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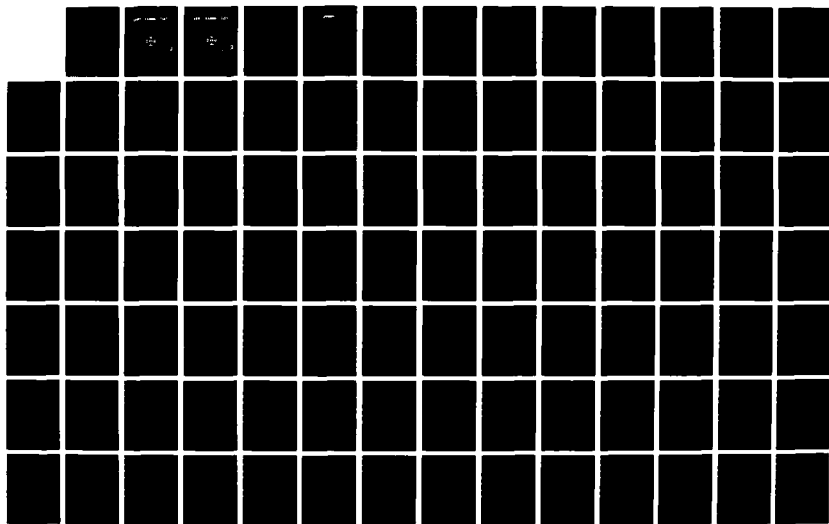
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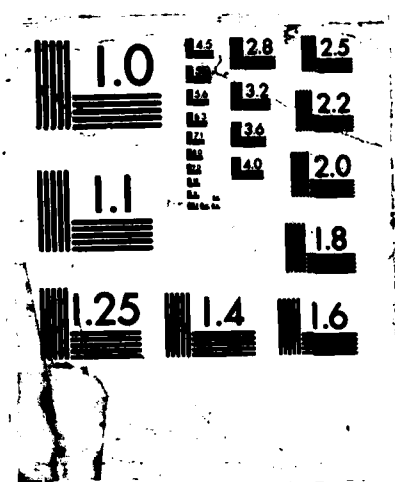
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REDEYE WEAPONS SYSTEM

TRAINING EFFECTIVENESS ANALYSIS (TEA) 1978
TEST REPORTS
Volume III

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TRAINING EFFECTIVENESS

ANALYSIS (TEA)

TRASANA TECHNICAL REPORT NO. 6-78 REDEYE WEAPONS SYSTEM

The report contained in this volume was prepared by the responsible System Work Team (SWT) for the Army Training Study. All results are subject to revision by further analysis, comparison with other data, and further testing. The views, opinions, and/or findings contained herein are not to be construed as an official Department of the Army or the US Army Training and Doctrine Command (TRADOC) position, policy, or decision unless so designated by other official documentation.

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TABLE OF CONTENTS

	<u>Page</u>
1. INTRODUCTION	1
a. Purpose	1
b. Background	1
c. Problem	1
d. Impact of the Problem	1
2. SCOPE	2
3. OBJECTIVES	3
4. ESSENTIAL ELEMENTS OF ANALYSIS	3
5. MEASURES OF TRAINING EFFECTIVENESS	3
6. MANPADS CONCEPT OF OPERATION	3
a. Purpose	3
b. Description	3
c. Engagement	4
7. RESOURCES FOR TRAINING TO PROFICIENCY	5
a. Introduction	5
b. Discussion of Critical Tasks	5
c. Institutional Training and Costs	7
(1) Army Training	7
(2) Army Training Costs	8
(3) Marine Training	10
(4) Marine Training Costs	10
(5) Reserve Training	10
(6) Reserve Training Costs	11
d. Unit Training and Costs	11
(1) Army Unit Training	11
(2) Army Unit Training Cost	12
(3) Marine Unit Training	12
(4) Marine Unit Training Cost	12
(5) Reserve Unit Training	12
(6) Reserve Unit Training Cost	12

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Table of Contents (continued)

	<u>Page</u>
e. Training Cost Analysis	13
(1) Ground Rules	13
(2) Types of Training	13
(3) Methodology	16
(4) Institutional Training	16
(5) CONUS Unit Training	20
(6) Europe Unit Training Costs	20
f. Essential Elements of Analysis	26
g. Conclusions	30
h. Recommendations	30
8. TRAINING RELATED TO PROFICIENCY ANALYSIS	31
a. Discussion	31
b. Test Results - Institution	33
c. Test Results - Unit	51
(1) Questionnaire Results	51
(2) Range Ring Proficiency	59
(3) MTS Tracking	59
(4) Test Discussion	66
(5) Significant Problems	73
d. Live Firings	76
(1) Army	76
(2) Marine	77
(3) RELS	77
e. Live Tracking	82
f. Summary of Test Results	83
g. Interoperability	90
h. Essential Elements of Analysis	92
(1) Training to Proficiency	92
(2) Individual Training	99
(3) Unit Training	102
i. Proficiency Retention vs Time in the Units	106
j. Conclusions	108
k. Recommendations	108

Table of Contents (continued)

	<u>Page</u>
9. PROFICIENCY RELATED TO WAR MODELS	110
a. Discussion	110
b. Air Defense War Models	110
c. Training Input to War Models	111
d. Model Modifications Required and Impact	111
e. Essential Elements of Analysis	112
f. Conclusions	123
g. Recommendations	124
10. WAR MODELS RELATED TO COMBAT EFFECTIVENESS	125
a. Discussion	125
b. Air Threat to Ground Forces	125
c. Model Results	126
(1) Effects of Proficiency Variation	126
(2) Combat Effectiveness Results	128
d. Essential Elements of Analysis	132
e. Summary	133
f. Conclusions	133
g. Recommendations	133
11. RESOURCES RELATED TO COMBAT EFFECTIVENESS	134
a. Discussion	134
b. Resources to Proficiency	135
c. Proficiency to Combat Effectiveness	138
d. Resources to Combat Effectiveness	138
e. Conclusions	139
f. Recommendations	139
12. TRAINING EFFECTIVENESS - RESERVES	140
a. Discussion	140
b. Training in Local Units	140
(1) Classroom Training	140
(2) Hands on Training	141
c. Institutional Refresher Training	141

Table of Contents (continued)

	<u>Page</u>
d. Reserve Training Costs	141
e. Reserve Proficiency	141
(1) In Local Units	141
(2) Before Refresher Training	144
(3) After Refresher Training	144
f. Essential Elements of Analysis	145
g. Recommendations	148
13. PERSONNEL PROGRAMS	150
a. Discussion	150
b. Personnel Stability Factors	150
c. Personnel Turbulence Factors	151
d. Preselection Criteria for Gunners	151
e. Essential Elements of Analysis	157
14. ARTS RESULTS APPLICATION TO STINGER TRAINING	168
a. Discussion	168
(1) STINGER Similarities	168
(2) STINGER Differences	168
b. Training Implications	170
(1) Institution	170
(2) Unit	179
(3) Reserves	179
(4) Live Firings	179
(5) Live Tracking	180
c. Conclusions	180
d. Recommendations	181
15. STUDY CONCLUSIONS	182
a. Training Effectiveness	182
(1) Institution	182
(2) Unit	182

Table of Contents (continued)

	<u>Page</u>
b. Training Costs	182
(1) Institution	182
(2) Unit	183
(3) Reserves	183
c. Resources Related to Training	183
d. Training Related to Proficiency	183
e. Proficiency Related to War Models	184
f. War Models Related to Combat Effectiveness	185
16. STUDY RECOMMENDATIONS	186
a. Training Effectiveness	186
(1) Institution	186
(2) Unit	186
(3) Reserves	186
b. Training Costs	186
(1) (1) Institution and Unit	186
(2) Reserves	187
c. Resources Related to Training	187
d. Training Related to Proficiency	187
e. Proficiency Related to War Models	188
f. War Models Related to Combat Effectiveness	189
APPENDICES	
I REDEYE Description	I-1
II Moving Target Simulator Description	II-1
III Tracking Head Trainer Description	III-1
IV Radio Controlled Miniature Aerial Target System and Ballistic Aerial Target System Descriptions	IV-1
V Essential Elements of Analysis	V-1
VI REDEYE Launch Simulator Description	VI-1
VII Target Alert Data Display Description	VII-1
VIII Units and Locations Visited by ARTS	VIII-1
IX Questionnaires Administered	IX-1
X Data Correlations	X-1
XI Live Firings and Tracking Test Descriptions	XI-1
XII References	XII-1
XIII ARTS Plan	XIII-1
XIV Glossary	XIV-1

ARMY TRAINING STUDY

REDEYE

1. INTRODUCTION

a. Purpose. The basic purpose of the Army Training Study (ARTS) is to determine the functional relationship between training resources and combat effectiveness and to determine the training programs required to optimize the capabilities of major new weapons systems programmed for delivery to the force in the 1980's. That relationship for the REDEYE Man-Portable Air Defense System (MANPADS) is established in this report.

b. Background. The developing Warsaw Pact air threat to the US Field Army is highly sophisticated, highly responsive, and massive. The attack force contains the HIND attack helicopter which poses a formidable threat to our armored and front-line forces. The REDEYE (See Appendix I for a complete description) and the follow-on STINGER offer a potential counter to this threat. Gunner's training, both quality and quantity, can substantially impact the effectiveness of REDEYE. This report identifies the critical training factors and relates them to gunner proficiency. Data obtained during the REDEYE Weapons System Training Effectiveness Analysis (WSTE) were also used in this study. The WSTE established the level of proficiency of REDEYE gunners upon completion of AIT and of gunners in selected units.

c. Problem. The Army faces constrained resources for the conduct of individual and unit training, and, therefore, must make optimum use of the resources available to build and improve Army combat effectiveness. The REDEYE MANPADS Weapons System has been chosen by the Army Training Study Group (ARTSG) to provide a vehicle for examining the relationships between training resources, training programs, individual and unit proficiency, war models, and combat effectiveness. The results of the REDEYE ARTS coupled with the previously conducted REDEYE WSTE will contribute to the data base from which sound decisions can be made regarding future Army training resources and programs.

d. Impact of the Problem. The REDEYE air defense system provides air defense at the maneuver-unit level. The proficiency of the gunner directly affects the survival as well as the performance of the unit. It is, therefore, imperative that gunner proficiency levels be defined and evaluated with respect to combat effectiveness. REDEYE gunner proficiency must be maintained at a level sufficient to assure survival of Army assets during a conflict. This proficiency level must be defined to assure that gunners are properly trained to accomplish this mission.

2. SCOPE

The scope of this report as defined in the study plan, is as follows:

- a. Examine and develop costs associated with training REDEYE gunners in the institution as well as in the units.
- b. Utilize the maximum extent possible data gathered for the REDEYE WSTEAs.
- c. Delineate the proficiency of the gunners upon graduation from the institution and in the units.
- d. Delineate the proficiency of the Army Reserves before and after institutional and unit refresher training.
- e. Examine the utility of the Marine REDEYE Launch Simulator (RELS) as an Army training aid.
- f. Examine the Marine unit training programs to determine applicability to the Army.
- g. Develop the relationship between gunner proficiency and combat effectiveness.

3. OBJECTIVES

The objective of this report as defined in the study plan, is as follows:

- a. To determine and associate REDEYE gunner training costs with those tasks essential to sustain and fight with the system.
- b. To determine the relationship of training programs to gunner proficiency. Of particular concern is the decay of proficiency as a function of time.
- c. To determine a methodology for utilizing variable levels of proficiency as parametric values in current war simulations.
- d. To develop a methodology to determine REDEYE team effectiveness as opposed to individual task proficiency.
- e. To determine the ability of current war models to give a measure of combat effectiveness in terms of gunner proficiency.
- f. To investigate the impact on proficiency expected from varying the mix of institutional and unit training and changes in training techniques and technology.

g. To describe the impact on proficiency of personnel turbulence/stability, and mental category and to develop the fluctuations in proficiency due to these variables.

h. To assess the benefits and costs associated with using training devices (e.t., Moving Target Simulator (MTS) [See Appendix II for MTS description], M49 Tracking Head Trainer (THT) [See Appendix III for THT description], Radio Controlled Miniature Aerial Target (RCMAT) and the Ballistic Aerial Target System (BATS) [See Appendix IV for RCMAT and BATS description], in lieu of other training resource requirements and the impact of reduced resources).

i. To define possible intensified training programs which might be offered by institutions to reserve units and the resultant impact on proficiency.

j. To define the interoperability impact relative to other user nations.

4. ESSENTIAL ELEMENTS OF ANALYSIS

See Appendix V

5. MEASURES OF TRAINING EFFECTIVENESS

a. Probability of Hit

(1) MTS - Scored by THT.

(2) Live Tracks - Scored by THT.

(3) Live Firings - Scored by range officer.

(4) REDEYE Launch Simulator (RELS) (See Appendix VI for RELS description) Firings - An assessment of REDEYE gunners was determined by questionnaires developed by TRASANA and the Army Research Institute.

b. Range Ring Profile Scores - Written test scores to demonstrate knowledge and application of the range ring profile (RRP).

c. Number of Aircraft Destroyed - A function of gunner proficiency.

6. MANPADS CONCEPT OF OPERATION

a. General. REDEYE is a man-portable, shoulder-fired air defense guided missile system designed to provide to the elements of the task force the capability to do their jobs in the face of an enemy air attack.

b. Description. REDEYE is a guided missile system designed to provide air defense against low-altitude hostile aircraft including jet and

propeller aircraft, helicopters, and reconnaissance drones. REDEYE maintenance is limited to go/no-go checks. The REDEYE weapons system weighs about 29 pounds. The missile has a solid propellant motor and high-explosive warhead which detonates on impact with the target. It homes on the target by the seeker locking onto the infrared (IR) radiation produced by the aircraft's engines. Once fired, it requires no guidance from the ground. REDEYE can engage aircraft to about 8,000 feet above ground level or to ranges between 3 and 4 KM. After the missile is fired, the launcher is discarded since it cannot be reloaded.

c. Engagement. The successful engagement of aircraft by REDEYE requires accomplishment of an ordered sequence of tasks: detection, identification, acquisition, sighting, and firing. The efficiency with which these tasks are accomplished depends primarily on the training of the gunners.

(1) Detection and Identification. To enhance visual detection and identification, each REDEYE team is authorized a Target Alert Data Display Set (TADDS) [See Appendix VII for TADDS description]. The battery-operated TADDS is a lightweight Frequency Modulation (FM) receiver used to obtain warning, location, and tentative identification of aerial targets detected by a Forward Area Alerting Radar (FAAR) belonging to the CHAPARRAL/VULCAN battalion. The TADDS displays this information on a color-coded grid representing an area 35 KM square.

(2) Acquisition. REDEYE depends exclusively on IR radiation from the target aircraft for acquisition and lock-on. On most of the directly incoming jet aircraft, exhaust radiation is masked by the fuselage and wing structure.

(3) Sighting and Firing. When acquisition is achieved, the gunner determines when the aircraft is within range based on the range ring profile, provides proper lead and superelevation, and fires the weapon.

d. REDEYE Organization. The basic tactical element is the team. Each team is composed of a team leader and a gunner. Both members of the team are trained as gunners, in communication, detection, and aircraft recognition. Both members of the team act as gunners to double the rate of fire during periods of intense air activity. Each team is equipped with a 1/4-ton truck, communications equipment, a trailer for weapons hauling, TADDS, and a basic load of six REDEYE weapons. Teams are assigned to REDEYE air defense sections which consist of a headquarters element composed of a section leader, a lieutenant, a section sergeant, and a radio/telephone operator/driver. The number of REDEYE teams assigned depends on the type of organization to which the section is attached; normally, a section is allocated one team per company-size unit. The section headquarters has a 1/4-ton truck, communications equipment, and TADDS to assist in command and control. The number of sections found in

any type division will vary based on the number of maneuver battalions/squadrons and cannon field artillery battalions assigned or attached to the division.

7: RESOURCES FOR TRAINING TO PROFICIENCY

a. Introduction

(1) The training programs conducted at the USAADS and in the units are established to teach and maintain REDEYE gunner proficiency in six critical tasks. The tasks were developed for a two-man team to conduct engagements for protection of our ground forces against hostile aircraft.

(2) The physical plant training resources of the institution are provided at locations away from the USAADS. These resources consist of Moving Target Simulators (MTS) and Tracking Head Trainers (THT) as described in Appendixes II and III. There are thirteen MTSs provided - four at USAADS and nine at locations to serve the reserve and active operational units around the world. The THTs are distributed down to the section level for all active Army units, and about one per State for the reserve components.

(3) This study considers the live round resources allocated for AIT classes and for units' Annual Service Practice (ASP). The cost of targets for the live firings and support costs for RCMAT and live aircraft tracking exercises are also included.

(4) A device used by the US Marine Corps was evaluated as a part of this study. The RELS is used by the Marines for both AIT and in the units. Forty-five RELS rounds were fired in conjunction with the live rounds fired by the USAADS AIT classes and ASP firings conducted at selected units. In addition, the RELS fired by the Marine AIT classes were also evaluated. The cost effectiveness of the RELS for Army training is included as a part of this overall training effectiveness analysis.

b. Critical Tasks

(1) The six critical tasks for REDEYE are provided in the Soldier's Manual, FM44-16P, with the standards of performance as contained in FM23-17 and FM23-17A. The tasks are as follows:

(a) Task 1056 - Occupy REDEYE position.

(b) Task 1057 - Engage hostile aircraft with REDEYE.

(c) Task 1058 - Perform immediate actions on REDEYE.

(d) Task 1059 - Perform preventive maintenance checks and services on REDEYE.

(e) Task 1060 - Destroy REDEYE.

(f) Task 1061 - Determine aircraft category for REDEYE ranging.

(2) Instruction is given encompassing all of the above tasks at both the institution and in the units. However, institutional training is concentrated on the basic weapon handling skills which are contained under Tasks 1057, 1058, and 1061. Unit training is distributed more uniformly over all six tasks. Unit individual training is oriented toward meeting the requirements for the Skill Qualifications Test (SQT), and the collective training oriented toward the Army Training and Evaluation Program (ARTEP).

(a) The SQT will be administered annually to each soldier to maintain his MOS qualification. There are three levels for the 16P series. The results are provided to the USA Training Support Center so the Army-wide results can be compiled, and an Individual Soldier's Report (ISR) returned to the individual tested. The score requirements are established to verify the qualification of the soldier in his current grade or level. A higher score is required to be considered for promotion. The results of testing to date have been invalidated by TRADOC, so it was not possible to check for correlation of the SQT results with the results of testing for the ARTS.

(b) The ARTEP is conducted annually. The requirements for the 16P personnel are usually incorporated into a battalion-size field exercise in which the REDEYE section must provide air defense for the units. The performance of the section is evaluated against prescribed standards by designated umpires from outside the unit/but within the division. The results of the ARTEP are generally retained at the division level. Since the evaluation is primarily an internal one, the unit commander can focus his subsequent training on the unsatisfactory or deficient areas of performance.

(3) The tasks are identified as critical when they meet the following three requirements for criticality in conducting an engagement with the weapon system (REDEYE):

(a) The task is critical to man's survival.

(b) The task is critical to the success of the team, section, or platoon.

(c) The task must be one which can be performed by a majority of the personnel holding the MOS.

The skill levels for the 16P REDEYE gunner were validated early in the deployment of the system, based on job performance measures for the

duties and tasks of the gunner and team chief. The gunner may be from trainee status through E-4 (16P10), and the team chief may be an E-4 or E-5 (16P20). The section sergeant is graded as an E-6 (16P30). Both gunners and team chiefs were tested in the basic REDEYE skills for this analysis. Information was also obtained from the section NCOs and section lieutenants in an effort to identify command problems in providing training.

(4) The USMC also train their REDEYE gunners at the USAADS training facility. A parallel evaluation of the Marine training was conducted, and two of the three Marine REDEYE platoons were tested as a part of the WSTE. However, all three of their REDEYE platoons were tested during ARTS in order to compare Army and Marine unit training both in terms of gunner proficiency and cost.

c. Institutional Training and Costs

(1) Army Training

(a) REDEYE gunner training for the US Army was originally provided as an additional skill requirement for 11B infantry man. In 1975, REDEYE and CHAPARRAL training were combined for AIT, and the REDEYE gunners were designated under the 16P MOS. Currently, the AIT course is seven weeks without self-paced instruction. The CHAPARRAL training is given during the first five weeks and REDEYE during the final two weeks. With self-pacing, the CHAPARRAL training is accelerated by reducing the time in the CHAPARRAL learning facilities, and the combined course is shortened by one week, i.e., the 3d, 4th, and 5th weeks are compressed into two weeks. REDEYE training is affected indirectly since Visual Aircraft Recognition (VACR) is taught for both CHAPARRAL and REDEYE during the 3d and 4th weeks. However, the time scheduled for VACR training is held to the normal 25 classroom hours.

(b) REDEYE training is concentrated during the first of the final two weeks. All of the training during the 6th week is conducted at the MTS facility. About 60 percent of the time is spent in the MTS classroom learning principles of operation and procedures, technique of fire, and tactical employment. The remainder of the time is spent in the MTS dome with the THT. Since the MTS dome can only accommodate two gunners with THT at one time, the observing students are drilled on recognition of aircraft category and application of the RRP.

(c) The 2d week of REDEYE training (7th and final week of the 16P course) provides time for a test on weapon system hardware. The THT is used to track live aircraft (helicopter and small jet) in the field. During the live aircraft tracking exercises the students train with both CHAPARRAL and the REDEYE THT.

(d) Prior to live firing, three of the top students are selected by the instructors for additional drilling with the THT in the MTS on the day of the firing. The purpose is to prepare the gunners and to make the selection of one student to fire the one live REDEYE missile allocated for each graduating AIT class.

(e) The selection of the student to fire the live round is not final until after the class has arrived at the firing site. The instructor/coach observes the three candidates while tracking the flight of the first Ballistic Aerial Target System (BATS). Then he makes the final selection based on the individual's ability to handle the weapon, acquire the BATS, and maintain a smooth track through the time of engagement.

(f) The instructor/coach remains with the gunner during the live firing to relay the countdown on the BATS launch to the student. Due to the critical time for engagement the REDEYE is activated about 10 seconds before target launch. This enables the student to detect and acquire the IR source on the target to verify the REDEYE seeker operation before launch. Following IR acquisition, the student is coached to pre-position the weapon to a point in space to accommodate acquisition of the target in flight. The student may fire after receipt of "weapons free" from the instructor. The coach is to provide the assistance necessary to assure a successful engagement to demonstrate the performance of the weapons system to the remainder of the class.

(g) Table 7-1 is a listing of the subcourses taught to US Army and US Marine Corps REDEYE gunner trainees. The subcourses are distributed throughout the period of training, and some variation occurs when holidays or conflicts with range schedules dictate.

(2) Army Training Costs.

(a) The costs for institutional training were derived from USAADS reports of resources used in the 16P course, REDEYE/CHAPARRAL, for AIT and the REDEYE Gunner and Controller Course for the National Guard. The costs for training the USMC REDEYE gunners were also obtained from these reports.

(b) The cost of the active Army REDEYE team members' institutional training was developed from the most current ATRM-159 for the 16P course. Only the REDEYE portion of the course was considered which included the three additional hours (18 total) of MTS training time scheduled during the ARTS. The three hours were added in response to the WSTEAs recommendations. The costs were inflated from FY 77 to FY 78 dollars, and the current cost for training an AIT student in REDEYE is \$2,250. This cost includes the basic Operations and Maintenance Army (OMA) of the institution (USAADS), Military Pay and Allowances (MPA) and Family Housing Management Accounting (FHMA) for the student and instructor, and the amortized Missile Procurement (Msl Proc) cost of the one live REDEYE round fired for each graduating class. Additional breakdown of the total cost is provided in paragraph e.

TABLE 7-1

REDEYE SUBCOURSES TAUGHT

<u>SUBCOURSE</u>	<u>NUMBER OF CLASSROOM HOURS</u>	
	<u>Marine</u>	<u>Army</u>
Visual Aircraft Recognition	25	25
Moving Target Simulator	15	18
Principles of Operation	3	5
Techniques of fire, operational procedures, tactical employment	14	14
Hardware Review	2	2
Map reading, Geographic reference, Command and Control	15	—
Exams and Critiques	7	5
Live AC Tracking	14	8
RELS Firing	4	—
Final Firing Exercise and Preparations	8	4
Administrative	<u>11</u>	<u>22</u>
Totals	118	103

(3) Marine Training

(a) REDEYE gunner training for the Marines is conducted in the facilities at USAADS by Marine instructors. Marine gunners are designated by 7212 specialty.

(b) The Marine training is conducted in three weeks. The subcourse content of the training is shown in Table 7-1 together with the Army AIT subcourses. Initially, the training in the MTS and the VACR instruction was distributed over the first two weeks of the course. The live track exercise, RELS firing, and the live fire exercise are conducted with the Army AIT in the final week.

(c) The number of RELS firings was reduced at the time of the WSTE A from two to one per student. Each student is required to fire the RELS during the live aircraft tracking exercise. The RELS is designed to familiarize trainees with the dynamics and acoustics of a live round firing.

(d) Every student who successfully completes the 7212 course is to fire a live round for qualification as a REDEYE gunner. The standard BATS target is used, and the Marine instructor accompanies each gunner at the firing position. The instructor functions as a team leader, and, except for emergencies, the gunner is to fire the live round without coaching.

(4) Marine Training Costs. The cost of the Marine REDEYE gunner institutional training was developed from the Army costs with modifications for the Marine POI. The total current cost for three weeks' AIT at USAADS is \$12,343. The higher cost for the Marine is because each student must fire a RELS and a live round as a part of his training. A complete breakdown of the costs is provided in paragraph e.

(5) Reserve Training. A two-week REDEYE Gunner and Controller Course is conducted for Army National Guard (NG) personnel at USAADS which satisfies the annual requirement for active duty. Twenty-one classes are scheduled beginning in May and continuing through the summer.

(a) The above course is similar to the POI for AIT, except VACR is integrated into the two weeks of instruction in the MTS, RRP, hardware, tactical employment, and live aircraft tracking. One live round is allocated for firing against a BATS target for each class.

(b) About 40 percent of the ARNG gunners who attended the summer classes in 1978 had attended previously. Therefore, in the analysis of proficiency of Reserve gunners in Section 8, those with previous training were considered in a category separate from those without previous training.

(6) Reserve Training Costs. The cost of the ARNG gunner's institutional training at USAADS was developed from the ATRM-159 for the REDEYE Gunner and Controller Course. The cost per student is \$2,219.. A breakdown of the cost is provided in paragraph e.

d. Unit Training and Costs.

(1) Army Unit Training.

(a) Training programs reviewed during this study in both CONUS and OCONUS teach the basic REDEYE skills which were taught in AIT. These skills include VACR, RRP, Principles of Operation, Techniques of Weapon Handling, Deployment, Tracking (either MTS, live aircraft or RCMAT or a combination of two or more). In addition to areas and quantity of training covered in AIT, the unit 16P gunner is required to increase the number of aircraft for VACR while in the unit (the number and type of aircraft dependent on the geographic area of the unit), additional SQT skills are taught within the unit (a 16P gunner enters the unit with the skills required for Skill Level 1). It is estimated a thirty-day lapse in training between AIT and unit training usually will occur. This is the result of leave taken at the end of AIT training (fifteen days, if gunner is assigned OCONUS, and eleven days if assigned CONUS), plus a two-week orientation within the unit. Of the Army REDEYE gunners tested within the units, eighty percent had AIT training; the remainder were being trained through OJT or "shadow school." The term "shadow school" is used where institutional instruction material is used to train personnel in the units.

(b) The MTS is considered the primary training device for 16P REDEYE gunners. The existing thirteen of these devices are placed at ten locations throughout OCONUS and CONUS. Due to the design of this study, in most cases, only units in the immediate vicinity of an MTS facility were used for test subject selection; therefore, little variation exists in the proficiency of these units which can be directly attributed to resource availability. If a marked reduction in POL became a reality much of the required frequent travel to and from the MTS facility would be limited or curtailed. This would give rise to a larger variation in proficiency due to the geographic factor. In lieu of an available MTS, many units presently use live aircraft tracking, if available locally, and/or RCMAT. All of these options for tracking hinge on the M49 Tracking Head Trainer (as well as maintenance thereon) as a critical resource. The THT is also the prime training device used in field exercises and/or ARTEP performance.

(c) A little-used procedure exists which allows retention of the expended live round tube and grip stock which may be ballasted and used

as a field handling trainer. This procedure is defined by a MIRCOM publication entitled, "Field Fabrication of the REDEYE M46 Field Handling Trainer", dated 22 June 1977. The cost involved in configuring the expended tubes is negligible and should be done both to replace damaged Field Handling Trainers and to augment the Army inventory of training equipment.

(2) Army Unit Training Costs.

(a) CONUS Unit Training. Paragraph e(5) of this section discusses costing attributed to REDEYE training in CONUS TOE units, consolidated REDEYE sections, and "shadow schools." The annual breakdown of a REDEYE section, Platoon, and "shadow school" are also provided. The respective annual cost per gunner in each is \$5,991, \$4,064, and \$684.

(b) Paragraph e(6) discusses Europe unit training costs of various units. The breakout costing in Mechanized Infantry, Tank Battalion, and Armored Cavalry, Field Artillery, and Infantry are also provided.

(3) Marine Unit Training. Marine unit training resources differ from that of the Army mainly in the area of MTS utilization and live round ammunition usage. Marine unit training does not include MTS tracking, however, a marked increase in live aircraft tracking is done by all Marine units compared to Army units which have access to MTS facilities. Army units average 1.6 man-hours live aircraft tracking per month while Marine units average 5.6 man-hours live aircraft tracking per month. Each Marine REDEYE gunner fires an "annual qualification" live round and a RELS; whereas, the Army fires one live round per section each year.

(4) Marine Unit Training Cost. The cost breakdown for the unit training of US Marine REDEYE platoons is provided in paragraph e. The largest cost parameter difference between Marine and Army training stems from the difference in ammunition requirements. The annual cost per Marine gunner is \$24,383.

(5) Reserve Unit Training (NG). As indicated in detail in Section 12, REDEYE unit gunners training resources are limited and geographically scattered. The result of these conditions produces a frustrating REDEYE unit training situation in the average National Guard unit which employs Air Defense support. As a result of this resource problem, most of the productive REDEYE training within the unit occurs during AT. This training is discussed in paragraph e(5) of this section.

(6) Reserve Unit Training Costs (NG). Costs for unit training in National Guard REDEYE sections are provided in paragraph e. These costs include AT discussed in paragraph e(5) of this section. The cost per National Guard REDEYE gunner annually is \$1,725 in the unit w/o AT.

e. Training Cost Analysis. This section provides the measures of resource requirements of REDEYE training in both the unit and institutional environments. Costs include those required for Soldier's Manual (SM) and ARTEP tasks. Costs of training for common subjects such as map reading and general military knowledge are not included.

(1) Ground Rules. Costs for REDEYE training were developed using the following guidelines:

(a) Costs shown are in constant FY 78 dollars.

(b) Costs are based on the Force Cost Information System (FCIS) data base. Vehicle costs in the FCIS were updated by FORSCOM parts and POL estimates. Personnel costs include pay and allowances, accession and separation costs, and overhead costs, but exclude institutional costs.

(c) Training for REDEYE ARTEP and SM tasks only were costed. Costs for common subjects training (chemical, biological, radiological, map reading, etc.) are not included.

(d) Institutional training costs are based on the TRADOC ATRM-159 report for REDEYE-related courses.

(2) Types of Training

(a) The training for REDEYE team personnel is conducted at both the unit and institutional levels. Unit training consists of resources dedicated to both collective (ARTEP) and individual (SM) tasks.

(b) ARTEP tasks for REDEYE sections are specified by type of battalion. In general, these tasks are common in content, but different in designation or numbering. Table 7-2 provides a listing of generic ARTEP tasks.

(c) REDEYE SM tasks are defined in FM 44-16P, Soldier's Manual for Short Range Air Defense Artillery Missile Crewmen. These tasks are those necessary individual skills required of REDEYE team members. Table 7-3 lists the SM tasks for the REDEYE. These tasks duplicate ARTEP tasks in many instances, so that, for example, aircraft recognition training is considered both in individual and collective training.

(d) Most REDEYE unit training is conducted at the section level or below. However, a special case exists wherein training may be conducted at an echelon higher than that of the parent unit. This instance is characterized by the training of more than one section at a level above battalion or squadron, and is termed "shadow school." Instructor personnel resources for this school are drawn from local units and are not totally dedicated to this mission in the same sense as instructor personnel assigned to formal institutional training.

TABLE 7-2

REDEYE GENERIC ARTEP TASKS

<u>Task Number</u>	<u>Task</u>
1	Prepare air defense priority list
2	Prepare air defense plan
3	Brief team members
4	Select REDEYE Positions
5	Occupy primary position
6	Engage hostile aircraft
7	Visually recognize aircraft
8	Disseminate early warning information
9	Submit after-action report
10	Displace to alternative position
11	Redistribute REDEYE missiles
12	Change weapons control status

TABLE 7-3

REDEYE SOLDIER'S MANUAL TASKS

<u>Task Number</u>	<u>Task</u>
1037	TADDs Emplacement and Operation
1038	TADDs Preventive Maintenance
1040	Visual Aircraft Recognition
1056	Occupy REDEYE Position
1057	Engage Hostile Aircraft
1058	Perform Immediate Action on REDEYE
1059	REDEYE Preventive Maintenance
1060	Destroy REDEYE
1061	Range Ring/Aircraft Determination
2011	REDEYE Position Reconnaissance
2012	REDEYE Position Selection

(e) Institutional training (paragraph 7c) for REDEYE team members consists of two courses of instruction. The first course is incorporated in the CHAPARRAL Crewman course (043-16P10). This course develops REDEYE and CHAPARRAL gunners for the active Army. The second course is the REDEYE Gunner and Controller course (250-F4-Y). This course is for REDEYE teams in the National Guard. A third course of instruction given to Marine REDEYE gunners by Marine instructors at Fort Bliss is included for comparison.

(3) Methodology. Training costs for REDEYE crewman were developed by TRASANA using the following means:

(a) Resource requirements for unit training were obtained from a survey of unit training schedules and interviews with REDEYE section chiefs. These requirements and usage factors were input to a cost estimating routine which produces training costs by appropriation.

(b) Costs for institutional training were derived from USAADS reports of resources utilized in the 16P course (CHAPARRAL/REDEYE) and the two-week REDEYE gunners course.

(c) Costs for exportable materials used in REDEYE training were obtained from USAADS.

(d) Costs for equipment parts and POL were obtained from FORSCOM.

(4) Institutional Training

(a) The cost of the active Army REDEYE team member's institutional training was developed from the most current ATRM-159 for the CHAPARRAL Crewman's course. Only the REDEYE portion of the course was considered. Also the increased MTS training for the current Program of Instruction (POI) was added to the original cost, and all costs were inflated to FY 78 dollars. Table 7-4 shows the breakdown of the costs of this course. The total cost per student for REDEYE training in this course is \$2,250.

(b) The cost of the National Guard REDEYE team member's institutional training was developed from the most current ATRM-159 for the REDEYE Gunner and Controller course. The only adjustment necessary for this course was to inflate the costs to FY 78 dollars. Table 7-5 shows a breakdown of the costs of this course. The total cost per student in this course is \$2,219.

(c) The cost of the Marine REDEYE gunner's institutional training cost was developed from the Army REDEYE gunner's cost with modifications for the Marine POI. Table 7-6 shows a breakdown of the costs of this course. The total cost per student in this course is \$12,343.

TABLE 7-4
COST PER GRADUATE - T_I (ACTIVE ARMY)

COURSE TITLE: CHAPARRAL CREWMAN (REDEYE ONLY)

COURSE NUMBER/MOS: 043-16P10

DOLLARS (FY 78)	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC</u>	<u>FHMA</u>
<u>Variable</u>				
Program 8 Mission				
Instructional Dept	\$60	\$242	\$	\$
Other	15	5		
Program 8 <u>TOE</u> Spt				
Ammunition			545	
Pay & Allowances				
Students		328		
All others				
Travel Pay to Course	95			
Per Diem at Course				
Program 8 Base Ops	257	85		
Support Cost				
Training Aids	7	2		
Other	69	60		
TOTAL	<u>503</u>	<u>722</u>	<u>545</u>	
<u>Fixed</u>				
Program 8 Mission	84	132		
Program 8 Base Ops	136	26		
Program 8 <u>TOE</u> Spt				
Equip Dept			34	
Support Costs				
Training Aids	3	1		
Other	37	19		8
TOTAL	<u>260</u>	<u>178</u>	<u>34</u>	<u>8</u>
Total Variable & Fixed	763	900	579	8

Time/Personnel:

Student Course Length 13 days

TABLE 7-5
COST PER GRADUATE - T₁ (NG)

COURSE TITLE: REDEYE GNR & CONTROLLER

COURSE NUMBER/MOS: 250-F4-Y

DOLLARS (FY 78)

	<u>OMA</u>	<u>MPA</u>	<u>PA</u>	<u>FHMA</u>
<u>Variable</u>				
Program 8 Mission				
Instructional Dept	\$40	\$188	\$	\$
Other	11	4		
Program 8 <u>TOE</u> Spt				
Ammunition			545	
Pay & Allowances				
Students		408		
All others				
Travel Pay to Course	257			
Per Diem at Course	37			
Program 8 Base Ops	199	66		
Support Cost				
Training Aids	5	2		
Other	<u>54</u>	<u>48</u>		
Total	603	716	545	
<u>Fixed</u>				
Program 8 Mission	66	102		
Program 8 Base Ops	105	20		
Program 8 TOE Spt				
Equip Depr			11	
Support Costs				
Training Aids	3			
Other	<u>28</u>	<u>14</u>		<u>6</u>
Total	202	136	11	6
Total Variable & Fixed	805	852	556	6

Time/Personnel

Student Course Length 10 days

TABLE 7-6
COST PER GRADUATE - T_I (MARINES)

COURSE TITLE: MARINE REDEYE GUNNER
043-7212

DOLLARS (FY 78)	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC</u>	<u>FHMA</u>
<u>Variable</u>				
Program 8 Mission				
Instructional Dept	\$50	\$275	\$	\$
Other	16	6		
Program 8 <u>TOE</u> Spt				
Ammunition			10288	
Pay & Allowances				
Students		382		
All others				
Travel Pay to Course	257			
Per Diem at Course				
Program 8 Base Ops	331	99		
Support Cost				
Training Aids	8	2		
Other	89	71		
Total	751	835	10288	
<u>Fixed</u>				
Program 8 Mission	76	153		
Program 8 Base Ops	119	28		
Program 8 <u>TOE</u> Spt				
Equip Depr			28	
Support Costs				
Training Aids	3	1		
Other	32	20		9
Total	230	202	28	9
Total Variable & Fixed	981	1037	10316	9

TIME/PERSONNEL

Student Course Length 15 days

(5) CONUS Unit Training

(a) Table 7-7 lists the costs attributable to REDEYE training in CONUS TOE units. This cost represents that for a five-team section.

(b) Some Divisions have consolidated REDEYE assets under the control of the VULCAN/CHAPARRAL Battalion. The costs in Table 7-8 represent this consolidation for a REDEYE platoon of four sections, nineteen teams.

(c) The "shadow school" concept within CONUS is illustrated by the Fort Bragg REDEYE school. This training is modeled after the two-week course of instruction at USAADS. Table 7-9 provides the costs associated with this "shadow school."

(6) Europe Unit Training Costs

(a) Unit training costs for mechanized infantry REDEYE sections are as shown in Table 7-10. These costs are based on a sample of five sections. The upper bound at 95 percent confidence is provided as a measure of cost variation.

(b) Table 7-11 provides the unit training costs associated with tank battalion and armored cavalry squadron REDEYE sections. These costs are based on a sample of eight sections.

(c) Unit training costs for field artillery sections are as shown in Table 7-12. These sections consist of three teams as opposed to five teams for maneuver elements. The costs shown are based on a sample of seven sections.

(d) Costs for REDEYE unit training in infantry battalions are provided at Table 7-13. These costs are based on a sample of three sections.

(e) Table 7-14 provides the aggregate costs for maneuver unit REDEYE sections. These costs are based on a sample of sixteen maneuver units.

(7) Reserve Unit Training Costs. Costs for unit training in National Guard REDEYE sections are provided at Table 7-15. These costs are based on a three-team section and include an annual active duty training.

(8) Marine Unit Training Costs. Table 7-16 provides the costs for training of US Marine REDEYE platoons. Marine training differs from Army training primarily in the live firing portion. Each individual in the Marine Corps fires one live missile annually; Army personnel fire one missile per section annually.

TABLE 7-7
CONUS ANNUAL COSTS
SECTION/GUNNER
(FY 78 \$)

	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC</u>	<u>Total</u>	<u>MSI Proc Plus OMA</u>
Cost Per Section	5,705	50,002	10,182	65,889	15,887
Cost Per Gunner	519	4,546	926	5,991	1,445

TABLE 7-8
CONUS ANNUAL COSTS
PLATOON/GUNNER
(FY 78 \$)

	<u>MEAN</u>				
	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC</u>	<u>TOTAL</u>	<u>MSL PROC PLUS OMA</u>
Cost Per Platoon	20,524	101,732	40,320	162,576	60,844
Cost Per Gunner	513	2,543	1,008	4,064	1,521

TABLE 7-9

CONUS ANNUAL COSTS

SHADOW SCHOOL

(FY 78 \$)

		MEAN			
		OMA	MPA	MSL PROC TOTAL	MSL PROC PLUS OMA
Cost Per Section	91	8,975	48	9,114	139
Cost Per Gunner	7	673	4	684	11

TABLE 7-10

EUROPE ANNUAL COSTS

MECHANIZED INFANTRY BATTALION

(FY 78 \$)

		MEAN				95% CONFIDENCE UPPER BOUND	
		OMA	MPA	MSL PROC TOTAL	MSL PROC PLUS OMA	TOTAL	MSL PROC PLUS OMA
Cost Per Section	14,054	87,284	10,629	111,967	24,683	146,821	34,236

TABLE 7-11

EUROPE ANNUAL COSTSARMORED UNITS

(FY 78 \$)

	MEAN				95% CONFIDENCE UPPER BOUND	
	OMA	MPA	PROC	TOTAL	MSL PROC PLUS OMA	MSL-PROC PLUS OMA
Cost Per Section	12,958	80,954	10,520	104,432	23,478	123,813
Cost Per Gunner	881	5,437	716	7,034	1,595	8,128
						1,857

TABLE 7-12

EUROPE ANNUAL COSTSFIELD ARTILLERY BATTALION

(FY 78 \$)

	MEAN				95% CONFIDENCE UPPER BOUND	
	OMA	MPA	MSL PROC	TOTAL	MSL PROC PLUS OMA	MSL-PROC PLUS OMA
Cost Per Section	8,715	75,204	10,539	94,458	19,254	111,407
Cost Per Gunner	876	7,090	1,031	8,997	1,907	10,052
						21,857
						2,336

TABLE 7-13

EUROPE ANNUAL COSTSINFANTRY BATTALION

(FY 78 \$)

	<u>MEAN</u>			<u>95% CONFIDENCE UPPER BOUND</u>		
	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC TOTAL</u>	<u>MSL PROC PLUS OMA TOTAL</u>	<u>MSL PROC PLUS OMA</u>	<u>MSL PROC PLUS OMA</u>
Cost Per Section	8,542	63,539	9,785	81,866	18,327	96,772
Cost Per Gunner	777	5,776	890	7,443	1,666	8,798
						1,751

TABLE 7-14

EUROPE ANNUAL COSTSMANEUVER UNIT

(FY 78 \$)

	<u>MEAN</u>			<u>95% CONFIDENCE UPPER BOUND</u>		
	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC TOTAL</u>	<u>MSL PROC PLUS OMA TOTAL</u>	<u>MSL PROC PLUS OMA</u>	<u>MSL PROC PLUS OMA</u>
Cost Per Section	12,472	79,667	10,416	102,555	22,888	115,514
Cost Per Gunner	891	5,648	751	7,290	1,642	8,092
						1,852
						25,903

TABLE 7-15
ANNUAL SECTION COSTS
NATIONAL GUARD
(FY 78 \$)

	MEAN				
	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC</u>	<u>TOTAL</u>	<u>MSL PROC PLUS OMA</u>
Cost Per Section	3,143	7,178	30	10,351	3,173
Cost Per Gunner	524	1,196	5	1,725	529

TABLE 7-16
ANNUAL PLATOON COSTS
MARINE UNITS
(FY 78 \$)

	MEAN				
	<u>OMA</u>	<u>MPA</u>	<u>MSL PROC</u>	<u>TOTAL</u>	<u>MSL PROC PLUS OMA</u>
Cost Per Platoon	32,994	447,634	279,686	760,314	312,680
Cost Per Gunner	1,073	14,253	9,057	24,383	10,130

f. Essential Elements of Analysis - Training Costs

(1) EEA 1. What is the cost of individual and collective training of REDEYE personnel in units?

