/Demonstration includes eight potential problems which could adversely affect training effectiveness. These problems address performance oriented activities requiring hands-on practice and associated elements. Since soldiers will not learn to perform the tasks required in operational settings without hands-on practice, the identification of problems in this category and their successful resolution is essential to optimal training outcomes. The following problems are defined and addressed:

a. Practice (General) (Questions 58, 59, 60, 61, 62) refers to motor aspects of practice, including objective-practice consistency and completeness, evidence that trainees practice, and final practice.

b. Practice Remembering (Questions 45, 46) details the use of memory aids and practice-test consistency.

c. Practice Using (Questions 47, 48, 49, 50) denotes problems related to USE or performance training, including their sequence, adequacy, and integration.

d. Demonstrations (Questions 42, 43, 44) addresses adequacy and effectiveness of instructive demonstrations.

e. Team Practice (Questions 65, 66, 67, 68) encompasses potential shortcomings and modifications for training team functions, including its provision, realism, and adequacy of feedback.

f. Feedback (Questions 63, 64) deals with the knowledge of results provided to trainees during practice.

g. Job Performance Aids (Questions 36, 51, 52) considers the use, adequacy and explanation of training aids.

h. Practice-test Consistency (Questions 53, 54, 55, 56, 57) examines the relationship of items practiced to those tested, including level, type, format, condition, and standards.

4. Testing addresses the problems and recommended methods for increasing effectiveness of tests. The deficiencies covered under this category include those related to the instructional design of testing materials and the way in which testing is carried out. Five generic problem areas are discussed along with recommended solutions. These are:

a. Objectives-test consistency (Questions 1, 2, 3, 4, 5, 6, 7) covers the match between learning objectives and corresponding test questions. The consistency of test item format, task level, content, conditions, and standards to learning objectives is discussed.

b. Test instructions (Questions 21, 22, 23) deals with the completeness and clarity of test directions and the degree to which instructors adhered to them during test administration.

c. Test adequacy (Questions 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20) involves the design of test items, answer keys, and test formats and recommendations for modifications.

d. Test realism (Questions 10, 24, 25) considers the relationship of the test to the conditions and requirements of the job being trained.

e. Contamination (Question 26) addresses the amount of help and external cues available during testing which may invalidate test results.

Section IV

SUMMARY AND CONCLUSIONS

Training Effectiveness Evaluation (TEE) offers one means of fulfilling many evaluation requirements within the context of a systems approach to training. The scope of a TEE may vary according to management needs and available resources, but the main purpose is always to identify training-related problems and to suggest underlying causes. A TEE may be conducted in support of an operational test of a new system, or it may address on-going training in a review capacity or in response to complaints. Within a specific TEE, data collection may encompass product evaluation, process evaluation, or both. Product evaluation involves an analysis of training design based on training documentation. Process evaluation examines the conduct of training. If the TEE addresses both product and process issues, performance discrepancies can be identified and corresponding training deficiencies can be isolated from the perspective of both design and implementation. In this case, much of the diagnostic work necessary to specify revision requirements is accomplished for the training manager and ISD support personnel. If only a product evaluation is conducted, only design deficiencies can be identified. This can be useful, however, as a quality control mechanism prior to investigating new discrepancies and deficiencies in the conduct of training, provided that the adequacy of objectives and the adequacy and consistency (with objectives) of the tests can be verified. Thus, a product evaluation component is a necessary component of a process evaluation.

Evaluation is not to be considered simply as the process following implementation. The term "evaluate" is used in the general judgmental sense of the continuous monitoring of a program or of the training function as a whole and involves both verification and validation. The process consists of internally evaluating the training program during each phase of its preparation (to the degree that resources permit) while concurrently externally evaluating the overall training function. Thus, following implementation, feedback is used to evaluate the program, assess the quality of soldiers' performances and check the organization's responsiveness to training needs. If evaluation of the program indicates a need for change, the development cycle is reentered

at the appropriate point. In a broader sense evaluation is a continual, empirically based process that involves the verification, validation, and assessment of data used by the training system, to insure that the needs of the Army are met in producing trained soldiers and combat ready units. It is important, therefore, to obtain a variety of complementary data from different sources; evaluation based on the evidence of only one type of feedback may be unreliable and lack validity. It should be remembered that evaluation is pointless unless action is taken to correct deficiencies and discrepancies revealed by that process, and that the management function of providing for quality control is equally important during each phase of the training process.