REDEYE unit training is not easily stratified by individual versus collective training due to commonality of SM and ARTEP tasks. Within the units sampled, approximately 5 percent of costs are attributable to individual (SM tasks) training, 5 percent collective (ARTEP) training, and 90 percent for training of tasks common to both SM and ARTEP. Individual training in a type division would, therefore, account for \$86 annually (without MPA) per individual, as would collective training. Combined individual and collective training would total \$1,542 annually per individual. Adding MPA costs would increase individual and collective training each by \$300 per individual, and combined training \$5,430 per individual.

(2) EEA 2. What is the cost of shadow schools for REDEYE personnel in units?

Shadow schools are characterized by training conducted at a level which aggregates more than one basic unit. In the REDEYE analysis this includes unit training that includes two or more REDEYE sections, and was found in three distinct instances. The first is the Moving Target Simulator (MTS), whose costs are addressed in EEA #5 below. The second shadow school encountered is the REDEYE Gunner School at Fort Bragg. This course is a 72 hour block given each REDEYE section member upon arrival at Fort Bragg. Average total cost per graduate for this course is \$684, which includes student and instructor MPA. Finally, a corps-level aircraft tracking exercise is conducted periodically in Europe. This exercise includes high performance aircraft and is for several sections. Cost for this exercise is approximately \$95 per team member per day. This cost includes aircraft, transportation, pay and allowances, and supporting equipment.

(3) EEA 3. What is the cost of training REDEYE personnel in TRADOC schools?

The breakdown of costs for active Army institutional training for REDEYE peculiar training is shown in Table 7-4. The total cost including the students pay and allowances is \$2,250. If the fixed costs, base operations costs and MPA are removed, to make this number compatible with the unit training cost without MPA, it becomes \$791. The breakdown of costs for National Guard institutional training for REDEYE personnel is shown in Table 7-5. The total cost including the students pay and allowances is \$2,219. If the fixed costs, base operations costs, and MPA are removed, again to make this number compatible with the unit cost without MPA, it becomes \$949. The breakdown of costs for the Marine institutional training for REDEYE personnel is shown in Table 7-6. The total cost including the students pay and allowances is \$12,343. If the fixed costs, base operations

costs and MPA are removed, to make this number compatible with the unit training cost without MPA, it becomes \$10,708.

(4) EEA 4. What is the cost of exportable materials to support REDEYE training in units?

Exportable materials involved in REDEYE training in the units consists of manuals, an Army correspondence subcourse, the Ground Observer Aircraft Recognition (GOAR) kit and technical lessons. Costs of the technical lessons are:

<u>Lesson Number</u>	<u>Contract Cost (FY 73)</u>
043-441-7870-F	7,722.63
043-441-7871-F	8,087.34
043-441-7872-F	6,283.08
043-441-7873-F	7,300.00*

* Estimated cost, exact data no longer available.

The costs of the manuals involved are:

<u>Number</u>	<u>Labor**</u>	<u>Printing</u>	<u>Total</u>
FM44-23	31,051	80,584	\$111,635
FM44-23-1	31,041	10,350	41,401
TC-44-71	31,051	4,742***	35,793
TC-44-71-1	31,051	3,694***	34,745
FM44-17	31,051	- ****	

** Estimated cost of GS-11 for 1.5 years.

*** Estimated - Processing of printing contract incomplete.

**** Cost data no longer available.

The cost of Army correspondence subcourse is:

<u>Labor+</u>	<u>Printing</u>	<u>Total</u>
\$1,124	\$414	\$1,538

+ GS-9 for 120 MH

The most recently produced GOAR kit had a cost of \$715.00 (FY 78). These kits were produced for Australia in 1977.

(5) EEA 5. What is the cost of REDEYE training aides/devices (simulators)? REDEYE training aides/devices consist of the GOAR kit, the Moving Target Simulator, the Tracking Head Trainer, and the field handling trainer?

(a) The cost of the GOAR kit was covered under EEA 4.

(b) The cost of the Moving Target Simulator (M-87) was:

	<u>Annual Recurring (FY 78)</u>		<u>Nonrecurring (FY 78)</u>		
	<u>OMA</u>	<u>MSL</u>	<u>OMA</u>	<u>MSL</u>	<u>MCA*</u>
CONUS	5073	4510	3000	379000	380000
EUROPE	5750	4510	3000	379000	425000

The above annual costs convert to approximately \$5.76 per training hour for a CONUS MTS and \$6.17 per training hour in Europe. Usually there would be one GS-7 and one GS-9 assigned with each MTS. However, at Fort Bliss there is less than one individual per MTS for their four units. In Europe, the situation is somewhat different. The Seventh Army MTS has only a GS-9 assigned to it. The Fifth Corps MTS has a 16P E7, two 16P E6s, and a local civilian grade C-7 assigned to it. Finally, the Seventh Corp has two 16P E7s and a C-7 assigned. The hourly rate of these individuals is shown below:

	<u>CONUS</u>	<u>EUROPE</u>
GS-9	9.25	11.24
GS-7	7.56	9.55
C-7	-	12.19
E-7	9.96	10.08
E-6	8.60	11.44

(c) The nonrecurring cost for the M-87 was taken from a contract for five MTS installations in the FY 79 budget. The cost of the Tracking Head Trainer (M-49) is:

	<u>Annual Recurring</u>		<u>Nonrecurring</u>	
	<u>OMA</u>	<u>MSL</u>	<u>OMA</u>	<u>MSL</u>
CONUS	\$579	\$515	\$270	\$28094
EUROPE	657	515	293	28094

*MCA cost varies widely by geographic area. The numbers given are average values.

(d) The final training device is the Field Handling Trainer (M46). The costs for the M46 are:

	<u>Annual Recurring</u>	<u>Nonrecurring</u>
CONUS	\$58	\$1527
EUROPE	62	1527

Additionally, some units use the expended REDEYE/launch tubes with grip stock in the place of the Field Handling Trainer. The cost of the expended round trainer is considered to be nil.

(e) The BATS should also be considered in the cost of training aids. It is used as the target for live REDEYE firings. The cost of the BATS is:

Equipment in REDEYE configuration - \$796.

Personnel to prepare the BATS for launch \$38.20, CONUS, \$46.21, Europe.

(f) The units of Fort Bliss also use the RCMAT for some training. The cost of RCMAT is \$25.60 per hour. That includes two WG-8s (at \$6.40 per hour) and the necessary equipment (at \$12.80 per hour).

(g) One final device being used by the Marines and which is being considered for Army use is the REDEYE Launch Simulator (RELS). The cost of the RELS is \$881 per launch.

(6) EEA 6. What is the delta cost associated with night or NBC training for REDEYE personnel?

REDEYE training in an NBC environment involves the use of the protective mask for chemical and biological warfare and the use of cover, dispersion, and immediate reaction in the nuclear battlefield. These measures provide no additional costs to conventional training and are easily incorporated into training exercises. REDEYE doctrine states that due to the missile signature and the limited visual detection, identification, and ranging capabilities, during hours of darkness, that REDEYE may be employed at night only when the defender is under air attack or the weapons control status has been declared "free." For these reasons, night training is minimal. Some units are authorized night vision goggles on the basis of one per team and headquarters; however, not many units have these devices, further restricting their operation at night. Use of these devices could enhance night training. The cost of these devices would be \$10,200 to equip each REDEYE team plus \$550 annually per device for operation and maintenance.

(7) EEA 7. What is the cost of training Reserve Component (RC) personnel

to REDEYE ARTEP standards?

The REDEYE training cost per individual in the RC unit surveyed is \$2,792 per year. This includes annual active training as well as weekend meetings. Excluding MPA costs this figure is \$530 per man per year.

(8) EEA 8. What is the cost of training Individual Ready Reserve (IRR) personnel to REDEYE SM standards?

IRR personnel could be trained to SM standards in either of two methods - unit or institutional. The first would be in a shadow school similar to the 72-hour course conducted at Fort Bragg. This method would result in a cost of \$640 per individual plus transportation costs to the nearest moving target simulator. The second method would be the current REDEYE two-week course at Fort Bliss which produces a cost of \$2,219 per graduate. The costs above are exclusive of fixed overhead and base operations costs in order to provide comparability.

g. Conclusions.

The current costs appear reasonable for the achieved level of proficiency in the institution units and Reserves.

8. TRAINING TO PROFICIENCY ANALYSIS

a. Discussion.

(1) The five Army AIT classes which were tested during this study comprised a total of 125 students in comparison to 71 students from two classes tested during the WSTEА. There were approximately seven months between the time classes 14 and 15-77 were tested for the WSTEА, and classes 44 through 48-77 were tested for the ARTS.

(2) Unit training, as it presently exists in 13 CONUS tactical units and 8 OCONUS tactical units, was investigated at convenient geographic areas (in most cases, at an existing MTS facility) in CONUS and OCONUS. Total unit testing involved 1,319 Army test subjects, 62 Marine test subjects, and 137 National Guard test subjects. A list of all units visited in this study, dates tested, and number of test subjects tested is located in Appendix VIII. Approximately one year elapsed between the testing of five Army units and two Marine units for the WSTEА, and the testing of the above units for the ARTS.

(3) The current status of REDEYE training to proficiency at the AIT and unit level was monitored through the use of questionnaires and tests developed for this purpose and administered by the study proponents. In addition, unit training and institutional refresher training for the USA Reserve (Army National Guard) was investigated.

(4) A copy of each of these questionnaires/tests, and a description of each may be found in Appendix IX. However, a short synopsis of each follows:

(a) Q₁/Q₂ AIT REDEYE Training Questionnaire:

- * Personal History
- * General Attitude
- * Training Assessment

(b) Q₃ REDEYE Range Ring Profile Proficiency Test:

- * Identify Aircraft (IA) Category
- * Determine Range Ring Coverage (DRRC)
- * Action - Fire/Hold Fire (AFHF)

(c) Q4/Q5 REDEYE Training Exercise Questionnaire:

- * Demographic Information
- * General Attitude
- * Training Assessment

(d) Q7 Unit Training Survey Questionnaire:

Training Performed in Unit

- * Individual
- * Collective

(e) Q8 Noncommissioned Officer Survey:

Formatted as Q7

(f) Q9 MTS Score Sheet:

Work Sheet Used in Scoring MTS Tracking

(g) Nonactive REDEYE Training Exercise:

Formatted as Q4/Q5; Specifically for National Guard

(h) REDEYE Launch Simulator Questionnaire:

REDEYE Gunner Opinions on RELS/Live Round Firings

(i) Section Leader Interview:

An Oral Training Evaluation

(j) Aptitude Scores (Records Search):

- * Armed Forces Qualification Test (AFQT)
- * Operator and Food (OF)
- * Field Artillery (FA)
- * General Technical (GT)

(5) Methodology of Analysis. The analyses applied are geared to provide data associations between various elements of the questionnaires/tests. The results of these associations support answers to test objectives and EEAs.

b. Test Results - Institution.

(1) Test data were obtained from the same WSTEAs sources. The students were graded in the MTS and on the RRP, and their responses to the Human Factors Questionnaire and the training survey were analyzed. With the exception of a minor change in grading the students' performance in the MTS, the grading criterion was the same.

(a) For purposes of comparison, the WSTEAs MTS data were regraded in accordance with the revised criterion which consisted of including target lead errors in conjunction with superelevating the weapon and launch boundary violations (scored as 8) with the normal hit (scored as 9) for determination of gunner proficiency (P_h). The reason for the change was that either a failure to lead or an improper lead when engaging a crossing target would not be critical except for instances of close-in high performance targets. It was concluded the change would result in a P_h which is more indicative or representative of the probability of successful launches.

(b) The scoring key for each engagement with the THT either in the MTS or during live tracking exercises was as follows:

Failure to Activate the Weapon	= 1
Failure to Acquire the Target	= 2
Failure to Uncage the Weapon	= 3
Failure to Track the Target	= 4
Failure to Superelevate	= 5
Failure to Track After Superelevate	= 6
Failure to Fire	= 7
Violate RRP, Failure to Lead Target Properly	= 8
Normal hit	= 9

(c) As stated above, the gunner proficiency (P_h) was the simple ratio of the number of engagements scored as an "8" or "9" to the number of attempts. As an example: A gunner was given five attempts to engage five successive targets in the MTS. He had a loss of

track after superelevation (6) on the first attempt, failed to lead a crossing target (8) on the second but the THT indicated a normal hit as he continued to track the target. He scored normal hits (9) on the last three attempts, so he would be given credit for four hits/five attempts for a $P_h = 0.80$. Each gunner's numerical scores were then summed and normalized to 100 to represent the percent or degree of completion in conducting successful engagements. Using the above data:

$$\frac{6 + 8 + 9 + 9 + 9}{5 \text{ attempts}} \times 11.11 = \text{Normalized Score}$$

$$\frac{41}{5} \times 11.11 = 91.12 \text{ percent}$$

If the same gunner had failed to acquire (2) his first target, but scored the same on the next four engagements, his P_h would be unchanged, but his normalized score would be lowered as follows:

$$\frac{2 + 8 + 9 + 9 + 9}{5 \text{ attempts}} \times 11.11 = 82.23 \text{ percent}$$

(d) In addition, it was recorded if the gunner exceeded the 30-second time limit of the BCU before completing his engagement sequence. In a tactical setting, he could replace the BCU, but probably would not be able to replace it in time to reengage the same target. However, these "time-outs" were excluded in computation of both P_h and the normalized score.

(2) The results of the tests given the AIT gunners during the ARTS were analyzed in order to compare them with the WSTEAs results. Some changes in training were implemented following the WSTEAs, based on conclusions of the study. Specifically, the WSTEAs conclusions were:

- The basic REDEYE course, as currently taught, produces gunners with a minimum acceptable level of critical task proficiency with the exception of range ring profile proficiency.
- To achieve the USAADS goal of 0.85, each student should be provided a minimum of 80 engagements in the MTS.
- The MTS is the most effective method of training AIT personnel and produces a P_h comparable to that obtained in live firing exercises.
- The RCMAT, while effective, does not currently contribute significantly to the gunner's P_h due to the small amount of time expended with it as a training aid.

- The RELS, based upon limited data, appears to be an effective training device to assist the gunner in overcoming the fear of firing the weapon, and warrants further study.
- The success ratio observed in AIT demonstration firings is higher than that which is observed in the units. This is due in part to the gunner coaching received during the AIT firings and the fact that the unit firings are more tactical in nature.
- The current expenditure of REDEYE training ammunition is required to build confidence in the Weapon System and reduce fear and concern about firing the weapon. Although firing a REDEYE does not appear to improve proficiency, it does appear vital in building gunner confidence.
- Application of the RRP is the most difficult task the gunner must accomplish, and it is also one of the most important.
- The RRP cannot be retained by the gunner.
- The REDEYE firing doctrine should be simplified.

In accordance with the second conclusion, a change was implemented to increase the number of engagements for each student gunner. The time scheduled for MTS training was raised from 15 to 18 classroom hours. It was also intended to limit the size of the sections to 8 or less students in order to assure each student was given a minimum of five tracks or engagements per MTS reel. Normally one MTS reel is used per hour in the classroom. Under this schedule, and with the limit on number per section, each student should have been able to conduct eighty-five engagements with the THT.

(a) The performance of the AIT classes during training in the MTS was monitored by grading each student on five successive engagements at three different points in the schedule. Eighteen classroom hours of instruction time were scheduled in which the first hour was for general orientation and familiarization with the THT. The students were graded during the second hour on MTS Reel 1, during the intermediate (Reel 5 or 6), and final periods (Reel 11 or 12). The training schedule during the time of this study provided for repeat instruction on several intermediate film reels, but the students were always graded on their first encounter with Reel 5 or 6. The schedule is shown in Table 8-1 for a class divided into two groups (A and B).

TABLE 8-1
MTS TRAINING SCHEDULE

			<u>AM</u>					<u>PM</u>		
	<u>DAY</u>	<u>GP</u>	<u>MTS REEL NO</u>				<u>GP</u>	<u>MTS REEL NO</u>		
1.	TUES	A	0+	1*	2	3	B	0	1*	2
2.	WED	B	3	4	5*	6	A	4	5*	6
3.	THUR	A&B	4	5	6	7	A&B	8	9	10
4.	FRI	--	(No Training in the MTS)							
5.	SAT	--	No Training							
6.	SUN	--	No Training							
7.	MON	A&B	9	10	11	12*				
8.	TUES	A&B	Live A/C Track A&B Live Fire							

+ Orientation Period

* Graded by ARTS

1. The results of student gunner performance for each of the graded reels were used to plot a "learning curve" for weapon handling proficiency. The mean proficiency for each class and the combined classes is given in Table 8-2 and is shown graphically in Figure 8-1.

TABLE 8-2
MTS PROFICIENCY (P_h) GROWTH

<u>DAY</u>	<u>44</u>	<u>45</u>	<u>AIT CLASS</u>			<u>ARTS COMBINED</u>	<u>WSTE COMBINED</u>
			<u>46</u>	<u>47</u>	<u>48</u>		
1 (Reel #1)	0.63	0.66	0.60	0.67	0.72	0.65	0.57
2 (Reel #5)	.71	.78	.63	.47	.59	.67	.64
7 (Reel #12)	.78	.79	.66	.70	.81	.76	.75*

* Day 4

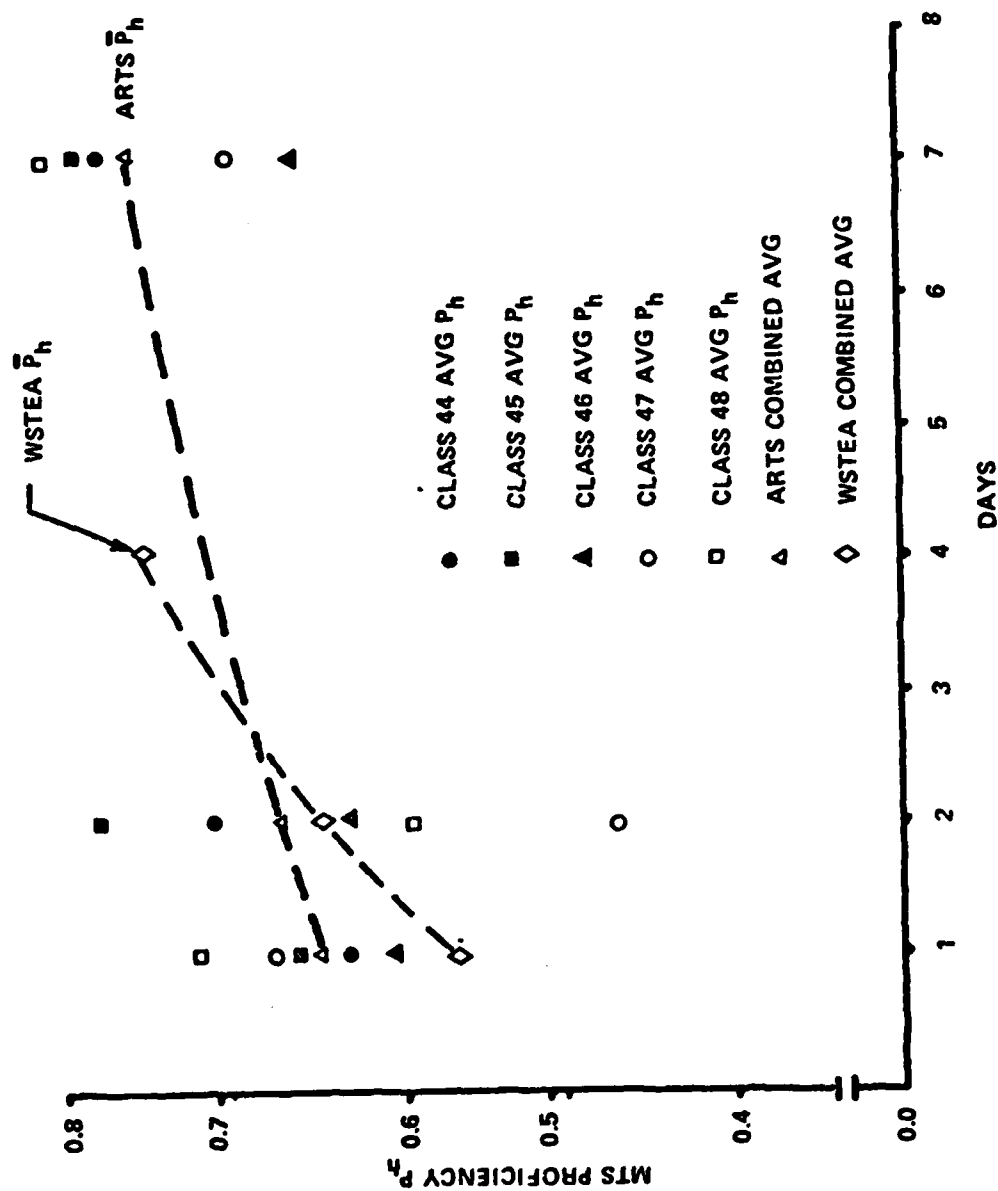


Figure 8-1. AIT MTS Proficiency Growth

2. The data points shown for the first, second, and seventh days correspond to the initial, intermediate, and final MTS reels, and the line connects the points which are the mean P_h for the five ARTS classes. This curve represents the growth in proficiency during the 18 hours of training in the MTS. The second line connecting data points on the first, second, and fourth days is for the combined two classes studied during the WSTE A. The WSTE A data were adjusted in accordance with the revised grading criterion for ARTS in order to make a valid comparison. Since the WSTE A data showed lower initial and intermediate scores, and the training was given in a shorter time frame, the "learning curve" appears to be more significant. However, the final proficiency was slightly higher for those trained during the ARTS ($P_h = 0.76$) than for those during the WSTE A ($P_h = 0.75$). It was expected that the final MTS proficiency would have been higher as a result of the additional training. However, both MTS and RRP proficiency appear related to the individual AFQT mental category and aptitude area scores. Discussion will follow in paragraph 8(c) on those factors and their relation to the gunner performance.

(b) The WSTE A study showed that the application of the RRP is the most difficult task for the REDEYE gunner, and it was recommended the firing doctrine be simplified because the RRP could not be remembered fully by the average gunner. In anticipation of simplification, no change in instruction of the current RRP was recommended or made. However, the same RRP test was given during the ARTS with the results as shown in Table 8-3.

TABLE 8-3

RANGE RING PROFILE PROFICIENCY

<u>CLASS</u>	<u>NUMBER</u>	<u>IA</u>	<u>DRRC</u>	<u>AFHF</u>	<u>ALL ACTIONS CORRECT</u>
44	39	0.724	0.436	0.707	0.262
45	27	0.743	0.414	0.704	0.228
46	21	0.690	0.378	0.751	0.204
47	12	0.685	0.537	0.764	0.292
48	23	0.727	0.505	0.761	0.309
ARTS COMBINED	122	0.719	0.444	0.730	0.256
WSTE A COMBINED	71	0.742	0.548	0.718	0.304

The results of student gunner performance in the RRP was markedly lower during the ARTS than during the WSTEА. The reason for this drop appeared to be related to the individual AFQT mental category and aptitude area scores, and the discussion of those factors follows.

(c) The current mental requirement for 16P training subsequent to enlistment in the Army is for an Operator and Food (OF) score of 90 or above. The requirement for enlistment in the Army is based on the Armed Forces Qualification Test (AFQT) score. The current minimum AFQT score for male enlistees is 10 or above which is a percentile score. The scoring is bracketed into five major categories as shown in Table 8-4.

TABLE 8-4

AFQT CATEGORIES

<u>CAT</u>	<u>PERCENT SCORE</u>
I	93-99
II	65-92
IIIA	50-64
IIIB	31-49
IVA	21-30
IVB	16-20
IVC	10-15
V	0-9 (Ineligible for Enlistment)

This discussion will consider only the first four major categories.

1. There is a direct relation between the AFQT score and the aptitude area scores as discussed in Appendix X. The relation between AFQT, OF, and GT for the WSTEА and ARTS test subjects is shown in Figure 8-2. The points are the mean values for each class and do not represent an absolute relationship between individual scores. The General Technical (GT) aptitude area score is also shown because of its relation to the AFQT score. However, since a number of the Essential Elements of Analysis (EEA) for the ARTS were concerned with the effects of the AFQT mental category as they relate to training, the remaining discussion will be limited to those scores.

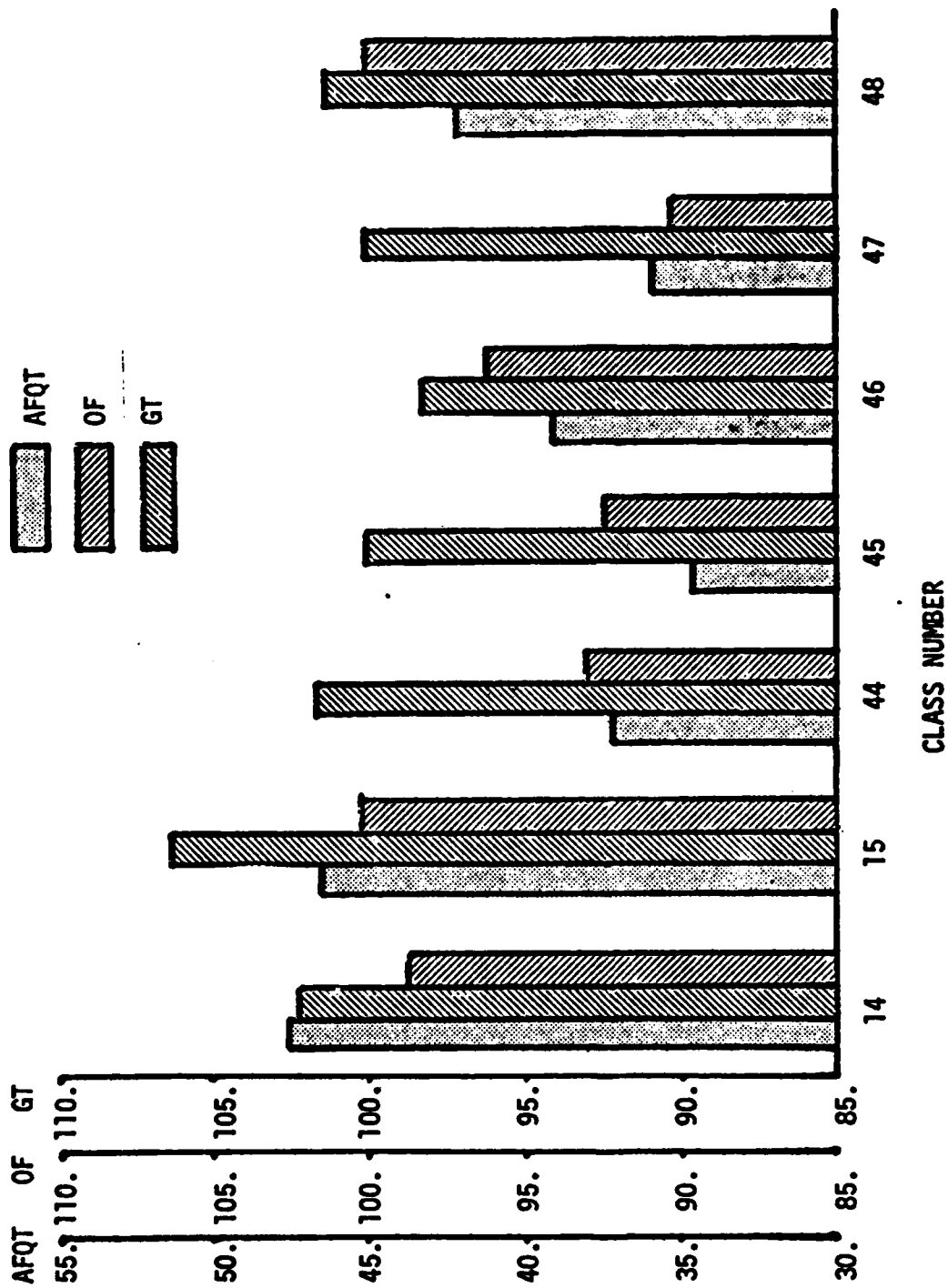


Figure 8-2. AFQT and Aptitude Area Mean Scores for AIT Classes

2. A relationship between educational level and either mental scores or performance was not apparent during the study. Eighty percent of the AIT students tested during ARTS were high school graduates or above at the time of enlistment. This figure is significantly higher than the 65 percent who had attained the same level during the WSTEa. However, since there was also a significant drop in RRP proficiency and less than the expected increase in the MTS proficiency (due to increased training time), a comparison of the mean AFQT, OF, and GT scores was made. A significant drop in the mean scores is listed as shown in Table 8-5.

TABLE 8-5

MEAN AFQT SCORES FOR WSTEa AND ARTS

	<u>MEAN AFQT</u>	<u>MEAN OF</u>	<u>MEAN GT</u>
WSTEa (71)	46.9	104.7	99.5
ARTS (122)	<u>37.3</u>	<u>100.1</u>	<u>94.1</u>
CHANGE	- 9.6	- 4.6	- 5.4

3. It was demonstrated during the WSTEa that there is a positive correlation between the mental and aptitude scores and proficiency in the RRP and MTS as shown in Table 8-6.

TABLE 8-6

CORRELATION COEFFICIENTS - WSTEa

	<u>AFQT</u>	<u>OF</u>	<u>GT</u>
RRP ALL ACTIONS CORRECT	+0.517	+0.394	+0.498
MTS P _h	0.186	.179	0.199

(A correlation coefficient of 0.250 is significant at the 0.05 level.) The correlation between MTS P_h and mental scores is not statistically significant, but does appear consistent. Figure 8-3 is a graphical presentation of the mean AFQT and MTS P_h for each class.

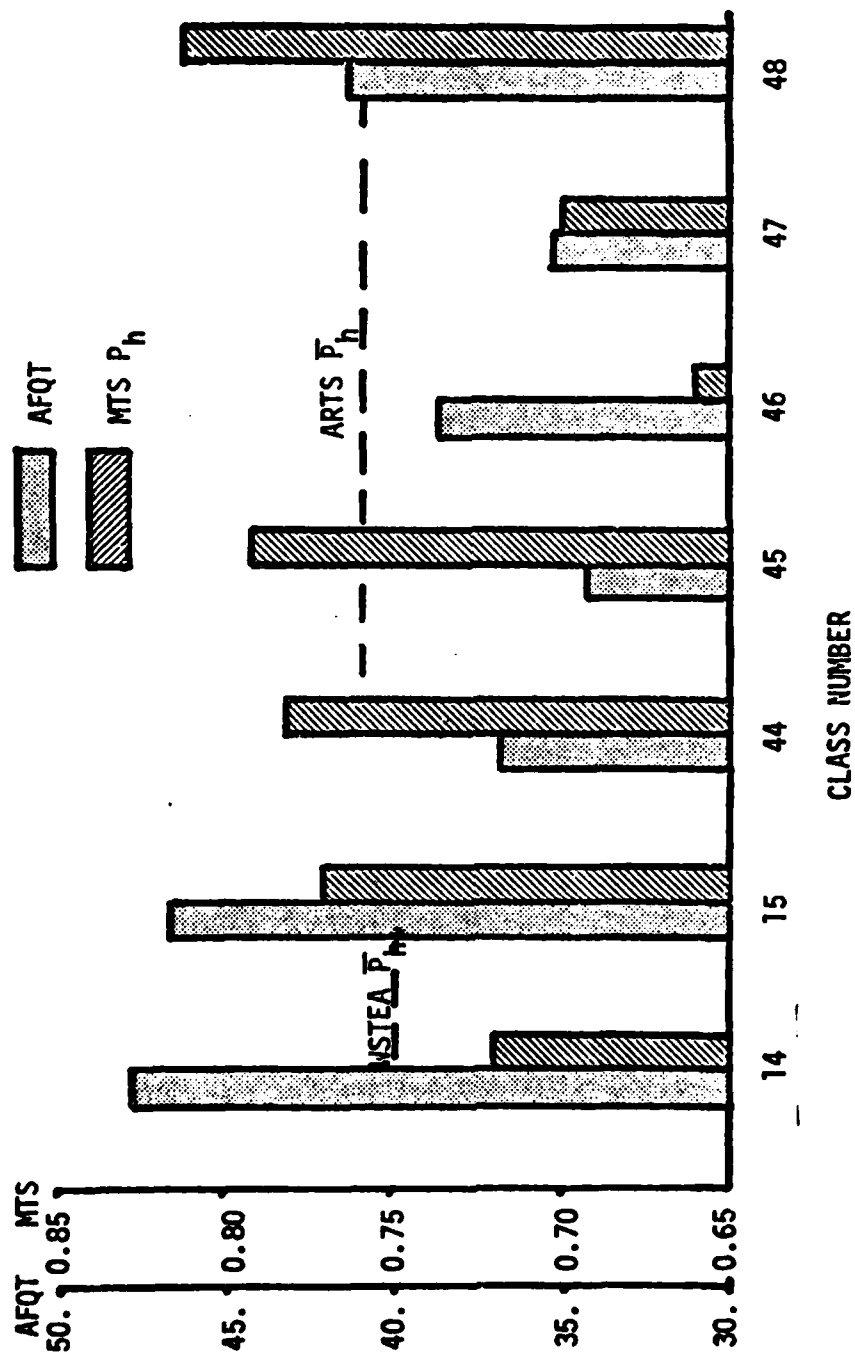


Figure 8-3. AFQT and MTS Proficiency (P_h) Mean Scores for AIT Classes

4. The correlation data in Table 8-6 indicate that the performance in the RRP would be affected more than in the MTS by a change in any of the mental or aptitude area scores if all other variables remained constant. However, when the training in the MTS was increased from 12 to 18 hours, the additional training compensated for the lower AFQT, OF, and GT scores, but the apparent increase was not significant. In the case of the RRP, there was no significant change in training except for that which was incidental to the three additional hours in the MTS. Therefore, the drop in the RRP "All Actions Correct" score was considered to be a direct function of the lower mental test scores. Figure 8-4 is a graphical presentation of the mean AFQT and RRP proficiency for each class. The respective means for the combined classes under the WSTE A and under the ARTS are also shown.

5. In comparing the performance of the two AIT classes during the WSTE A, and the five classes during the ARTS separately, the following percentage breakdown by AFQT mental category in Table 8-7 should be noted which shows a significantly larger population of Category IV gunners for ARTS.

TABLE 8-7

AIT CLASS COMPOSITION BY PERCENTAGE IN
EACH AFQT CATEGORY - WSTE A & ARTS

<u>CLASS NUMBER</u>	<u>AFQT CATEGORY</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
<u>WSTE A</u>	<u>(93-100)</u>	<u>(65-92)</u>	<u>(31-64)</u>	<u>(10-30)</u>
14 & 15	3	15	72	10
<u>ARTS</u>				
44	0	10	57	33
45	0	4	64	32
46	0	0	80	20
47	0	0	63	37
48	<u>4</u>	<u>14</u>	<u>50</u>	<u>32</u>
ARTS MEAN	1	7	61	31

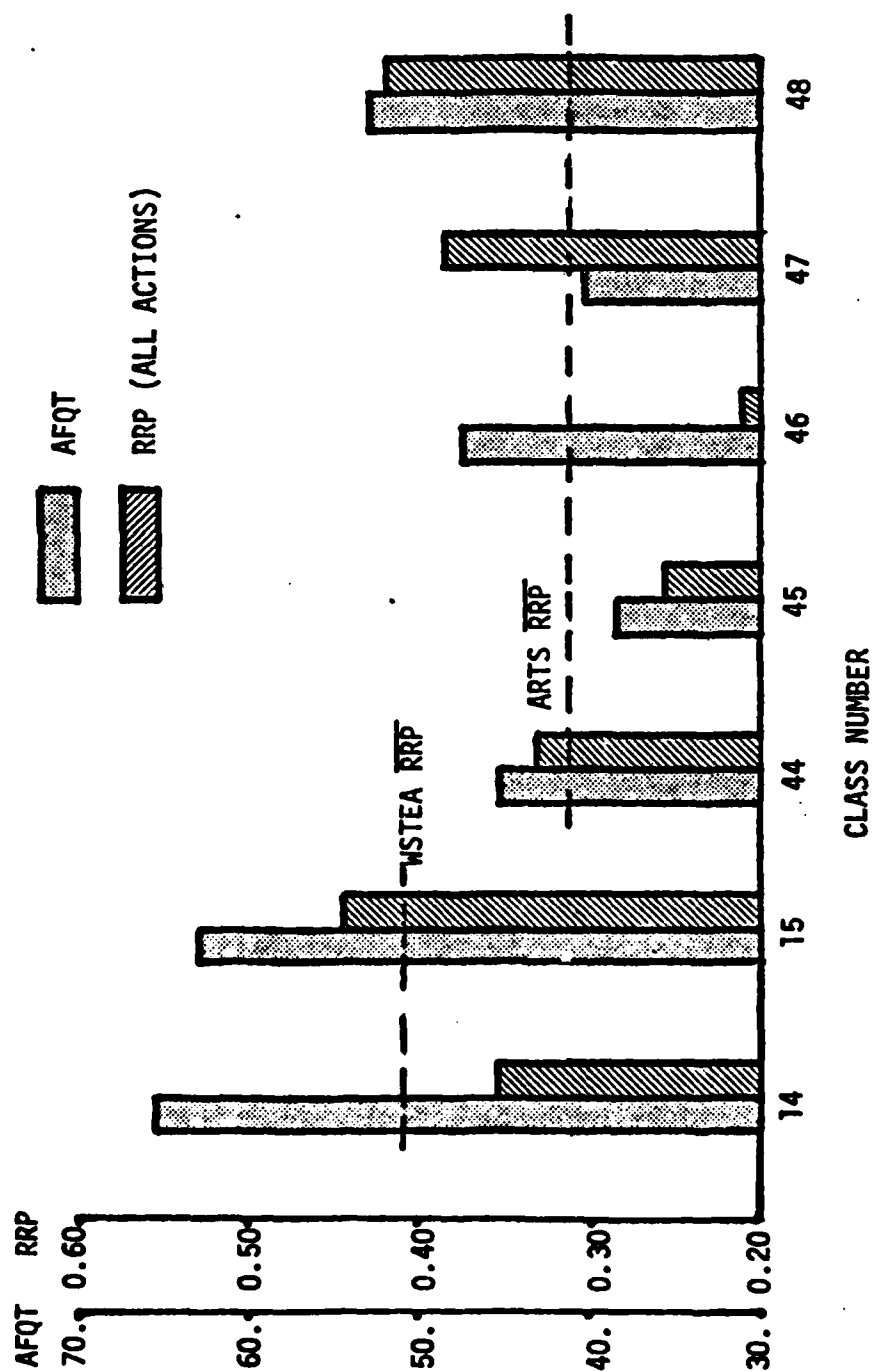


Figure 8-4. AFQT and RRP Proficiency Mean Scores for AIT Classes

6. The levels of performance or proficiency in the RRP and in the MTS on the final reel were then determined for each of the AFQT mental categories. The score for each of the three parts of the RRP test are shown in Table 8-8.

TABLE 8-8
PROFICIENCY (%) VS AFQT CATEGORY

CATEGORY (n)	RRP PROFICIENCY				MTS P_h (n)
	IA	DRRC	AFHF	ALL ACTIONS CORRECT	
I (1)	0.833	0.611	0.944	0.444	1.0 (1)
II (8)	0.806	0.694	0.931	0.535	0.81 (8)
IIIA (13)	0.761	0.662	0.846	0.427	0.71 (13)
IIIB (61)	0.730	0.432	0.731	0.248	0.79 (57)
IVA (18)	0.642	0.330	0.676	0.133	0.74 (18)
IVB (16)	0.667	0.281	0.608	0.135	0.66 (17)

NOTE: The number of gunners who were tested in the RRP differed slightly from the number tested in the MTS, and so the sample size (n) is shown for each.

In observing the decreasing order of scores for each of the major lower mental categories, it should be noted that the CAT IV performance was unacceptable in all areas of the RRP test, but within an acceptable range of P_h in the MTS. The determination of range ring coverage (DRRC) is the most difficult for all mental categories in comparison to identification of the aircraft type (IA) and action fire/hold fire (AFHF). However, it is acutely difficult for the CAT IV, and this was one of the major factors in dropping the "All Actions Correct" score to less than 14 percent.

7. The difficulty in learning the range ring is due to the complexity of the RRP matrix. The gunner must be able to decide when he should activate, fire, hold fire, resume fire, and cease fire in order to successfully engage aircraft. To make an engagement decision, he must correctly identify a hostile aircraft under one of six categories - large prop, small prop, large jet, small jet, large helo, and small helo; determine if the aircraft is incoming or outgoing; measure the fraction or portion of the range ring the aircraft fills - ($1/4$, $1/3$, $1/2$, $2/3$, $3/4$, 1, $1-1/2$, 2, 3, etc.) and compare his findings with a memorized RRP table which is a 6 by 5 matrix of correlated information. Figure 8-5

	INCOMING →			← OUTGOING	
	<u>ACTIVATE</u>	<u>FIRE</u>	<u>HOLD FIRE</u>	<u>RESUME FIRE</u>	<u>CEASE FIRE</u>
SMALL JET	N ₁	—	N ₂	N ₃	N ₄
LARGE JET	N ₅	—	N ₆	N ₇	N ₈
SMALL PROP	N ₉	N ₁₀	N ₁₁	N ₁₂	N ₁₃
LARGE PROP	N ₁₄	N ₁₅	N ₁₆	N ₁₇	N ₁₈
SMALL HELI	N ₁₉	N ₂₀	N ₂₁	N ₂₂	N ₂₃
LARGE HELI	N ₂₄	N ₂₅	N ₂₆	N ₂₇	N ₂₈

Figure 8-5. Range Ring Memory Matrix

- NOTES: 1. The actual numbers or values in the matrix are classified CONFIDENTIAL, and so notional numbers with successive subscripts are listed as shown to illustrate the complexity of the RRP.
2. FM-23-17A also gives "cease activate" points for three aircraft categories that are not taught in AIT. If these points were included, the matrix would become 6 by 6.

displays the RRP matrix for the six categories of aircraft. An example of a line of this matrix might be that for a certain aircraft category a gunner should activate on the incoming aircraft at 1/4, fire between 1/4 and 2, hold fire between 2 and 4, resume fire between 3 and 1 (outgoing), and cease fire at 1 or less.

8. The different levels of performance were also observed during the MTS training for the AIT classes during both the WSTEa and the ARTS. The WSTEa data shown in Figure 8-6 illustrates a consistent pattern for all four categories. The CAT IV gunners achieved an acceptable level of proficiency during the normal training cycle, but also demonstrated a marked drop in P_h less than a week after completion of training. None of the CAT IV gunners were retained for additional training in the MTS, so no data were collected beyond the time shown.

9. Proficiency growth in the MTS during the ARTS was also related to the respective mental categories during the normal AIT training schedule as shown in Figure 8-7. The exception for the CAT I gunner on the second day can be disregarded because of the sample size of one. The data from both CAT I and II does not have statistical significance because of the small sample size. However, the patterns are consistent overall, and should be noted.

10. The final proficiency of the AIT classes was also analyzed by mental category. The breakdown of proficiency for each step of the engagement did not indicate a consistent pattern of performance related to mental category. The only observation that could be made for the classes as a whole was that "acquisition of target" (AT) and "superelevate and lead" (SEL) were the two steps on which there was the highest incidence of failure.

(d) Study of Q_1/Q_2 questionnaires was made both to compare responses among the AIT classes within ARTS and to compare the combined AIT class responses between the ARTS and the WSTEa. The results were as follows:

1. A majority of the students under the ARTS were in the 17-19 age bracket which was a slightly younger group than under the WSTEa. Eighty percent of the ARTS subjects had completed high school or above at the time of entry into the service as compared to 65 percent of WSTEa.

2. The response to questions on reasons for enlisting, type of assignment wanted, and what they were doing at the time of enlistment all appeared to be very closely related. The two reasons given for enlistment most often were "to serve country" and "to get additional education." Combat leader and technical assignments were the order of

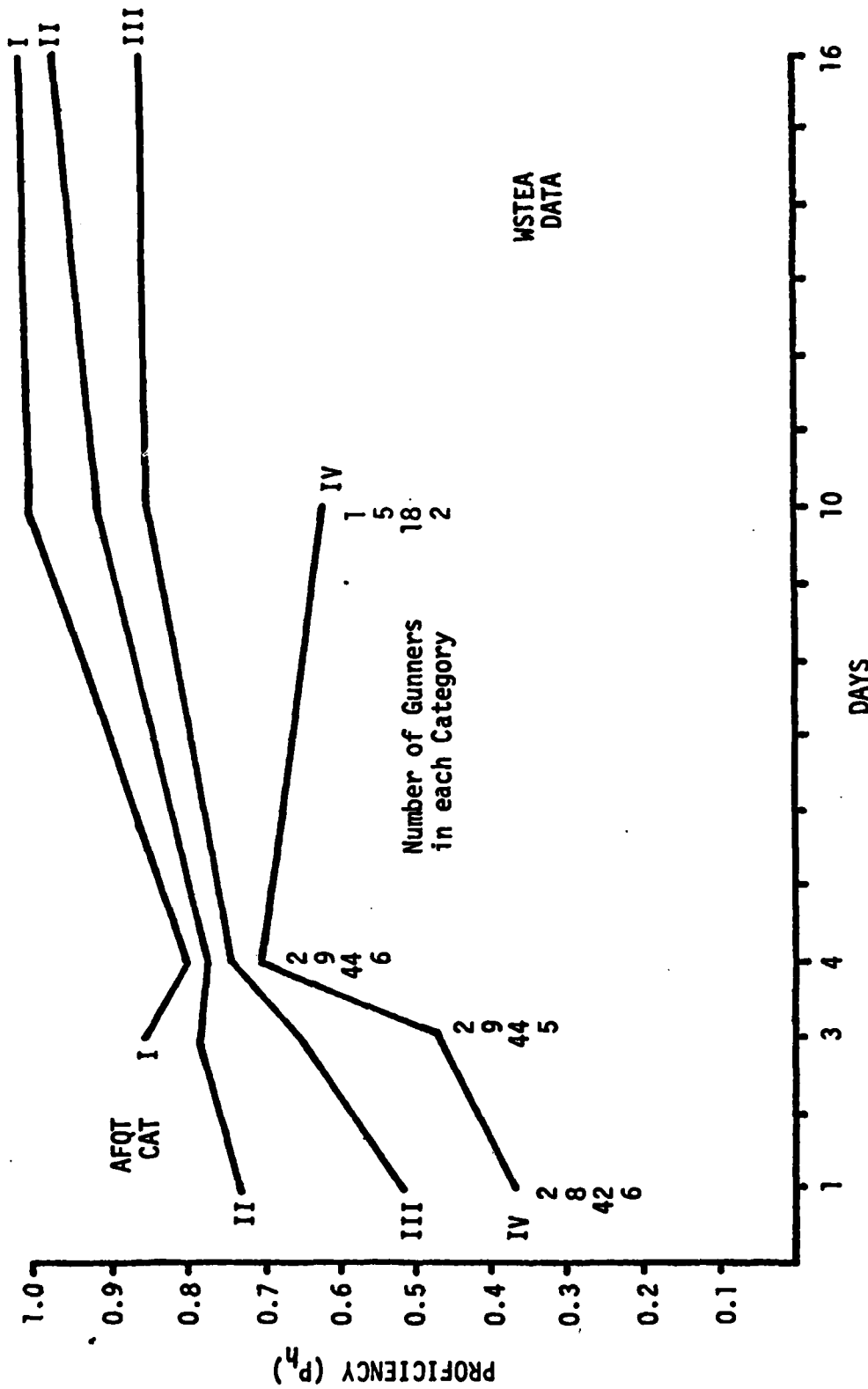


Figure 8-6. MTS Proficiency Growth vs AFQT Category and Time

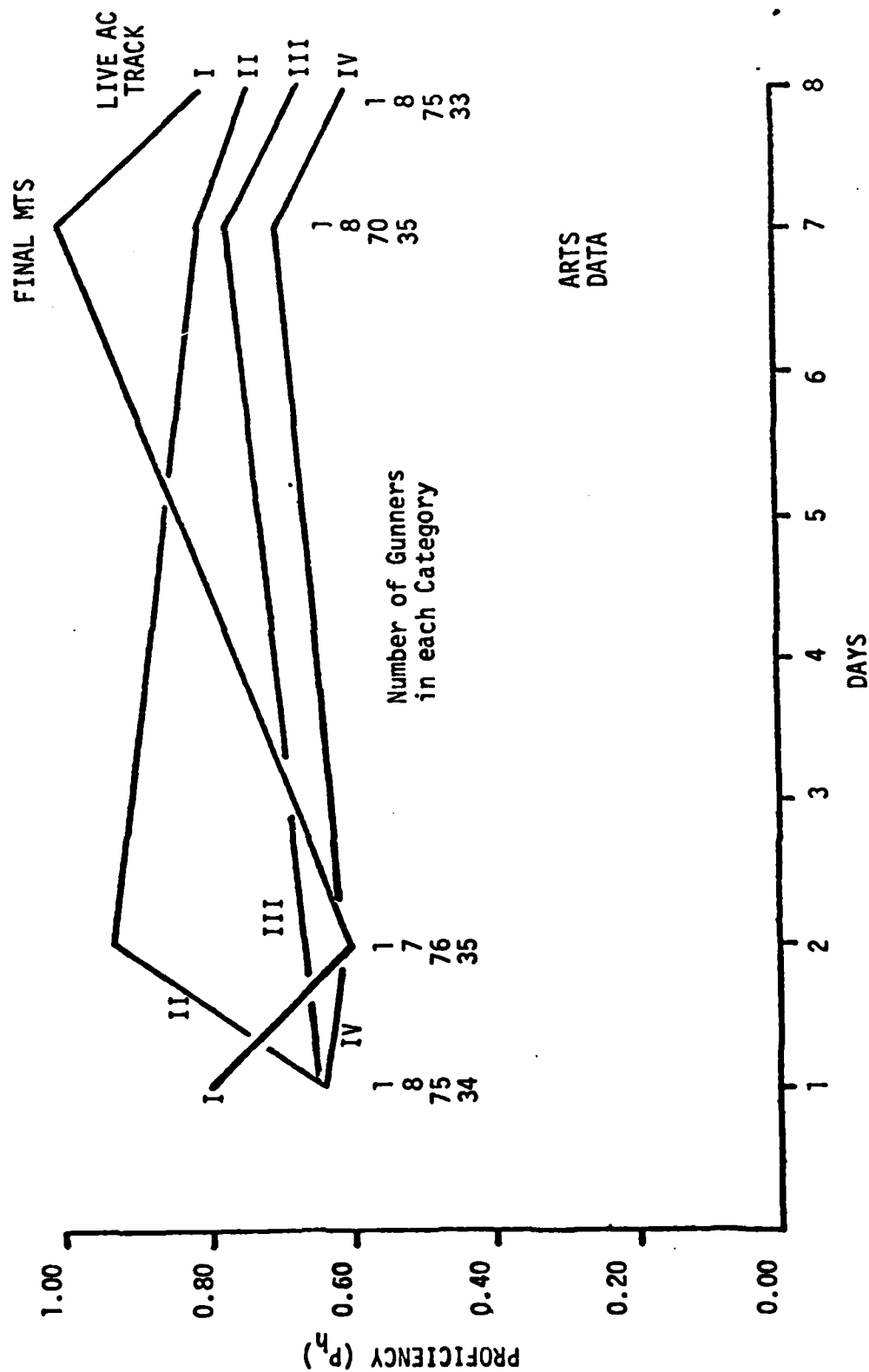


Figure 8-7. AIT MTS Proficiency Growth vs AFQT Category and Time

preference for a majority of both groups (ARTS and WSTEAs), and over 30 percent of both groups had either just graduated or were working full time at the time of enlistment. No particular size community was predominant in the responses to their childhood home locations.

3. The section of Q1/Q2 that provided a key to the individual attitude, motivation, leadership, and discipline also followed the profile of WSTEAs very closely. This was reflected in Table 8-9 as follows:

TABLE 8-9

AIT HUMAN FACTORS WEIGHTED MEAN SCORES FOR CLASSES

CLASS NO.	WSTEAs		ARTS				
	<u>14</u>	<u>15</u>	<u>44</u>	<u>45</u>	<u>46</u>	<u>47</u>	<u>48</u>
ATTITUDE	84.7	84.5	80.9	80.8	79.3	85.3	85.3
MOTIVATION	70.7	71.3	71.0	74.6	70.4	78.5	77.1
LEADERSHIP	76.2	75.0	77.1	81.3	79.4	84.5	81.6
DISCIPLINE	68.7	67.0	70.0	73.5	68.6	76.1	72.1
NO. STUDENTS	29	42	39	29	20	12	18

4. In detail, results of the Human Factors responses showed that a majority felt the Service is very important for the defense of the country, and were in strong agreement that by being in the military "I am performing an important service to my country." They also were in strong agreement that we "not only need modern weapons, but also a large number of well trained men." They strongly disagreed with the statement "I don't care how well I do in the Service," and disagreed with "Much of what is taught in the military is simply useless information." They were positive in their attitude toward the Service and the way they had been treated. Their first response indicated a slight shift from the WSTEAs subjects was on the likelihood of reenlistment. A majority of the ARTS responses ranged from borderline to very likely, whereas the majority of WSTEAs ranged from likely to very likely. A second shift was noted in their agreement that most officers in the Service are well qualified for their jobs. A majority of the ARTS responses ranged from agreement to strong agreement, whereas the majority of WSTEAs responses ranged from borderline to strong agreement. It was of interest that the majority of both groups indicated their NCOs and officers were "understanding" to "very understanding" of their men's needs. The responses also indicated the NCOs and officers were held in approximately the same degree of regard or respect.

5. In the remaining section of Q₁/Q₂ the students provided their assessment of the learning ease or difficulty, quality of instruction, and amount of training for each of the eight areas of training:

Aircraft Recognition

Command and Control

Communications

Map Reading

Range Ring Profile

Ranging

Weapon Handling and Target Engagement

Weapon System Characteristics

Generally, the responses indicated that the areas were "easy" to "very easy," except for Weapon Handling and Target Engagement and Weapon System Characteristics. A majority indicated both of these areas were "average" in ease/difficulty. The quality of instruction was also given "good" to "excellent" ratings for all, except the two areas mentioned, and a third area, Ranging, in which it was indicated the instruction was "average." Finally, the amount of training was indicated to be "short" to "too short" for all of the areas which "were easy" to "very easy" and in which instruction was "good" to "excellent." However, where they had assessed the training to be more difficult ("average") and the instruction "average," they indicated the amount of training was "just right." The responses are probably more of an indication of what they enjoyed during their training rather than an objective assessment of their needs. This seemed to be true especially in the area of the range ring profile which is recognized to be difficult both to learn and apply. However, the majority gave it the "easy to learn," and "good" to "excellent" instruction ratings.

6. Finally, a majority felt that firing a REDEYE round is very important and gave their first choice reason because it "builds confidence in the weapon by destroying a target." All of the foregoing appeared to closely match the responses from students during the WSTE A.

c. Test Results - Unit.

(1) Questionnaire Results. Unlimited information could be extracted

and compared from these questionnaires. However, only information having a direct relevancy or possible impact on training is extracted and shown here. For specific values, reference may be made to a print-out of results from all questionnaires in Appendix IX.

(a) Unit Demographic Information:

<u>AGE RANGE</u>	<u>ARMY %</u>	<u>MARINE %</u>	<u>RESERVE %</u>
17-19 Yrs	23.7	26.2	0
20-22 Yrs	44.5	63.1	4.0
23-25 Yrs	18.4	7.7	12.0
26-28 Yrs	7.6	3.1	16.0
28-31 Yrs	4.2	0	20.0
32-34 Yrs	1.0	0	8.0
35 Yrs	0.6	0	40.0
<u>CURRENT LEVEL OF EDUCATION</u>			
12 Yrs	13.9	6.2	16.7
HS Grad	52.8	58.5	29.2
GED	12.4	16.9	0
Some College	18.4	18.5	50.0
Coll Grad	2.1	0	0
Post Grad	0.4	0	0
Advance Deg	0	0	4.2
<u>PREFERRED HANDEDNESS</u>			
Left	11.4	14.1	4.0
Right	88.6	85.9	96.0
<u>PERCENT WHO WEAR GLASSES</u>			
	24.4	36.9	32.0

(b) General Attitude

Satisfaction With Military Job

	<u>ARMY %</u>	<u>MARINE %</u>	<u>RESERVE %</u>
Strongly Agree	9.1	0	24.0
Agree	26.5	13.8	60.0
Neither Agree or Disagree	21.2	26.2	4.0
Disagree	26.4	40.0	4.0
Strongly Disagree	16.8	20.0	8.0

Members of His Section Work Together as a Team

Strongly Agree .	14.8	15.4	40.0
Agree	40.9	64.6	56.0
Neither Agree or Disagree	22.3	15.4	4.0
Disagree	16.9	4.6	0
Strongly Disagree	5.1	0	0

Believes His Section Puts Out High Quality Work

Strongly Agree	15.3	10.8	40.0
Agree	38.5	43.1	52.0
Neither Agree Nor Disagree	27.1	33.8	8.0
Disagree	15.1	9.2	0
Strongly Disagree	4.0	3.1	0

Gunner Feels His Section Leader Accepts Responsibility
For All Actions

	<u>ARMY %</u>	<u>MARINE %</u>	<u>RESERVE %</u>
Strongly Agree	9.8	9.2	13.6
Agree	39.6	36.9	50.0
Neither Agree or Disagree	21.5	33.8	27.3
Disagree	17.5	20.0	4.5
Strongly Disagree	11.5	0	4.5

Likelihood of Reenlistment

0%	42.3	73.4	4.0
20%	12.2	7.8	0
40%	12.1	9.4	0
60%	16.2	7.8	4.0
80%	7.2	1.6	28.0
100%	10.0	0	64.0

(c) Unit Training:

Where Was Initial REDEYE Training Received?

AIT	80.0	68.3
OJT	11.5	0
OTHER	8.4	31.7

How Closely Are Training Schedules Followed?

90-100%	21.0	14.3
75-90%	22.7	17.5
50-75%	18.9	23.8
25-50%	18.5	22.2
<25%	18.9	22.2

Number of Hours/Month Engaged in RRP Practice

	<u>ARMY %</u>	<u>MARINE %</u>
NONE	33.4	21.9
<4 Hours	41.3	43.8
Between 4-10 Hours	16.9	21.9
Between 10-15 Hours	5.6	10.9
>15 Hours	2.7	1.6

Number of Hours/Month Tracking in the MTS

NONE	38.7	87.5
<4 Hours	29.3	9.4
Between 4-10 Hours	21.2	1.6
Between 10-15 Hours	6.9	0
>15 Hours	4.0	1.6

Percent of Time in Field Spent on Non-REDEYE Tasks

90-100%	22.9	3.2
75-90%	17.3	14.3
50-75%	16.0	22.2
25-50%	17.1	33.3
<25%	26.7	27.0

Could You Engage a High Performance Aircraft?

Yes	48.0	76.6
Not Sure	40.5	20.3
No	11.5	3.1

What (SM) Level Completed?

	<u>ARMY %</u>
Level One	29.6
Level Two	34.7
Level Three	11.9
None	23.8

What SQT Tasks Gave Most Difficulty?

a. LEVEL ONE

Occupy REDEYE Position	9.9
Engage Hostile Aircraft	6.9
Proper Action on Malfunction	5.4
Perform all PM Procedures	9.2
Categorize Aircraft and Apply Profile	43.8
Have not Taken SQT	24.9

b. LEVEL TWO

Conduct all Reconnaissance Tasks	59.4
Select a REDEYE Position	40.6

c. LEVEL THREE

Plan a REDEYE Defense	31.2
Supervise REDEYE Teams in Reconnaissance, Selection and Occupation of Positions	31.6
Control REDEYE Team by Application of Correct Procedures for Weapons Control and Fire Commands	37.1

How Many Hours/Month Do You Spend Studying SM Tasks?

	<u>ARMY %</u>
NONE	33.2
Less Than 1 Hour	22.8
1-4 Hours	31.7
>4 Hours	12.3

During an ARTEP, What Percent of Time Are You Actively Engaged in an AD Role?

100%	14.3
75%	16.7
50-75%	14.5
25-50%	13.4
25%	10.8
5%	12.5
Never Participated	17.7

What Do You Do During ARTEP Exercise?

MOS-Related Tasks Other Than Site Selection, Tracking or VACR	30.9
Non-MOS Related Tasks	50.8
Nothing	0

(d) NCO Unit Training

What is Your MOS?

	<u>ARMY %</u>	<u>RESERVE %</u>
16P	81.8	75.0
11B	6.4	
Other	11.8	25.0

Who Has Responsibility for Training Schedules?

	<u>ARMY %</u>	<u>MARINE %</u>	<u>RESERVE %</u>
Verbally from Higher Authority	25.9	40.0	50.0
In Written Form	19.4	20.0	0.0
Left to My Own Initiative	54.6	40.0	50.0

How Closely Can You Follow Training Schedules?

90-100%	4.5	0.0	0
75-90%	24.5	60.0	25.0
50-75%	31.8	0.0	50.0
25-50%	21.8	20.0	25.0
<25%	17.3	20.0	0.0

Number of Hours/Month Trainee Spent on RRP?

None	76.2	80.0	66.7
< 4 Hours	9.9	0.0	33.3
Between 4-10 Hours	13.9	20.0	0.0
Between 10-15 Hours	0.0	0.0	0.0
>15 Hours	0.0	0.0	0.0

Number of Hours/Month Trainee Spent Training in MTS?

None	2.4	0.0
<4 Hours	39.0	50.0
Between 4-10 Hours	58.5	50.0
Between 10-15 Hours	0.0	0.0
>15 Hours	0.0	0.0

Percent of Total Time in Field Used for REDEYE Training

	<u>ARMY %</u>	<u>MARINE %</u>	<u>RESERVE %</u>
90-100%	0.0	0.0	25.0
75-90%	3.6	0.0	0.0
50-75%	13.6	40.0	0.0
25-50%	21.8	20.0	0.0
<25%	60.9	40.0	75.0

(2) REDEYE Range Ring Proficiency Test. The RRP test is discussed in Appendix IX. The results of this test for each unit are as follows:

(a) The failure rate for answering all 3 parts of each question correctly is shown in Table 8-10 for each Army, Marine, and Reserve (NG) unit tested.

(b) The overall total failure rate for identification of aircraft (IA) category is shown in Table 8-11 for each Army, Marine, and Reserve (NG) unit tested.

(c) The gunner's ability to view a target through a range ring and determine the relation in size of the target relative to the RR size. Results of this DRRC subtask as extracted from the unit RRP listings are shown in Table 8-12 for each Army, Marine, and Reserve Unit tested.

(d) The results of the memory recall of the action fire hold fire (AFHF) decision portion of this test (recall of the proper RRP given a category and relative size of aircraft) are shown in Table 8-13 for each Army, Marine, and Reserve Unit tested.

(e) The amount of training received by each unit on RRP has been extracted from the unit survey questionnaires and compared with the P_h RR scores based on "All Actions Correct." This comparison is shown in Table 8-14 and in Figure 8-8.

(3) MTS Tracking Test.

(a) During the scoring of the MTS tracking test, rather than score a hit or miss only, a gunner's errors are categorized into tasks. These tasks are scored in addition to the hits. This gives a granularity to

TABLE 8-10

RRP "ALL ACTIONS (AA) CORRECT"
UNIT PERFORMANCE

<u>Army Tactical Unit</u>	<u>AA Percent Failure</u>
1	67
2	57
3	58
4	62
5	66
6	61
7	53
8	69
9	68
10	66
11	72
12	69
13	70
14	76
15	63
16	59
17	73

<u>USMC Tactical Unit</u>	<u>AA Percent Failure</u>
1	62
2	66
3	61

<u>Reserve Unit</u>	<u>AA Percent Failure</u>
1	73
2	67
3	66

TABLE 8-11

RRP "IDENTIFY AIRCRAFT" (IA)
UNIT PERFORMANCE

Army Tactical Unit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

IA Percent Failure

21
17
18
22
20
19
16
22
22
19
31
25
23
33
23
17
27

USMC Tactical Unit

1
2
3

IA Percent Failure

16
21
18

Reserve Unit

1
2
3

IA Percent Failure

31
19
26

TABLE 8-12

RRP "DETERMINE RANGE RING COVERAGE" (DRRC)
UNIT PERFORMANCE

<u>Tactical Army Unit</u>	<u>DRRC Percent Failure</u>
1	46
2	34
3	34
4	35
5	41
6	40
7	32
8	44
9	48
10	39
11	45
12	42
13	48
14	58
15	37
16	37
17	44

<u>USMC Tactical Unit</u>	<u>DRRC Percent Failure</u>
1	36
2	40
3	34

<u>Reserve Unit</u>	<u>DRRC Percent Failure</u>
1	44
2	43
3	41

TABLE 8-13

RRP "ACTION FIRE HOLD FIRE" (AFHF)
UNIT PERFORMANCE

<u>Tactical Army Unit</u>	<u>AFHF Percent Failure</u>
1	28
2	26
3	28
4	31
5	32
6	24
7	18
8	31
9	30
10	33
11	40
12	34
13	34
14	22
15	33
16	27
17	40
<u>USMC Tactical Unit</u>	<u>AFHF Percent Failure</u>
1	29
2	29
3	27
<u>Reserve Unit</u>	<u>AFHF Percent Failure</u>
1	42
2	27
3	26

TABLE 8-14

RANGE RING PROFILE TRAINING TIME
AND PROFICIENCY

<u>ARMY UNIT</u>	<u>TRAINING HOURS/GUNNER/MONTH</u>	<u>P_h RR</u>
1	2.9	0.33
2	4.5	0.43
3	3.8	0.42
4	1.8	0.38
5	2.1	0.34
6	1.5	0.39
7	7.2	0.47
8	2.9	0.31
9	3.2	0.32
10	7.7	0.34
11	4.9	0.27
12	3.5	0.31
13	3.3	0.30
14	3.2	0.24
15	3.2	0.37
16	3.7	0.41
17	3.5	0.27
<u>MARINE UNIT</u>	<u>TRAINING HOURS/GUNNER/MONTH</u>	<u>P_hRR</u>
1	4.9	0.38
2	2.9	0.34
3	4.4	0.39
<u>RESERVE UNIT</u>	<u>TRAINING HOURS/GUNNER/MONTH</u>	<u>P_hRR</u>
1	4.75	0.27
2	NA	0.33
3	NA	0.34

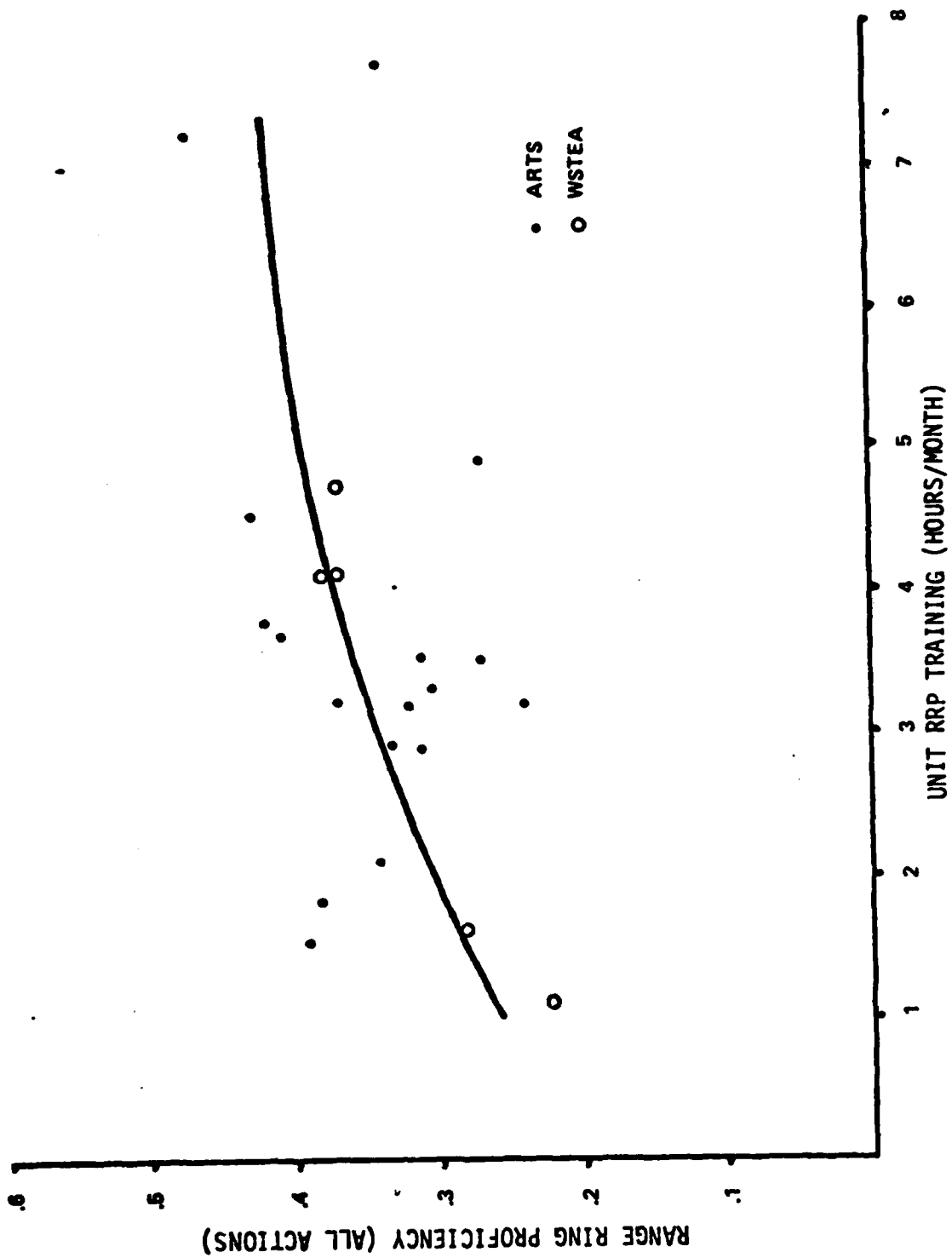


Figure 8-8. Unit RRP Training vs Proficiency.

this test which allows an analysis of what tasks present the most problems to the gunner. These tasks are listed below.

o Activate (AB)	o Elevate/Lead (SEL)
o Acquire (AT)	o Maintain Track (TTA)
o Uncage (UG)	o Fire (ST)
o Track (TT)	o Other (OT)

The proficiency in each task is listed in Table 8-15 for each of the units tested. The OT column represents a composite of errors (improper lead and launch boundary violations). The table provides a basis for unit comparison and indicates that the gunners have more difficulty in the AT and SEL tasks than any other single task. The time-out (TO) column indicates the percentage of times the gunners did not fire at the target within the 30-second life of the BCU.

(b) The MTS tracking proficiency (P_h) is listed in Table 8-16, for each Army, Marine, and Reserve (NG) unit tested. Their proficiency is also plotted as a function of training time per month in Figure 8-9.

(4) Test Discussion

(a) Comparative analysis between WSTE A and ARTS Q_4/Q_5 extracted data follows:

1. The age ranges of REDEYE gunners within the units both of WSTE A and ARTS were dominated by the 20-22 year age brackets. The Marine units in both WSTE A and ARTS appear to be on the average slightly younger than their Army counterparts, while the Reservists appear to be around the 30-year bracket.

2. The current lack of education appears nearly the same between the two studies as the predominance of gunners, both in Army and Marines, are high school graduates with approximately 18 percent having some college. The Reservists have what appears to be a gap in the area of high school graduates with higher percentages not high school graduates, and, again, a high percent with some college.

3. Preferred handedness was not documented in the WSTE A study. A high predominance of 16P gunners are right-handed, as indicated by ARTS data.

4. The wearing of eye glasses was not checked during WSTE A. A slightly larger percent of Marines wear eye glasses than their Army 16P counterparts.

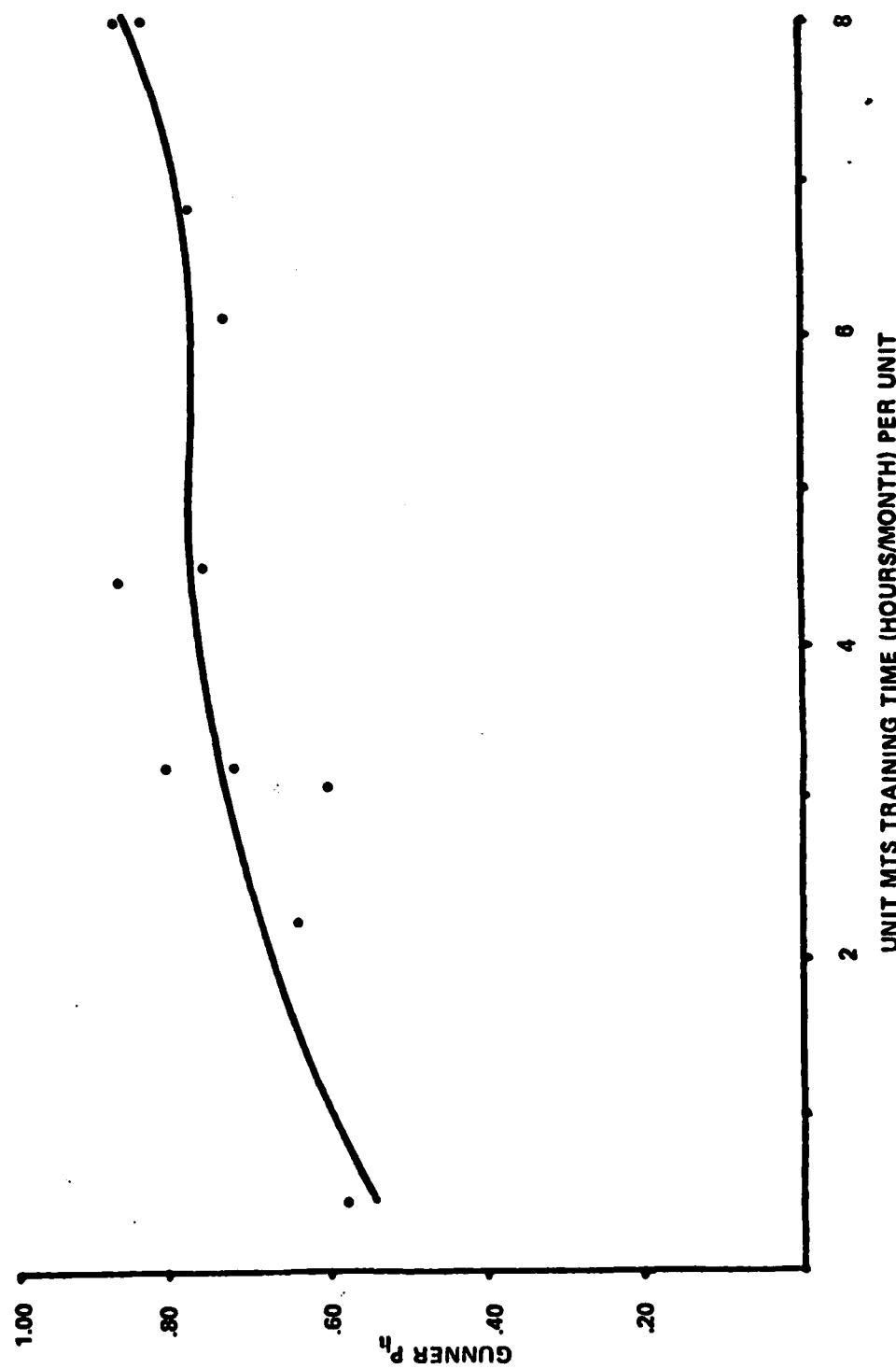


Figure 8-9. Unit MTS Training Time vs Gunner P_H

TABLE 8-15

UNIT TASK PROFICIENCY
MTS TRACKING HEAD TRAINER

<u>UNIT</u>	<u>AB</u>	<u>AT</u>	<u>UG</u>	<u>IT</u>	<u>SEL</u>	<u>ITA</u>	<u>ST</u>	<u>P_h</u>	<u>OT</u>	<u>TO</u>	<u>NO. OF GUNNERS</u>
1	.980	.973	.920	.987	.953	.933	.980	.73	.787	2.0	30
2	1.000	.931	.995	.993	.976	.981	.990	.87	.807	0.5	85
3	.989	.922	.987	.991	.956	.988	.998	.83	.800	6.0	116
4	.987	.918	.992	.998	.924	.989	.995	.80	.729	0.6	108
5	1.000	.919	.997	1.000	.996	.996	1.000	.84	.741	0.6	73
6	.976	.927	.970	.978	.927	.967	.980	.72	.811	2.4	99
7	.994	.916	.942	.948	.845	.981	.955	.58	.794	5.8	31
8	.981	.947	.987	.966	.960	.931	.984	.76	.807	5.0	64
9	1.000	.937	.997	.974	.968	.911	.991	.78	.765	0.6	70
11	.954	.857	1.000	.949	.966	.914	1.000	.64	.754	2.9	35

TABLE 8-15 (CONT)

<u>UNIT</u>	<u>AB</u>	<u>AT</u>	<u>UG</u>	<u>TI</u>	<u>SEL</u>	<u>ITA</u>	<u>ST</u>	<u>P_h</u>	<u>OT</u>	<u>TO</u>	<u>NO. OF GUNNERS</u>
12	.990	.888	.979	.971	.925	.867	.977	.60	.831	7.5	77
14	1.000	.867	.967	1.000	.967	.933	.933	.67	.933	3.3	6
15	1.000	.911	.978	1.000	.978	1.000	1.000	.87	.844	2.2	9
AV	.988	.920	.984	.983	.944	.954	.988	.76	.787	3.0	54
NG1	1.000	.900	1.000	.967	.933	.967	1.000	.77	.666	13.3	6
NG2	.962	.895	.962	.981	.924	.943	.952	.62	.848	4.8	21
AV	.970	.896	.970	.978	.926	.948	.963	.65	.807	6.7	27
M1	.985	.908	.977	.969	.962	.969	1.000	.77	.815	9.2	26

TABLE 8-16

MTS PROFICIENCY (P_h)UNIT PERFORMANCE

<u>TACTICAL ARMY UNIT</u>	<u>TRAINING HOURS/GUNNER/MONTH</u>	<u>PROFICIENCY (P_h)</u>
1	6.1	0.73
2	8.0	0.87
3	3.2	0.81
4	3.2	0.80
5	8.0	0.84
6	3.2	0.72
7	0.4	0.58
8	4.5	0.76
9	6.8	0.78
10	NA	NA
11	2.2	0.64
12	3.1	0.60
13	1.5	NA
14	NA	0.67
15	4.4	0.87
16	4.2	NA
17	0.9	NA

USMC TACTICAL UNITPROFICIENCY (P_h)

1	NA	0.77
2	NA	NA
3	NA	NA

RESERVE UNITPROFICIENCY (P_h)

1	7.5	0.77
2	NA	0.62
3		0.59

5. The 16P Army personnel when asked about their personal satisfaction with their job in the service tended to give a middle-of-the-road stand. The Marines were, in all cases, not satisfied with their jobs in the unit. In contrast, the Reservists were quite satisfied with their jobs.

6. Army personnel during WSTEa study indicated a stronger feeling that they worked together as a team than did the Army gunners in the ARTS. Marines in both studies indicated they thought they worked well as a team. Reservists had about the same feeling as Marines did on this subject.

7. The Army and Marine units in both studies indicated their sections produce average-to-fair quality work. The Reservists indicate their work is of a high quality.

8. The gunners' feelings toward their immediate supervisors willingness to accept responsibility as an average fell into the "neither agree nor disagree" category in both studies for both Army and Marines. The Reservists had a higher regard for their supervisors' acceptance of responsibility.

9. The likelihood of reenlistment at the end of current enlistment for Army personnel under the WSTEa was predominately zero percent. Under ARTS, a slightly higher chance of reenlistment. The USMC indicates virtually zero percent possibility of reenlistment in both studies. The Reservists indicated a high percent likelihood of reenlistment.

(b) Comparative analysis between WSTEa and ARTS Q7 (Unit Training) extracted data follows:

1. Initial REDEYE training was received in AIT by greater than 70 percent of the unit Army gunners interviewed in both studies. Approximately the same percent of Marine gunners received their training in AIT, but the remaining percentage received their training in a shadow school; no OJT was indicated to be used for Marine training.

2. Units' adherence to a training schedule for both Marine and Army in both studies appears to be only about 50 percent of the time.

3. A wide variation (5 to 8 times) of hours spent per month per man on RRP practice exists in both studies for all units, Army and Marine. A graphic display of the RRP proficiency versus training time is shown in Figure 8-8.

4. A variation in training time on the MTS for tactical units shown in hours/gunner/month is depicted below:

WSTEAM ARMY UNITS	-	0.88 to 9.27 hours/man/month
ARTS ARMY UNITS	-	0 to 8.00 hours/man/month
WSTEAM MARINE UNITS	-	0 to 0.12 hours/man/month
ARTS MARINE UNITS	-	0 to 0.95 hours/man/month

A comparison was made of the ARTS training time among Army units tested both in the WSTEAM and ARTS studies. The normalized averages are:

ARTS	-	4.53 hours/month
WSTEAM	-	4.34 hours/month

Army units appear to be getting only a slight increase in MTS training. However, the overall unit P_h values for WSTEAM and ARTS are:

* WSTEAM P_h - 0.71

* ARTS P_h - 0.77

5. The percent of time in the field spent on non-REDEYE related tasks is indicated to be evenly spread over all Army units from less than 25 to 10 percent of the time. The Marine contingency indicates less time on non-related tasks while in the field than the Army.

6. Gunner personal opinion as to whether he really thinks he could fire a tactical round under battle conditions varied for Army personnel from yes to uncertainty. For the Marines a predominant yes was in evidence.

7. A breakout of all units combined regarding 16P SM skill levels presently completed:

LEVEL 1	30%
LEVEL 2	30%
LEVEL 3	15%
NONE	25%

No notable trends resulted from comparing OCONUS and CONUS units.

^aNormalized to compensate for class size

8. The SQT tasks which gave 16P personnel the most difficulty by levels are:

LEVEL 1	RRP
LEVEL 2	Reconnaissance Tasks
LEVEL 3	Fairly even distribution of difficulty for all three tasks

9. Amount of time each 16P spends studying his SM - 33 percent indicate none; 55 percent spent from 1-4 hours/month and about 12 percent indicating more than 4 hours/month.

10. During a battalion ARTEP, what part of this time is the gunner actively engaged in AD activities? Army personnel answers to this were evenly distributed from 100 percent down to 5 percent with about 18 percent who have not yet participated in an ARTEP.

11. The time during an ARTEP which is not devoted to AD duties for the greater part is devoted to non-MOS related tasks.

(c) A comparative analysis was made between Q8 questionnaire data and companion questions asked of the gunners regarding unit training. No disparities between the responses were in evidence.

(5) Significant Problems

(a) During the Army Training Study, the work teams visited every active division in the world that utilizes REDEYE. The analyses of these divisions has shown numerous problems that are common to all REDEYE units and sections. In some locations the problems were so severe that the ARTS work team judged REDEYE to be not combat effective. In these cases, it was not always because proficiency was low, but because of the gunner's attitude, and more importantly, the Battalion Commander's attitude towards REDEYE. These problems are discussed in the following paragraphs and their solution reflected in the Conclusions and Recommendations sections.

1. Moving Target Simulators do not have TDAs and are not directly funded. While all MTS personnel were conscientious towards their duties, the means by which the MTSs were supported requires improvement.

a. In some cases MTS military personnel had no previous experience in REDEYE, and therefore, were not qualified as instructors.

b. Cases have been found where funding is not supplied to support the MTS facility. Rather, it is attached to a Chaparral/Vulcan battalion who must support it out of existing funding.

c. At one location, it had not been determined who should sign for the MTS, therefore, no supply account could be established and no supply requisitions processed.

d. Maintenance equipment was lacking at one location, therefore, the civilian technician spent his own money, estimated at \$5,000, to obtain test equipment.

e. In Germany, the Finthen MTS has three NCOs and a full time civilian technician; the Schwabach MTS has two NCOs and a full-time civilian technician, while the Vilseck MTS has one civilian. He is responsible for scheduling, operations, maintenance, and janitorial services. This civilian is also responsible for the other two MTS facilities and must visit them on a scheduled basis. When this occurs, or when he is on vacation, or sick, the MTS at Vilseck must be shut down due to the lack of any qualified personnel to operate the facility. This underscores the fact that a standard MTS TDA must be developed.

2. Additional MTS facilities are required and, in particular, in Europe. While three MTS facilities are available in Germany, only two actually support gunners to any degree. Due to the lack of MTS facilities in Europe, some gunners receive MTS training once every six months. Once per month is considered the minimum training frequency. The three are located at the following points. The V Corps MTS is located at Finthen Airfield about 10 KM south of Mainz. The VII Corps MTS is located at O'Brien Barracks in the town of Schwabach which is about 15 KM southwest of Nürnberg. The 7th ATC MTS is located outside the town of Vilseck which is about 20 KM southwest of Grafenwöhr. The ARTS work team found the three MTS facilities in Germany in excellent condition and operated by highly competent personnel. These three facilities must support all European-assigned gunners. The Finthen and Schwabach MTS facilities, since they are assigned to the V and VII Corps, are very effectively utilized. The Vilseck MTS is assigned to the 7th ATC which is a support command and does not, therefore, have assigned combat troops. Therefore, the only gunners that utilize this MTS are those that happen to be at Grafenwöhr with their assigned battalions for training exercises. In actuality, what happens is that those gunners who go down to Grafenwöhr with their battalions for training exercises are used as road guides, drivers, ammunition haulers, etc., and do not have time to train in the MTS. Because of this, the MTS at Vilseck is not as effectively utilized as those at Finthen and Schwabach. It should be made clear that this is not a reflection on the personnel that operate the MTS facilities. The utilization of the Vilseck MTS is purely

voluntary and most divisions would rather use their REDEYE gunners for other purposes. The utilization of the Vilseck MTS should be increased or it should be moved to a more advantageous location.

3. The M49 Tracking Head Trainer (THT) is the REDEYE section's primary training device and is utilized within the MTS to score gunner proficiency. They are fragile and easily "knocked out" of alignment. They are serviced by Ordnance facilities located at Wiesbaden and Nürnberg. Each section is supplied with one THT for training. If they become inoperable, they must be transported under guard, since they are CONFIDENTIAL, to the appropriate Ordnance facility. Once in the hands of repair personnel they are relatively simple to repair, usually requiring no more than 15 minutes to an hour. The problem: it is difficult, if not impossible, for the REDEYE section chief (usually an E5) to get a truck and guard for THT transportation to the repair facility. Therefore, he must ship the THT through post shipping and receiving facilities which takes from three to nine months for the round trip. Rather than be without the THT for this period of time, the section will train on a faulty or non-working THT. At one location visited by the ARTS team, eight of the ten THTs that the REDEYE sections brought in were faulty. In this particular case, the Ordnance repair facility was located nearby, and a team was dispatched to repair the THTs. All eight were repaired within an hour. The solution to this problem is threefold:

- a. Train the MTS technicians to repair the THTs at the MTS and assign to him the necessary equipment.
- b. Schedule the THT repair personnel into each division location on a regular basis to repair THTs.
- c. Supply Ordnance repair facilities with additional THTs to be exchanged for those from the units that cannot be easily or quickly repaired.