The Guidelines for Revising Training Program Deficiencies described in this report provides, we believe, a broader and more complete method for revising training program curriculum and procedural discrepancies than has heretofore been available to Army Air Defense. As a part of the TEE system, the guidelines provide the specific means for increasing training effectiveness by correcting the major discrepancies revealed by the assessment. Together with the TEE, the guidelines provide extension of the evaluation methodology initiated by the Harless Guidelines and developed further by Kristiansen and his coworkers at the Army Research Institute. The present results and documents are an additional step in refining instructional systems evaluation technology to increase training effectiveness.

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Appendix

SHORT FORMS OF MASTER LIST QUESTIONS

1. Is the TEST FORMAT appropriate for the OBJECTIVE?	(See table in job aid.)
2. Are there test items for the TLO or all of its critical parts/LOs? (See job aid for critical parts.)	1 = Test items for TLO or all parts/LOs 2 = No test items for TLO and for some parts/LOs 3 = No test items for TLO and for most parts/LOs
3. Is there a test item for each critical part of each LO? (See job aid for critical parts.)	1 = Items for all parts 2 = Items for many, but not all parts 3 = Items for only a few parts or for no parts
4. Does the TASK LEVEL of the test item match the TASK LEVEL of its OBJECTIVE?	(See table in job aid.)
5. Does the content of the test item match the content of its OBJECTIVE?	1 = Same 2 = Slightly different 3 = Very different
6. Do the CONDITIONS of the test item match the CONDITIONS of its OBJECTIVE?	1 = Exact match 2 = Minor mismatch 3 = Severe mismatch
7. Do the STANDARDS of the test item match the STANDARDS of its OBJECTIVE?	1 = Exact match 2 = Minor mismatch 3 = Severe mismatch
8. For true-false, multiple choice, and matching items is only one answer correct?	1 = Only one answer is correct 3 = More than one answer can be correct
9. For short answer, fill-in, listing, and performance items are all acceptable answers in the answer key?	1 = All correct answers are in answer key 3 = Some correct answers are <u>not</u> in answer key
10. Does the test item provide opportunities for COMMON ERRORS to be made?	1 = Yes 3 = No
11. Is the language of the test item easy for students to understand?	1 = Easy 2 = Somewhat difficult 3 = Very difficult
12. Is the test item different from previous PRACTICE and EXAMPLES? (USE-CONCEPT, USE-RULE, or USE-PRINCIPLE only)	1 = Different 2 = Presented before, USE-UNAIDED 3 = Presented before, USE-AIDED

13. Is the answer to the test item given away by other item(s)?	1 = Answer not given away 2 = Other items give clues 3 = Answer can be found in other item(s)
14. Is the answer to the test item dependent on answering previous item(s) correctly?	1 = Answer not dependent on other items 3 = Previous items must be correctly answered
15. Are sketches and diagrams used in the test item easy to understand?	1 = Easy to understand 2 = Somewhat confusing 3 = Very confusing
16. Is the test item tricky or misleading?	1 = Not misleading 2 = Somewhat misleading 3 = Very misleading
17. Is the test item well constructed? (See job aid for criteria list for the test format used.)	1 = Meets all criteria 2 = Deficient on noncritical criteria 3 = Deficient on critical criteria
18. When performance steps are scored, does the instructor use a checklist?	1 = Fills in completely 2 = Uses as a reference or fills in partially 3 = Does not use
19. Is each correct answer position used about the same number of times? (true-false, multiple choice, or matching items only)	1 = Yes 3 = No
20. Are specific patterns of correct answer positions repeated across test items or are single positions repeated in blocks? (true-false, multiple choice, or matching items only)	1 = No patterns easily seen 3 = Patterns can be seen
21. Are test administration directions complete?	1 = Directions are complete 2 = Directions provided, but incomplete or unclear 3 = Directions are not provided
22. Do instructors follow the directions when administering the test?	1 = Yes 2 = Some variations from directions 3 = Significant variations from directions
23. Are adequate test instructions provided to the student?	1 = Yes 2 = Instructions provided, but unclear 3 = No instructions provided