4. REDEYE personnel complain that they are routinely deprived of their equipment, thus, degrading or even preventing effective training. Vehicles, trailers, radios, slide projectors, and television trainers are routinely borrowed, and, in some cases, permanently. REDEYE personnel appear to receive an inordinate amount of extra details. As an example: One armor battalion undergoing tank gunnery at Grafenwöhr did not send its teams to the Vilseck MTS for evaluation during the ARTS visit. When asked why, the answer was that they were needed as road guides. This would have been the only opportunity in six months for these teams to train at an MTS. These type conditions have a serious effect upon the morale of REDEYE personnel. They usually feel not needed, are not used, and are not understood or accepted as part of their units. Two specific comments from REDEYE gunners, attributed to their superiors, exemplify the

general attitude found in many REDEYE units. From Armor: "That thing doesn't kill tanks, does it? Then, I'm not interested in it." From Artillery: "My primary mission is artillery, and since I can't fire for effect with REDEYE, my training will be in artillery." This attitude appears to be the crux of the entire REDEYE problem. The REDEYE mission and training requirements are not understood or appreciated. These supervisors do not understand the vulnerability of their units to air attack and the fact that REDEYE can assist in defending their positions.

5. As part of the ARTS evaluation, the teams requested that REDEYE sections/teams bring copies of their unit training schedules. The purpose for this request was to determine unit training costs. Of forty-nine sections represented at one location only six were able to provide training schedules. The reasons stated were either, "Not available," or "Non-existent." Many section chiefs simply stated: "What training schedules? There aren't any." The lack of training within units was further indicated in response to one of the survey questions concerning the worst feature of REDEYE training. Typical responses were, "What training?", or "Not enough." Two conclusions were drawn from this. (1) REDEYE personnel wanted to train. (2) They are not getting adequate training. Similarly, REDEYE NCOs, in general, are dedicated and anxious to train, but the "system" defeats them. The lack of a commissioned officer in their units impairs the ability of REDEYE personnel to communicate with their units.

6. Most of the problems described herein can be easily fixed. Until they are, the REDEYE gunner's attitude and morale will remain poor.

d. Live Firing

(1) Army

(a) The live firings evaluated during this study are divided into two categories. The first is the single live round fired at the conclusion of AIT and is intended to demonstrate the weapon capability to the entire class. The second group consists of the active division annual service practice (ASP) firings. Each REDEYE section is authorized to fire one REDEYE per year to maintain their proficiency. It is noted here that while the top student from each AIT class fires a live REDEYE and one gunner from each REDEYE section around the world fires a round each year, the AIT instructors are not authorized to fire a live round. This places the instructor at a disadvantage when he coaches the AIT student in the firing exercise as he has not personally fired a live round. The instructor cannot relate "From firsthand experience" what to expect from firing a round and, therefore, cannot fully instruct the students in this most important phase of training. Live firing exercises form the most important part of the gunner's training, both in the unit and institution, as is evidenced

by the responses to the RELS questionnaire. As one gunner commented, "Live firings puts it all together." A summary of the live firing exercise is shown in Appendix XI.

(b) The results of the live firings conducted by AIT classes 3-78 through 25-78, National Guard classes 9-78 through 17-78 and ASP firings conducted at Fort Polk, Fort Bliss, Fort Lewis, Fort Hood, and Fort Carson between March and July 1978 were included in this study. The success rate for the 71 rounds fired, less 11 weapon malfunctions, was 96.7 percent. The success rate with the weapon malfunctions included was 81.7 percent. The records did not include the times the gunners failed to fire because of failure to acquire, loss of track, improper superelevation or lead, etc. Also, not included were rounds determined to be bad prior to launch (i.e., no gyro spin UP, loss of IR, bad BCU) by the AIT instructor/coach.

(2) Marine

(a) The live firings conducted by the Marine Corps (Classes 4-, 5-, 6-, 7-78) at McGregor Range, Fort Bliss, Texas, were included in this study. Also, one Marine instructor qualification firing was considered. Each Marine trainee is required to fire a live round in order to qualify as a REDEYE gunner and each gunner is also required to fire one round per year to maintain his qualification as a gunner. Each Marine AIT instructor is also required to fire one live round per year to maintain his qualification as a REDEYE gunner. A summary of these firings is shown in Appendix XI.

(b) The success rate for the 22 rounds fired, less 2 weapon malfunctions, was 100 percent. The success rate with the weapon malfunction included was 90.9 percent. As indicated above, paragraph 1b, these scores do not include gunner or prelaunch weapon errors.

(3) RELS - The REDEYE Launch Simulator (RELS) is a Marine Corps training device which simulates faithfully the firing of a REDEYE missile from the launch tube. The RELS does not contain a sustainer motor or any other explosive except the REDEYE Eject Motor and travels only 100 to 300 feet down range. A more detailed discussion of the RELS can be found in Appendix VI.

(a) The Army purchased 45 RELS from the Marine Corps for evaluation and possible use as an Army training aid. The RELS were fired by both AIT gunners and by REDEYE gunners conducting ASP firings. The study team made every effort to insure that the gunner, AIT or in the unit, selected to fire the live round also fired one RELS prior to the live

REDEYE firing. Each gunner was given a questionnaire after the firings in order to determine the effectiveness of the RELS as a training device. In addition to the 45 RELS fired by Army personnel, 21 RELS were fired by Marines at Fort Bliss upon completion of their training. The questionnaires were given Marine gunners. A summary of the RELS firings conducted in support of this study is shown in Appendix XI. The results of the RELS firings showed a 100 percent success in firing the 66 RELS.

(b) The questionnaire for the RELS evaluation was developed by the study team and is shown along with the number of responses to each statement obtained from the gunners interviewed during this evaluation.

REDEYE LAUNCH SIMULATOR (RELS) QUESTIONNAIRE

	<u>ARMY UNIT</u>	<u>ARMY AIT</u>	<u>MARINE AIT</u>	<u>RES AT</u>
1. Have you ever fired a live REDEYE round prior to today?				
YES	11.1%	0	0	20%
NO	88.9%	100%	100%	80%
2. Prior to today's firing, did you think a RELS firing would be helpful to you				
YES	61.1%	73.7%	95.2%	20%
NOT SURE	22.2%	10.5%	4.8%	40%
NO	5.6%	0	0	0
No opinion, as I had never heard of RELS	11.1%	15.8%	0	20%
3. Prior to today I thought RELS would be helpful by simulating the blast, smoke, and weight change of a REDEYE.				
YES	100%	94.4%	90.5%	100%
NO	0	5.6%	9.5%	0

	<u>ARMY UNIT</u>	<u>ARMY AIT</u>	<u>MARINE AIT</u>	<u>RES AT</u>
4. Prior to today I thought RELS would be helpful by reducing worry or concern about firing a live REDEYE round.				
YES	88.9%	88.9%	100%	100%
NO	11.1%	11.1%	0	0
5. How did you feel during the time period after firing RELS, but before firing a live round?				
Firing the RELS made me less apprehensive toward firing a live round.	72.2%	63.2%	57.1%	60%
Made no difference: I was just as nervous firing the live round as I would have been if I had never seen a RELS.	16.7%	21.1%	4.8%	20%
Made no difference: I was not nervous firing either RELS or live round	11.1%	15.7%	38.1%	20%
6. I think that firing a RELS served to:				
Reduce fear or concern about firing weapons.	66.6%	57.9%	23.8%	60%
Build confidence in REDEYE	16.7%	42.1%	76.2%	20%
Give a feel for what to expect in combat	16.7%	0	0	20%

6. (continued)	<u>ARMY UNIT</u>	<u>ARMY AIT</u>	<u>MARINE AIT</u>	<u>RES AT</u>
Do nothing; it is not realistic enough.	0	0	0	
Add nothing to my ability as a REDEYE gunner.	0	0	0	
7. After firing a RELS and a live REDEYE round, in my opinion, firing a REDEYE live round in preparation for combat is:				
Very important	82.3%	84.2%	90.0%	60.0%
Important	17.3%	15.8%	10.0%	40.0%
Neither important nor unimportant	0	0	0	0
Unimportant	0	0	0	0
8. After firing a RELS and a live REDEYE round, in my opinion, firing a RELS in preparation for combat is:				
Very important	64.7%	47.4%	47.6%	40.0%
Important	29.4%	47.4%	47.6%	20.0%
Neither important nor unimportant	0	5.2%	0	40.0%
Unimportant	5.9%	0	4.8%	0
Very important	0	0	0	0
9. In your opinion, did the RELS accurately simulate a REDEYE round firing?				
YES	88.2%	84.2%	100%	100%
NO	11.8%	15.8%	0	0

	<u>ARMY UNIT</u>	<u>ARMY AIT</u>	<u>MARINE AIT</u>	<u>RES AT</u>
10. If your answer to question #9 was "NO," what was unrealistic about firing a RELS?				
Blast	11.1%	0	0	0
Weight Change	0	5.3%	0	0
Noise	0	0	0	0
Tracking	0	10.6%	0	0
11. If you had not fired a REDEYE, do you think that you would have benefited as much from firing the RELS only?				
YES	47.1%	63.2%	19.0%	
NO	52.9%	36.8%	81.0%	
12. Results of your live firing were:				
Direct hit	35.3%	47.4%	42.9%	80%
Tactical kill	35.3%	36.8%	52.4%	20%
Weapon fired, but did not obtain a lock on target	29.4%	10.5%	4.7%	0
Weapon did not fire (hang fire)	0	5.3%	0	0
I did not pull the firing trigger	0	0	0	0

(c) The 1st Training Brigade, which is responsible for AIT REDEYE training, was asked to prepare a report discussing the use of RELS as a training aid from the instructor's experience gained during the time the device was tested. The following comments were received for inclusion in this study.

The REDEYE Launch Simulator has increased the skills of the REDEYE gunner (AIT) as attested by sixteen REDEYE instructors assigned to B Battery, 4th Training Battalion, 1st Training Brigade, Fort Bliss, Texas.

The RELS would provide an eject only training device to allow each REDEYE gunner the experience of firing a shoulder-held weapon, provide the REDEYE gunner the opportunity to engage a live tactical aircraft and increase the scope of our REDEYE training program.

The acoustic and shock levels, weight and balance, and handling characteristics are identical to REDEYE through the launch eject phase.

This includes BCU activation, time delay, noise, recoil, weight center of gravity, and weight loss during egress.

The use of RELS has decreased the apprehension of the REDEYE gunner and added confidence in his ability to execute with the live REDEYE missile.

e. Live Tracking

(1) Following completion of training in the MTS, students are trained in the field to track live aircraft with the THT. The high performance jet aircraft (A7 Corsair) are provided for tracking by the New Mexico Air National Guard, Kirtland AFB, New Mexico. Helicopter target aircraft are provided locally. It is planned that the helicopter be used for the first target and that the A7 Corsair arrive at intervals of one hour following. About 45 minutes of on-station time is provided by each aircraft and approximately 20 sorties conducted with each.

(2) The Army trainees alternate between Chaparral and REDEYE during the live tracking exercise. The Marines devote all the target time for REDEYE and include their firing of the RELS while tracking the A7, as did the Army AIT trainees. No scoring of the live tracking exercises was conducted due to time limitations, expense, and training restrictions.

(3) No attempt was made to evaluate live aircraft tracking in unit during this study due to time and cost limitations. Section chiefs and training NCO's interviewed stated that live aircraft tracking was coordinated with neighboring USAF and Navy airbases and it was determined that an average of only 1 1/2 hours per month was spent conducting live tracking exercises.

f. Summary of Test Results

(1) AIT

(a) Student gunners tested during the ARTS achieved a slightly higher proficiency in the MTS than those tested under the WSTEА. However, they scored significantly lower in their proficiency on the RRP.

(b) A majority of the REDEYE gunners trained during ARTS were in AFQT mental Cat III but over 30 percent were in Cat IV. The average of the AFQT scores for all of the ARTS students was 37.3 which was 9.6 points below the average of those tested for the WSTEА.

(c) Comparison of the student responses to the Q₁/Q₂ questionnaire during ARTS indicated no significant change from the responses obtained during the WSTEА.

(2) For a comparative analysis, Table 8-17 shows some of the results obtained from the 5 units which were tested both for the WSTEА and ARTS. Due to personnel turbulence, there may have been changes in training philosophy and methods which could not be quantified. However, it appeared there was a direct relationship between the changes in Training Time and the changes in MTS and RRP proficiencies. The changes were especially apparent in the cases of Units 1 and 5. Unit 1 scored the lowest in both MTS P_h and RRP during the WSTEА, but recorded significant increases in both during the ARTS. This was attributed to significant increases in training time in both areas. Conversely, Unit 5 scored high in both MTS P_h and the RRP initially, but recorded lower scores during the ARTS. The lower scores also correspond to reduced time reported for training. No major changes were observed in either allocated training time or proficiencies for the remaining units.

(3) REDEYE Gunner AFQT and Aptitude Area Distribution. During the conduct of the Army Training Study, it was necessary to gather various test scores achieved by the gunners upon enlistment into the Army. These scores were related to performance and were utilized in an effort to identify the prerequisites of a proficient REDEYE gunner. As other studies have shown, current male enlistees have an AFQT score in the range

AND ARTS VS. TRAINING TIME

*AV

of categories IIIB to IVA. The AFQT and 3 of the aptitude area test scores were utilized by the ARTS group and anomalies were noted in the distribution of scores for the approximately 1200 gunners tested. AFQT is derived from the Armed Services* Vocational Aptitude Battery (ASVAB) and is the sum of their aptitude in Word Knowledge, Arithmetic Reasoning and Space Perception.

$$AFQT = WK + AR + SP$$

AFQT is the prime score utilized to determine if someone is eligible for enlistment. In addition, scores in other aptitude areas such as Operator and Food (OF), Field Artillery (FA) or others must be 90 or higher to qualify for a specific MOS or career field. For example an enlistee must achieve an OF score of 90 or higher to qualify for 16P training. The range of AFQT scores and the categories are as shown in Table 8-4.

(b) GT is also derived from the ASVAB and is defined as:

$$GT = WK + AR + \text{Constant}$$

It will be noted that GT is identical with AFQT with the exception of Space Perception and the constant. The GT score is not utilized as an enlistment criteria.

(c) In order to be eligible for enlistment, AFQT scores must equal or exceed the following values.

High School Graduate	16 (IVB minimum)
Age 18	31 (IIIB minimum)
Age 17	50 (IIIA minimum)
Prior Service	31 (IIIB minimum)

Observing Figure 8-10, it is apparent that there is a disproportionate number of gunners (out of 1215) appearing at these scores. There is also a disproportionate number of gunners missing to the left of these scores. In addition a large number of gunners appear at 21 and 65 which are the minimum scores for categories IVA and II respectively. The peaks at 33, 56 and 80 are unexplained at this time but may be due to the limited sample size. The dashed line represents the distribution that might be expected for this type of variable. Since, as pointed out earlier, AFQT and GT are similar it would be expected that the distributions would be the same or at least similar. Observing Figure 8-11,

*See Appendix X for a detailed discussion of ASVAB.

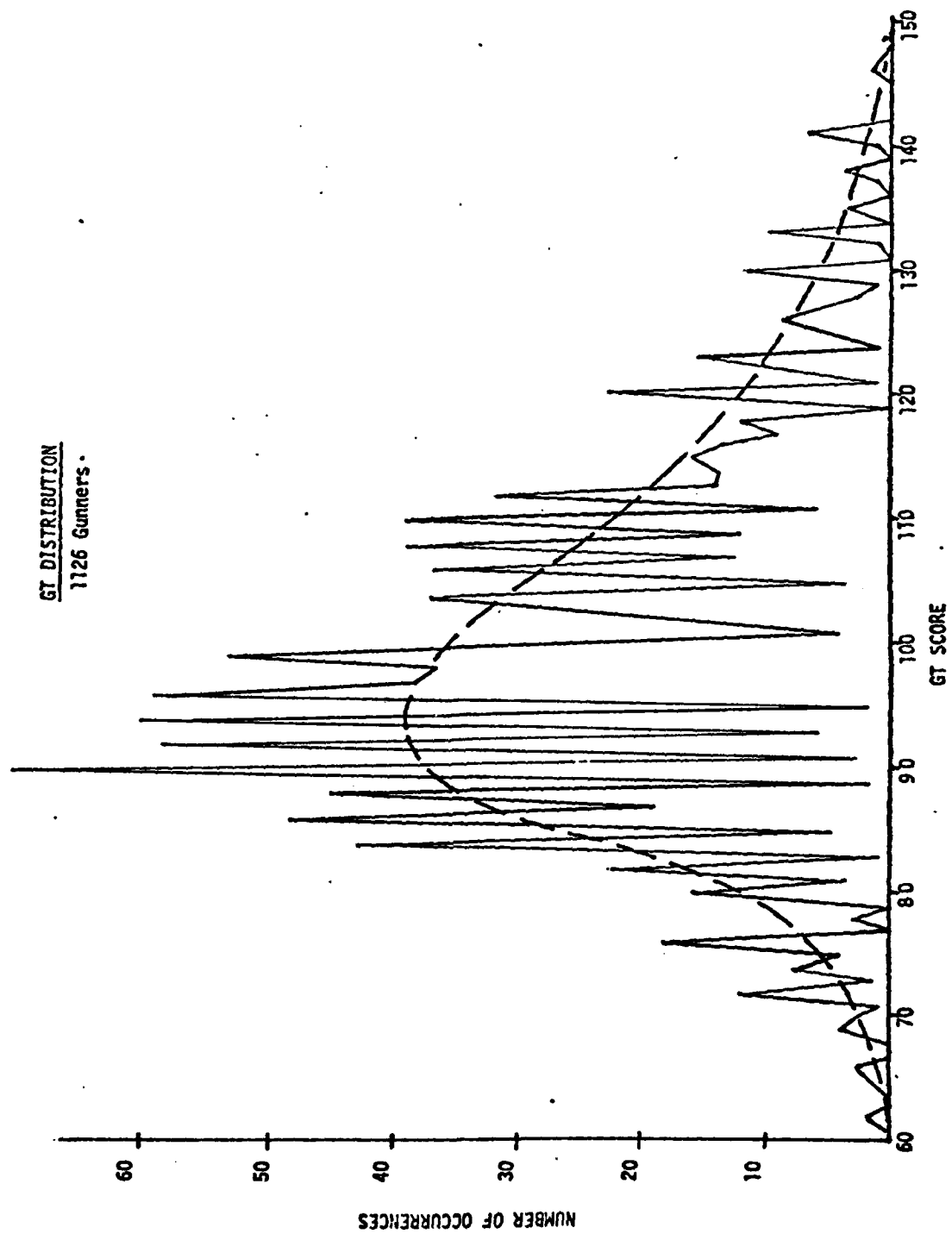


Figure 8-11. General Technical (GT) Score Distribution

which is a distribution plot of the same gunners, it can be seen that they differ and that the GT distribution more closely fits the expected normal distribution. Two points in GT are noted as disproportionate and these are the scores of 88 and 90. The number of gunners achieving scores of 90 is too large and the number achieving 88 is too small. Some of the peaks observed can be attributed to the method of scoring. Due to these methods it is impossible to achieve certain scores. This would cause some scores to "bunch" or be grouped together which could cause disproportionate numbers at various points. It is not expected, however, that these would always appear at the points which correspond to minimum score requirements.

(d) OF and FA distributions for the same gunners are displayed in Figures 8-12 and 8-13 and as GT do not show disproportionate levels. The OF scores below 90 are not displayed since that is the minimum for REDEYE qualification.

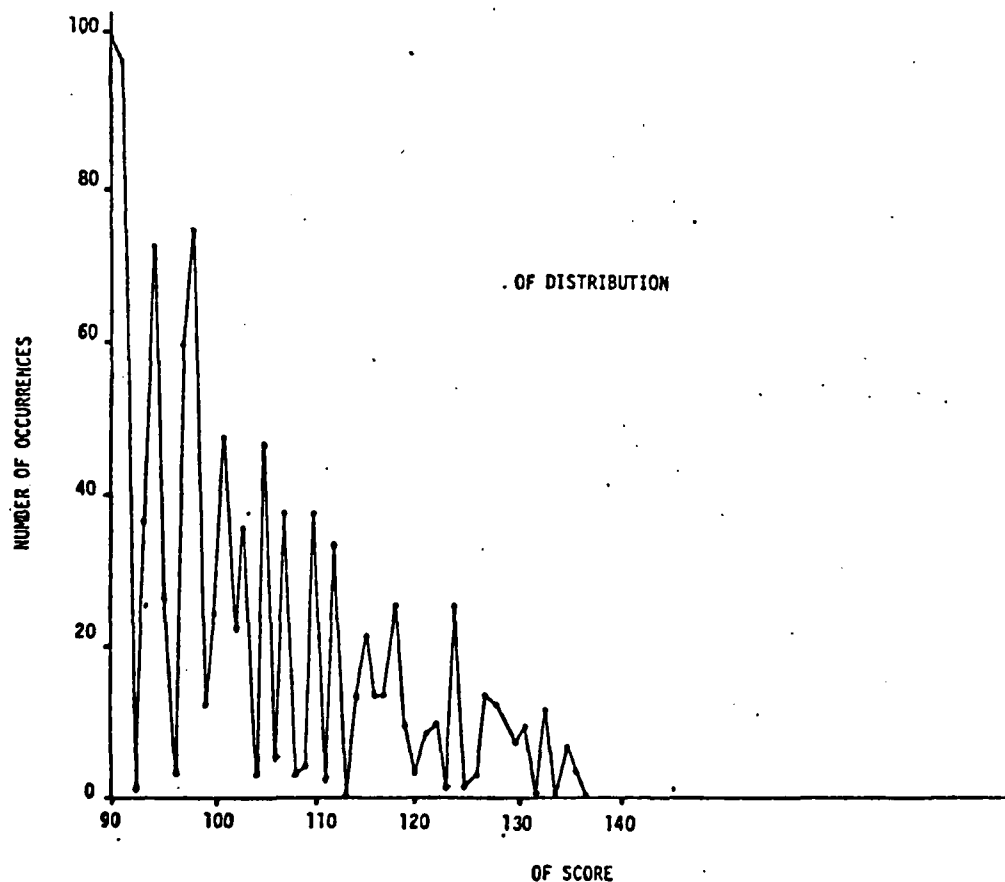


Figure 8-12. Operator and Food (OF) Score Distribution

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ARMY TRAINING STUDY: TRAINING EFFECTIVENESS ANALYSIS
(TEA) SUMMARY VOLUME. (U) ARMY TRAINING AND DOCTRINE
COMMAND FORT MONROE VA F J BROWN 00 AUG 70

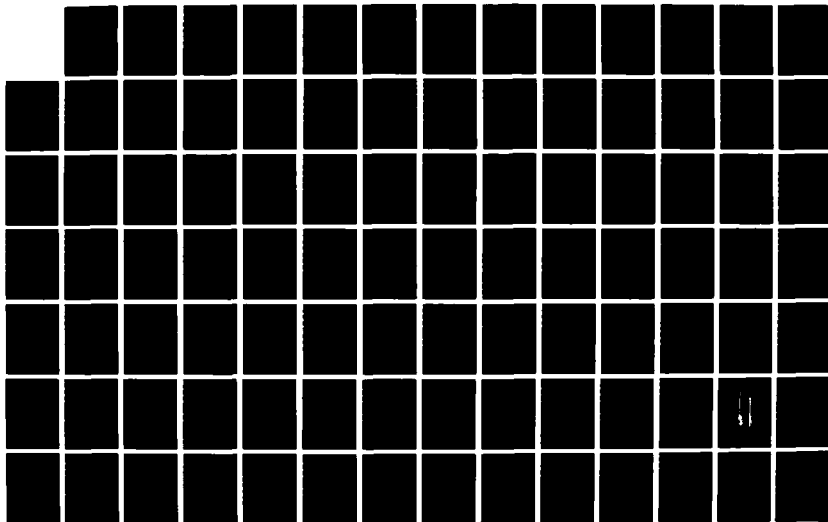
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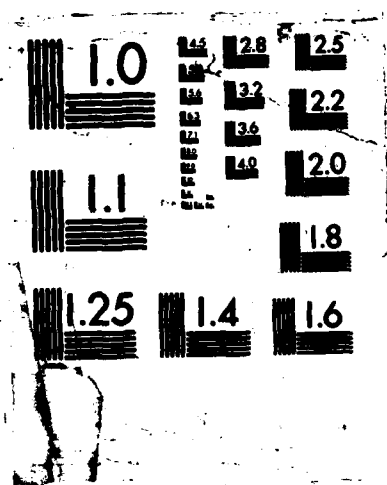
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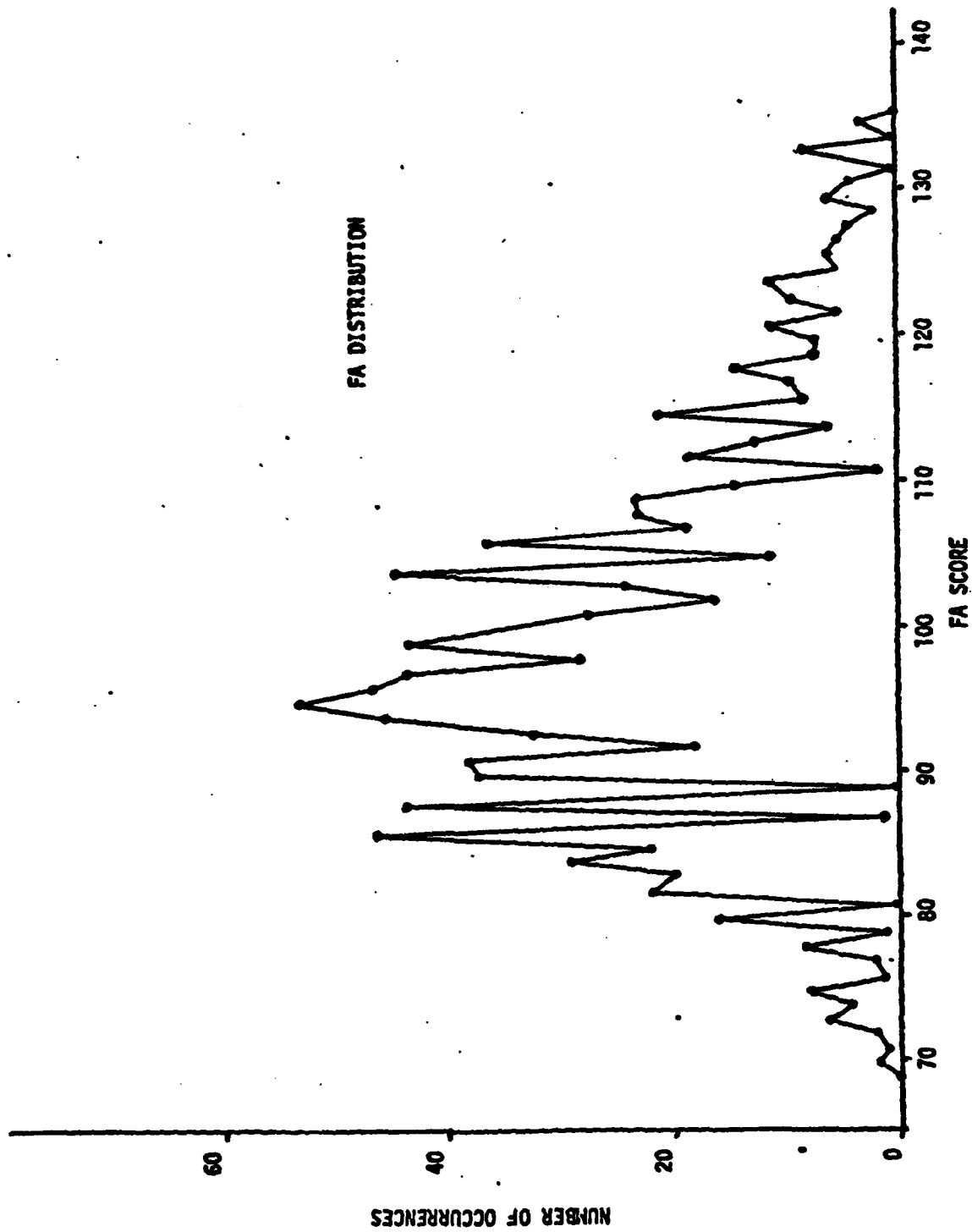


Figure 8-13. Field Artillery (FA) Score Distribution

g. Interoperability. German Army Utilization of REDEYE.

(1) Source of Information. On 8 June 1978, SGM Witting of the German Army Liaison Office was contacted for information on the German Army basic training and selection of REDEYE gunners, training, and the field Army utilization of REDEYE for the defense of maneuver units. SGM Witting had extensive experience with the REDEYE System and REDEYE training and had invented a method of training REDEYE gunners in tracking aircraft and progressing through the mechanical steps of launching a REDEYE. This training equipment is discussed in paragraph (3).

(2) Basic Training and Selection of REDEYE Gunners. Basic German Army draftees are separated according to their ability and aptitude. Of these, the most qualified are assigned to Air Defense. After they arrive in their Air Defense unit, they are further screened by their leaders, and the best of these are trained as REDEYE gunners. Their basic training consists of about 100 hours, of which a high percentage is VACR. Due to the quality of their gunners, they do not experience the problems with range ring memorization that the US Army does. This fact corroborates the ARTS findings that the range ring profile can be more effectively retained by the more intelligent gunners. The German gunners do not fire a live REDEYE during basic training.

(3) Unit Training. Emphasis is placed on unit training and, in particular, VACR. Training requirements are established at four hours per week and 30 minutes of live tracking with the THT per month. The US Army supplies one THT per US REDEYE section (about 10-12 gunners), and the German Army about the same. As with the US Army, the THTs receive a large amount of use and are continually in need of maintenance. The German Army does not have Moving Target Simulators and does not utilize the US Army MTs in Germany. In the units the gunners utilize the invention of SGM Witting to perform tracking exercises with model aircraft. (See Figure 8-14.) The aircraft, with an IR source, can be replaced to simulate all types of threat aircraft. With the exception of the batteries, there is no power required to operate the simulator. The velocity of the model can be varied and adjusted to desired velocities by turning the crank at prescribed rates. When the aircraft reaches the end of its travel, it automatically rotates 180° for the return trip. The simulator requires little storage space and takes about 15 minutes to set up. If electrical power is available, a motor can be used in place of the manual crank. The cost in 1973 was about \$150 per unit. This would make an excellent, cost-effective trainer for the Reserves.

(4) Field Army Utilization of REDEYE. The REDEYE gunners are under

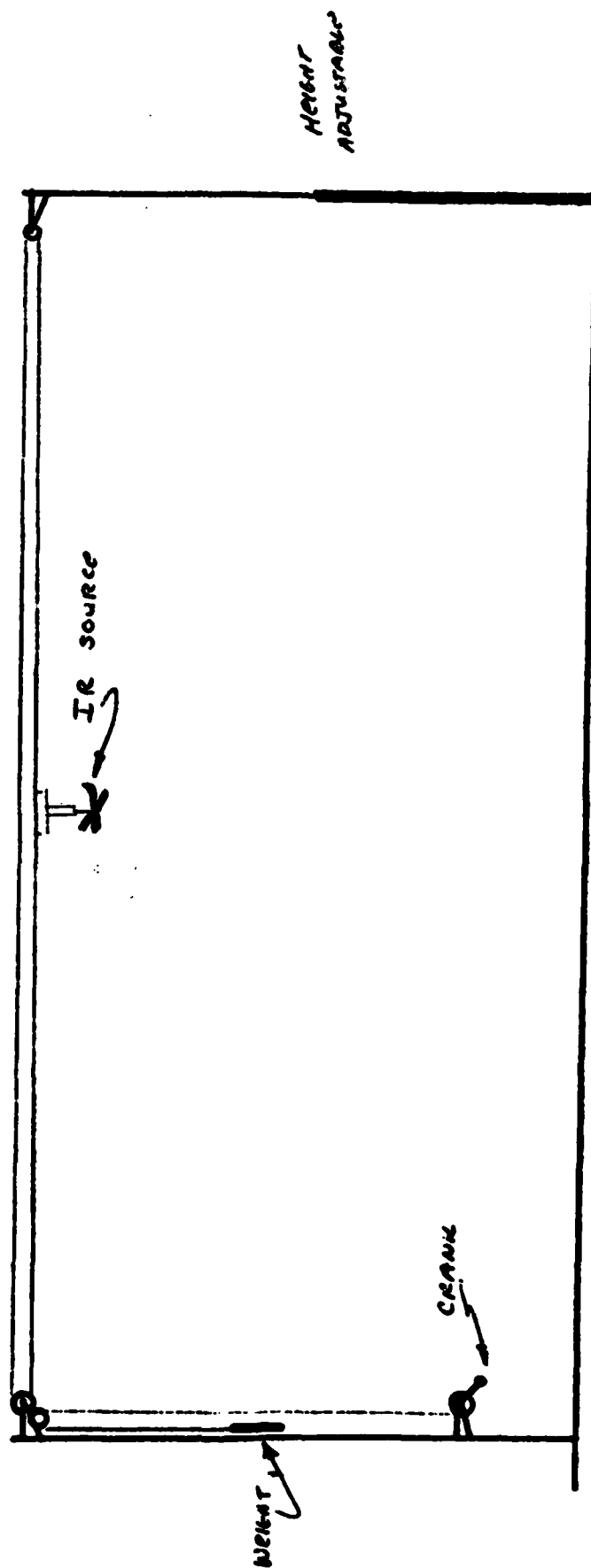


Figure 8-14. German Army REDEYE Tracking Trainer (Simplified Drawing)

the control of the Air Defense Command and are not integrated into the various divisions as in the US Army. One reason for this is that the maneuver units, such as armor, do not have communication equipment to relay Air Defense status (i.e., weapons tight, weapons hold, weapons free). If, for example, an armor unit requires Air Defense, it requests such, and it is supplied by the Air Defense Command to the extent requested and available. The Air Defense unit is still, however, under the operational control of the Air Defense Command. More consistent and better training is assured this way and more closely approaches the US Army DIVADA concept.

h. Essential Elements of Analysis (EEA)

(1) The EEAs concerning training to proficiency with findings are as follows:

(a) EEA 1. How were current SM and ARTEP tasks developed?

1. The current Soldier's Manual for the Short Range Air Defense Artillery Missile Crewman, FM 44-16P, contains the individual task list which identifies critical tasks for a REDEYE gunner. A critical task must meet three requirements: (1) critical to man's survival; (2) critical to the success of the team, section, or platoon; and (3) must be a task that a high percentage of the MOS are capable of performing. The conditions under which the tasks are to be performed, the equipment to be used, the skills and knowledge required, and the standard reference for each task are also delineated. The tasks are reviewed periodically; however, the REDEYE tasks have remained essentially the same as originally developed.

2. The ARTEP requirements for unit training are based on the mission of the combat unit. ARTEP is designed to provide guidance for training and evaluating all elements of a unit from the squad/crew to the battalion task force level. The REDEYE section and team requirements are essentially the same under each type unit except for the differences related to mobility and number of teams assigned. The problems, such as those imposed by terrain and weather conditions, are combined during the evaluation of the ARTEP. The basic REDEYE ARTEP module used for the various units has been used since ARTEP was approved in 1975, and no major changes are anticipated until a change in firing doctrine is implemented.

(b) EEA 2. How well does proficiency on 16P SM tasks measure a REDEYE gunner's ability to fight his weapon or perform his specific duty?

1. There are six tasks delineated in the SM for REDEYE gunners:

Task 1056 Occupy REDEYE position

- Task 1057 Engage hostile aircraft with REDEYE
- Task 1058 Perform immediate actions on REDEYE
- Task 1059 Perform preventive maintenance checks and services on REDEYE
- Task 1060 Destroy REDEYE
- Task 1061 Determine aircraft category for REDEYE ranging

All of the tasks relate to gunner proficiency in weapon handling. The SM does not include a task related to the "Rules of Engagement" which are critical and unique for each area of operation. Lack of this knowledge not only would reduce the gunner's effectiveness, but would make him a threat to friendly aircraft.

2. Task 1056 is to be tested in the field under the supervision of the unit as a part of the ARTEP. The skills and knowledge required for setting up in an assigned position include taking maximum advantage of the terrain, camouflage of the equipment and gunner position, and establishing communications. This task is critical for gunner survivability.

3. Task 1057, engagement of hostile aircraft; Task 1058, perform immediate actions on REDEYE; Task 1060, destruction of REDEYE; and Task 1061, determination of aircraft category, all relate to handling the weapon system in a tactical environment. The skills and knowledge listed are essentially the procedure for use of the weapon from removal of the covers through acquisition, tracking, and firing at a target within the launch boundaries. Gunners were tested on their proficiency in Tasks 1057 and 1061 as a part of the ARTS. The gunner's ability in these tasks is considered the most important of the SM tasks for combat effectiveness. The success of the engagement depends primarily on the individual gunner, and secondarily, on the team chief to aid in target detection and identification. The task must also be performed within a critical time constraint when engaging a high performance target aircraft or when the terrain masks portions of the target flight of lower performance aircraft. The remainder of the tasks are not time-critical and can be performed with assistance of other personnel. Therefore, it is considered that proficiency in Tasks 1056, 1057, and 1061 provide a measure of the REDEYE gunner's ability to "fight his weapon" and survive.

(c) EEA 3. How well does proficiency on the ARTEP tasks measure the collective abilities to fight weapons systems or perform the unit's assigned mission?

1. The REDEYE module used for the various combined arms unit exercises specifies the general conditions for a REDEYE team/section to provide Air Defense support for the elements within a test area. Two of the three requirements are usually evaluated in the field, and the third in a classroom.

2. The requirements to select and occupy a position and to effectively engage hostile aircraft are graded by the umpires in the field. The selected position for the first requirement must provide all-around defense to the task force, facilitate the earliest possible engagement of the target aircraft, and provide mutual support to adjacent teams. Considerations for the terrain are included in order to provide all-around observation and routes for access and egress. Each team is also required to occupy a primary position within 30 minutes and select an alternate position to take maximum advantage of cover and concealment dependent on the mission of the battalion. Each team leader/gunner must successfully engage two of the three targets, or all three targets dependent upon ARTEP level, to satisfy the second requirement. These engagements are not necessarily conducted at the positions occupied. Usually, they are conducted at a location which will accommodate all gunners from the section with THTs and so each umpire can evaluate several gunners concurrently. Either high performance aircraft or model aircraft may be used in the field or the MTS may be used to test the gunner's ability to engage targets.

3. The third requirement for visual aircraft recognition is always tested in the classroom. The Ground Observer Aircraft Recognition (GOAR) kit is used in which slides of aircraft are shown. The team leaders/gunners are given five seconds exposure of each slide, and they must write their answer on a test sheet. To be rated "Satisfactory," 90 percent of the REDEYE section must correctly identify at least 90 percent of the aircraft shown (45 out of 50 aircraft).

4. Since SM tasks 1056, 1057, and 1061 are incorporated in the ARTEP, proficiency in these ARTEP tasks provide a measure of the REDEYE gunner's ability to "fight his weapon."

(d) EEA 4. What is the relationship between time formally allocated for individual REDEYE training in the units and SM tasks passed? (a) Bringing entry-level personnel up to SM standards; (b) Maintaining SM standards.

1. There is a direct relationship between training time and frequency of training periods in the MTS, and the weapon handling proficiency. Units who provided as little as one hour per month formal training in the MTS and RRP ranked low on the proficiency curve (Ref Figs 8-8 and 8-9) and those who provided eight or more hours on a regular schedule ranked higher. Data were not available on bringing entry level personnel up to standards, except through interviews with section leaders.

2. New personnel do not receive a significant amount of additional training because they are not required to take the SQT or participate in an ARTEP until they have been in the unit approximately six months.

3. Maintaining SM standards is incidental to the training in preparation for SQT and ARTEP, and so the training objectives are oriented toward those requirements. The results of SQT for 16P personnel have been invalidated by TRADOC; thus a relationship could not be determined between allocation of time for individual training and SQT scores. The SQT scores may provide an indication of the maintenance level of SM standards.

(e) EEA 5. What is the relationship between SM tasks passed and the degree/intensity of employment of various REDEYE training support materials?

The only method to determine the number of SM tasks passed is to survey the results of the SQT. Since SQT results have been invalidated, the only inference that can be drawn from the ARTS data is that MTS and live aircraft tracking training increase gunner proficiency. The units that use the MTS regularly, and that conduct live aircraft tracking exercises demonstrated a higher level of proficiency than those who either did not have an MTS available or did not conduct regular training in the MTS or at live aircraft tracking.

(f) EEA 6. What instruction can be eliminated/reduced from BT and REDEYE AIT/OSUT without degrading REDEYE individual training proficiency? How much time is required to develop loyalty, esprit, unit morale, and discipline?

1. The amount of instruction that could be eliminated from AIT was addressed in the original REDEYE WSTE. ARTS data determined that a majority of AIT students felt they did not receive enough training in the areas of aircraft recognition and range ring profile, but that the amount of training received in weapon handling was "just right." There was no area in which students responded to indicate their training was too long.

2. There is no way to determine the amount of time that is needed to develop esprit, loyalty, unit morale, and discipline. However, ARTS data show that a majority of REDEYE gunners are interested in doing a good job, but due to the deprivation of training time by commanders and staff officers, REDEYE soldiers get little coherent training time. This is considered one of the major contributing factors to low unit morale and esprit.

(g) EEA 7. What is the impact on the proficiency relationship to time for REDEYE gunners if 10, 25, or 40 percent of AIT training is transferred to units?

Data were not obtained to directly answer this EEA. The units do not consider the AIT-trained gunner to be trained adequately to assume duties immediately, and do not require newly assigned personnel to be tested within the first six months in the unit. Further reduction of AIT would create a need for more formal training as opposed to OJT currently employed by most units. A large part of this EEA is directly related to personnel actions that would make REDEYE a separate MOS.

(h) EEA 8. What is the relationship between ARTEP tasks passed and time spent on collective REDEYE training in units?

There is some relationship between ARTEP tasks passed and collective unit REDEYE training. The relationship appears to be that certain tasks are critical to passing the ARTEP; however, crash training can achieve a satisfactory rating for the ARTEP and no benefit be realized collectively. An effective on-going unit training program is needed to maintain proficiency.

(i) EEA 9. What is the relationship between ARTEP tasks passed and time since the last ARTEP?

No data were available on this subject since most units conduct a pre-ARTEP exercise just prior to the evaluated ARTEP.

(j) EEA 10. What increases in REDEYE training proficiency can be achieved through ARTEP without the use of combat simulation training techniques?

There is minimal increase in gunner proficiency through ARTEP without combat simulation training techniques. Since SM tasks and ARTEP tasks for REDEYE are the same, and individual training is done in an ARTEP environment, combat simulation training techniques are the only thing which may enhance REDEYE gunner proficiency.

(k) EEA 11. What is the increase/decrease in individual REDEYE proficiency attributable to collective (ARTEP task) training in units?

A valid unit training plan with concerned command emphasis is required to increase individual REDEYE gunner proficiency. The ARTEP tasks and SM tasks (which are the same) will increase gunner proficiency but only if commanders become concerned about REDEYE training and give them time to train.

(l) EEA 12. What is the increase/decrease in collective REDEYE proficiency attributable to individual (SM tasks) training in units?

Data were not obtained which would identify changes in collective REDEYE proficiency as a function of individual training. It can be

assumed that the proficiency of the unit will be directly related to individual levels of performance.

(m) EEA 13. What are impacts on REDEYE training proficiency of working under difficult conditions - night/NBC/lack of sleep/stress?

1. Since REDEYE is a fair weather system, night operations are difficult because of problems in aircraft identification.

2. The problem encountered during NBC operations is that the present mask makes it difficult for the gunner to place his cheek bone against the transducer. Another problem is that gunners with glasses have a difficult time seeing the sights because the inserts move away from the gunner's field of vision.

3. Lack of sleep is another problem, especially in Infantry and Armor units. The unit "digs-in" during the day and the REDEYE gunners provide Air Defense. At night, when the unit moves, the gunners must go also. This tires the gunner extremely fast, which makes him less astute in performing the critical tasks.

(n) EEA 14. What training programs are required to insure 30, 40, and 70 percent of enlisted personnel validate higher grade in SQT?

It is difficult to determine training programs that would insure gunners would validate their SQT until SQT results are analyzed. Command emphasis would play an important role in improving REDEYE training and morale.

Since REDEYE is not a separate unit under AR 220-1, sufficient data could not be gathered to answer these EEAs (15, 16, and 17).

(o) EEA 15. How does the current unit training readiness report (AR 220-1) correlate with actual REDEYE proficiency?

(p) EEA 16. What is the relationship between SQT scores and REDEYE MOS status as stated in the current unit readiness report?

(q) EEA 17. What changes should be made in the unit training readiness report? How could SQT and ARTEP results be modified for use in a readiness reporting system?

(r) EEA 18. What peacetime training policies hinder the development of REDEYE gunner proficiency, such as safety requirements on live fire?

1. The most significant hinderance to REDEYE training is the actual lack of command emphasis on REDEYE training. Responses to a survey question of "what is the worst feature of REDEYE training?" varied from

"what training?" to "not enough." These answers appeared in approximately 50 percent of the units tested. Two conclusions drawn from ARTS testing were: (1) REDEYE personnel want to train, (2) In many cases, they are not training. One of the main reasons REDEYE gunners are not getting training time is that REDEYE personnel are used primarily as detail troops. In most units, less than 50 percent of the time is spent on REDEYE-related tasks. As one gunner stated, "the worst feature of REDEYE training is that the people who don't work in it don't know how important it is to the people who do." Another gunner stated, "I really don't know what the best training is because we haven't had any. Supposedly, we studied for SQT, but we ended up painting jeeps and sweeping the motor pool . . . Our field training generally means keeping out of the ISG's sight or else we end up on detail." This type of attitude is prevalent in a goodly portion of the units where the command structure does not realize the importance of REDEYE.

2. Another significant hinderance to REDEYE gunner proficiency is the limited number of live REDEYE rounds available to be fired. A great majority (94 percent Army; 98 percent Marines) of REDEYE gunners felt it was important to fire a REDEYE round. The main reason was because it builds gunner confidence by destroying the target. It is interesting to note that weapon malfunctions seriously degrade the gunner's confidence in the weapon.

3. Firing restrictions during live REDEYE firing at Grafenwöhr are so stringent that the firing could actually be counter-productive. Due to the very narrow range limits, gunners have only 3-5 seconds to go through the entire firing sequence. Consequently, the number of direct hits and even "tactical kills" are very low compared to results in AIT. This degrades gunner confidence in the weapon and impairs morale as indicated by interviews with the gunners.

(s) EEA 19. What REDEYE gunner proficiency is achieved through the use of shadow schools?

REDEYE gunner proficiency can be improved through the use of schools conducted by the Division/Brigade. These schools serve to supplement unit training by standard testing the subject matter and ensuring that training is accomplished. In areas where an MTS is located, these schools are even more effective. The problem associated with those schools is that all instructors come out of the units' assets as there is no authorized TDA for these schools. The presence of an MTS at each location would be a tremendous help to REDEYE training especially if a cadre of three to four instructors were authorized to run a school at each MTS. It should be noted that these schools cannot take the place of REDEYE AIT due to the limited assets that would be available.

(2) The EEAs concerning individual training with findings are as follows:

(a) EEA 1. How will increased simulator training for REDEYE affect the acquisition of training proficiency?

From data collected during the REDEYE Weapons Systems Training Effectiveness Analysis (WSTEAs), it was shown that as the training hours spent in the MTS were increased, the measured gunner proficiency (P_h) also increased. In order to determine the MTS training time required to obtain an average gunner P_h of 0.85, sixteen gunners were given additional MTS training. These sixteen gunners were tested at the one-hour, seven-hour, and twelve-hour points in the normal AIT-MTS training cycle. They were then given an additional eight hours of MTS training and retested. Based on these results, it was determined that twenty hours of training or eighty simulated engagements were required to obtain a P_h of 0.85. A P_h growth curve (Figure 8-1) was generated in the WSTEAs which shows a positive relationship between MTS training time and attained gunner proficiency. During the ARTS evaluation, five AIT classes were tested at three times during their fifteen hours of MTS training. These results are also shown in Figure 8-1. Therefore, in terms of maximum benefit from simulator training time, twenty hours is considered the desirable number of hours to be devoted to this phase of AIT REDEYE training.

(b) EEA 2. What will be the projected REDEYE learning curves with the use of new training technologies and techniques?

No new training techniques were evaluated during the time frame of this study. The 16P course recently has been adapted for self-pace instruction, but no evaluation of gunner performance under the self-pace instruction has been made.

(c) EEA 6. What is the relationship between individual and unit training for REDEYE skills?

A comparison of the measures of proficiencies recorded during this study shows that the active Army units scored higher, overall, on the range ring profile scores, but lower on the MTS testing.

	<u>RANGE RING PROFILE</u> <u>ALL ACTION</u>	<u>MTS</u> <u>P_h</u>
AIT Classes (7)	0.28	0.75
Active Units (14)	0.35	0.73

The increase in proficiency shown in the RRP results would indicate that

continual training and application of the RRP increase the retention of the RRP. A comparison of the hours of REDEYE training received in AIT and in units is shown below. The portion of the AIT 16P course relating directly to REDEYE is 103 hours long, of which 70 hours are spent in actual classroom training. The remaining time is administrative time, exams, critiques, and review time. The average time spent in the units per month in REDEYE-related training was 18.7 hours. The following table compares the percentage of available training time from AIT and units for the REDEYE training tasks.

PERCENT OF AVAILABLE REDEYE TRAINING TIME

<u>TRAINING TASK</u>	<u>AIT</u>	<u>UNITS</u>
Visual Aircraft Recognition	35.7	35.3
Moving Target Simulator	25.7	24.6
Techniques of Fire, Operational Procedures, Tactical Employment	20.0	21.4
Principles of Operation	7.1	10.7
Live A/C Tracking	11.5	8.0

(d) EEA 7. What minimum skills must the REDEYE gunner have when he arrives in the unit?

Army REDEYE gunners are designated under the 16P MOS (See Chapter 7, Part c(1)). Currently, the five weeks consist of CHAPARRAL weapon system training and subjects common to both systems, and the last two weeks are devoted to the specific weapon system. The students receive twenty-five hours of Visual Aircraft Recognition training, eighteen hours Moving Target Simulator time, and also training in the areas of principles of operation, hardware review, tactics, techniques of fire, live aircraft tracking, and firing exercises. Upon graduation from AIT the students are awarded the 16P REDEYE gunner MOS and have obtained the skills required by the SQTs and Skill Level 1 of FM 44-16P. These are considered the minimum skills required when he arrives in the unit.

(e) EEA 9. What is the amount of actual time available to units to conduct REDEYE training?

From the Unit Training Questionnaire Q7, it was determined that 60 percent or more of the gunners indicated that less than thirty-six classroom hours were available for REDEYE training per month. This total is

subdivided by REDEYE subjects as follows:

<u>SUBJECT</u>	<u>HOURS</u>	<u>GUNNER RESPONSE</u>
VACR	Less Than 10 Hours	Over 60%
RRP	Less Than 4 Hours	Over 60%
System Description	Less Than 4 Hours	Over 70%
Tactical Employment	Less Than 4 Hours	Over 60%
Live Track (Models)	None	Over 60%
Live Track (A/C)	Less Than 4 Hours	Over 80%
MTS Tracking	Less Than 10 Hours	Over 70%

During field exercises gunner responses indicate that over 50 percent of the time available for REDEYE training is spent on non-REDEYE related tasks.

(f) EEA 10. What is the amount of training time required to optimize individual REDEYE training proficiency in units?

Figure 8-9 shows the relationship between measured gunner proficiency (P_h) and the average amount of time per month spent in MTS training. This graph shows that approximately eight to nine hours of MTS training per month is required to maintain a P_h of 0.85. Figure 8-8 shows the relationship between range ring profile (RRP) test results and training hours per month spent in RRP training. This figure shows that a majority of units spends an average of three hours or less per month on RRP training, but that there is a direct relationship between RRP scores and hours per month spent in RRP training. It should be noted that the two units which devoted over six hours per month on RRP training scored significantly higher than the other units.

(g) EEA 11. What are the resources (manpower, dollars, and time) associated with alternative institutional REDEYE training programs?

During the WSTE A study three alternative institutional training methods were studied to determine which method results in the greatest gunner P_h . The alternative training programs analyzed were: (1) eight training sessions of RCMAT tracking, (2) four sessions of MTS classes, and four sessions of RCMAT tracking, and (3) eight sessions of MTS. Since these three training programs consist of eight one-hour training sessions each and would require two instructors, training program one would require two RCMAT operators, and program three would require an

MTS technician for the eight hours of training. However, program two would require two RCMAT operators for four hours and an MTS technician for four hours. No costing was considered during the WSTEAs study.

(h) EEA 12. What are the resources associated with alternative individual REDEYE training programs in units?

All Unit REDEYE training programs reviewed taught the basic REDEYE skills, VACR, RRP, Principles of Operation, Techniques of Fire and Tracking, either model or live aircraft, or MTS, or a combination. The GOAR kit was used in all units as a vehicle to teach VACR. Several units supplemented the GOAR kit slides with slides made from recent photographs of the latest foreign and American aircraft. These slides were made by gunners (at no cost) with an interest in photography and in learning to identify aircraft. All other subjects with the exception of the tracking exercises were taught out of Technical Manuals, Soldiers Manuals, and other readily available printed training materials. The type and length of tracking training received in the units depended on the availability of an MTS. When the MTS was available nearly all tracking was done there, and the only live tracking the gunners received was what was done during field exercises. When an MTS was not available tracking exercises were coordinated with the nearby Air Force, Naval, and Marine fighter groups and necessarily took place away from the section's normal training site. Some units used RCMAT equipped with an IR source for tracking practice. When scheduling is possible, units without MTSs will send gunners TDY to an MTS for further tracking experience.

(i) Several EEAs which pertained to alternative training methods (EEA 3), mixes of training programs (EEA 4), length of BCT (EEA 5), crew training in the institution (EEA 8), division of responsibility between the institution and unit (EEA 13), and various OJT programs (EEA 14) were not addressed. They were considered outside the scope of this study.

(3) The EEAs concerning unit training with findings are as follows:

(a) EEA 1. What is the relationship between REDEYE training proficiency and: equipment available/equipment required, ammunition available/ammunition required, POL available/POL required, training time available/training time required, and instructor-student ratio?

The training proficiency, as used within this EEA, was measured by testing the units the gunner's tracking ability in the MTS. The other parameters making up the relationship were extracted from training and attitude questionnaires. This EEA was divided into five subanalyses as discussed below:

1. Training Proficiency Versus Equipment Availability/Required - All Army REDEYE sections have the same equipment; therefore, a comparison of different equipment versus proficiency was not made.

2. Training Proficiency Versus Ammunition Available/Required - The uniqueness, complexity, and high cost of a REDEYE round makes it a difficult weapon to simulate and prohibitive in cost to use as practice rounds in the same sense as other weapon systems. The present REDEYE ammunition usage within the unit is one round per section per year. The top gunner fires; the only restriction being that the same gunner may not fire the following year. It is felt that the act of firing or observing the firing of a live REDEYE round contributes more to the psychological feeling of the gunner. In this light, live round firing contributes more to "readiness" than "training proficiency." The results of the WSTE A study indicated that, at a minimum, the present baseline ammunition requirements should remain the same. This is endorsed by this study with additional ammunition requirements that may be imposed by ARTS which addresses the feasibility of adapting RELS for Army REDEYE training.

3. Training Proficiency Versus Petroleum, Oils, and Lubricants (POL) Available/Required - No comparison of proficiency and POL available could be made as the POL parameter at the time of comparison was not a limited value. A subjective consensus extracted from interviews of REDEYE section leaders indicated a significant reduction in POL would curtail field exercises which would adversely affect training proficiency in such REDEYE task areas as deployment, live tracking, etc. Least affected would be VACR tasks for all units and MTS tracking proficiency for units having a direct geographic access to an MTS.

4. Training Proficiency Versus Training Time Available/Required - Data representative of training proficiency were extracted from the RRP test and MTS tracking scores. Data representative of training time available were extracted from REDEYE Gunner Training Questionnaire (Q7). A tabulation of these parameters is shown in Table 8-14 and 16. Data were extracted from both WSTE A and ARTS studies to facilitate a larger sample size. Figure 8-9 indicates the increase in MTS tracking proficiency with an associated increase in tracking time/month. Training time required to approach a P_h of 0.85 would require approximately ten hours of MTS training time. Figure 8-8 indicates the increase in RRP proficiency with an associated increase in RRP training time. Training time required will not be projected for RRP due to its simplification as a result of the WSTE A study.

5. REDEYE Instructor-Student Ratio. Data from interviews with the section leader indicate an average of one instructor per 6.5 students.

(b) EEA 2a. What REDEYE unit training programs have to be eliminated/reduced as a result of 30 percent decrements in various resources?

Unit training programs may be categorized into four areas. Each of these will be addressed as to impact of resource reductions.

MTS	- MTS operation could maintain normal training programs. Possible adjustments that may be necessary in scheduling of manpower were included as one of the resources implied within the EEA. Power consumption within an MTS is nominal compared to other facilities. Spare parts, an off-the-shelf item, would not have an immediate impact. A reduction in a resource directly affecting transportation of troops to and from an MTS would be overcome by better utilization of vehicles.
CLASSROOM TRAINING	- Trainers and training materials are already procured. Therefore, a resource reduction would have no effect upon this area of training.
LIVE TRACKING	- Dedicated aircraft missions would be impacted by this EEA, however, very few units employ live tracking using dedicated aircraft. Most tracking is done under "piggy-back" conditions, i.e., tracking aircraft at the end of an active runway. Therefore, little or no effect would be felt in this area by a resource reduction.
LIVE FIRING	- As REDEYE is a stockpiled item out of production, no immediate effect would be noted in this area. Therefore, a 30 percent decrement in resource is not seen to adversely affect the REDEYE training programs, if adjustments and cooperation are exercised within the units.

(c) EEA 2b. What is the effect of training equipment storage procedures similar to those employed by GSFG?

This question is not applicable to the REDEYE.

(d) EEA 3. If units employing REDEYE are decremented 30 percent of their equipment, what is the impact on REDEYE training proficiency, combat effectiveness, resources, and unit morale/motivation?

If a unit's total assets (to include REDEYE equipment) were decremented

by this amount, this would have a significant effect on REDEYE proficiency, effectiveness, and consequently, morale/motivation. This "across the board" 30 percent equipment reduction would likely be compounded in the REDEYE section. This would occur by virtue of the fact that in non-Air Defense oriented units REDEYE occupies a low priority. Equipment within the unit already reduced by 30 percent would be replaced by REDEYE section equipment (jeeps).

(e) EEA 4. What is the impact on unit and individual REDEYE gunner's proficiencies as a result of national conservation programs? (e.g., 50 percent reduction in POL.)

As indicated in paragraph 8h(3)(a)3, a reduction in POL would reflect most heavily on the REDEYE gunner's field tasks such as deployment. This reduction would reduce the individual's field proficiency, which in turn, reduces the unit effectiveness by some percent less than individual proficiency loss.

(f) EEA 5. What is the impact on individual REDEYE proficiency resulting from limited access to training devices?

The Moving Target Simulator (MTS) is considered the primary training device for REDEYE. A comparison between the MTS proficiency and the geographic availability of this device by units was made to determine if there is a reflection on proficiency based on equipment availability.

Some bias is introduced by those units which have immediate access to an MTS, but fail to adhere to their POI. Results, disregarding the bias, indicate only a slight decrease in MTS proficiency as the unit's geographic distance from a training MTS increases.

(g) EEA 6. What is the impact on individual/collective REDEYE proficiency of limited local training areas and constrained major training areas?

1. Individual proficiency of the REDEYE gunner will be adversely affected by limited or constrained training areas. An example of this is evident in live aircraft tracking where the target aircraft is restricted in tactical headings and altitude restrictions. All required aspect angles cannot be experienced nor tactics such as the target aircraft using low-level approaches and approaches toward the target at the same azimuth as the sun.

2. Collective training will also be adversely affected. This would be derived indirectly from lack of individual training plus degradation of training in deployment and tactics required of REDEYE teams and sections.

1. Proficiency Retention vs Time in the Units

(1) It was an objective of both the WSTE A and the ARTS to retest a representative sample of the AIT test subjects after they had been assigned to their respective units. This was to determine the status of individual proficiency in the MTS and RRP following completion of AIT in an effort to quantify the loss of proficiency in terms of a "forgetting curve". Four cases are shown in Table 8-18.

(2) A small sample (Case 1) of WSTE A AIT gunners were retested twice. Thirteen of the 72 were tested about 3.4 months following completion of AIT, and again 10 months later. These are shown as Case 1 in Table 8-18, which indicates the gunner proficiency dropped significantly in the MTS and slightly for the RRP between completion of AIT and the start of unit training. Since less than half those retested for the WSTE A had received any REDEYE training in their units, this drop was considered to represent a forgetting curve for the weapon handling skill. The slight change in RRP proficiency was attributed to their never having acquired an acceptable level of proficiency initially. At the time of the second retest, this group had regained their forgotten skills in the MTS, but had not made any improvement in the RRP.

(3) The second group (Case 2) was made up of the gunners who were tested in their units during the WSTE A and were tested again during the ARTS. Approximately 30% of the Army gunners from the 5 units were retested. In the one year interval, there was a significant increase in proficiency for the 130 gunners in the MTS and 134 who were given the RRP test. This is the desired result of unit training as the gunner progresses in his MOS.

(4) The third group (Case 3) was made of gunners from the 5 AIT classes who were retested in their respective units under ARTS. Approximately 34% of the 125 trainees were tested 5.9 months after their completion of AIT. Their proficiency in both the MTS and RRP had also dropped since AIT which was similar to the results observed during the WSTE A. It was concluded that in the period between 3 months and 6 months after AIT, the gunners are fully integrated into the unit training cycle but have not recovered from the loss of proficiency due to forgetting. It is concluded that additional intensive training is required to regain the "forgotten" skills as soon as possible upon arrival at the unit. It is also probable that the lower AFQT scores of the ARTS AIT test subjects is a factor in the lack of recovery.

(5) The fourth group (Case 4) is included from the WSTE A. Twenty eight percent of the 72 gunners from AIT were either returned to USAADS for retest, or were tested at their assigned unit. As stated for Case 1 less than half had received any REDEYE training at their units in the 3.4 months since AIT and the overall performance had dropped significantly.

TABLE 8-18
PROFICIENCY COMPARISON OF AIT GUNNERS RETESTED IN UNITS

CASE	No. GUNNERS	AIT			UNIT			AV TIME SINCE AIT (MONTHS)
		WSTE A	ARTS		WSTE A	ARTS		
		<u>MTS</u>	<u>RRP</u>		<u>MTS</u>	<u>RRP</u>	<u>MTS</u>	
1	13	13	13		0.63	0.32	0.80	13.0
2	130	134			0.72	0.33	0.86	NA
3	43	56		0.78	0.30		0.68	5.9
4	25	25		0.77	0.32		0.58	3.4

j. Conclusions

(1) The three additional hours of MTS training which were implemented following the WSTEА recommendations, were beneficial, as indicated by a slight increase in the MTS proficiency. However, the actual benefit was not apparent because of the lower AFQT scores of the ARTS test subjects, in comparison with the WSTEА subjects.

(2) The markedly lower RRP proficiency for ARTS test subject was also attributed to the lower AFQT scores. A direct relationship between RRP proficiency and AFQT score was demonstrated.

(3) Gunners having AFQT scores in the Category IV bracket achieved an acceptable level of proficiency in the MTS, but were unacceptable in their RRP proficiency.

(4) The RELS was concluded to be a realistic simulation through the launch phase of a live round, based on the subjective evaluation of 63 gunners who fired a RELS prior to firing a live round. Therefore, it was considered to be an effective training device to reduce fear and build gunner confidence.

(5) Instructors for REDEYE AIT need the experience of having fired a live round to enhance their effectiveness with the students.

(6) The direct relationship between training time and proficiency in the MTS and RRP was demonstrated in the 5 units tested during the WSTEА and retested during the ARTS.

k. Recommendations

(1) Category IV personnel should be ineligible for REDEYE training.

(2) The RELS should be adopted for training REDEYE gunners both in the institution and in the unit.

(3) All REDEYE instructors at USAADS should be allocated one live round for firing for qualification as an instructor. Firing a RELS should be included if adopted for institutional training.

(4) It is necessary that where MTS facilities are available that gunners receive regular, standardized training in REDEYE handling and tracking.

(5) A feasibility study be conducted for a mobile MTS training van which would encompass highly trained instructors which would insure standardized training. This method would be beneficial to remote regular Army units as well as a high percent of Reserve units.

(6) Current unit training varies considerably between units. The SQT program affords a standardized POI for individual training; however, commanders must give these programs support.

(7) Units which are supported by REDEYE should be better informed of the tactical advantage afforded by air defense.

9. PROFICIENCY RELATED TO WAR MODELS

a. Discussion.

(1) The capability of weapons systems can be represented in a war model. How well the actual system parameters may be represented depends upon the flexibility and resolution of the model and the availability of the system parameters

(2) The REDEYE air defense system has been in the Army inventory for a considerable length of time and has been the subject of several studies. These studies range from field tests with early models of REDEYE trainers in 1958 through various Army and contractor tests and studies. Some of these are listed at Appendix XII, references. These tests and studies were concerned with visual detection, ranging, and REDEYE man/weapon interrelated motor reaction times. Therefore, there are data available for REDEYE gunner parameters. In addition, the REDEYE WSTEAD study conducted during 1977 yielded additional data concerning REDEYE gunner proficiency with the Tracking Head Trainer (THT). The WSTEAD data and the data collected for the REDEYE ARTS study provided a wide base of proficiency data on actual Army, Marine, and Reserve REDEYE gunners. These data are a measure of the actual proficiency of the gunner in completing the engagement sequence. Previous studies were by necessity, limited to small groups of gunners whose proficiency may have been high as compared to all the REDEYE gunners in the service.

b. Air Defense War Models.

(1) Of the various air defense war models available to represent an air defense system, only two large scale air defense models have the flexibility to accept a wide range of REDEYE gunner proficiency parameters. These are the Computer Model (COMO) III and the Tactical Air Defense Computer Simulation (TACOS). The REDEYE gunner proficiency parameters that may be represented with these models are discussed in paragraph 9e.

(2) For this study, the COMO III model was selected for computer simulation runs. As discussed in the EEAs, the model has the flexibility to accept a wide range of gunner performance data. It has been used for previous REDEYE system studies; and, finally, the COMO III model is accepted by both the US and the European analytical communities.

(3) The COMO III model is a large scale computer simulation model based upon the concept of critical events with some time-step operations. The model represents each weapons system by a weapons deck that describes the characteristics of the system to any degree of detail defined by the analysis; the penalty for detail being an increase in run time. The description of the war game (scenario) is developed using an input language called COMIL. The COMIL describes how the individual weapons systems, RED and

BLUE, will be used in the scenario in terms of deployment, time phasing, tactics, and also, provides for input of critical system parameters. The RED air attack is described by aircraft on preplanned paths with preplanned targets. The BLUE air defense is described by location of the air defense units, their rules of engagement, critical system parameters, and preplanned target criteria.

c. Training Input to War Models

(1) War models like COMO III do not lend themselves to parameters that directly reflect training. The models do provide for system and gunner proficiency parameters that can, in some cases, indirectly reflect training parameters. In addition, parameters such as the ability of gunners to deploy to the proper locations can be reflected in the scenario by placement of weapons relative to assets and other weapons systems.

(2) The REDEYE gunner proficiency parameters which reflect the level of training that can be characterized in COMO III are mainly two types.

(a) Parameters that reflect the gunner's ability to complete the required REDEYE engagement sequence while the target is still within launch boundaries.

(b) Parameters that reflect the reaction time associated with the REDEYE engagement sequence.

(3) As discussed in paragraph 9b (Air Defense War Models), the TACOS and COMO III models provide input variables that allow the REDEYE gunner's proficiency and reaction times to be characterized. The actual parameters that each model represents are discussed in paragraph 9e. A list of SM tasks and ARTEP requirements that can be represented in each model are discussed in EEA 6, EEA 7, EEA 8, and EEA 9.

d. Model Modifications Required and Impact

(1) The COMO III model has enough input variables to reflect the REDEYE system and gunner proficiency parameters in simulation runs without modifying the COMO frame (main program structure) or the REDEYE weapons deck. However, the COMIL was modified to reflect a pseudo-deployment based upon the expected air threat to central Europe. The COMIL input variables were also set to reflect the REDEYE gunner proficiency as measured by the REDEYE WSTEAs and by preliminary REDEYE ARTS data. The proficiency was represented in the model by the "probability of gunner failure" parameter. This is the complement of the gunner's proficiency in that it reflects the probability that the required engagement will not be completed.

This parameter being a composite, does not provide the flexibility to enter the gunner proficiency in completing individual steps within the engagement sequence. The model could be modified to allow each of the engagement steps (See SM Task 1057, Engage Hostile Aircraft with REDEYE) to be represented as model parameters. However, the resources and time required to do so made it prohibitive for this study.

(2) REDEYE gunner reaction times are represented relatively well in the COMO III model as are the estimates of target range, activation range, and launch boundaries. For a fine grain analysis of the REDEYE gunner's contribution to RED aircraft kills in today's Army, current reaction times, and range estimates are required. These were not measured explicitly in the REDEYE ARTS study. This is further discussed in EEA 2.

e. Essential Elements of Analysis - Proficiency to War Models.

The EEAs concerning proficiency to war models with findings are as follows:

(1) EEA 1. How is REDEYE training proficiency incorporated into the traditional Mobility, Firepower, Survivability (MFS) formula used in war games?

(a) The three factors of the MFS formula can be translated into either direct or indirect REDEYE gunner proficiency parameters in war games.

(b) The mobility can be indirectly used in models such as TACOS and COMO III as an availability parameter.

(c) Firepower is used as a direct parameter in most air defense models.

(d) Survivability is played directly in most models. In the TACOS model, the vulnerability of the REDEYE system may be entered as the same as a targeted unit or asset to which the REDEYE has been attached or the REDEYE may be entered in the model as a dedicated target. In the COMO III model the REDEYE can be designated as the target for any of the aircraft in the scenario.

(2) EEA 2. How can we improve our capability to measure REDEYE gunner proficiency?

(a) The REDEYE gunner proficiency was measured in three ways in the study:

1. Moving Target Simulator (MTS). Proficiency with the THT.
2. Tactical Aircraft Tracking. Proficiency with the THT.
3. Range Ring Profile Test.

(b) The testing methods described above do not measure several important parameters of REDEYE gunner proficiency. Specifically, the times associated with when the gunner performs the steps in the sequence as opposed to when he should perform them are very difficult to measure by an observer. Of equal difficulty are measures of the gunner's estimate of target range, activation range, and launch boundaries. The RRP test does ask the gunner to indicate whether he would fire or not fire based on category and size relative to the range ring. However, this is a written test and does not accurately measure the gunner's perception of ranges when actually using the THT.

(c) A method could be devised to measure the time at which the gunner performs each engagement step in the MTS which would require MTS modification. The MTS electronics provide an indication of when the aircraft enters and leaves the launch boundaries, and also, when the infra-red (IR) source is turned on and off. Additional instrumentation could be provided to record and/or display these times with the times at which the gunner performed the steps in the engagement sequence. These data would then provide delay times for each step of the sequence relative to when they should be performed and would also provide an indication of the gunner's estimate of ranges involved. The following time data would be required to be recorded or displayed:

1. Target is at Activation Range
2. IR Source is Turned on
3. Target Reaches Incoming Launch Boundary
4. Target Reaches Outgoing Inner Launch Boundary
5. Target Reaches Outgoing Outer Launch Boundary
6. Gunner Activates THT
7. Gunner Acquires the Target
8. Gunner Uncages the Gyro
9. Gunner Superelevates and Leads Target
10. Gunner Presses Fire Trigger

(d) An alternative method of measuring the ability of the gunner to judge the range of a target and the appropriate launch boundaries may also be measured using the tactical aircraft and a reference radar. This

method uses switch closures to record the actions of the gunner and radar data to record the position of the target as was used in a test in support of the REDEYE WSTEAs. In the test, only the action of gunner firing was recorded, but the method could be expanded to include all the gunner's actions.

(3) EEA 3. Do existing models adequately provide for variations in individual REDEYE proficiency?

(a) Air Defense models usually represent the capability of a weapons system as an effectiveness footprint which includes very accurate parameters concerning the weapon. The effectiveness of the man in the loop is either not represented at all or is included in system parameters such as reaction time.

(b) One Air Defense model examined, COMO III, does provide for variations in individual REDEYE proficiency. The COMO III model uses an input language which allows REDEYE gunner proficiency parameters to be varied for any given computer run. In addition to a large range of REDEYE weapon parameters, the following are provided for REDEYE gunner parameters in the COMO III model:

1. Gunner Estimate of Ranges:

- Incoming Activation Range
- Outgoing Activation Range
- Range of Target

2. Gunner Estimate of Boundaries:

- Incoming Inner Launch Boundary
- Outgoing Inner Launch Boundary
- Outgoing Outer Launch Boundary

3. Reaction Delays

- Launch to New Assignment
- Visual Detection to Activation
- Delay to Superelevate and Lead
- Launch Delay

4. Probability of Gunner Failure

(c) The COMO III model allows the above parameters to be set at a fixed value, or they may be defined as functions which represent the average gunner with a standard deviation. In this manner, it is possible to model the effect of variations in gunner proficiency.

(d) A second Air Defense model, TACOS, also provides for variation in REDEYE gunner proficiency. The following are gunner-related TACOS parameters.

1. Gunner Estimate of Ranges:

- Range of Target
- Launch Ranges

2. Reaction Delays:

- Detection to Acquisition
- Acquisition to Fire
- Intercept Evaluation to New Launch

3. Availability/Reliability

- REDEYE Weapon Reliability, or
- REDEYE Weapon and Gunner Availability as a Single Number

4. Probability of Detecting Target as a Function of Target Range, Climatic Conditions, and Type of Aircraft.

(e) With the TACOS model the delay times and availability are fixed numbers while the ranging errors may be input as a mean and standard deviation.

(f) Of these two models, COMO III was selected because it is better suited to examine the effects of REDEYE gunner training and proficiency. COMO III has better resolution for the parameters such as launch boundaries and probability that the gunner will fail. In addition, COMO III has provisions for tables or functions to be entered rather than single value parameters.

(4) EEA 4. Do existing models include provisions of collective REDEYE training factors?

(a) Existing models do not include provisions for directly translating collective REDEYE training factors into model parameters. Certain aspects of collective training could be indirectly translated into model parameters.

(b) Collective training factors that might be considered for indirect use in models include:

1. Visual Aircraft Recognition (VACR)
2. Reconnaissance of REDEYE positions
3. Select REDEYE positions
4. Plan REDEYE defense

(5) EEA 5. What is the performance required of REDEYE (STINGER) personnel and equipment on the mid-intensity battlefield during the mid 1980's?

A measure of the performance required of REDEYE gunners and equipment during the mid 1980's has been derived through computer simulations. These simulations, discussed in section 10, used a typical Red air raid scenario as postulated for the 1980's. REDEYE team positions were located near the FEBA and around Blue assets. The scenario was executed with REDEYE only and then with Improved Hawk and ROLAND to determine the contribution of the REDEYE system and to measure the combat effectiveness required of REDEYE. The analysis of the results of these simulations, plotted as Figure 10-3, indicates that a proficiency of nearly 1.0 will satisfy the requirement. In the target rich environment that has been postulated a highly proficient gunner is required.

(6) EEA 6. What SM tasks can be translated directly to REDEYE proficiency parameters in current simulations?

Task 1057, Engage Hostile Aircraft with REDEYE, FM-16P, Soldiers Manual, can be directly translated into REDEYE proficiency parameters in current simulations.

(a) Place target in range ring and use range ring profiles for that particular aircraft category to determine if target is in active zone.

(b) Wait until target is in range prior to activating.

(7) EEA 7. What ARTEP tasks can be translated directly to REDEYE proficiency parameters in current simulations?

(a) As listed in the response to EEA 3, both the COMO III and the TACOS models provide a number of parameters to describe varying aspects of the REDEYE gunner's proficiency in engaging hostile aircraft. Both models incorporate parameters reflecting the gunner's ability to accurately determine range to the aircraft and the launch boundaries of the REDEYE. Both models also have parameters for time delays in the engagement sequence, although COMO III allows these to be variable parameters rather than fixed constants.

(b) The one ARTEP task not reflected directly or indirectly in either COMO III or TACOS is the gunner's proficiency at identifying forward area aircraft, since both models assume all aircraft presented to REDEYE to be hostile.

(8) EEA 8. What SM tasks can be translated indirectly to REDEYE proficiency parameters in current simulations?

The following FM-16P, Soldiers Manual, tasks can be indirectly translated into REDEYE proficiency parameters in current simulations.

(a) Task 1056, Skill Level 1, Occupy REDEYE Position

1. Take maximum advantage of terrain

2. Establish communications

3. Report ready-for-action status

(b) Task 1057, Skill Level 1, Engage Hostile Aircraft with REDEYE

1. Use the safety activator device to fire the BCU.
2. Continue to track the target during the 3-5 second warm-up period.
3. Uncage, as soon as possible, by pressing and holding the uncage bar.
4. Squeeze the firing trigger slowly and hold 3-5 seconds while continuing to track the target.

(c) Task 1061, Skill Level 1, Determine Aircraft Category

1. Use the correct range ring profile for each category to make proper engagement decisions.
2. Determine aircraft category to make proper decisions for activation, engagement, hold fire, and cease engagement.

(d) Task 2012, Skill Level 2, Select REDEYE positions

1. Be within the given approximate location
2. Have clear fields of fire
3. Have all-around observation, if possible
4. Take maximum advantage of available cover and concealment
5. Allow for adequate FM communications (line of sight)

(e) Task 3033, Skill Level 3, Plan REDEYE Defense

1. Apply the principle of:
 - Balanced defense
 - Mutual support defense
 - Early engagement
 - Overlapping fire
 - Depth
 - Weighted defense
2. Select approximate positions which will facilitate established defense priorities.

3. Select positions to counter enemy's most likely combination of weapons and techniques.

4. Adapt defense plans to support unit's defense priorities.

5. Select approximate positions from a map.

(f) Task 3034, Skill Level 3, supervise REDEYE teams in reconnaissance, selection, and occupation of positions.

1. Perform a map reconnaissance of potential positions.

2. Select alternate and supplementary positions.

3. Select positions which meet the following criteria: (1) be within the given approximate location, (2) have clear fields of fire, (3) have all-around observation, if possible, (4) take maximum advantage of available cover and concealment, (5) must allow for adequate FM (VOICE and TADDS) communications, (6) occupation must take maximum advantage of terrain, and (7) apply camouflage procedures.

(g) Task 3035, Skill Level 3, Control REDEYE Teams During Target Engagement.

1. Utilize weapons control information

2. Recognize and react to hostile criteria

3. Implement command and control measures

4. Apply the elements of the air defense rules of engagement

5. Apply the specific rules of engagement in effect

6. Apply methods of control for air defense units

7. The tasks that are concerned with selecting positions, planning the defense, and controlling the teams are translated into model parameters by varying the location of REDEYE teams in successive simulations, varying the availability of REDEYE teams, and by varying the position and height relative to terrain. The tasks concerned with engaging aircraft are represented by parameters such as probability of gunner failure and probability of determining when to activate the weapon.

(9) EEA 9. What ARTEP tasks can be translated indirectly to REDEYE proficiency parameters in current simulations?

The REDEYE gunner's proficiency in engaging hostile aircraft and the REDEYE team's proficiency in selecting and occupying positions can be indirectly translated to an input parameter in the TACOS simulation. A composite parameter is used in TACOS to represent the proportion of teams that are in proper positions, alert for aircraft, with operable equipment, and their probability of successfully engaging a hostile aircraft. The effects of being in a bad position result in the aircraft being out of engagement range, target being masked during the range that it would be engageable, and jet aircraft presenting only an incoming engagement capability during the engagement range due to masking or restricted fields of fire.

(10) EEA 10. Can tests be designed to be administered with SQT that would yield values for REDEYE parameters used in current simulations?

As described in the response to EEA 2, tests can be designed to be administered with the SQT that would yield REDEYE parameters. Extra time that would be required to administer the SQT if extensive testing were added may be a consideration.

(11) EEA 11. Can tests be designed to be administered with ARTEP that would yield values for REDEYE parameters used in current simulations?

It would be difficult to collect meaningful REDEYE parameter data during an ARTEP because of the nature of the ARTEP. The ARTEP is a field evaluation and would not lend itself to the precise measurements required to gather parameter data. See the response to EEA 2.

(12) EEA 12. Can new models be designed which directly use REDEYE training parameters?

Models can be designed that would directly reflect all the REDEYE training parameters associated with the sequence of steps required to fire the REDEYE weapon. However, as covered in EEA 2, the parameters associated with the gunner's ability to judge ranges and the reaction times involved in a typical engagement are difficult to measure using current techniques.

(13) EEA 13. How are training and human factor parameters incorporated into the AMSAA REDEYE data?

(a) The training parameters associated with the REDEYE system are indirectly incorporated into AMSAA performance curves. The AMSAA curves aggregate probability of detection, probability of gunner failure, system reliability, and missile lethality into a single performance value. The probability of gunner failure component does reflect the gunner's training.

(b) Human factors, other than the probability of gunner failure, are not included in AMSAA performance requirements.

(14) EEA 14. What is the relationship between SM tasks passed and REDEYE system capability as described by MN/DT/AMSAA curves?

(a) The REDEYE system was field tested in 1958. Materiel need (MN) documentation was written before that. Development tests (DT) were also performed in the same time frame. The REDEYE work team contacted AMSAA, the REDEYE Project Office, the Air Defense School, and TRASANA in an attempt to locate the MN or DT documentation. The team was unable to locate the documents at these facilities, and there was insufficient time to investigate all possible sources. From conversations with AMSAA and REDEYE project personnel, it appears that there is no direct relationship between SM tasks passed and MN/DT curves.

(b) The AMSAA performance curves do include the probability of REDEYE gunner failure as described in EEA 13 of this section. The probability of gunner failure can, in turn, be related to Task 1057: Engage Hostile Aircraft with REDEYE. This is the only SM task that is reflected in the AMSAA data.

(15) EEA 15. What is the relationship between ARTEP tasks passed and REDEYE system capability as described by MN/DT/AMSAA curves?

(a) As discussed in EEA 14 above, the MN/DT curves were not available to the system work team. Through discussions with AMSAA and REDEYE project personnel concerning available documentation, it was concluded that there is no relationship between the MN/DT capability requirements and ARTEP tasks passed.

(b) The AMSAA performance curves do reflect the ability of the REDEYE gunner to pass the ARTEP task concerned with engaging hostile aircraft. The gunner is required to engage two out of three aircraft in a typical ARTEP. This parameter can be entered into the AMSAA performance formula as the probability of the gunner failing.

(16) EEA 16. To what degree can the ability of the unit commander and staff to integrate combat systems (REDEYE and other SHORAD) on the battlefield be incorporated into war models?

The ability of the commander and staff to integrate combat systems can be incorporated to the following extent:

(a) The placement of REDEYE systems relative to other SHORAD systems can be varied in successive simulations to show how well the AD assets are deployed.

(b) The availability of REDEYE and other systems can be varied to represent the proficiency of each system to be combat ready.

(c) The ability to coordinate fires within the communication capabilities of the systems involved can be varied in war models.

(17) EEA 17. How are motivation/morale related to REDEYE proficiency?

(a) Three statements or questions in the Unit - General Information and Attitude Questionnaire, Q₄/Q₅, were examined to determine the motivation and attitude of REDEYE gunners toward the Army. These are:

- ° Statement 1. "I enjoy the day-to-day work activities that make up my duty assignment."
- ° Statement 3. "The conditions I work under make me feel like doing my best."
- ° Question 19. "Likelihood of reenlistment at the end of your current enlistment?"

1. Army-wide, over 40 percent of the gunners responded in the negative to Statement 1, over 50 percent of the gunners responded in the negative to Statement 3, and over 60 percent indicated that they would not reenlist (Question 19). Two OCONUS units and one CONUS unit did have a positive majority response to Statement 3, and a majority of one OCONUS unit and two CONUS units responded in the positive to Statement 1. Of all the units surveyed, only one OCONUS unit had a majority who indicated that they would reenlist.

2. The MTS and RRP performance results of the units that responded in the positive were examined to determine if there is a relationship between motivation/attitude and proficiency. One of the units that responded in the positive to Statement 3 did have the highest MTS proficiency. However, the second unit was just average, and the third was the lowest. Of the units responding in the positive to Statement 1, two were below the average proficiency, and the other one was about average. Similar observations were obtained with the comparison of RRP and the responses indicating that there is no apparent relationship between motivation as measured by the Q₄/Q₅ questionnaire and proficiency.

(b) Six statements in Q₄/Q₅ were examined as indicators of morale and attitude toward other members of the REDEYE section. These are:

- ° Statement 2. "I want to work hard for the people with whom I work."
- ° Statement 6. "Men in my section know how to get the job done right."

- Statement 7. "If a man needs help, he can usually count on others to provide it."
- Statement 8. "The members of my section are a good group to work with."
- Statement 9. "Members of my section work together as a team."
- Statement 11. "My section does high-quality work."

1. A majority of all Army units responded in the Positive to Statement 2. All except one unit responded in the positive to Statements 6, 7, 8, 9, and 11. One unit had a negative response to both Statements 6 and 11. This unit had a 0.76 P_h in the MTS that was near the average 0.77 for all units, and they had an RRP score for all actions correct of 0.311 as compared to the average value of 0.35. Another unit responded in the negative to Statements 7, 8, and 9. This unit had MTS P_h of 0.66 versus the Army average of 0.75 and an RRP score of 0.383 versus an Army average of 0.35. This would indicate that morale may be related to MTS proficiency, however, another unit had an MTS P_h of 0.58, which was the lowest observed, and answered the above questions in a very positive manner. Therefore, there does not appear to be a relationship between morale as measured by the attitude questionnaire and proficiency.

f. Conclusions

(1) REDEYE gunner proficiency can be represented in current war models examined as a single number that reflects the gunner's ability to complete the entire sequence of steps with the THT, i.e., activation through fire. The models do not have provisions for breaking this proficiency down for each required step. Since all REDEYE gunners do not encounter difficulty with the same engagement steps, it is difficult to accurately reflect the proficiency of REDEYE gunners with the THT versus training.

(2) Proficiency involves more than just the ability to complete an engagement sequence. The REDEYE gunner must be able to complete the engagement while the target is still engageable. To do this he must be proficient in estimating the range of the target and appropriate activation and launch boundaries and complete the engagement sequence with a minimum of delay. The current war models do provide parameters that reflect the gunner's estimates of ranges and can represent their estimate of ranges versus training. The reaction time parameters in the models do not provide for all possible reaction times associated with an engagement. The COMO III model has a wide range of reaction time parameters, but does not have inputs for the following parameters:

- (a) Time from gunner's estimate of activation range to activation.
 - (b) Time from activation to track.
 - (c) Time from track to uncage gyro.
 - (d) Time from uncage to superelevate and lead.
 - (e) Time from superelevate and lead to fire.
- (3) Other training factors such as the ability to deploy, correctly identify hostile aircraft, and integrate the weapons system can be indirectly reflected in war models.

g. Recommendations

(1) Current war models that are considered for analysis of training versus REDEYE gunner proficiency should be modified to reflect the gunner's proficiency with each step of the REDEYE engagement sequence.

(2) Tests should be designed to measure the following gunner proficiency components for the average Army gunner. The values in use are for a better than average gunner.

- (a) Reaction times associated with the REDEYE engagement sequence.
- (b) Gunner's estimates of target range, activation range, and launch boundaries.

10. WAR MODELS RELATED TO COMBAT EFFECTIVENESS

a. Discussion

(1) The REDEYE ARTS study has two main objectives. To determine the relationship between the combat effectiveness of the current Army REDEYE gunners and their level of training; and, to determine the level of combat effectiveness and training resources that will be required for REDEYE (or follow-on systems) in the mid-1980 time frame.