24. Does the FINAL TEST integrate tasks as they are integrated in the "real world?"	1 = Yes 2 = Partially 3 = No, tasks are tested separately
25. Are tasks and task steps tested in the same sequence as they are performed in the "real world?"	1 = Yes 2 = Slightly out of sequence 3 = Very different sequence
26. In the test free of external cues or help?	1 = Yes 2 = Hints given 3 = Answers are given away
27. Are motivational techniques employed?	1 = Yes 3 = No
28. Is the trainee attitude positive?	1 = Positive 2 = Indifferent 3 = Hostile or frustrated
29. Are course ENTRY SKILLS reviewed?	1 = Review with practice 2 = Review with no practice 3 = No review
30. Is mastery of prerequisite skills verified prior to new instructions?	1 = Yes 3 = No
31. Are OBJECTIVES presented to the student?	1 = Yes 3 = No
32. Are the basic PRESENTATION COMPONENTS present?	(See guidance and tables in handbook.)
33. Are STATEMENTS complete?	1 = STATEMENT complete 2 = Few parts missing 3 = Many parts missing
34. Are STATEMENTS for CONCEPTS, PROCEDURES, or RULES adequate? (See job aid criteria.)	1 = Completely adequate 3 = Some or all features omitted
35. Does STATEMENT HELP provide sufficient explanation?	1 = Help provides sufficient explanation 2 = Help gives insufficient explanation 3 = Help is confusing
36. Does training include instruction on the use of required job performance aids?	1 = Yes 3 = No
37. Are EXAMPLES and NON-EXAMPLES adequate?	1 = Yes 3 = No

38. Is EXAMPLE HELP adequate?	1 = Help provides sufficient explanation 2 = Help gives insufficient explanation 3 = Help is confusing
39. Are EXAMPLES sequences from easy to hard? (CONCEPTS only)	1 = Yes 3 = No
40. Are there enough EXAMPLES? (See job aid for criteria.)	1 = Yes 3 = No
41. Are NON-EXAMPLES included? (CONCEPTS only)	1 = Yes 3 = No
42. Do DEMONSTRATIONS show how to correct/avoid common errors?	1 = Yes 3 = No
43. Are steps in a DEMONSTRATION the appropriate size? (See job aid.)	1 = Yes 2 = Step size is too small 3 = Step size is too large
44. Are tasks and task steps DEMONSTRATED in the same sequences as they are performed in the "real world?"	1 = Yes 2 = Slightly out of sequence 3 = Very different sequence
45. Are memory aids used? (PRACTICE REMEMBERING only)	1 = Used 3 = Not Used
46. Does each PRACTICE REMEMBERING item have the same content and format as the test item?	1 = Same 2 = Same content, different format 3 = Different content
47. Are PRACTICE USING items sequenced from easy to hard?	1 = Yes 3 = No
48. Do PRACTICE USING items provide opportunities for COMMON ERRORS to be made?	1 = Yes 3 = No
49. Are PRACTICE items different from EXAMPLES? (USE-CONCEPT, USE-RULE, or USE-PRINCIPLE only)	1 = Different 3 = Presented before
50. Does PRACTICE USING integrate tasks as they are integrated in the "real world?"	1 = Yes 2 = Partially 3 = No, tasks are practiced separately

51. Are job performance aids (JPAs) usable? (See criteria in job aid.)	1 = Easy to use 2 = Hard to use 3 = Unusable
52. Do all students use the job performance aid (JPA)?	1 = Yes 2 = Up to 20% do not use JPA 3 = More than 20% do not use JPA
53. Does the TASK LEVEL of the PRACTICE item match that of the test item(s)?	1 = Yes (2 and 3 — See table in job aid.)
54. Does the CONTENT TYPE of the PRACTICE item match that of the test item(s)?	1 - Yes 3 = No
55. Does the FORMAT of the PRACTICE item match that of the test item(s)?	1 = Yes (2 and 3 — See table in job aid.)
56. Do the CONDITIONS of each FINAL PRACTICE item match those of the test item(s)?	1 = Yes 2 = Slightly different 3 = Very different
57. Do the STANDARD of each FINAL PRACTICE item match those of the test item(s)?	1 = Yes 2 = Slightly different 3 = Very different
58. Is FINAL PRACTICE free of external cues or help?	1 = Yes 2 = Hints given 3 = Answers are given away
59. Are there PRACTICE items for each TLO or all of its critical parts/LOs?	1 = PRACTICE items for the TLO or all parts/LOs 2 = No PRACTICE items for the TLO and for some parts/LOs 3 = No PRACTICE items for the TLO and for most parts/LOs
60. Is there a PRACTICE items for each critical part of each LO? (See job aid for critical parts.)	1 = PRACTICE for all parts 2 = PRACTICE for many, but not all parts 3 = PRACTICE for only a few parts or for no parts
61. Do all students PRACTICE?	1 = Yes 2 = Up to 20% of students do not PRACTICE 3 = More than 20% of the students do not PRACTICE