(2) The level of training of REDEYE gunners cannot be directly translated into combat effectiveness. There is, however, a relationship between training and gunner proficiency and proficiency can be related to combat effectiveness through computer simulations. The components of proficiency can be entered into war models as simulation parameters and varied to determine their effect.

(3) The COMO III model was used in computer simulation to determine the effect of proficiency on combat effectiveness. The basis of the scenario used in the simulations was the HIMAD 1 scenario developed by the Directorate of Combat Developments (DCD) of the USAADS. This scenario is a large scale mid-1980 European scenario involving the PATRIOT, Improved HAWK, and ROLAND weapons systems for defense and a large scale air raid over a division size area. The scenario was modified for the REDEYE simulations as follows:

- (a) The Patriot air defense system was removed.
- (b) The size of the air raid was reduced to 86 aircraft.
- (c) The REDEYE air defense system was added to the scenario.

b. Air Threat to Ground Forces

(1) The mid-1980 European scenario that was modified for this study is based on the RED air raid that is expected over a division size ground force. This raid consists of a mix of time staged attacks on BLUE air defense, division assets, and other BLUE assets in and behind the division area.

(2) The detailed description of the air threat to ground forces may be found in "Warsaw Pact Air Threat (1985)" (U).

c. Model Results

(1) Effects of Proficiency Variation

(a) One series of computer simulations used only the REDEYE system for BLUE air defense against the RED air raid. The purpose of these simulations was to evaluate the effect of REDEYE proficiency in terms of RED kills as a function of proficiency. In these simulations the proficiency was varied from 0.1 to 1.0 probability of success in increments of 0.1. Ten Monte Carlo runs were made for each simulation. Reaction times associated with the engagement sequence were fixed at the values used in the Project Successor study. These reaction times appear to reflect a much better gunner than the average Army gunner. However, as discussed in Section 9, Proficiency to War Models, the reaction times for an average gunner are not available. The same is true for the gunner's estimates of ranges. For the range estimates the values used in Project Successor were modified to reflect errors in estimating range as measured by the range ring profile test given to all the gunners surveyed. The results of these simulations are presented in Table 10-1 and Figure 10-1.

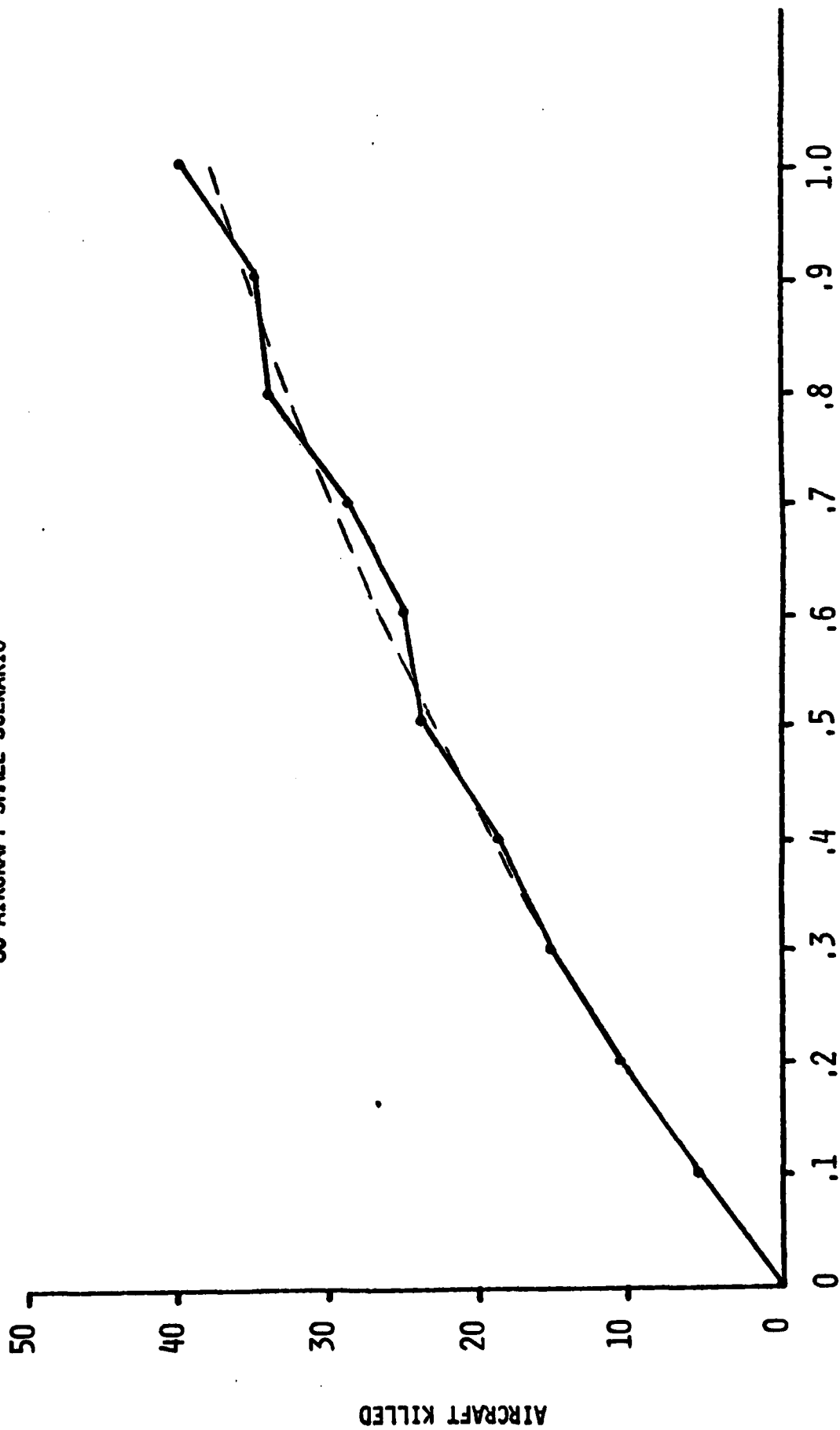
TABLE 10-1

RED AIRCRAFT KILLED VERSUS REDEYE GUNNER PROFICIENCY

<u>REDEYE GUNNER PROFICIENCY (P_h)</u>	<u>RED AIRCRAFT* KILLED</u>
0.1	5.4
0.2	11.1
0.3	14.9
0.4	18.1
0.5	23.5
0.6	24.3
0.7	29.3
0.8	33.9
0.9	34.2
1.0	40.2

**Ave of 10 Simulations*

24 REDEYE TEAMS
86 AIRCRAFT SMALL SCENARIO



REDEYE GUNNER PROFICIENCY

Figure 10-1. Aircraft Killed vs Gunner Proficiency

(b) These results indicate that the number of RED aircraft killed increases in a direct relation to the gunner's proficiency. The RED kills increased from 5.4 to 40.2 as the proficiency increased from 0.1 to 1.0.

(c) The relationship of training to proficiency is discussed in section 8, Training to Proficiency Analysis, where the P_h versus training time is plotted as Figure 8-9. The results from Figure 8-9 and Figure 10-1 were merged as Figure 10-2 to show a relationship between time in hours per month spent in training in the MTS and the RED aircraft killed in the simulation. This relationship is plotted as the percent of aircraft downed as a function of hours of training time in the MTS and indicates that gunner proficiency in terms of RED aircraft downed in the scenario has a direct relationship to training.

(d) Computer simulations were then executed with all the air defense systems active to evaluate the contribution of REDEYE when deployed with other air defense systems. The REDEYE gunner proficiency was varied as before for ten Monte Carlo runs for each proficiency. These results are presented in Table 10-2 and Figure 10-3.

(e) Analysis of these results indicates that the REDEYE air defense system contributes to the defense of the BLUE assets. With REDEYE in the defense the number of RED aircraft killed increased from 67.7 to 77.4.

(2) Combat Effectiveness Results

(a) The relationship of proficiency to combat effectiveness was evaluated in a series of computer simulations. The first simulation used only the Improved HAWK (IH) and ROLAND in the defense. This simulation represents the combat effectiveness of the two air defense systems in the scenario without the effect of the REDEYE system. This data is presented in Table 10-2 in the row for REDEYE probability of success (P_h) equal to zero.

(b) The analysis of these results indicates that for this scenario of 86 aircraft the IH killed 45 RED aircraft and the ROLAND killed 22. These results are plotted on Figure 10-3 for REDEYE gunner P_h equal to zero.

(c) The REDEYE was then activated in the scenario. The REDEYE gunner P_h was varied from 0.1 to 1.0 in increments of 0.1 to evaluate the contribution of REDEYE for varying levels of proficiency. These results are also presented in Table 10-2 and Figure 10-3 for values of P_h of 0.1 through 1.0.

(d) Analysis of the results indicates that the REDEYE contributes to the defense by killing additional RED aircraft when integrated with the IH and ROLAND systems. The additional aircraft killed increased from 68 to 77 as the P_h was varied from 0.1 to 1.0.

24 REDEYE TEAMS
86 AIRCRAFT SCENARIO

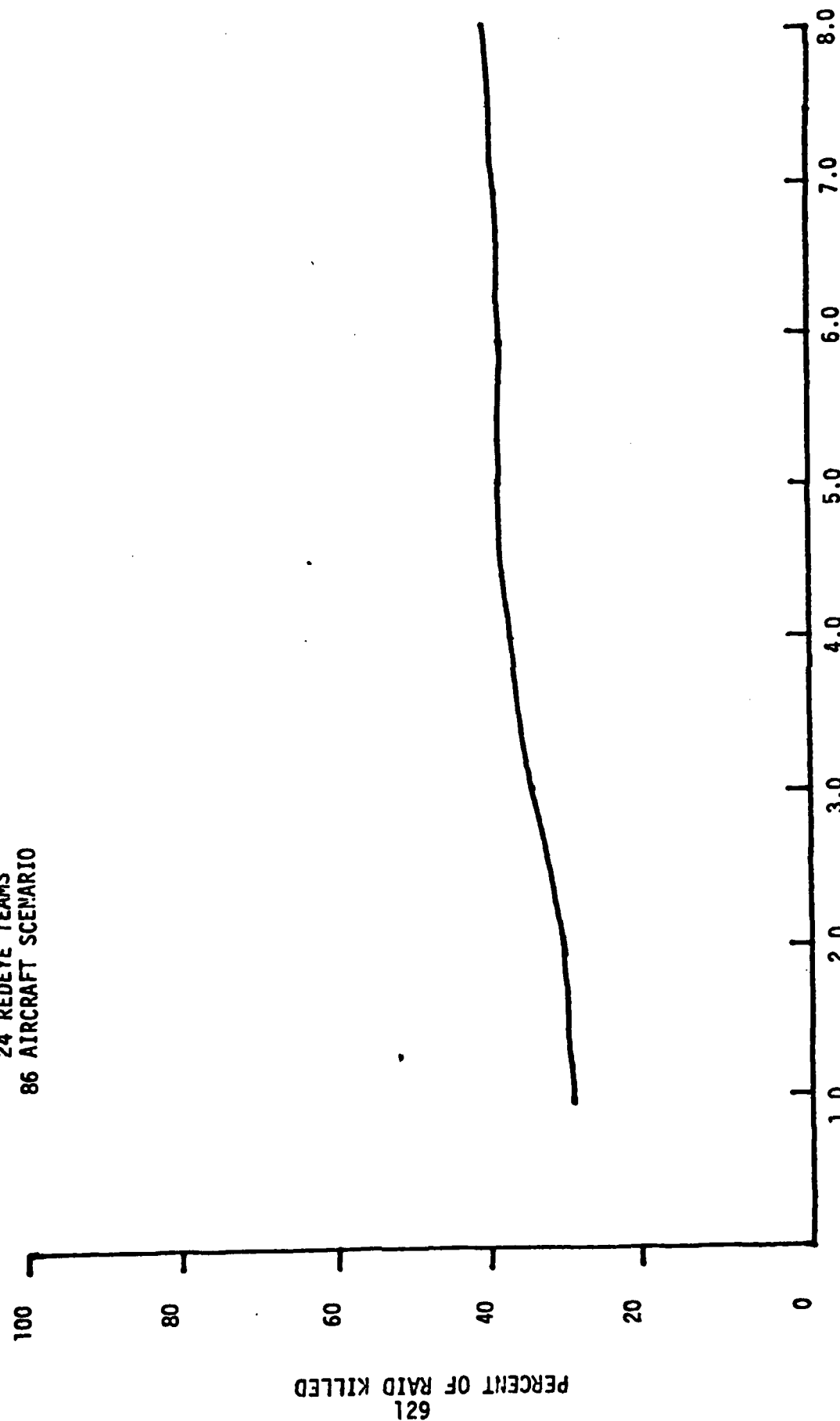


Figure 10-2. Percent of Aircraft Killed vs Training Hours

TABLE 10-2

SIMULATION RESULTS VERSUS REDEYE GUNNER PROFICIENCY (P_h)

REDEYE P_h	REDEYE A/C KILLS	IH A/C KILLS	ROLAND A/C KILLS	TOTAL A/C KILLS
0.0	0	45.3	22.4	67.7
0.1	2.1	46.7	22.4	67.7
0.2	3.7	47.9	21.0	72.6
0.3	6.6	44.7	21.8	73.1
0.4	8.5	44.0	21.0	73.5
0.5	9.3	46.3	20.8	76.4
0.6	13.1	44.8	20.2	78.1
0.7	11.9	45.3	20.1	77.3
0.8	14.6	43.9	19.0	77.5
0.9	16.5	42.9	19.5	78.9
1.0	16.7	40.2	20.5	77.4

24 REDEYE TEAMS
11 IHAWK UNITS
36 ROLANDS

86 ATTACK AIRCRAFT

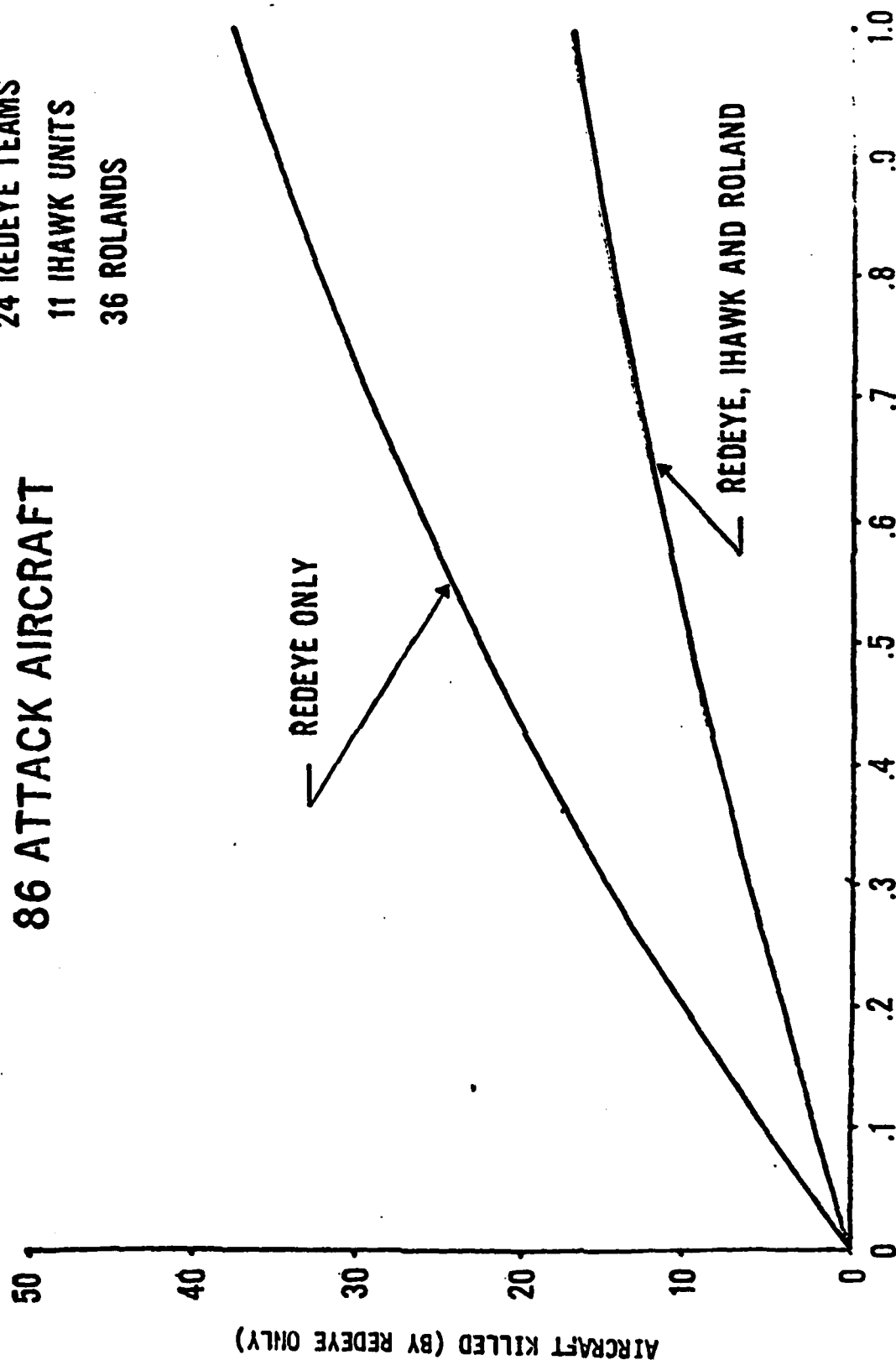


Figure 10-3. Aircraft Killed vs Gunner Proficiency

d. Essential Elements of Analysis - War Models to Combat Effectiveness

(1) EEA 1. What is the impact on the REDEYE contribution to combat effectiveness of the ability of the commander and staff to successfully integrate weapons systems on the battlefield? To integrate combat systems? systems?

(a) The impact of the commander and staff who do not integrate the REDEYE and other weapons systems successfully is that fewer RED aircraft will be killed and there may be an increase in wasted missiles and assets lost. The systems must be located so that they complement each other's capabilities and shortcomings and do not simultaneously engage the same targets with a resulting waste of missiles. A long range, high fire power system cannot be collocated with a short range system unless the short range system is used to overcome shortcomings of the long range system. These shortcomings are such parameters as minimum range, minimum altitude, restricted fire sectors, inability to engage receding targets, minimum target speed, and requirement to track a target until intercept.

(b) The ability to integrate combat systems also has an impact on the contribution of REDEYE. A tank force that is sent out without air defense coverage such as REDEYE will be very vulnerable to attack from the air. Therefore, REDEYE must be deployed along with other combat arms to provide the air defense coverage that they lack.

(2) EEA 2. Can levels of REDEYE personnel training, night training, crew operations or logistics be varied in multiple runs of games to derive different battle payoffs?

(a) Levels of REDEYE personnel training and night training can be reflected as gunner proficiency in war games. As far as the system work team (SWT) was able to determine, there are no proficiency parameters available for night performance.

(b) The crew operations such as locating in defense positions, visually recognizing hostile aircraft, and engaging aircraft can be played in war models.

(c) The effect of logistics can be played in war games. The REDEYE team uses a 1/4-ton truck, utility (M151) with a trailer and has a basic load of six REDEYE rounds. The effect of low POL supplies could be played in a model where a battle lasts several days by not being able to relocate REDEYE teams to new locations based upon the results of each day in the battle. In a similar manner, the effect of not being able to keep the REDEYE teams supplied with REDEYE rounds can be played very easily in war games.

e. Summary

(1) The effects of varying the REDEYE gunner proficiency were evaluated in a small scale scenario consisting of 24 REDEYE teams and 86 aircraft. Analysis of the results of this simulation indicate that there is a direct relationship between the gunner's proficiency and the number of aircraft downed.

(2) The relationship between the number of aircraft downed as a percent of the raid and the number of training hours in the MTS was then developed. The results of the simulation were merged with data relating the gunner's proficiency versus the number of hours per month spent in the MTS.

(3) Improved HAWK and ROLAND were then used in the simulations to evaluate the contribution of the REDEYE system when integrated with other air defense systems.

f. Conclusions

(1) Increasing the REDEYE gunner's proficiency will result in killing a greater number of aircraft in a typical target-rich environment. The number of aircraft killed increased as the gunner's proficiency was increased from 0.1 to 1.0 probability of success.

(2) The REDEYE gunner's combat effectiveness increases as the training time in the MTS is increased.

(3) The REDEYE or follow-on air defense system is required in the mid-1980 time frame to complement the SHORAD systems that will be in the field.

g. Recommendations

(1) It is recommended that the average proficiency P_h for Army REDEYE gunners be maintained at or above 0.8 probability of successfully engaging an aircraft.

(2) It is recommended that REDEYE gunners in tactical units receive eight or more hours of training per month in the MTS or engaging tactical aircraft to maintain the P_h recommended in (1) above.

11. RESOURCES RELATIVE TO COMBAT EFFECTIVENESS

a. Discussion

(1) Combat effectiveness, the bottom line on all Army preparation and training, in the broad sense, is the result of two factors--weapons effectiveness and troop or gunner, in this case, preparedness. For this study, weapons effectiveness, while not considered, turns out to be quite high; on the order of 0.92.* The main focus in ARTS is gunner preparedness, which includes both training received and his ability to respond correctly to this training. The Army restricts the quality of enlistees very little. Currently, all enlistees who have an AFQT score above IVC are accepted. In the IVC category a limit exists of no more than 10% of the total male force. In reality, this means that all in the IVC category that apply are accepted for service. Category V personnel are not accepted for service. The AFQT categories and their numerical ranges are shown in Table 11-1.

TABLE 11-1

AFQT CATEGORIES

<u>CATEGORY</u>	<u>PERCENT RANGE</u>
I	93-99
II	65-92
IIIA	50-64
IIIB	31-49
IVA	21-30
IVB	16-20
IVC	10-15
V	0-9

Within the ARTS study, most of the gunners are in the IIIB and IVA categories. This is based on a sample size of over 2,000 gunners from both the WSTE A and ARTS studies.** REDEYE gunners must also achieve an Operator and Food (OF) score of at least 90 in a score range of 53-147. The OF score is derived from the Armed Services Vocational Aptitude Battery (ASVAB) and determines the enlistee's aptitude in the following areas:

**Currently Measured REDEYE Reliability*

***WSTE A Tested 482 Gunners*

ARTS Tested 1643 Gunners

GI	General Information
AI	Automotive Information
CA	Combat Arms

A detailed description of the ASVAB is provided in Appendix X.

(2) The majority of all REDEYE gunners fall into Categories IIIB and IVA with a high percentage in the low IIIB category. From all appearances, the average enlistee's AFQT scores have been dropping during the last few years. The gunners tested in the units during the WSTE A had been in their units from 3 to 18 months and had an AFQT mean score of 52.3 or Category IIIA (291 gunners). The WSTE A AIT student gunners had an AFQT mean score of 46.8 or a high Category IIIB (60 gunners). The ARTS AIT student gunners had an AFQT mean score of 37.3 or a low Category IIIB (120 gunners). Because of the observed decline, the AFQT scores for 6 AIT classes which were in residence at USAADS during July 1978, were also obtained for comparison. The AFQT mean score for 157 gunners was 39.6, which is also a low Category IIIB. The training administered to low category AFQT gunners, by necessity, must be different from that administered to high category AFQT gunners. Additionally, as the AFQT score goes down certain tasks become very difficult for the lower category AFQT gunners. Given a certain amount of training dollars, and the limited amount of training time which always accompanies lower funding, methods must be developed which will allow a high dollar return and better trained troops. For REDEYE, and in particular STINGER*, eliminating lower AFQT category personnel from the training base as well as modifying the training program will greatly assist in accomplishing the task at hand, i.e., better trained gunners at a reduced cost. With these facts in mind, the following paragraphs trace through the ARTS model, i.e., resources to combat effectiveness.

b. Resources to Proficiency

(1) Currently approximately 80% of the gunners interviewed in the units received their REDEYE training at the USAADS AIT. The current cost of training a 16P REDEYE gunner is \$2,250 and the unit yearly training cost \$9,072 per gunner. The WSTE A assessed the MTS as the most effective training device available to the Army. There are 13 world wide. One in Korea, three in Germany and nine in CONUS of which four are located at the Air Defense School. Their estimated current cost is \$762,000 in CONUS and \$807,000 in Europe, which includes the building and projection equipment. The normal operation of an MTS would call for the following personnel and costs as shown in Table 11-2.

^aSee Section 14 of this Report

TABLE 11-2

MTS PERSONNEL OPERATING COSTS

<u>PERSONNEL</u>	<u>YEARLY</u>	<u>HOURLY</u>
1, E-7	\$20720	\$ 9.96
1, E-6	17899	8.61
1, GS-9	19249	9.25
	<u>\$57868</u>	<u>\$27.82</u>

The yearly and hourly operating cost of 9 CONUS MTS, excluding personnel is \$9,583 and \$6.58 respectively. Adding personnel costs, the yearly and hourly total costs are \$67,451 and \$34.40 respectively. During one hour of operational time 20 attack profiles are displayed and two gunners may track simultaneously for a total of 40 attack profiles. This equates to \$0.86 per attack profile per gunner.

(2) During the conduct of the ARTS evaluation 18 Improved HAWK personnel were tested in the Vilseck MTS in Germany. These gunners while classified as "REDEYE qualified," in reality had little or no REDEYE training. Many had never seen an MTS, THT or REDEYE and had to be shown where the activate uncage, and trigger switches were. MTS Reel No 5 was used and each gunner was given 10 attack displays to engage with the THT and were graded on each pass. Their proficiency growth is shown in Figure 11-1. Approximately 4.5 hours were expended to raise the proficiency of 18 gunners from .64 to .86. Using these gunners as an example, the cost to raise their proficiency .22 points was \$154.80 or \$3.91 per 0.1 proficiency increase per gunner. Using AIT class 44-78 as a similar example the proficiency of 38 gunners grew from 0.61 to 0.78 in 18 hours of MTS time or a cost of \$9.34 per .1 proficiency increase. The difference here is attributed to the forgetting during an AIT class. MTS instruction during AIT takes place over a seven day period** (See Figure 8-1). Observing this curve for class 44-78 it is noted that their proficiency grew from 0.63 to 0.71 in 5 hours of MTS training time. The proficiency growth from day two to day seven resulted in an increase of 0.07 to 0.78 for an additional 13 hours of MTS time. The cost of the first 0.08 proficiency increase is \$5.71 per 0.1 per gunner and the cost of the last 0.07 proficiency increase is \$16.39 per 0.1 per gunner. The difference between the growth of the Improved HAWK and AIT personnel appears to be in the forgetting between testing periods during AIT. This strongly suggests that gunners can increase their proficiency dramatically with short intensified training periods in the MTS.

⁴Based upon 7 hours per day, 4 day week

^{**}See Table 7-1 for the AIT class MTS training schedule

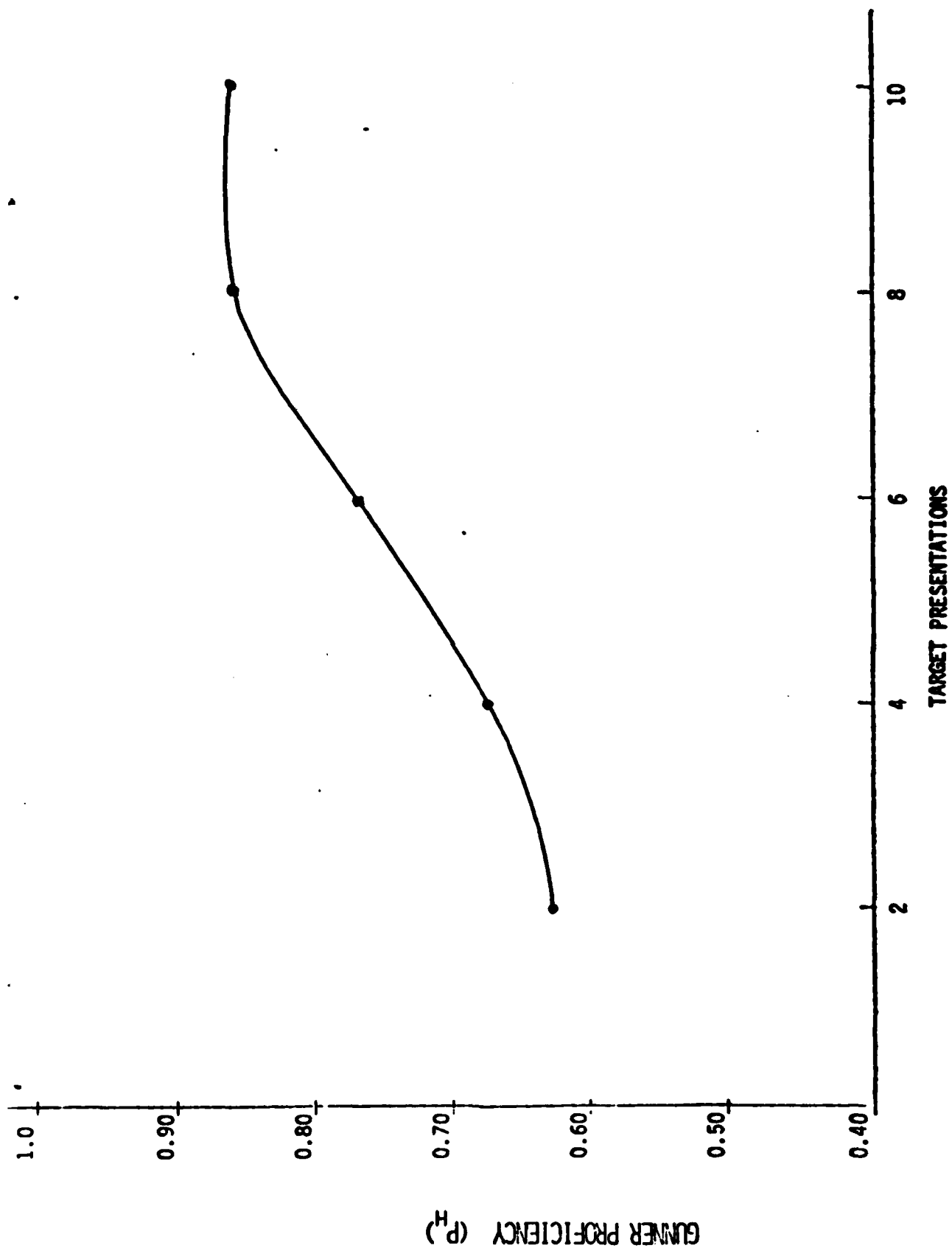


Figure 11-1. Special Group MTS Proficiency Growth

c. Proficiency Related to Combat Effectiveness

(1) As observed in Section 8, unit MTS proficiency varies from 0.58 minimum to 0.84 maximum. This proficiency is primarily the mechanical proficiency in handling the weapon. The range ring profile proficiency, which determines how well the gunner can engage a target within the engagement contours, varies from 0.24 minimum to 0.47 maximum. The product of these numbers yields overall proficiency and varies from 0.14 minimum to 0.39 maximum. As a result of the REDEYE WSTE A recommendations, the range ring memory matrix has been reduced from 24 numbers to 4. This should essentially remove the basic limit on REDEYE effectiveness, which is the range ring proficiency, and move the expected proficiency to that obtained in the MTS.

(2) Figure 10-1 shows effectively a linear relationship between proficiency of the gunners and the number of aircraft downed. Based upon this relationship, the higher the gunner proficiency the more aircraft downed. It, therefore, behooves all unit commanders to train their gunners to the maximum attainable and to maintain their proficiency at this level through consistent and frequent training. It has been shown that short but frequent training periods within the MTS are much better than longer but less frequent training periods. The results of the training of the Improved HAWK gunners described above show that proficiency can be dramatically increased with short but intensive training periods, e.g., one to two hours per week should both increase proficiency initially and maintain proficiency at a high level.

d. Resources Related to Combat Effectiveness

(1) It is apparent that training within the MTS yields the greatest increase in gunner P_h and, therefore, should be maximized. The initial cost and low operating costs makes the MTS a cost effective training device in terms of the number of gunners accommodated and results obtained. The premise that aircraft downed increases linearly with P_h points out the necessity of high gunner P_h values. While it is not possible to maintain high P_h values 0.80 - 0.90 all the time it is possible to peak gunner proficiency to this value by short, frequent training periods. More MTS facilities are required throughout CONUS and Europe. The additional locations are shown in Appendix II.

(2) It has been shown that to raise gunner proficiency requires very little in expenditures. The fact that a REDEYE gunner with a \$9,000 weapon can shoot down \$1,000,000 aircraft gives leverage that cannot be ignored in a future conflict.

e. Conclusions

MTS training in the units is not frequent enough. In some cases this is due to the lack of available time.

f. Recommendations

(1) The allocation of live rounds for ASP should continue (recommended in the WSTEAs) in order to demonstrate weapon capability and to build gunner confidence.

(2) MTS facilities are needed in the western CONUS regions to provide training opportunity for the 7th and 9th Infantry Divisions. Additional facilities are also needed in the eastern CONUS regions and Europe to relieve the training workload on existing facilities.

12. TRAINING EFFECTIVENESS - RESERVES (NATIONAL GUARD)

a. Discussion

(1) Due to the distribution of REDEYE elements within the National Guard, it was not feasible to contact individual REDEYE sections or teams for the purpose of this study. In lieu of individual contact, visits were made to the VII and VIII Reserve Regions to obtain REDEYE training and cost information. Training problems in both regions appeared to be relatively common. Some of the problems are:

(a) REDEYE training programs within the regions vary greatly due to proximity to an MTS (access to facilities being one of the major factors). Distance also is a factor in field exercises in some units.

(b) Productive training time is a major problem due to the nature of a one-meeting/month format. It looks good on paper, i.e., 48 training periods per year, but this has little bearing on actual training time due to: infrequency of meetings requires a certain amount of redundant effort; requirements imposed upon the Guard take up a high percentage of usable time, i.e., emergencies, parades, community events, etc.

(c) Due to time lapse between training periods, the "forgetting" curve is very steep.

(d) The 16P grade structure as it now stands has more restrictive advancement opportunities than other MOSs.

(e) Only one THT is allocated per state.

(2) A sample of 109 NG test subjects of approximately 500 were tested during annual training (AT) at Ft Bliss, TX. This institutional refresher training allowed a sufficient sample size to enable testing of REDEYE gunners who had no REDEYE training, and those who were taking the course as a refresher. Learning and retention parameters could both be investigated under these conditions. The results of this testing is included under paragraph e of this section.

b. Training in Local Units

(1) Classroom Training. No specific data were collected during this study which would give a confident figure for classroom training times. As indicated in paragraph 12f (EEA), unit training across the board is lacking due to insufficient resources within a geographic area. This is reflected even in classroom training due to the fact training aids must be shared among some units or borrowed from an active unit. As an example,

in the Nebraska Guard, the 67th HHC must travel three hours by POV to obtain a GOAR kit for use in VACR classroom training. VACR proficiency as well as RRP proficiency are tasks which need a high frequency of training to maintain a given proficiency. Classroom instruction of the weapon hardware deployment, and the RRP tasks appear to be areas which should be least affected by geographic and resource problems, but only affected by incentive, leadership interest in AD, and unit training time available. A measure of unit classroom instruction as it presently exists within the unit may be made by assuming that RRP proficiency is an indicator of unit classroom training. The six AT classes monitored at Fort Bliss during the months of June and July 1978 were administered the RRP test. These test subjects provided a cross-section of CONUS National Guard units. Based upon the above assumption that RRP is an indicator of unit classroom instruction, the results of RRP testing is shown in paragraph 12e and may be referenced for comparison with active Army units.

(2) Hands-on Training. Hands-on training suffers to a high degree from lack of resources with the exception of those National Guard units close to MTS facilities. Again referencing the AT classes monitored during this study, an MTS tracking test was administered to these students. The results of this tracking test is shown in paragraph e(2) and may be compared with active Army unit results on the same test. Only a composite CONUS score may be ascertained from these tests as computations were based on each class. Test subjects comprising each class were from random geographic areas.

c. Institutional Refresher Training. Reserve institutional refresher training is conducted at the MTS facilities at the Air Defense School, Fort Bliss, Texas. The Reserve refresher curriculum is similar to that of the AIT curriculum with the exception of a shorter training period within the MTS. Approximately 40 percent of the National Guard AT students tested at Fort Bliss for the ARTS study were taking the course as refresher training. One gunner from each AT class is selected during training to fire a live round based on his performance. This method of selection is identical to that of the AIT classes. This live firing is the only opportunity a Reserve 16P gunner may have with a live REDEYE round.

d. Reserve Training Costs. Reserve training costs are discussed in section 7e with a breakout of training costs shown in Table 7-5.

e. Reserve Proficiency. The previously mentioned six AT classes which were monitored at Fort Bliss, Texas, were used to obtain Reserve proficiency data. The methodology of this Reserve testing is depicted in Figure 12-1. A breakout per class of those individuals taking the training as a refresher or on a first time basis is shown in Table 12-1.

(1) In Local Units. A wide variation of proficiency will exist in

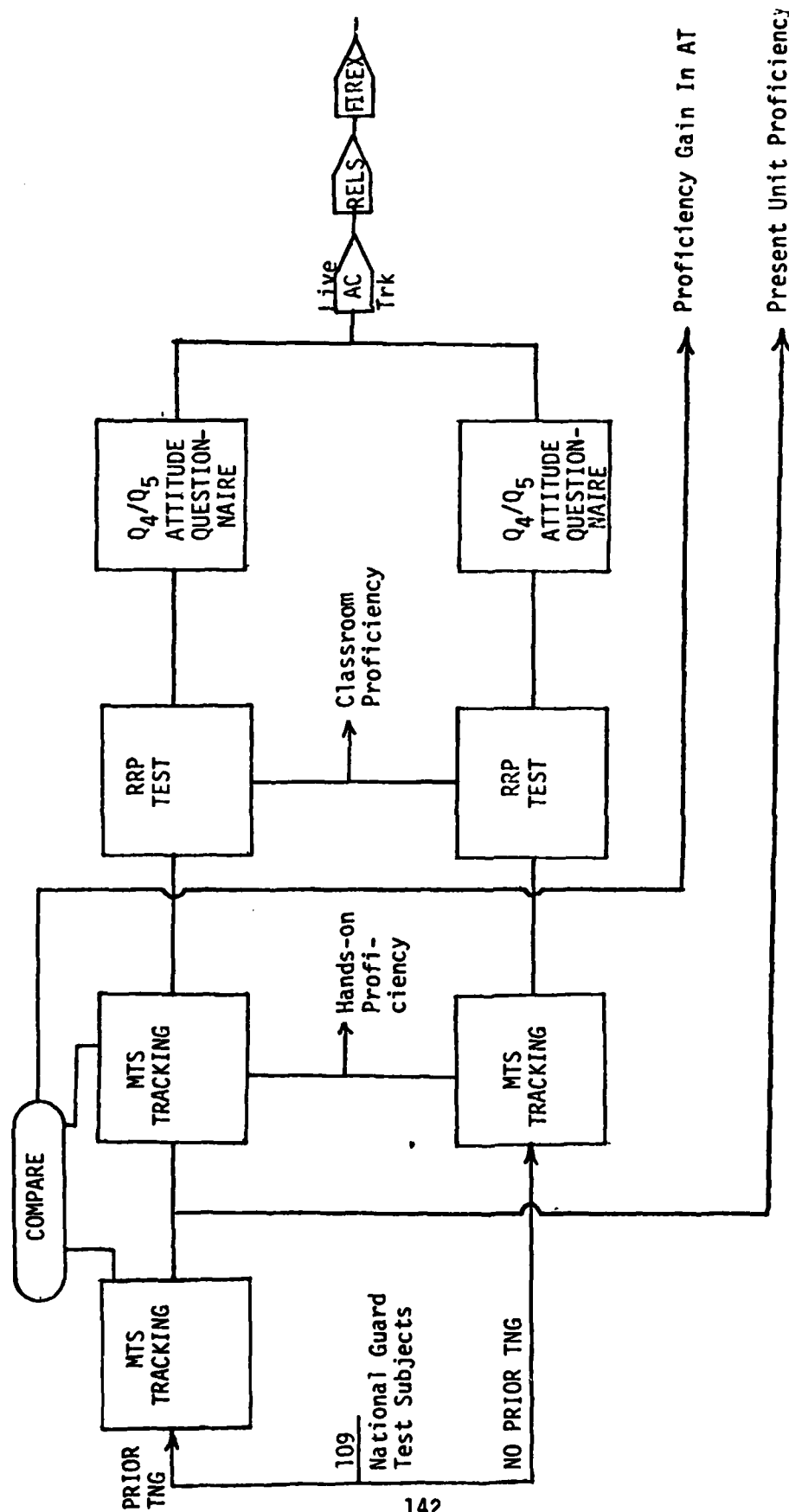


FIGURE 12-1
RESERVE PROFICIENCY EVALUATION METHODOLOGY

TABLE 12-1
MTS EXPERIENCE OF (AT) TEST SUBJECTS

<u>NATIONAL GUARD CLASS</u>	<u>NUMBER WITHOUT PREVIOUS EXP.</u>	<u>NUMBER WITH PREVIOUS EXP.</u>	<u>TOTAL</u>
11-78	11	10	21
12-78	6	12	18
13-78	10	8	18
14-78	20	3	23
17-78	8	9	17
19-78	<u>8</u>	<u>4</u>	<u>12</u>
TOTALS	63	46	109

local units directly related to availability of resources, local mission, and commander's feelings toward Air Defense. In most cases, the time lapse from the last AT refresher course is a major factor in the proficiency of National Guard gunners as this will have been the only hands-on training they receive.

(2) Before Refresher Training. Present National Guard REDEYE proficiency was perceived to be that of the proficiency measured on 16P test subjects who had had previous AT formal training. These subjects were given five MTS passes prior to the MTS tracking portion of their AT training. The average P_h for this group during this test phase was 0.45. These results are considered the average proficiency of National Guard 16P gunners as it presently exists and would be the proficiency of the National Guard at the onset of a mobilization order.

(3) After Refresher Training.

(a) Hands-on proficiency (P_h) which was measured by performance in the MTS was as indicated for those with previous experience to be initially 0.45. Their proficiency was increased to 0.71, a gain in proficiency of 0.26 attributable to refresher training.

(b) Classroom Proficiency. A measure of this proficiency was previously stated to be reflected by the results of the RRP test administered to all test subjects. The average results of all six AT classes was 34.2 percent correct on All Actions. During this study, two separate units, not in the AT phase were tested. Unit 1 is an Air Defense unit based close to and having access to an MTS. Unit 2 did not have the access to an MTS as did Unit 1, but had just completed a one-week "shadow school." Unit 1's RRP proficiency was 26.8 percent (All Actions). Unit 2's RRP proficiency was 32.8 percent (All Actions).

(c) Attitude. Through the use of attitude questionnaires, an indication of the reservist attitude toward various aspects of his National Guard affiliation were solicited. The general responses to some attitude areas as well as a comparison to the responses by regular Army units to the same questions are given below.

1. Work or job attitude - the reservist, in general, indicated a satisfaction with his job and a sense of accomplishment derived from the activities which make up his work assignment. The reservists' counterpart, the regular Army 16P, did not indicate as much enthusiasm toward his work assignment.

2. Working Conditions - working conditions were deemed to be better by the reservist than the regular Army personnel.

3. Personnel inter-relationships - this encompasses the people with which the 16P works with on a daily basis as well as his immediate superior. Both the Reservist and active 16P expressed a predominate trust in each other as well as good leadership qualities by their immediate superiors (section leaders/section Sergeant).

4. Turbulance - when asked the likelihood of pursuit of a career in the military, 66 percent of the Reservist indicated a greater than 60 percent chance that they would reenlist. This is approximately 10 percent lower than the 77 percent retention figure given by the VIII Readiness Region.

f. Essential Elements of Analysis - Reserve Training (NG)

(1) EEA 1. What level of REDEYE proficiency can be achieved for the NG units prior to deployment?

Average proficiency obtained from six classes during AT at Fort Bliss, TX, during the time period June and July 1978 will be considered representative of proficiencies of NG units prior to deployment. These proficiencies are listed below.

Average MTS P_h 0.45

Average RRP 0.34
(All Actions)

(2) EEA 2. What individual and collective REDEYE training programs are required to achieve proficiency in NG units prior to deployment?

Training programs which closely adhere to AT POI.

(3) EEA 3. What are the resources required to achieve REDEYE proficiency in NG units prior to deployment?

At minimum, 1 Tracking Head Trainer (M49) per REDEYE section and at least 3.3 hours per man per month usage of an MTS.

(4) EEA 4. How do all the other excursions influence NG REDEYE combat effectiveness, training programs, and associated resources?

"Other excursions" are not defined within this EEA. However, one excursion which is not obvious on paper, but is a large factor in actuality, is true training time within the unit. Each meeting involves a reviewed reorganization of activities with the usual clean up activities at the end of the meeting, also, additional activities imposed upon the units throughout the year which may not show up in the planning phase. All of these excursions combined give a resultant actual REDEYE effective

training time of approximately four hours* of training time/month.

(5) EEA 5. Can the NG REDEYE training system respond to mobilization requirements without revision?

Only to a level of AIT proficiency. With the limited resources, proficiency degradation takes over when the gunner returns to his unit training environment.

(6) EEA 6. What is the relationship between training, proficiency, and REDEYE personnel retention in the NG?

(a) A relationship between unit training and proficiency is difficult to ascertain as REDEYE training within the unit is virtually nil. The proficiency of the NG REDEYE gunner is that which is retained from his last two-week course at AT.

(b) REDEYE personnel retention is approximately 77 percent. This information was extracted from oral interviews conducted at the Reserve Region offices.

(7) EEA 7. What is the relationship of individual REDEYE training to collective REDEYE training in the NG in sustaining proficiency?

Other than training conducted during AT, individual REDEYE training is considered to be based on the SQT program which does not have sufficient participation at the time of data collection for this study. Collective REDEYE training is, basically, conducted during AT. This type of training frequency (once per year) does not contribute to the ability to sustain proficiency.

(8) EEA 8. What is the cost of training REDEYE gunners in NG units to ARTEP standards?

The cost of AT at USAADS is provided in paragraph 7, but no information was obtained on a field exercise which would relate to ARTEP.

(9) EEA 9. How would variations from the current 38 days of Annual/ Reserve training impact on the combat effectiveness of REDEYE gunners?

Since the fourteen-day AT time period is the most productive, REDEYE

**A subjective figure arrived at through discussion of the problem with personnel at the VIII Readiness Region.*

training received (Individual and Collective), variations of AT time would have a direct effect on combat effectiveness. As previously stated, REDEYE-related training at the units during the remaining twenty-four days is virtually nil. An additional AT period, as an example, six months after present AT would enhance combat effectiveness.

(10) EEA 10. How much annual training time is required to sustain REDEYE gunners in NG units at ARTEP standards?

Fifteen days annual training time is required if the REDEYE gunners have been school trained during an AT period. Thirty days annual training would be required for a new REDEYE gunner.

(11) EEA 11. What is the cost of training the IRR (Individual Ready Reserve) REDEYE gunners to Soldiers Manual standards?

This question is answered in paragraph 7e (Study Costing).

(12) EEA 12. How much training time is required annually to sustain IRR REDEYE gunners to Soldiers Manual standards?

Neither the Soldiers Manual nor Skill Qualification Test are available to 16P personnel in the IRR.

(13) EEA 13. What are the required resources of alternative training to improve the premobilization REDEYE training of NG personnel (Officer/NCO/E1-E4)?

- (a) One week-end/quarter of MTS tracking.
- (b) One M-76 training package/battalion.
- (c) One GOAR kit/battalion.
- (d) Must have a good mix and frequency of training, both hardware and deployment.
- (e) It is also recommended to carry the 16P MOS in the National Guard as a secondary MOS. Advancement for Officers/NCO/EM in the 16P MOS is limited when carried as a primary MOS; i.e., EM can advance to E7 in another MOS, whereas, a 16P E6 is dead end.

(14) EEA 14. What is the level of REDEYE training readiness of an average roundout battalion, D + 30, D + 60 unit?

Information was obtained for this study only from Regions VII and VIII. The level of REDEYE training readiness was low, however, a roundout battalion which is D + 30 or D + 30+ would have sufficient time to prepare their REDEYE teams for mobilization. A mobilization training time of 7 days would be sufficient if a plan exists for such mobilization training.

(15) EEA 15. What ARTEP level should be required for REDEYE gunners in those units which would not be committed until after D + 60? What training program and associated resources would be required?

(a) The lowest ARTEP level is sufficient for REDEYE gunners not committed until after D + 60.

(b) Training programs equivalent to AIT plus unit collective field training. All resources necessary for above training programs would be necessary and in such quantity to facilitate an accelerated program.

(16) EEA 16. How much increase in REDEYE proficiency can be achieved in 30 days? At what echelon should reserves be employed? What REDEYE training programs and resources are required to maintain the approximate premobilization REDEYE proficiencies?

(a) A REDEYE gunner proficiency of 0.85 can be achieved in 30 days. The amount of increase would be dependent upon his starting proficiency.

(b) Reserve employment is not applicable to REDEYE training.

(c) Premobilization proficiencies are answered by EEA 1 and EEA 7.

(17) EEA 17. Can simulations played to a D + 30 and D + 60 scenario, and can war games be set at D + 30/D + 60 scenario with REDEYE?

Yes; based on information obtained from EEA 14 and EEA 16.

g. Recommendations

(1) Investigate the feasibility of the formation, in each Readiness Region, a REDEYE battery which geographically is complementary to an available MTS.

(2) Reiteration of the recommendation made in Section 8, referencing a mobile MTS feasibility study.

(3) One week-end/quarter of MTS tracking for maintenance of proficiency.

(4) Maintain one M-76 trainer kit per battalion.

(5) An investigation into the feasibility of use of the "German Clothesline" target for THT tracking use in the local reserve units. This trainer is described in Section 8 (Interoperability).

13. PERSONNEL PROGRAMS

a. Discussion

(1) The status of personnel attitude of active and non-active REDEYE Army units, five Army AIT classes, and three Marine Corps REDEYE units was evaluated during this study. Questionnaire Q4/Q5 was designed to measure the attitude of the troops, establish the profile of a typical REDEYE gunner, and to isolate various stability/turbulence factors. This questionnaire was given to all the troops surveyed, except the AIT classes. Questionnaire Q1/Q2 was used to measure AIT student attitudes, and these will be reported separately from the Q4/Q5 responses.

(2) It was found that the responses to Q4 and Q5 from the active Army units, both CONUS and OCONUS, were similar, and therefore, were grouped together for reporting purposes. The following discussion of the troop responses to Questionnaire Q4/Q5, will be considered: Group I, active Army REDEYE gunners, both CONUS and OCONUS; Group II, Marine Corps REDEYE gunners; and, Group III, Army Reserve and National Guard REDEYE gunners. The AIT student responses to Q1/Q2 will be treated separately.

(3) The general consensus received from interviews with active Army gunners indicates a dissatisfaction with the treatment and consideration they receive from their units. Comments fell into two general categories. First, they were not being properly used in their primary role as REDEYE gunners, and, second, not receiving enough "hands-on" equipment training in the MTS or during field exercises. A high percentage of the gunners interviewed felt they were considered a detail unit, spending a large portion of their available training time pulling maintenance on vehicles, on guard duty, assigned as drivers, or performing other details not related to their MOS. A nearly equal proportion of gunners expressed dissatisfaction with the training they receive, both in the classroom and in the field. They stated that they do not train enough with hardware, and when they go on field training exercises, training aids are rarely taken along. In contrast, the Marine Corps always take the M49 Tracking Head Trainers (THT) on field exercises. A major complaint of National Guard gunners was the lack of REDEYE training by their unit due to lack of training devices and non-availability of MTS facilities.

(4) The morale of the REDEYE gunners interviewed was found to be low in all groups except the National Guard units and the AIT students.

b. Personnel Stability Factors

(1) Factors pertaining to the mental well-being of the gunners, such

as personal sense of accomplishment, job satisfaction, and his attitude toward his co-workers and supervisors work together to partially define personnel stability. These factors were sampled by Questionnaire Q4, which was given to all the units surveyed, except the AIT personnel. Responses to representative questions relating to personnel stability are shown in Table 13-1 for the three groups defined in paragraph a above.

(2) The responses from the AIT students to Questionnaire Q1, designed to measure attitude, motivation, leadership, and discipline of AIT personnel, indicated that over 75 percent of the students were properly motivated and had a good attitude toward their training, unit, co-workers, instructors, and Officers-In-Charge. Less than 15 percent of the students indicated that the morale of their company was low.

c. Personnel Turbulence Factors

The stability factors discussed above also operate in a negative sense to indicate a measure of dissatisfaction of the troops toward their working environment. Other questions on Questionnaires Q4 and Q7, however, addresses in a more direct fashion the personnel turbulence (turnover) within units. These questions relate to the length of time in grade, time in their unit, time left in service, and their intent to reenlist and to make a career of the Army. There was no questionnaire specifically designed to measure AIT student turbulence factors, therefore, no discussion of this group will be made. Responses to questions from Q4 and Q7 relating to turbulence factors are shown in Table 13-2 for the three groups defined in paragraph a above.

d. Preselection Criteria for Gunners

(1) Gunner proficiency was measured by two selected complex tasks which the gunner must perform in order to successfully engage an aircraft. The first task requires the gunner to know the seven weapon engagement steps in the correct sequence in order to properly fire the REDEYE weapon. The gunner's proficiency (P_h) in completing these seven steps in the firing sequence was measured in the MTS. The second task measured, in order to establish gunner proficiency, requires the gunner to determine the target's range ring profile (RRP). The RRP for a given aircraft target is representative of the REDEYE's engagement capability against the target and requires the gunner to correctly categorize the aircraft, determine its size relative to the range ring, and then decide if he can successfully engage the aircraft. If the gunner does not identify and size the aircraft correctly, it is unlikely that he will engage the aircraft while still in range of the weapon or within the time limit of the Battery Coolant Unit. The gunner proficiency in properly defining a target's RRP was determined by a written RRP test.

TABLE 13-1
GROUP RESPONSE TO Q4/Q5 PERSONNEL STABILITY

	<u>GROUP I RESPONSE (%)</u>	<u>GROUP II RESPONSE (%)</u>	<u>GROUP III RESPONSE (%)</u>
1. I enjoy the day-to-day work activities that make up my duty assignment.			
(a) STRONGLY AGREE	4.3	1.5	23.9
(b) AGREE	21.4	10.8	56.9
(c) NEITHER AGREE OR DISAGREE	28.1	24.6	19.7
(d) DISAGREE	28.9	41.5	0.0
(e) STRONGLY DISAGREE	17.2	21.5	0.0
2. The conditions I work under make me feel like doing my best.			
(a) STRONGLY AGREE	6.0	0.0	19.3
(b) AGREE	16.5	12.3	42.2
(c) NEITHER AGREE OR DISAGREE	19.3	23.1	21.1
(d) DISAGREE	37.7	40.0	15.6
(e) STRONGLY DISAGREE	20.4	24.6	1.8
3. All in all, I am satisfied with my job in the military.			
(a) STRONGLY AGREE	9.7	0.0	24.8
(b) AGREE	26.1	13.8	51.4
(c) NEITHER AGREE NOR DISAGREE	20.5	26.2	13.8
(d) DISAGREE	25.9	40.0	9.2
(e) STRONGLY DISAGREE	17.8	20.0	0.9

TABLE 13-1 (cont'd)

	<u>GROUP I</u>	<u>GROUP II</u>	<u>GROUP III</u>
4. Men in my section know how to get the job done right.			
(a) STRONGLY AGREE	15.0	23.1	30.3
(b) AGREE	39.5	56.9	47.7
(c) NEITHER AGREE OR DISAGREE	22.5	12.3	13.8
(d) DISAGREE	16.9	7.7	7.3
(e) STRONGLY DISAGREE	6.2	0.0	0.9
5. The members of my section are a good group to work with.			
(a) STRONGLY AGREE	18.8	20.0	42.2
(b) AGREE	45.1	58.5	45.9
(c) NEITHER AGREE NOR DISAGREE	21.9	16.9	10.1
(d) DISAGREE	10.1	4.6	0.9
(e) STRONGLY DISAGREE	5.3	0.0	0.9
6. My section does high quality work.			
(a) STRONGLY AGREE	15.3	10.8	26.6
(b) AGREE	37.5	43.1	49.5
(c) NEITHER AGREE NOR DISAGREE	27.4	33.8	19.3
(d) DISAGREE	15.0	9.2	3.7
(e) STRONGLY AGREE	4.9	3.1	0.9
7. He (Supervisor) is willing to make changes in his way of doing things.			
(a) STRONGLY AGREE	14.0	9.2	23.8
(b) AGREE	40.9	46.2	49.5

TABLE 13-1 (cont'd)

	<u>GROUP I</u>	<u>GROUP II</u>	<u>GROUP III</u>
(c) NEITHER AGREE OR DISAGREE	16.3	23.1	19.8
(d) DISAGREE	18.7	12.3	3.0
(e) STRONGLY AGREE	10.2	9.2	4.0
8. He (Supervisor) clearly explains why a particular action is needed.			
(a) STRONGLY AGREE	12.5	9.2	23.8
(b) AGREE	40.1	40.0	50.5
(c) NEITHER AGREE OR DISAGREE	22.0	30.8	19.8
(d) DISAGREE	17.4	18.5	4.0
(e) STRONGLY DISAGREE	4.6	8.9	2.0
9. He (Supervisor) is aware of his men's capabilities.			
(a) STRONGLY AGREE	15.9	15.4	26.7
(b) AGREE	42.4	50.8	48.5
(c) NEITHER AGREE OR DISAGREE	17.2	16.9	15.8
(d) DISAGREE	15.7	12.3	7.9
(e) STRONGLY DISAGREE	8.9	4.6	1.0

TABLE 13-2

GROUP RESPONSE TO Q4 & Q7 PERSONNEL TURBULENCE

	<u>GROUP I RESPONSE (%)</u>	<u>GROUP II RESPONSE (%)</u>	<u>GROUP III RESPONSE (%)</u>
1. Length of time in present unit (troop):			
(a) LESS THAN 30 DAYS	2.7	6.2	NA
(b) BETWEEN 1 AND 6 MONTHS	24.7	13.8	NA
(c) BETWEEN 6 AND 12 MONTHS	21.5	35.4	NA
(d) LONGER THAN 1 YEAR	51.1	44.6	NA
2. Is your ETS (expiration Term of Service) date			
(a) LESS THAN 6 MONTHS FROM PRE- SENT?	11.3	4.6	NA
(b) BETWEEN 6 AND 12 MONTHS FROM PRESENT?	23.6	20.0	NA
(c) BETWEEN 1 AND 2 YEARS FROM PRESENT?	52.0	53.3	NA
(d) INDEFINITE?	13.1	23.1	NA
3. Length of time as member of present REDEYE team			
(a) LESS THAN 30 DAYS	6.6	7.9	NA
(b) BETWEEN 1 AND 6 MONTHS	33.2	22.2	NA
(c) BETWEEN 6 AND 12 MONTHS	31.7	23.3	NA
(d) LONGER THAN 1 YEAR	36.9	38.1	NA
4. Likelihood of reenlisting at the end of your current enlistment:			
(a) 0%	42.7	73.4	13.1

TABLE 13-2 (cont'd)

	<u>GROUP I</u>	<u>GROUP II</u>	<u>GROUP III</u>
(b) 20%	12.4	7.8	8.4
(c) 40%	11.9	9.4	13.1
(d) 60%	15.1	7.8	20.6
(e) 80%	7.6	1.6	17.8
(f) 100%	10.2	0.0	27.1
5. Do you think that you will pursue a career in the military?			
(a) NO, DEFINITELY NOT	35.5	67.7	23.9
(b) NO, PROBABLY NOT	15.2	10.8	11.9
(c) UNDECIDED	26.8	16.9	27.0
(d) YES, PERHAPS	9.4	4.6	17.4
(e) YES, PROBABLY	7.6	0.0	13.8
(f) YES, DEFINITELY	5.5	0.0	11.0

(2) The General Technical (GT), Operator and Food (OF), and Field Artillery (FA) aptitude area scores for the gunners tested during this study were gathered so a relationship between the aptitude area scores and the measured gunner proficiency could be determined, if one exists. During the REDEYE WSTEa study similar data were collected and a positive correlation was found between gunner proficiency and aptitude scores and the Armed Forces Qualification Test (AFQT) scores.

(3) Correlation coefficients were calculated to determine if there is a relationship between the gunner's aptitude scores and his measured proficiency in the two tasks as a REDEYE gunner. The gunner's AFQT, GT, FA, and OF Aptitude Scores were correlated with their proficiency in the MTS and their scores on the written RRP test given during the REDEYE WSTEa study and this study. The correlation coefficients obtained from both studies will be given for completeness.

(a) From the WSTEa study the correlation coefficients for the AFQT, GT, and OF scores, in relation to each part of the RRP test and the final MTS P_h , are tabulated for the 61 AIT gunners tested in Table 13-3. A correlation coefficient of 0.250 is required for significance to the 0.05 level.

(b) Also from the WSTEa study, the correlation coefficients for the AFQT, GT, and OF scores, in relation to each part of the RRP test and results of the MTS P_h for the approximately 300 unit gunners tested are shown in Table 13-4. A correlation coefficient of 0.113 is required for significance at the 0.05 level.

(c) Further testing of two AIT classes was conducted in the MTS during the WSTEa to relate the gunner's P_h , time between testing, and mental category. AIT classes 14 and 15 were given five tests in the MTS with various times between tests. The results of this test are shown in Figure 8-6. During this present ARTS study, FA aptitude scores were also collected. It was found that the units are not required to retain AFQT scores for REDEYE gunners.

(d) The correlation coefficients for the GT, OF, AFQT, and FA scores in relation to each part of the RRP test and results of the MTS P_h are shown in Table 13-5 for the AIT students, and in Table 13-6 for the unit gunners tested during the ARTS.

e. Essential Elements of Analysis - Personnel Programs

(1) EEA 1. How does personnel stability/turbulency influence REDEYE training programs?

TABLE 13-3

WSTE AIT PERFORMANCE - MENTAL SCORE CORRELATION

	<u>AFQT</u>	<u>GT</u>	<u>OF</u>
RRP Aircraft Category	+0.332	+0.289	+0.353
RRP Target Size	0.348	0.311	0.285
RRP Fire/No Fire	0.389	0.333	0.378
RRP Total Score	0.452	0.392	0.421
RRP All Correct Actions	0.492	0.467	0.461
MTS Final P _h	0.195	0.146	0.244

Correlation coefficient required for significance at the 0.05 level is 0.250.

TABLE 13-4

WSTE A UNIT PERFORMANCE - MENTAL SCORE CORRELATION

	<u>AFQT</u>	<u>GT</u>	<u>OF</u>
RRP Aircraft Category	+0.332	+0.292	+0.247
RRP Target Size	0.447	0.416	0.373
RRP Fire/No Fire	0.337	0.354	0.230
RRP Total Score	0.479	0.461	0.372
RRP All Correct Actions	0.517	0.498	0.394
MTS P _h	0.186	0.199	0.179

Correlation coefficient required for significance at the 0.05 level is 0.138

TABLE 13-5

ARTS AIT PERFORMANCE - MENTAL SCORE CORRELATION

	<u>GT</u>	<u>OF</u>	<u>AFQT</u>
RRP Aircraft Category	+0.232	+0.203	+0.325
RRP Target Size	0.387	0.260	0.475
RRP Fire/No Fire	0.377	0.247	0.461
RRP Total Score	0.440	0.309	0.552
RRP All Correct Actions	0.453	0.310	0.538
MTS P _h	0.054	0.028	0.073

Correlation coefficient required for significance at the 0.05 level is 0.195.

TABLE 13-6

ARTS UNIT PERFORMANCE - MENTAL SCORE CORRELATIONARMY TACTICAL UNITS

	<u>GT</u>	<u>OF</u>	<u>AFQT</u>
RRP Aircraft Category	+0.304	+0.200	+0.352
RRP Target Size	0.334	0.215	0.423
RRP Fire/No Fire	0.338	0.208	0.357
RRP Total Score	0.398	0.254	0.465
RRP All Correct Actions	0.405	0.253	0.474
MTS P _h	0.161	0.083	0.167

Correlation coefficient required for significance at the 0.05 level is 0.088.

(a) Based on the number of REDEYE gunners who were tested in their units during the WSTE A and who were available to be retested during the ARTS, it was indicated that the turnover for both CONUS and non-CONUS units was approximately 50 percent per year.

(b) The areas which are designated hardship areas are especially affected because of the 100 percent turnover each year. Several REDEYE section lieutenants interviewed had been in their assignments less than 3 months, and none had been able to implement programs of training to their own satisfaction. Few of the section leaders had the benefit of overlapping with their predecessor and so most of them must develop their own training plans without the benefit of an "institutional memory." This, combined with the continuing rotation of gunners, makes it difficult to maintain an on-going effective training program. It would be expected that the combat effectiveness of any particular section should be built up during the assignment of the section lieutenant. However, this could not be supported with data from the MTS or RRP test.

(c) Two sections in Korea with newly assigned lieutenants were checked to determine whether their section proficiency was low in either of the areas tested. Both sections were lower than the desired levels for the MTS and RRP, but matched the overall average of Korea. Without previous or future data for comparison, it can only be surmised that the sections were at a lower level of proficiency than would be demonstrated at a later time when routine training would be implemented. This is because of the direct relationship shown between training time and overall weapon handling proficiency both during the WSTE A and the ARTS.

(d) Thus, lack of personnel stability adversely effects REDEYE training programs. In order to compensate for the lack of stability, air defense training is required in the battalion if proficiency is to be maintained at an acceptable level.

(2) EEA 2. What is the feasibility of maintaining unit leadership for REDEYE gunners in units over an extended period of time (2-3 years)?

It would be desirable to stabilize unit leadership provided it does not constitute a deterrent to the career progression of ADA officers. None of the section leaders interviewed had been in their assignment for longer than 21 months; however, a 2-year assignment is considered maximum. Most officers expect and want a new assignment within a one to two year period, especially as openings develop at the battalion and higher head-quarter levels. Thus, it is not considered feasible to extend unit leadership beyond the current 2-year period.

(3) EEA 3. What is the effect of peacetime attrition in REDEYE training, both in the unit and in the institution?

(a) Peacetime attrition appeared to be tied to the current enlistment of the unit gunners tested, based on the responses to the Q4. A majority of the gunners from all except one unit indicated they would not reenlist following their current enlistment. The only unit in which this response was not uniformly recorded was in Korea and the indication was that a majority did expect to pursue a career in the Army.

(b) The overall attrition does impose a higher workload for training new personnel in both the unit and the institution.

(4) EEA 4. What changes are expected in enlistment criteria? How will this impact on individual REDEYE training requirements in the training base?

(a) The requirements for enlistment, as specified in AR 601-210, Regular Army Enlistment Program, are subject to change as the needs for personnel vary. The changes which have been noted in the past have resulted in a lowering of physical and mental requirements in order to fill quotas. A specified change, dated 7 Oct 77, permitted acceptance of AFQT mental Category IVC, but limited the number to 10 percent of the total male force.

(b) The AFQT data were obtained for more than 90 percent of the gunners tested and less than one percent were in the IVC category. This is considered to be because acceptance in 16P training requires an OF aptitude area score of 90. The relation between AFQT and OF scores is shown in Appendix X on Correlations. Therefore, the impact on REDEYE training cannot be assessed until the need for personnel necessitates a waiver of minimum requirements. Based on the learning and retention data obtained during the WSTEa, the minimum requirements should not be waived, but should be raised. If the requirements are raised, it would be expected the individual training could be less intense and could be adapted to self-paced instruction more satisfactorily.

(5) EEA 5. Are enlistees' sense of values more critical to training proficiency than intellectual aptitude?

(a) An indication of the enlistees' sense of values was taken from the General Attitude section of Q4. A majority of gunners tested agreed with the statement, "I want to work hard for the people with whom I work,"; with, "Men in my section know how to get the job done."; and with,

"If a man needs help, he can usually count on others (of his unit) to provide it." However, they disagreed with the statements: "The conditions I work under make me feel like doing my best," and with, "I gain a sense of accomplishment from the day-to-day tasks that make up my assignment." The aforementioned responses varied in intensity but were generally applicable to both the active Army and Marine units. The Army reserve units contrasted with the active units in their response to several statements. The reservists were in strong agreement with the statements, "I enjoy the day-to-day activities that make up my assignment."; "The conditions I work under make me feel like doing my best."; "I gain a sense of accomplishment from the day-to-day activities that make up my assignment."; and, "All in all, I am satisfied with my job in the military." In the remaining statements, the reservists responded similarly to the active Army and Marine gunners to indicate their desire to work hard, and their regard for the members of their units. As would be expected, a majority of the reservists also indicated their intention to pursue a career in the military.

(b) In all of the foregoing, it appears clear that the gunners have the desired sense of values, but that the lack of satisfaction with the working conditions and the lack of a sense of accomplishment are some of the reasons for not pursuing a career in the Army. It, therefore, appears that when a man does not intend to continue his Army career, he will not strive for improved proficiency as he would if he were expecting to remain in the service.

(6) EEA 6. What is the availability of Army eligibles?

No information was obtained under the ARTS on the availability of those eligible for Army service. General information would indicate that the quality of personnel in terms of mental and physical abilities, and educational level is lower now than during the time when the draft was in effect. The education level, and average AFQT, OF, and GT scores are shown under EEA 7, Table 13-1, for the AIT classes tested under the WSTEA, for the AIT classes under the ARTS, and for a sample of the unit gunners tested under ARTS. The average scores for the latter group of AIT gunners (ARTS) are markedly lower than for either of the other two groups. The current situation imposes additional requirements for both time and training resources to motivate and develop the capabilities of the personnel who are available,

(7) EEA 7. What should be the eligibility criterion in terms of age, mental, physical, and education?

(a) The current requirements for eligibility and acceptance for 16P training are carried in AR 611-201 and are only specific in terms of the minimum aptitude area OF score and a physical profile serial of 222221. There is an additional requirement for visual color discrimination between

red and green. A security clearance of CONFIDENTIAL is also required.

(b) Demographic data were obtained on the subjects tested during the ARTS from the questionnaires administered as well as their personnel files. Based on the questionnaires, 80 percent of the enlistees tested during AIT (classes 44 thru 48-77) were HS graduates and above at the time of entry into the Army. This is notably higher than in the units where only 68 percent entered the Army as HS graduates or above. However, the indicated high level of education is offset by significantly lower mental test scores as shown in Table 13-7. The 122 AIT gunners tested under ARTS had an average AFQT score of 37.3 and OF aptitude area average score of 100.1. Scores were obtained from six AIT classes during July 1978, and the mean for 157 students approximated those of the earlier classes. Data obtained from the units revealed that the average AFQT score was 47.7 and average OF score was 102.6. The GT aptitude area test scores were also obtained, and the AIT average of 94.1 was notable in its being lower than the 99.4 found in the units. The scores from the units approximated those obtained from the AIT classes during the WSTE. Thus, the educational level does not appear to be a significant factor by itself. Neither is age significant, although a majority of those in AIT were in the 17-19 age bracket. A majority of the unit gunners were under 22 years of age, although many of the units had gunners who were "35 years or older." Since no problems were noted, age need not be included in the criterion.

(c) The mental criterion should be reviewed in consideration of the disparity between those gunners being trained in AIT, and the gunners currently in the units. The minimum OF score should not be waived, or possibly the GT score should be imposed as a requirement. The GT score is considered to be a better indicator of the gunner's ability to apply the mental arithmetic in sizing an aircraft for the range ring. No problem was noted with the use of the current physical criterion.

(8) EEA 8. Should the time required to learn the REDEYE MOS skill be tied to the length of service contract?

The combined CHAPARRAL and REDEYE AIT requires 7 weeks. The REDEYE peculiar training is given during the final 2 weeks, and so neither the combined nor peculiar training require enough time to warrant adding the learning time to the service contract.

(9) EEA 9. What is the correlation between motivation and mental category?

(a) A majority of the AIT gunners from classes 44 thru 48-77 were in the AFQT mental Category III, followed by Category IV. The number in Categories I and II was too small for statistical confidence to compare the average scores of the other categories.

(b) The motivation scores derived from Q_4/Q_5 are tabulated in Table 13-8 for each mental category. Sixty-five percent of the student gunners in Category III had an average motivation score of 74.1 percent and the 27 percent who were in Category IV had a slightly lower motivation score of 73.2 percent. It does not appear the direct correlation is significant during AIT. The motivation score is derived from the gunner's response to questions relating to the desire to work, to realize a sense of accomplishment, and to contribute to the functions of the Army.

(10) EEA 10. What is the REDEYE knowledge decay factor for each mental category?

Data were gathered during the WSTE A in which AIT gunners were returned to the MTS following their regular training. The results are shown in Figure 8-6 which include the progression of proficiency during the normal AIT period for each category. The proficiency for each of the four groups was relatively close upon completion of regular training. However, following several days before resumption of training, the measured proficiency of Category IV gunners dropped markedly in comparison to increased proficiency for the Category I, II, and III gunners. This was considered an indication of the ability of all gunners to learn to handle the THT (weapon) during intensive training with an acceptable level of proficiency. However, the decay factor was demonstrated to be significant for Category IV as soon as the training was interrupted or discontinued. None of Category IV gunners were trained beyond the nine-day termination point.

(11) EEA 11. What time differential will be required to train low mental category personnel to desired levels of REDEYE proficiency?

An acceptable level of proficiency was attained in the normal training period. However, the retention of the learned skills appeared critical. No new data on retention were obtained during the ARTS to permit a comparison with the results of the WSTE A. It is assumed that repetitive training would result in increased retention for all categories, but it cannot be ascertained whether the low mental category personnel could ultimately be trained satisfactorily (if at all) to sustain the desired level without major time differential penalties.

(12) EEA 12. What additional resources will be needed to train low mental category personnel to desired levels of REDEYE proficiency?

(a) The current type training equipment that permits hands-on training is best suited for training the lower mental category. Availability of the MTS is shown to be beneficial for all gunners. The units having immediate geographic access to an MTS demonstrated higher proficiency in both P_h and "all actions correct" for the RRP. Since a majority of the gunners are in Category III, the range ring profile presents a difficult task. Training in the MTS should be effective in applying the range ring while handling the weapon (THT).

TABLE 13-7
EDUCATION LEVEL AND
AVERAGE MENTAL SCORES OF PERSONNEL TESTED

	<u>Percent Compl HS & Above</u>	<u>AFQT Avg.</u>	<u>OF Avg.</u>	<u>GT Avg.</u>
AIT Classes 14 & 15-77 (WSTE A)	65	46.9 (60) *	104.7 (61)	99.5 (61)
AIT Classes 44 thru 48-77 (ARTS)	80	37.3 (120)	100.1 (122)	94.1 (122)
Unit Gunners (ARTS)	68	47.7 (857)	102.6 (727)	99.4 (783)
AIT Classes 25 thru 30-78	NA	39.6 (157)	99.5 (157)	95.3 (157)

TABLE 13-8
MOTIVATION VS. AFQT MENTAL CATEGORY

<u>CATEGORY</u>	<u>NO. GUNNERS AIT</u>	<u>AVG MOTIVATION SCORE %</u>
I	1	77.1
II	8	70.7
III	74	74.1
IV	31	73.2

**Number of subjects as shown in parentheses*

(b) It is also considered that use of the RELS is beneficial in training gunners of all categories. Therefore, the RELS should be of even greater value for training the lower mental categories to relieve apprehension and fear than for those who may have a clearer understanding of the operation of the weapon system.

(13) EEA 13. What is the feasibility of the assignment of individuals to the REDEYE MOS by mental category?

The levels of performance as determined by the RRP test and with the THT in the MTS all follow the direct relationship with the mental category as shown in Table 13-9. The P_h measured for Category IV personnel was marginal and lower than for all others. The Category IV gunners scored lowest in all parts of the RRP test, and their score for "all actions correct" was extremely low. Based on these results, it does appear desirable to restrict the REDEYE MOS to Category III and above, even though they learned to handle the weapon with an acceptable level of proficiency.

(14) EEA 14. What is the impact of individual motivation on acquiring/retaining REDEYE proficiency?

It is assumed and indirectly concluded that individual motivation does have an impact both on acquiring and retaining proficiency with REDEYE. The proficiency in the MTS and with the RRP relate directly to the mental category. The relationship shown in EEA 9, Table 13-8, indicates a slightly lower motivation score for Category IV. However, motivation as determined by the questions given in Q_4/Q_5 may not be adequately quantified for purposes of comparison with learning and/or forgetting. It is generally intended that the instructors will impart motivation to the individuals by their various respective techniques. Due to the number of instructors involved, their individual effectiveness could not be isolated.

(15) EEA 15. What are the battlefield and training program implications of REDEYE NCO/leadership shortages and grade mismatch?

The requirement for competent and self-reliant personnel is underscored when the REDEYE team must operate semi-independently in the battlefield. The leadership shortages and grade mismatch would probably be unimportant in event of a real emergency.

(16) EEA 16. What are the battlefield and training program implications of REDEYE gunner replacements flow?

(a) The basic weapon handling skills can be taught to the Category III and above personnel with the current training equipment and facilities within one day. This would not permit the training with the current range ring profile, but in view of the pending simplification training will be reduced markedly.

(b) in event of an OCONUS emergency, the existing MTS facilities within CONUS could be committed to refresher training for replacement personnel. Approximately 120 gunners could be trained per week on a one-shift per day schedule (six-day operation/one-day maintenance). The nine CONUS MTS facilities could prepare 960 gunners per week if required, and those OCONUS facilities could be used similarly if conditions permit.

(c) The current geographic location of the MTS facilities would make it difficult for the divisions in the western US to transport personnel to either Fort Bliss or Fort Carson for "refresher" training prior to going overseas. The earlier proposed construction of an MTS at both Fort Ord and Fort Lewis has added justification when considering these potential requirements.

TABLE 13-9

AIT GUNNER PROFICIENCY VS. MENTAL CATEGORY

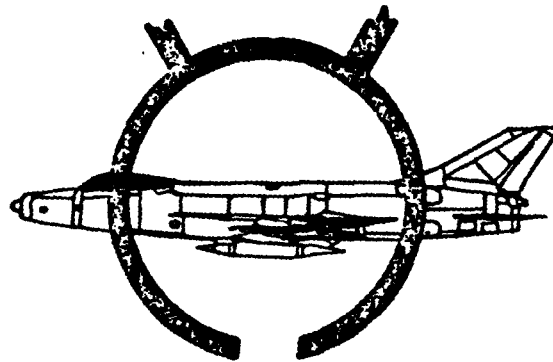
AFQT MENTAL CATEGORY	PH FINAL MTS FILM	RANGE RING PROFILE			ALL ACTION CORRECT
		IA	DRRC	AFHF	
I (1)	1.00	0.83	0.61	0.94	0.44
II (8)	0.81	0.81	0.70	0.93	0.54
III (70-74)	0.70	0.74	0.47	0.75	0.24
IV (34-35)	0.70	0.65	0.31	0.64	0.13

NOTE: The number of gunners included is shown in parentheses.

14. ARTS RESULTS APPLICATION TO STINGER TRAINING

a. Discussion.

(1) STINGER Similarities. The STINGER system, which is the REDEYE follow-on, is essentially identical in its appearance and operation aspects to the REDEYE. The sight picture, shown here, as well as the location of the activate, uncage, and trigger switches are all identical



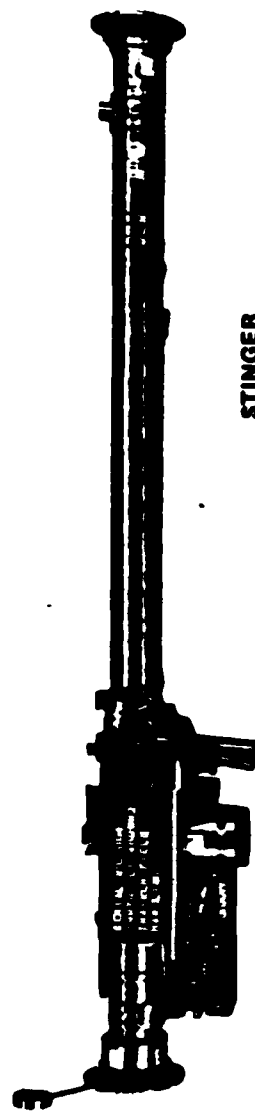
with REDEYE. With the exception of the IFF system supplied with STINGER, the critical tasks associated with firing the weapons are identical. A visual comparison is shown in Figure 14-1.

(2) STINGER Differences.

(a) The basic STINGER system is 5.6 pounds heavier and 10 inches longer than REDEYE. Since the range of STINGER is greater than that of REDEYE, the range ring profiles, which the gunner must commit to memory, are different. This difference is considered to be negligible since, in all probability, the STINGER range ring profile will be simplified as has the REDEYE.

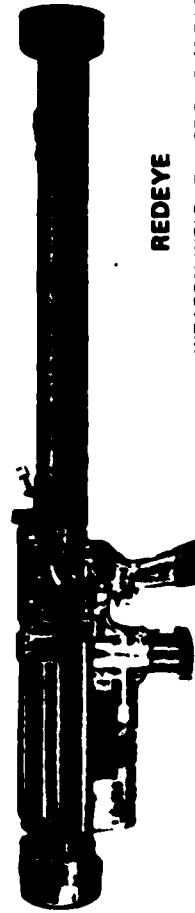
(b) The lifetime of the STINGER BCU is approximately 45 seconds instead of the 30 seconds for REDEYE.

(c) The IFF system represents the largest difference between the STINGER and REDEYE. The IFF antenna is mounted on the right side of the weapon and "pops" open when pulled upward. The gunner carries a belt pack for the IFF system which includes the interrogator, battery, and computer. When the sight is aligned with the unknown aircraft and the interrogate switch depressed (located behind trigger switch on grip), the IFF responds with the following code:



STINGER

WEAPON WEIGHT - 35 LB MAXIMUM 33.4 LB CURRENT
HARDWARE (READY TO FIRE
WITH IFF ON LAUNCHER)
WEAPON LENGTH - 60-IN. MAXIMUM



REDEYE

WEAPON WEIGHT - 27.8 LB (READY TO FIRE)
WEAPON LENGTH - 50 IN.

Figure 14-1 REDEYE AND STINGER CONFIGURATIONS

- Many "beeps" - Unknown target (FOE)
- Two "beeps" - Mode 4 response (Friend)
- One "beep" - Mode 3 reply (Friend)
- No "beep" - System malfunction

Based upon the response the gunner takes the appropriate action.

(d) The IR acquisition tone is an actual tone as derived directly from the IR signal. On both REDEYE and STINGER, the strength of the IR tone is an indication of the strength of the IR source.

(e) The STINGER has an incoming engagement capability against jet aircraft while the REDEYE, in general, does not. In recent tests with REDEYE conducted by ARTS, both the F4 Phantom and the French mirage jets exhibited good IR signals on the incoming "leg" of their approach. This is not true, however, on most jet aircraft. The STINGER is capable of engaging all known threat aircraft on their incoming "leg."

b. Training Implications.

(1) Institution

(a) Since the STINGER and REDEYE systems are similar, the training can be expected to be similar. The problems encountered in REDEYE can for the most part be expected with STINGER, and in some cases will be more severe. Specific areas uncovered by both the WSTEa and ARTS efforts, that are of specific interest, are listed below.

1. The results of the WSTEa proved that the range ring profile matrix, consisting of 24 numbers, could not be retained by the majority of the REDEYE gunners. This was supported by the testing of 491 gunners and is reinforced by the ARTS effort which tested 1518 gunners. This section will discuss the AFQT correlation factors and AFQT relationship to training to show that STINGER gunners cannot be drawn from lower AFQT category troops. The AFQT categories and their range of percentile values are shown in Table 14-1. The average gunner AFQT scores for both WSTEa and ARTS gunners are shown in Table 14-2. It should be noted that the average WSTEa AIT gunners were a high Category IIIB while the ARTS AIT gunners were a low Category IIIB, a difference of 9.5 points. In addition, the Unit AFQT scores are in the IIIA Category. The number of gunners within each category for both the WSTEa and ARTS are shown in Table 14-3. From this table it is obvious that the majority of the REDEYE

TABLE 14-1

PERCENTILE RANGE

<u>CATEGORY</u>	<u>RANGE</u>
I	93-99
II	65-92
IIIA	50-64
IIIB	31-49
IVA	21-30
IVB	16-20
IVC	10-15
V	0-9

TABLE 14-2

WSTE A AND ARTS MEAN AFQT SCORES

<u>STUDY</u>	<u>NO. OF GUNNERS</u>	<u>MEAN AFQT</u>	<u>CATEGORY</u>
WSTE A			
AIT	60	46.8	IIIB
UNITS	291	52.3	IIIA
ARTS			
AIT	120	37.3	IIIB
UNITS	857	47.7	IIIB
MARINES	45	64.6	II

TABLE 14-3

NUMBER OF GUNNERS IN EACH AFQT CATEGORY

	<u>AIT</u>		<u>ARMY UNITS</u>		<u>MARINES</u>
	<u>WSTEA</u>	<u>ARTS</u>	<u>WSTEA</u>	<u>ARTS</u>	<u>ARTS</u>
CAT I	2	1	6	26	1
CAT II	9	8	89	193	29
CAT III	44	74	196	635	28
CAT IV	6	35	39	155	1

gunners* are in the Category III and IV range. The correlations shown in Appendix X show that while there is not a significant correlation between AFQT scores and the performance of the basic SM tasks within the MTS (gunner P_H), there is a correlation between AFQT and forgetting the basic SM tasks as well as range ring profile performance. Figure 8-5 shows the performance of WSTEA gunners which were held over an additional seven days in order to evaluate the result of additional training time within the MTS**. As shown in this figure, most of the MTS training took place over a four-day period, Tuesday through Friday. The gunners received approximately one hour of live tracking on the following Wednesday and were then tested in the MTS on Friday, seven days after their last MTS training. During this interval, the Category I, II, and III gunners increased in proficiency while the Category IV gunners decreased in proficiency. Figure 8-6 displays a similar set of data for the ARTS AIT gunners. The gunners displayed here were not held over for additional testing for the ARTS AIT gunners. Here, with a larger sample of Category III and IV gunners, it is observed that very little proficiency increase is observed as training time increases. The fact that only one Category I and eight Category II gunners were available in the ARTS AIT data sample points out the basic training problem within REDEYE and to a greater extent, STINGER when it is deployed. The more difficult tasks within REDEYE, and,

* The number of gunners throughout this report in various comparisons may vary since AFQT scores were not available on all gunners and some did not show up for either testing or retesting.

** See WSTEA Report

in particular, within STINGER cannot be accomplished by Category IIIB and IV gunners. Within STINGER the operation of the IFF system, the acquisition of the target in the presence of other IR sources and the memorization of the current STINGER range ring profile will require gunners with AFQT categories greater than REDEYE.

2. As a result of the WSTE A the REDEYE range ring profile matrix been reduced from 24 to 4 numbers. This will increase the gunner's P_h by allowing more time during AIT in the MTS for tracking proficiency training and will increase the probability that he will fire the weapon when required to do so. However, a basic problem still exists in that while the gunner need not now commit 24 numbers to memory, the Category III and IV gunners cannot judge range ring percentages. The range ring profile test* administered to gunners required the gunners to: (1) identify the aircraft as one of the six categories; (2) determine the size of the aircraft relative to the range ring; and (3) decide whether to fire or not to fire. With reference to Figure 14-2, the aircraft is a

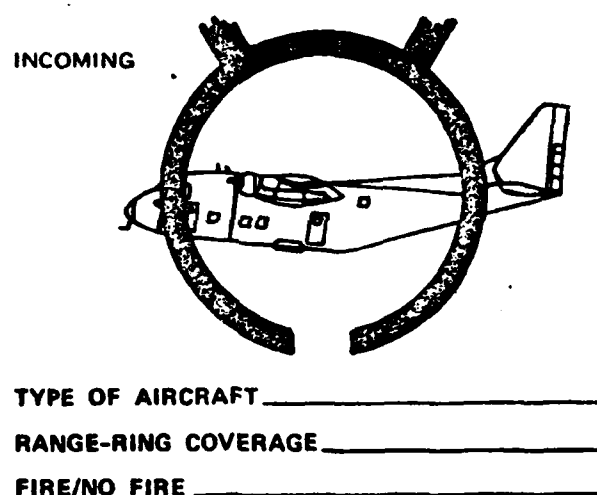


Figure 14-2. Range Ring Sight Picture

*See Appendix IX

large prop (IA)*, its range ring coverage is 1 1/2 times the RR (DRRC)*, and his action should be to fire (AFHF)*. To obtain a kill the gunner must get all three correct. Table 14-4 shows how the ARTS Unit gunners performed these tasks by AFQT category. The final column shows the percentage of gunners in that category that answered all three correctly.