62. Do all students meet the required STANDARDS in FINAL PRACTICE?	1 = Yes 2 = Up to 20% of students do not 3 = More than 20% of students do not
63. Is FEEDBACK provided for PRACTICE?	1 = FEEDBACK HELP is given 2 = Correct answer only is given 3 = No feedback is given
64. Is FEEDBACK HELP adequate?	1 = Help gives enough explanation 2 = Help gives insufficient explanation 3 = Help is confusing
65. Is TEAM PRACTICE provided?	1 = Yes 3 = No
66. Are TEAM PRACTICE CONDITIONS the same as (or as close as possible to) those of the real task?	1 = Yes 2 = Slightly different 3 = Very different
67. Is TEAM PRACTICE FEEDBACK provided?	1 = FEEDBACK HELP is given 2 = Success/Failure feedback only is given 3 = No feedback is given
68. Is FEEDBACK HELP for TEAM PRACTICE adequate?	1 = Help gives enough explanation 2 = Help gives insufficient explanation 3 = Help is confusing
69. Are all PRESENTATION COMPONENTS separated and identified?	1 = Yes 2 = Some are not 3 = Most or all are not
70. Is the technical quality of written or spoken material adequate? (See job aid for criteria. Make notes on specific problems.)	1 = Most criteria met 2 = Several criteria not met 3 = Few criteria met
71. Is the wording of written or spoken material easy for the students to understand?	1 = Yes, few hard words and long sentences 2 = Some hard words and long sentences 3 = Many hard words and long sentences
72. Is the instructor's presentation or the narration easy to listen to?	1 = Yes 2 = Dull and monotonous 3 = Hard to listen to

73. Is the instructor's presentation or the narration supported by visuals?	1 = Completely 2 = Partially 3 = Not at all
74. Are visuals easily understood?	1 = Yes 2 = Understandable with effort 3 = Very hard to understand
75. Are the OBJECTIVES (TLOs and LOs) within each LESSON sequenced properly? (Prerequisites taught first.)	1 = Yes 3 = No
76. Are the LESSONS sequenced properly within the course?	1 = Yes 3 = No
77. Are the media appropriate for the objectives? (See table in job aid.)	1 = Yes 3 = No (note key words, underlined in table, on worksheet.)
78. Can the media used provide all necesary stimuli?	1 = Yes 3 = No
79. Are the course administration directions complete?	1 = Yes 2 = Partially incomplete 3 = Incomplete or non-existent
80. Do course administration directions make realistic demands of students and instructors?	1 = All demands are realistic 3 = Some demands are unrealistic (Note what they are.)
81. Is the instructor/trainee ratio such that all students can see, hear, and receive feedback?	1 = Yes 2 = A few students cannot see, hear, and receive feedback 3 = Many students cannot see, hear, and receive feedback
82. Does the instructor follow the methods in the Instructor Guide?	1 = Yes 2 = Follows to some extent 3 = Follows very little or not at all
83. Does the instructor teach all of the content in the LESSON materials?	1 = Yes 2 = Much of the content 3 = Very little of the content (If 2 or 3, note what was left out.)
84. Did the instructor limit his teaching to the content in the LESSON materials?	1 = Yes 3 = No (Please note what other things he taught.)

85. Is there enough space for all of the trainees?

1 = Yes
2 = A little crowded
3 = Very cramped or some students can't fit in the space at all

86. Is instruction free of distractions?

1 = Yes
2 = Distractions are annoying
3 = Distractions seriously interfere with the instruction

87. Is the lighting appropriate for the training situation?

1 = Yes
2 = Students have trouble reading or seeing displays & equipment
3 = Students cannot read or see displays & equipment

88. Is the temperature appropriate for the training situation?

1 = Yes
2 = Temperature makes students uncomfortable
3 = Temperature seriously interferes with learning

89. Is the instructor's attitude positive?

1 = Yes
3 = No

90. Are frequent breaks provided? (5-10 minute breaks every hour)

1 = Yes
2 = Breaks too short or infrequent
3 = Breaks not provided

91. Is the speed of presentation appropriate?

1 = Yes
2 = Too slow
3 = Too fast

92. Was the allotted training time too long or too short?

1 = Appropriate length
2 = Too long
3 = Too short

93. Does the training device/ equipment used in training function properly?

1 = yes
2 = Minor malfunctions, little change from intended task performance
3 = Major malfunctions, substantial change from intended task performance

94. Is there anything else unusual about the LESSON materials, or do any other critical incidents occur during training that would interfere with learning? (Describe each one below. Rating = 3)