TABLE 14-4
RRP PERFORMANCE BY AFQT MENTAL CATEGORY

<u>CATEGORY</u>	<u>NUMBER OF GUNNERS</u>	<u>PERCENTAGE CORRECT</u>			
		<u>IA</u>	<u>DRRC</u>	<u>AFHF</u>	<u>ALL ACTIONS</u>
I	26	88.0	75.4	89.7	57.9
II	193	84.6	72.9	78.2	49.0
III	635	78.2	58.7	68.4	33.5
IV	155	69.8	44.3	58.6	22.1

As this table shows, the most difficult task for the gunners is the determination of range ring coverage. Basically, a large percentage of the gunners (predominantly the Category III and IV) do not have a good understanding of percentages. In some cases, the gunners were confused as to which was the standard to be compared, the range ring or the aircraft. As an example, for Figure 14-3a, the gunners would sometimes size it as 1/4 rather

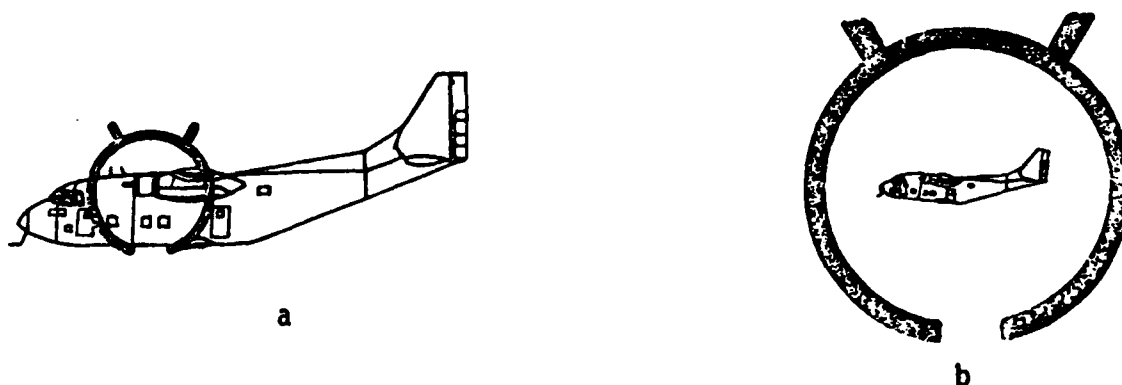


Figure 14-3. Range Ring Coverage Comparison

*IA - Identify Aircraft
DRRC - Determine Range Ring Coverage
AFHF - Action-Fire-Hold Fire

than 4, thinking that the range ring was $\frac{1}{2}$ the size of the aircraft. Figure 14-3b would be sized as 2 instead of $\frac{1}{2}$ for the same reason. Until the gunners in both AIT and the units are taught the correct method of sizing aircraft, the range ring profile will remain a problem no matter how simple the memorization matrix becomes. Table 14-5 shows the AFQT correlation factors for the WSTE A and ARTS Unit range ring proficiency.

TABLE 14-5
AIT RRP PERFORMANCE VS. AFQT CORRELATION

<u>RANGE RING PROFILE TASK</u>	<u>COEFFICIENTS</u>	
	<u>WSTE A</u>	<u>ARTS</u>
Aircraft Category (IA)	+0.332	+0.352
Range Ring Size (DRRC)	0.447	0.423
Action - Fire, Hold Fire (AFHF)	0.337	0.357
All Actions Correct (AAC)	0.517	0.474

For the correlation to be significant the factors must exceed 0.088. From this table it is observed that the range ring coverage task (DRRC) requires the greatest level of AFQT of the three tasks to be performed. The answering of all three correctly requires the greatest level of AFQT of all the individually performed tasks.

3. Performance in the MTS in accomplishing the basic SM tasks is also category dependent. Tables 14-6 and 14-7 show the WSTE A and ARTS AIT gunners measured MTS performance as a function of AFQT category.

TABLE 14-6
WSTE A AIT FINAL MTS PERFORMANCE
BY AFQT MENTAL CATEGORY

<u>CATEGORY</u>	<u>NUMBER OF GUNNERS</u>	<u>AVERAGE AFQT SCORE</u>	<u>P_h</u>
I	2	96	0.80
II	9	79	0.77
III	44	47	0.74
IV	6	18	0.70

TABLE 14-7

ARTS UNIT FINAL MTS PERFORMANCE
BY AFQT MENTAL CATEGORY

<u>CATEGORY</u>	<u>NUMBER OF GUNNERS</u>	<u>AVERAGE AFQT SCORE</u>	<u>P_h</u>
I	20	94	0.87
II	143	73	0.83
III	488	40	0.75
IV	108	21	0.72

Although both tables show improvement in MTS measured P_h with AFQT, the difference between Category I and IV gunners is only 10 percent points for the WSTE A data and 30 percentage points for the ARTS data. In both cases, the Category IV gunners perform at an acceptable level of 0.70 P_h. Additionally, there is not a significant mathematical correlation between MTS performance and AFQT scores. This is observed in Table 14-8.

TABLE 14-8

WSTE A AND ARTS MTS PERFORMANCE - AFQT CORRELATION COEFFICIENTS

	<u>1ST TEST</u>	<u>2ND TEST</u>	<u>FINAL TEST</u>	<u>NO. GUNNERS</u>	<u>r REQ'D</u>
WSTE A	+0.169	+0.214	+0.195	60	0.250
ARTS	0.110	0.222	0.073	118	0.195

The coefficients must exceed the values shown for significance to the 0.05 level. The three test points were given at the beginning, midpoint, and at the end of MTS training. During the conduct of the WSTE A Class 15, eighteen gunners were held over and retested, as described above, after seven days without MTS training. The forgetting of lower category gunners and their performance in the MTS after a lapse in training then becomes significant. This is shown in Table 14-9.

TABLE 14-9

WSTEAMTS PERFORMANCE - AFQT CORRELATION

6 and 12 DAYS AFTER GRADUATION

	<u>1ST RETEST</u>	<u>2ND RETEST</u>	<u>NO. GUNNERS</u>	<u>r REQ'D</u>
CORRELATION COEFFICIENT	+0.400	+0.487	18	0.468

This shows that lower AFQT category gunners tend to forget more and require more refresher training than higher AFQT category gunners. Basically, mechanical steps can be taught to all AFQT categories sufficiently to perform in a minimally acceptable manner. However, training must be conducted more often to assure this performance in the lower category AFQT. Those tasks requiring logical thought and a correct decision based upon this thought cannot be learned as effectively or retained once learned by lower AFQT category personnel. The three critical tasks required of STINGER discussed above will require higher AFQT category personnel. Since STINGER gunners have not been tested, it is impossible to state categorically the minimum required AFQT level. A good estimate, based upon the knowledge acquired through the WSTEAM and ARTS data, would be an AFQT level of III and higher.

4. The STINGER sight, while essentially identical to REDEYE, requires the gunner to identify and activate the weapon when the aircraft fills 1/6 of the 10 mil range ring or when the aircraft subtends an angular arc of 1.66 mils. The physical size of the range ring is 0.1 inches and is viewed at a 10-inch distance (eye location). Figure 14-4 shows the actual size of the sight.



Figure 14-4. Range Ring Size

An aircraft with a 10 meter wing span theoretically would be visible at 10 KM. Figure 14-5 depicts this condition.

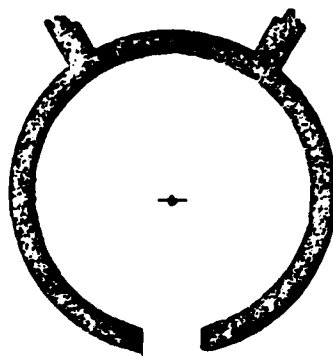


Figure 14-5. Range Ring Sight Picture-Small Jet

However, if this figure is reduced to the size of the figure 14-4, it becomes apparent that the wings will not be visible, and all that will be seen, if the eye could resolve it, is the head-on view of the fuselage. In this case, for a small jet, the fuselage diameter is about two meters. For the fuselage to fill one mil of the range ring, the aircraft would be at a range of 2 KM. In actual practice, the root of the wings, due to their thickness, will cause the visible part of the aircraft to exceed 1 mil prior to 2 KM, and perhaps as far back as 4-5 KM. While it is true that the exhaust from the jet will aid detection, the problem of IR acquisition and identification remain. The basic resolution of the normal human eye varies from 0.5 to 0.7 mils. So, basically, the gunner must detect the target by the time it reaches about 1.0 mil in size and take an irreversible action (activate and fire) when the aircraft reaches 1.66 mils in size. Between the time the gunner first observes the aircraft at about 1.0 mil and weapon activation occurs, the gunner must interrogate the aircraft with the IFF transponder. Considering the normal eye's basic resolution, it does not appear feasible to expect the gunner to see well enough to make such critical decisions, let alone detecting and acquiring the aircraft with the unaided eye. It appears that the STINGER's forward engagement capability exceed the gunner's ability to effectively engage targets at 1/6 range ring values. Selecting and training gunners to accomplish this task will put rigorous preselection criteria such as

visual acuity, color vision, response times, intelligence, AFQT, GT, etc. With this type of criteria it is highly doubtful that enough gunners could be found to satisfy current Army requirements.

(b) The REDEYE Launch Simulator (RELS)* was developed for the Marine Corps and is currently being utilized in both Marine AIT, where each gunner fires one upon graduation, and in the units where one per gunner per year is fired. This is in addition to the one live REDEYE per year that each gunner is required to fire to qualify as a REDEYE gunner. The STINGER Launch Simulator (STLS) is currently being developed for the Marine Corps for use in STINGER AIT and unit training. The results of the RELS evaluation given in paragraph 8e(3) indicates that the RELS is an excellent training device which reduces gunner fear of firing the weapon and gives the gunner confidence in the REDEYE system. The Army should give consideration to purchasing the STLS for training in that the results of the ARTS evaluation assesses its value as high. Additionally, quantity buys tend to reduce cost which would result in a savings for both the Army and Marine Corps.

(2) Unit Training.

(a) All of the above points apply equally to STINGER training in the units. The addition of the IFF capability to STINGER will require a method to train and test the unit gunners. Due to the unavailability of the MTS to most unit gunners, some additional test equipment must be available to the units to exercise the IFF function. This is of paramount importance due to the significance of a negative IFF response from an aircraft being engaged. The alternate method would be the tracking of live Air Force aircraft, which is costly and engages the aircraft in low priority, low pay-off tasks.

(3) Reserves. The MTS availability problem in the Reserves is compounded over that of the Regular Army unit. Geographic location and lower funding for transportation to and from an MTS at intervals required to maintain proficiency would be prohibitive for a small number of REDEYE gunners from each Reserve unit.

(4) Live Firings. The live firing exercise in conjunction with REDEYE training has proven beneficial. Each REDEYE AIT class fires one live round upon the completion of training and each active Army REDEYE section fires one live round per year. Firing a live round gives the gunners an assurance that the REDEYE system is an effective air defense weapon. It is felt that live firings of the STINGER system is as important as the firing of the REDEYE. Any decrease in the live firing of STINGER from what is presently being done in REDEYE will reduce the effectiveness of STINGER training by not allowing the gunners to personally observe the system in operation if not actually getting to fire it.

*See Appendix VI

(5) An approach that could be used to allow more live firings by Army personnel is to have STINGER gunners fire quality assurance rounds as part of their ASP training. Secondly, the use of the STLS as a training device be made part of the STINGER AIT training by allowing each AIT student to fire the STLS. It was found during this ARTS that firing the RELS trainer helped to ease the concern and apprehension that the gunner has in firing a live round. (Sec 8d(3)). If each STINGER AIT student fired a STLS they would receive the experience of feeling a STINGER being fired, and, therefore, overcome their fear of firing a live round without expending a live STINGER.

(6) Live Tracking. The REDEYE AIT students receive approximately three hours of actual live aircraft tracking training time. Live tracking gives the gunners an opportunity to experience tracking high performance aircraft with the THT under field conditions and gives them a feel of what to expect in combat. The STINGER system being slightly more complex (added IFF function) will require more time for the gunner to properly learn; therefore, gunners should be given more live tracking training against high performance aircraft equipped with IFF transponders to train them not only with the acquisition and aiming of the STINGER but with the IFF functions.

c. Conclusions.

(1) The STINGER range ring profile, which is as complex as the original REDEYE of 24 numbers, requires simplification. This simplification should be determined by computer simulations which would show trade-offs between various profiles and STINGER effectiveness.

(2) The STINGER system can be utilized by the currently available REDEYE gunners. Gunners with AFQT scores below III must be ineligible for STINGER training due to the complexity of the system as described above.

(3) The requirement to detect, acquire, identify, and activate the STINGER by the time the attacking aircraft reaches 1/6 range ring is unrealistic. The best gunners could not be trained to effectively accomplish this requirement. In all but flat terrain, obstacles will prohibit most acquisition at this range.

(4) The RELS training package, as shown in Section 8d(3) above, is an effective training aid to reduce fear and build gunner confidence. While it may be too late in the REDEYE program to acquire the RELS, the STLS for STINGER would also be effective as a training aid.

d. Recommendations. It is recommended that:

- (1) The STINGER range ring profile matrix be simplified.
- (2) Category IV and lower AFQT mental category gunners be ineligible for STINGER training programs.
- (3) A more realistic activation criteria be developed for the STINGER gunner.
- (4) The STLS be acquired for use in the STINGER training program.

15. STUDY CONCLUSIONS

a. Training Effectiveness

(1) Institution. It is concluded that:

(a) The STINGER range ring profile, which is as complex as the original REDEYE of 24 numbers, requires simplification. This simplification should be determined by computer simulations which would show trade-offs between various profiles and STINGER effectiveness.

(b) The STINGER system cannot be effectively utilized by the currently available REDEYE gunners. Gunners with AFQT scores below III must be ineligible.

(c) The requirement to detect, acquire, identify, and activate the STINGER by the time the attacking aircraft reaches 1/6 range ring is unrealistic. The best gunners cannot be trained to effectively accomplish this requirement.

(d) The RELS training package is an effective training aid to reduce fear and build gunner confidence. While it may be too late in the REDEYE program to acquire the RELS, the STLS for STINGER would also be effective as a training aid.

(2) Unit. It is concluded that:

(a) Less than one half of the REDEYE gunners are satisfied with their work assignments and working conditions.

(b) Over half of the REDEYE gunners are satisfied with their co-workers and supervisors.

(c) Over 50 percent of the REDEYE gunners do not plan to reenlist.

(d) The turnover rate of REDEYE gunners is approximately 30 percent per year based on questionnaire responses. However, based on the number of gunners available for retest in the units visited during the WSTE A, the actual attrition to the sections was approximately 50 percent per year.

(e) Based on the analysis conducted in section 8 there is positive correlation between AFQT mental score and gunner performance in both the MTS and RRP.

b. Training Costs

(1) Institution. It is concluded that the current costs appear reasonable for the achieved level of proficiency.

(2) Unit. It is concluded that the current costs appear reasonable for the level of training and proficiency achieved.

(3) Reserves. It is concluded that funding for additional training equipment and facilities is needed within each Readiness region.

c. Resources Related to Training. It is concluded that:

(1) The current resources for training REDEYE gunners are needed to maintain proficiency of qualified personnel.

(2) Additional facilities (MTS) and equipment (THT) are needed for hands-on training of lower mental category personnel.

(3) MTS facilities are needed in the western CONUS regions to provide training opportunity for the 7th and 9th Infantry Divisions. Additional facilities are also needed in the eastern CONUS regions and Europe to relieve the training workload on the existing facilities.

(4) The expended live round launch tubes can be retained by the units to be modified for use as field handling trainers.

d. Training Related to Proficiency. It is concluded that:

(1) The five additional hours of AIT MTS training, which were implemented following the WSTEА recommendations, were beneficial as indicated by an increase in the MTS proficiency of AIT gunners during the ARTS.

(2) The markedly lower RRP proficiency for ARTS/AIT test subjects was attributed to the lower AFQT scores. A direct relationship between RRP proficiency and AFQT score was demonstrated.

(3) Gunners having AFQT scores in the Category IV bracket achieved an acceptable level of proficiency in the MTS, but were unacceptable in their RRP proficiency.

(4) Determination of range ring coverage is the most difficult task for gunners of all categories in relation to the three parts of the RRP test.

(5) The RELS was concluded to be a realistic simulation through the launch phase of a live round, based on the subjective evaluation of 63 gunners who fired a RELS prior to firing a live round. Therefore, it was considered to be an effective training device to reduce fear and build gunner confidence.

(6) Instructors for REDEYE AIT need the experience of having fired a live round to enhance their effectiveness with the students.

(7) As shown in Table C-17, the unit (#1) which fared the poorest during WSTEAs testing in both training time devoted to MTS and training time devoted to RRP, as well as MTS P_h and RRP test results, had marked increases in training times with resultant increases in both test scores during ARTS testing. Conversely, the unit (#5) which fared the best under the WSTEAs study in the areas of training time and scores, reduced training time at the MTS and on RRP with a resultant decrease in ARTS test scores in both of these areas.

(8) The direct relationship between RRP unit training time and RRP proficiency followed much the same trends in the ARTS as was observed in the WSTEAs.

(9) Firing a live round builds confidence in the weapon system by engaging and destroying a target and reduces the gunners fear of firing the weapon. Therefore it is important to continue the allocation of live rounds for use by the units.

(10) MTS facilities do not have a standardized TDA and are not directly funded.

(11) Tracking head trainers require periodic maintenance in lieu of turn-in for repair when necessary.

(12) REDEYE gunners are assigned more than their share of non-REDEYE related duties.

(13) REDEYE gunners are routinely deprived of their vehicles and equipment for training.

(14) Additional MTS facilities are required both in CONUS and Europe; however, Europe should have priority.

(15) The Vilseck MTS could be utilized more effectively.

(16) The RCMAT cannot be utilized in Europe due to FM frequency interference.

(17) REDEYE sections do not, in general, have the officer which is authorized.

(18) Battalion commanders are not generally aware of the problems REDEYE sections are having or the mission of REDEYE air defense.

e. Proficiency Related to War Models. It is concluded that:

(1) REDEYE gunner proficiency can be represented in current war models as a single number that reflects the gunner's ability to

AD-A106 325

ARMY TRAINING STUDY: TRAINING EFFECTIVENESS ANALYSIS
(TEA) SUMMARY VOLUME. (U) ARMY TRAINING AND DOCTRINE
COMMAND FORT MONROE VA F J BROWN 88 AUG 78

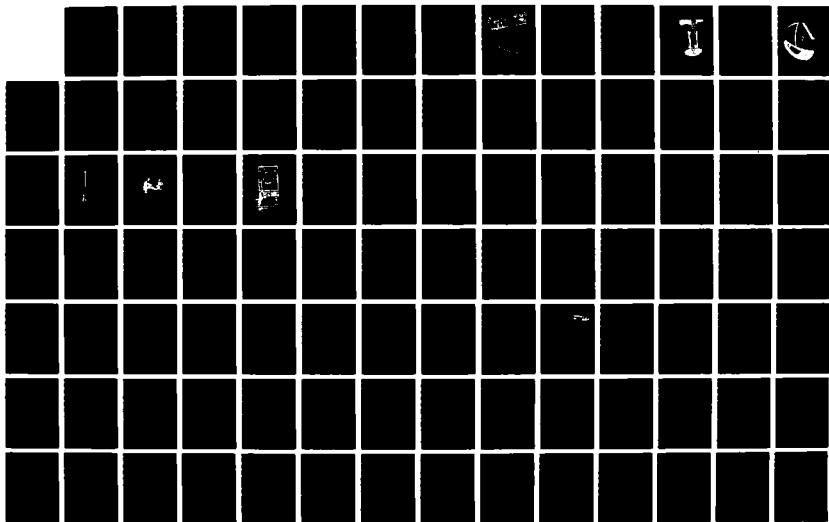
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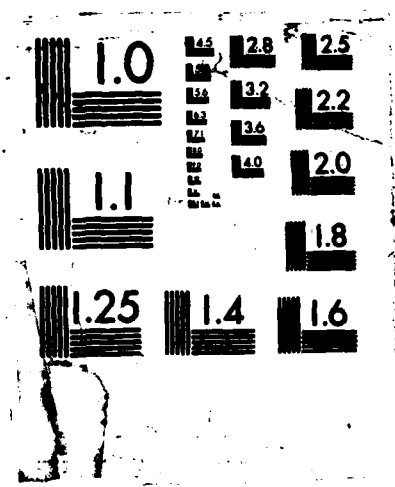
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the entire sequence of steps with the THT, i.e., activation through fire. The models do not have provisions for breaking this proficiency down for each required step. Since all REDEYE gunners do not encounter difficulty with the same engagement steps, it is difficult to accurately reflect the proficiency of REDEYE gunners with the THT versus training.

(2) Proficiency involves more than just the ability to complete an engagement sequence. The REDEYE gunner must be able to complete the engagement while the target is still engagable. The current war models do provide parameters that reflect the gunner's estimates of ranges and can represent their estimate of ranges versus training. The reaction time parameters in the models do not provide for all possible reaction times associated with an engagement. The COMO III model has a wide range of reaction time parameters, but does not have a parameter for each of the following:

- (a) Time from gunner's estimate of activation range to activation.
- (b) Time from activation to track.
- (c) Time from track to uncage gyro.
- (d) Time from uncage to superelevate and lead.
- (e) Time from superelevate and lead to fire.

(3) Other training factors such as the ability to deploy, correctly identify hostile aircraft, and integrate the weapons system can be indirectly reflected in war models.

f. War Models Related to Combat Effectiveness

(1) Increasing the REDEYE gunners proficiency will result in killing a greater number of aircraft in a typical target-rich environment. The number of aircraft killed increased as the gunners proficiency was increased from 0.1 to 1.0 probability of success.

(2) The REDEYE gunners combat effectiveness increases as the training time in the MTS is increased.

(3) The REDEYE or follow-on air defense system is required in the mid 1980 time frame to complement the SHORAD systems that will be in the field.

16. STUDY RECOMMENDATIONS

a. Training Effectiveness

(1) Institution. It is recommended that:

(a) The STINGER range ring profile matrix be simplified.

(b) Category IV AFQT mental category gunners be ineligible for STINGER training programs.

(c) A more realistic activation criteria be developed for the STINGER gunner, such as activate after identification.

(d) The STLS be procured for use in the STINGER training program.

(2) Unit. The recommendations for the STINGER weapon system under the institution also apply to the unit.

(3) Reserve Components. It is recommended that:

(a) The feasibility of the formation of a REDEYE battery be investigated for each Readiness Region to provide access to available MTS facilities.

(b) The feasibility of a mobile MTS be extended to consider support for the reserve components.

(c) One weekend per quarter be devoted to MTS tracking to maintain proficiency.

(d) One M-76 trainer kit per battalion be allocated for reserve training.

(e) An investigation into the feasibility of use of the "German clothesline" target trainer for THT tracking use in local reserve units.

b. Training Costs

(1) Institution and unit. It is recommended that:

(a) Live rounds be allocated for instructors to fire as a qualification for instruction at the institution.

(b) The RELS training package be procured for use both in AIT and the units for the remaining operational time for REDEYE.

(c) The STLS training package be procured for use both in AIT and the units for STINGER.

(2) Reserve Components. It is recommended that funds be allocated to provide one M-76 trainer kit per battalion throughout the reserve structure.

c. Resources Related to Training. It is recommended that:

(1) Based on the analysis in Section 8, the RELS training package be purchased by the Army to provide two RELS launchers per division, cavalry regiment, and separate brigade; and, one RELS round per gunner per year in the active Army units. The total number of rounds to be procured should be limited to that required for the remaining years REDEYE is to remain with the active units.

(2) The allocation of live rounds for ASP must continue as recommended in the WSTE, one per section per year, to build gunner confidence in the weapon and reduce fear of firing.

(3) Priority be given to construction of the previously proposed MTS facilities at Fort Ord and Fort Lewis to serve the needs of western CONUS; Fort Stewart, Fort Campbell, and Fort Polk for eastern CONUS; and three locations in Europe to augment the current facilities.

(4) The expended live round launch tubes be retained by the units to augment their supply of field handling trainers.

d. Training Related to Proficiency. It is recommended that:

(1) Category IV personnel be ineligible for REDEYE training.

(2) The RELS be adopted for training REDEYE gunners both in the institution and in the unit.

(3) All REDEYE instructors at USAADS be allocated one live round for firing for qualification as an instructor. Firing a RELS should be included if adopted for institutional training.

(4) It is necessary that where MTS facilities are available that gunners receive regular, standardized training in REDEYE handling and tracking.

(5) A feasibility study be made on a mobile MTS training van which would encompass highly-trained instructors which would insure standardized training. This method would be beneficial to remote regular Army units as well as a high percent of reserve units.

(6) The SQT program be followed as a standardized POI for individual training. However, commanders must give these programs support.

(7) Units which are supported by REDEYE should be better informed of the tactical advantages afforded by air defense.

(8) MTS facilities be funded directly and have a standardized TDA of two NCOs that are REDEYE qualified and one civilian technician.

(9) Additional MTS facilities be constructed at the locations given in Appendix II. Three should be constructed in Europe and given priority over CONUS construction should funding be limited.

(10) The civilian technician assigned to maintain the MTS should be trained to maintain the THT in all but the most extensive repairs. THT test equipment should be supplied to each MTS facility.

(11) Ordnance personnel visit active divisions on a scheduled basis to repair faulty THTs on-site.

(12) Ordnance repair sites be supplied additional THTs to exchange for those in the field that require major repairs.

(13) REDEYE gunners receive an equitable share of non-REDEYE related duties.

(14) REDEYE gunners retain their vehicles and equipment for training.

(15) The Vilseck MTS utilization be increased or the equipment moved to a more advantageous location.

(16) The RCMAT control frequencies be changed so that they may be utilized in Europe for tracking training.

(17) The officer slot within the REDEYE sections be filled.

(18) Battalion commanders be oriented in REDEYE air defense capabilities and deployment concepts.

e. Proficiency Related to War Models. It is recommended that:

(1) Current war models that are considered for analysis of training versus REDEYE gunner proficiency be modified to reflect the gunner's proficiency with each step of the REDEYE engagement sequence. The COMD III REDEYE weapons deck can be modified to reflect the gunner's proficiency in greater detail with relatively little cost.

(2) Tests be designed to measure the following gunner proficiency components.

(a) Reaction times associated with the REDEYE engagement sequence.

(b) Gunner's estimates of target range, activation range, and launch boundaries.

f. War Models Related to Combat Effectiveness. It is recommended that:

(1) The proficiency of the REDEYE, or follow-on system, gunners be maintained at a 0.8 to 0.9 level to combat the air threat expected in the mid 1980 time frame.

(2) Computer model simulations be used to evaluate the proficiency required of REDEYE, or follow-on system, gunners for the following:

(a) There is a change in the expected air threat to ground forces.

(b) New air defense systems are fielded that have different capabilities and limitations than current systems.

(c) The role of REDEYE/STINGER changes.

APPENDIX I

REDEYE WEAPON SYSTEM DESCRIPTION

The REDEYE Weapon M41 (Figure I-1) consists of a missile, launcher, and battery/coolant unit.

a. The REDEYE guided missile (Figure I-2) is a supersonic, surface to air missile using passive infrared (IR) homing and proportional navigation guidance. It has six major sections.

(1) Seeker Section. The seeker section contains the seeker head IR detector and electronic modules.

(2) Control Section. The control section is composed of an electronic unit and motor driven control surfaces (fins).

(3) Missile Battery Section. The missile battery section provides electrical power for the missile during flights.

(4) Fuze and Warhead Section. The fuse timer ignites the sustainer motor, arms the warhead, and prepares the warhead for detonation. The warhead provides the explosive force to destroy the target. Upon impact with the target the warhead can be detonated by the penetration impulse generator or by the inertia sensing device. If the missile fails to hit the target the warhead will be detonated by the self-destruct circuit after approximately 15 seconds of flight.

(5) Rocket-Motor Section. The rocket-motor section consists of an ejector motor and a sustainer motor. The ejector motor provides the thrust to eject the missile from the launch tube. The missile then coasts for approximately 7 meters, thereby, providing gunner safety from sustainer motor backblast. The fuze timer then fires the sustainer motor which provides the thrust to accelerate the missile and maintain its flight.

(6) Tail Assembly Section. The tail assembly section consists of four stabilizing fins that are in a folded position while the missile is in the launch tube. After the missile is ejected from the launch tube, the tail fins unfold and lock in flight position. The tail fins do not provide guidance action but are required to stabilize the longitudinal axis of the missile throughout its flight.

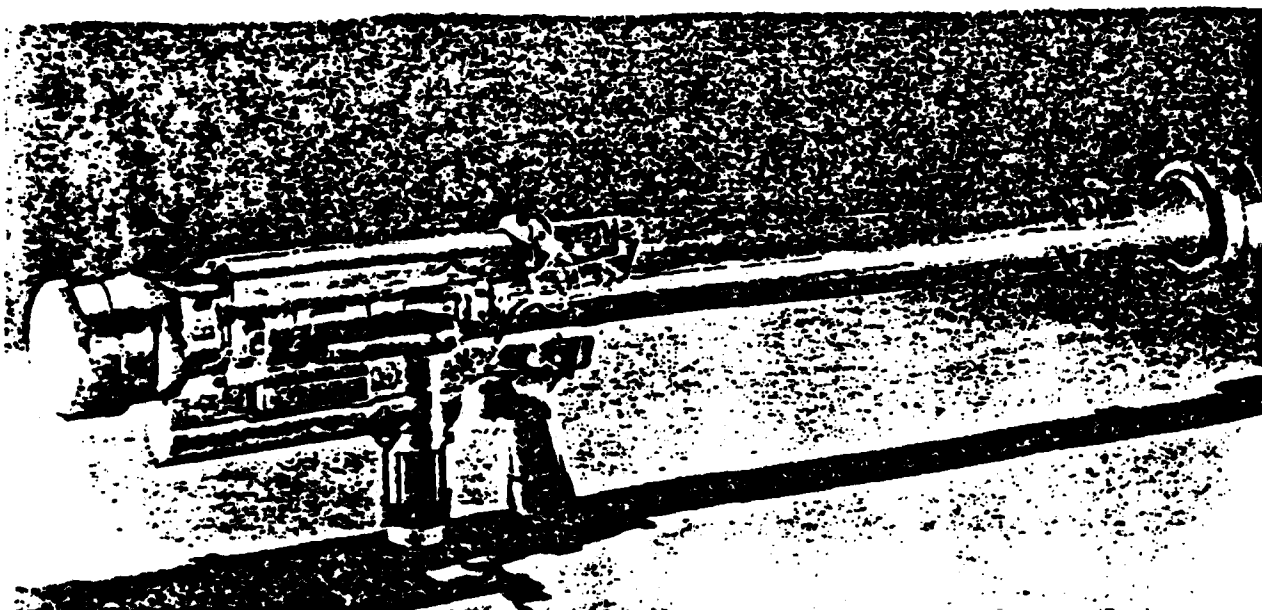


Figure I-1. The REDEYE Weapon

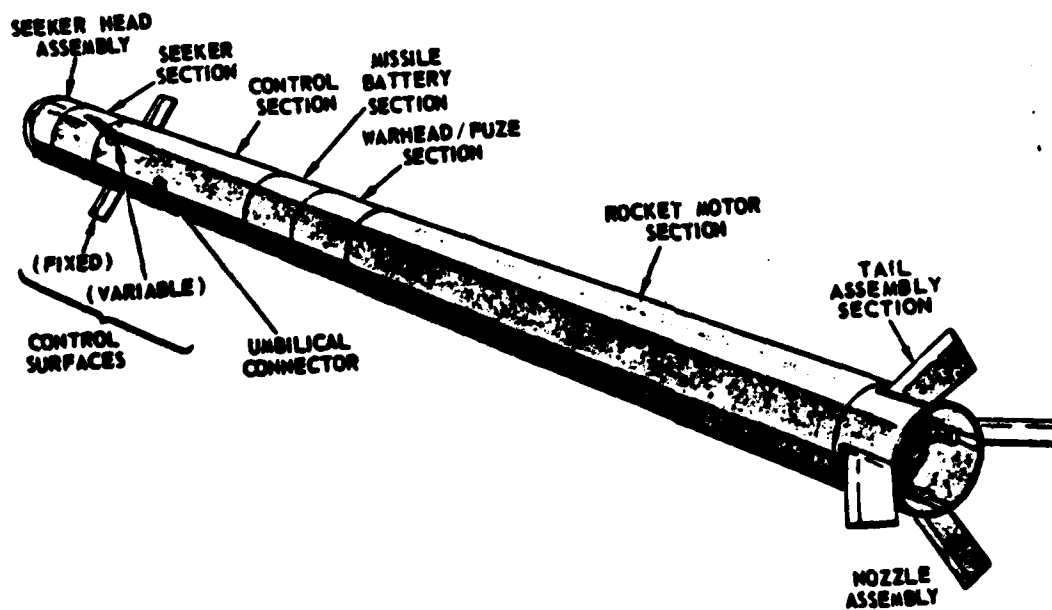


Figure I-2. The REDEYE Missile

b. The launcher (Figure I-3) provides the means for transporting, aiming, and firing the missile. It consists of three main sections.

(1) Launcher Tube. The launch tube is a cylindrical container which houses the missile and is the main support for all other parts of the launcher.

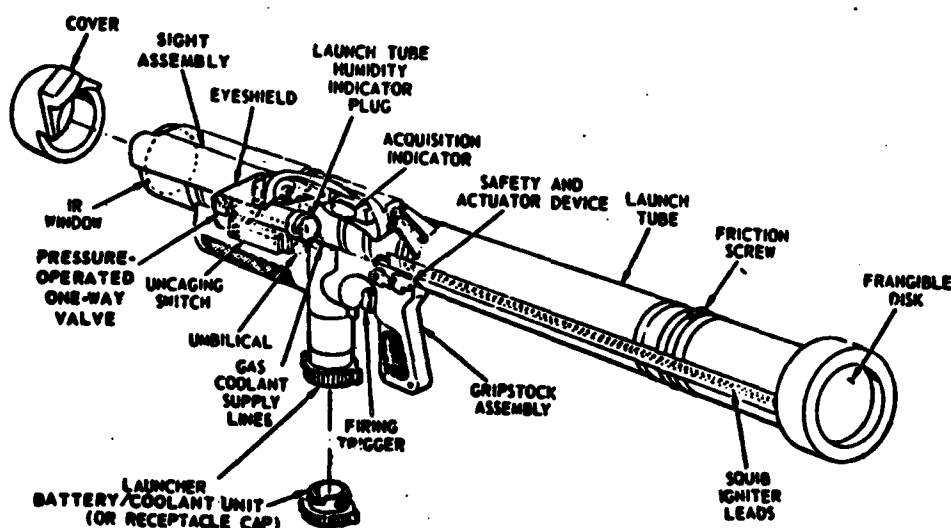


Figure I-3 The REDEYE Launcher

(2) Open Sight Assembly. The open sight assembly (Figure I-4) provides the means to aim the weapon, track the target, perform range estimation and insert superelevation and lead. It has an acquisition indicator mounted to the rear of the sight cover which provides the gunner with an audible and vibration indication when the missile seeker has acquired the target.

(3) Gripstock. The launcher gripstock contains the controls (safety and actuator device, uncaging switch, and firing trigger), and power and coolant channels necessary to launch the missile. The pistol grip, near the center of balance, is the natural right-hand hold point of the weapon.

c. The battery/coolant unit (Figure I-5) supplies the electrical power required to energize the launcher electrical circuits (30-second pre-launch power) and contains freon gas used to cool the detector cell, making it supersensitive to the presence of infrared radiation. The unit is activated when the safety and actuator device on the launcher is pressed forward. The battery/coolant unit is located forward of the pistol grip.

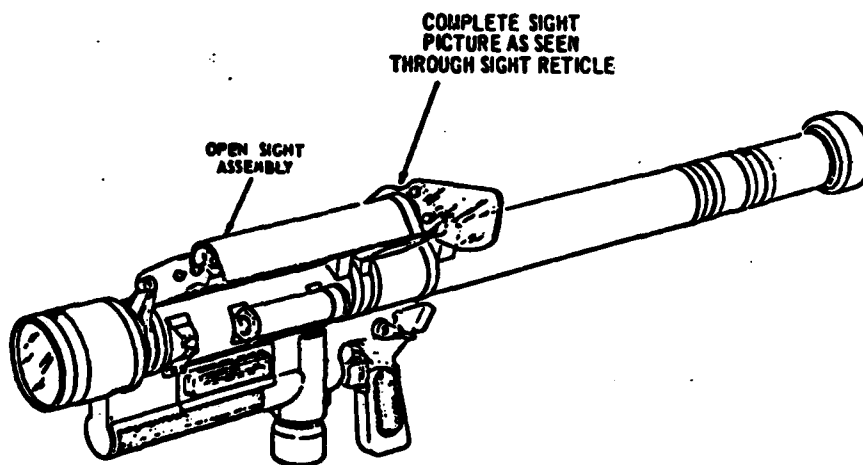
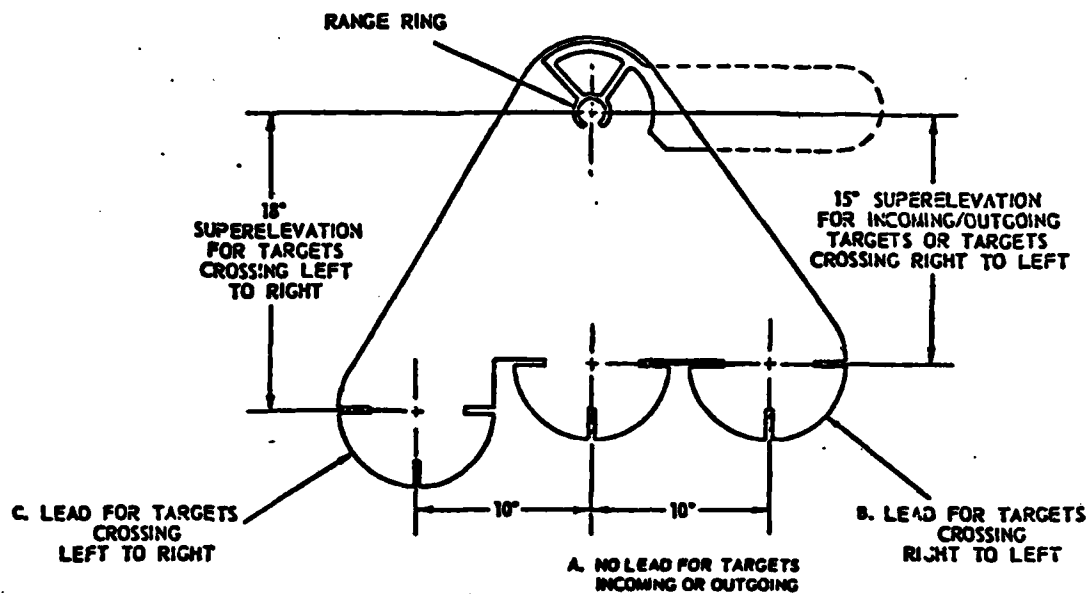


Figure I-4 Open Sight Assembly

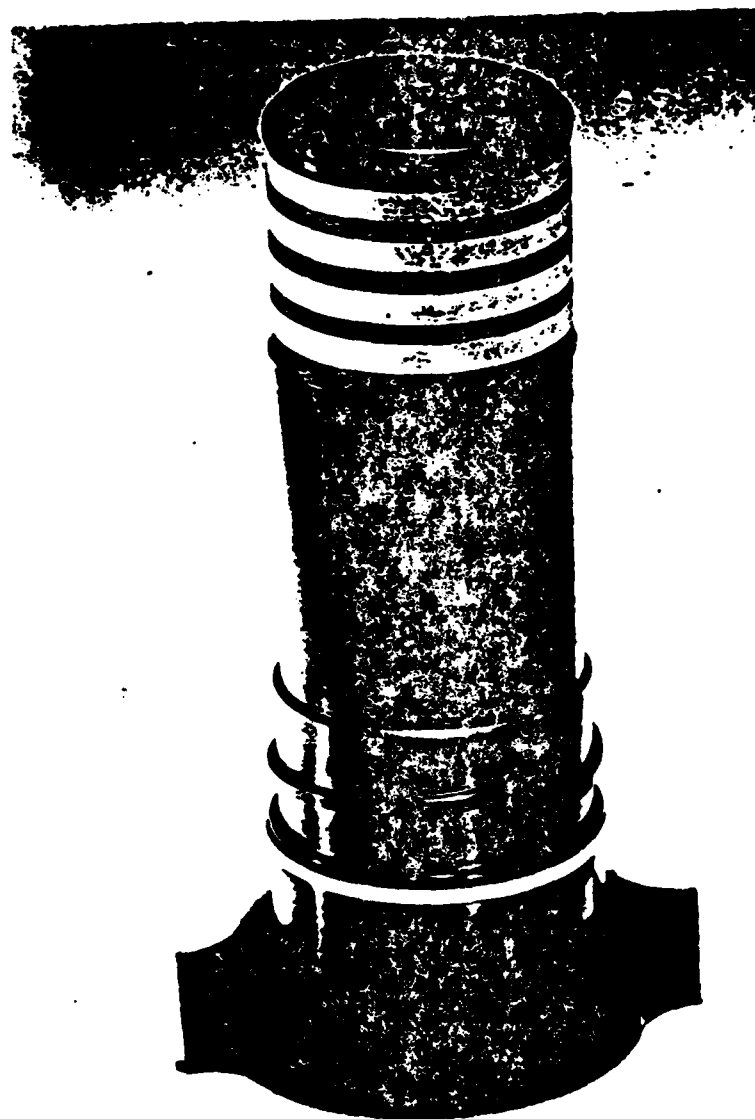


Figure I-5 Launcher Battery/Coolant Unit

APPENDIX II

MOVING TARGET SIMULATOR (MTS) DESCRIPTION

1. The REDEYE Moving Target Simulator (MTS) M87 and the Tracking Head Trainer (THT) M49 are used to simulate tactical air defense engagements for training gunners as shown in Figure II-1. The MTS is employed for both institutional and unit training. Detailed descriptions of the M87 and M49 can be found in TM 9-6920-427-10 and TM 9-6920-428-12 respectively.

2. The MTS projects the images of hostile aircraft against a natural sky background with 3-channel sound effects. Background battle sounds may also be introduced for realism. Twelve reels of film are used with 20 target presentations per reel. Reels 1 thru 10 contain progressively more difficult target presentations, i.e., Reel 1 presents low performance aircraft in flight patterns that are relatively easy to engage. In proceeding to Reel 10, the aircraft may appear from directly forward up to 90 degrees to either side, and maneuver at altitudes from ground level to beyond the vertical range of REDEYE. The velocity of the aircraft may be up to 650 knots. Reels 11 and 12 contain aircraft of all performance categories, and are representative of the variety of targets to be engaged by the tactical REDEYE Weapon System. Detailed descriptions of the target aircraft types and flight path parameters for each film reel are provided in the Instructors Manual, Moving Target Simulator, FM 44-17, July 1975 (CONFIDENTIAL).

3. In addition to projecting the image of hostile aircraft, infrared (IR) radiation is provided by superimposing an IR spot on the moving target. The IR can be detected by the IR sensor in the THT and tracked by the gunner using the THT as a weapon.

4. The THT is a full scale model of the REDEYE Weapon System. The launch tube and grip stock assembly is ballasted to simulate the weight of the tube with the tactical missile. The operation of the device is to simulate the operating characteristics of the weapon system from activation to firing. A performance indicator assembly is provided on the device to indicate the status and sequence of operation conducted by the trainee. The firing sequence must be completed within 31 seconds following activation, which approximates the life of the tactical battery/coolant unit (BCU). Thus, the gunner must operate the THT under the same time constraints of the weapon system.

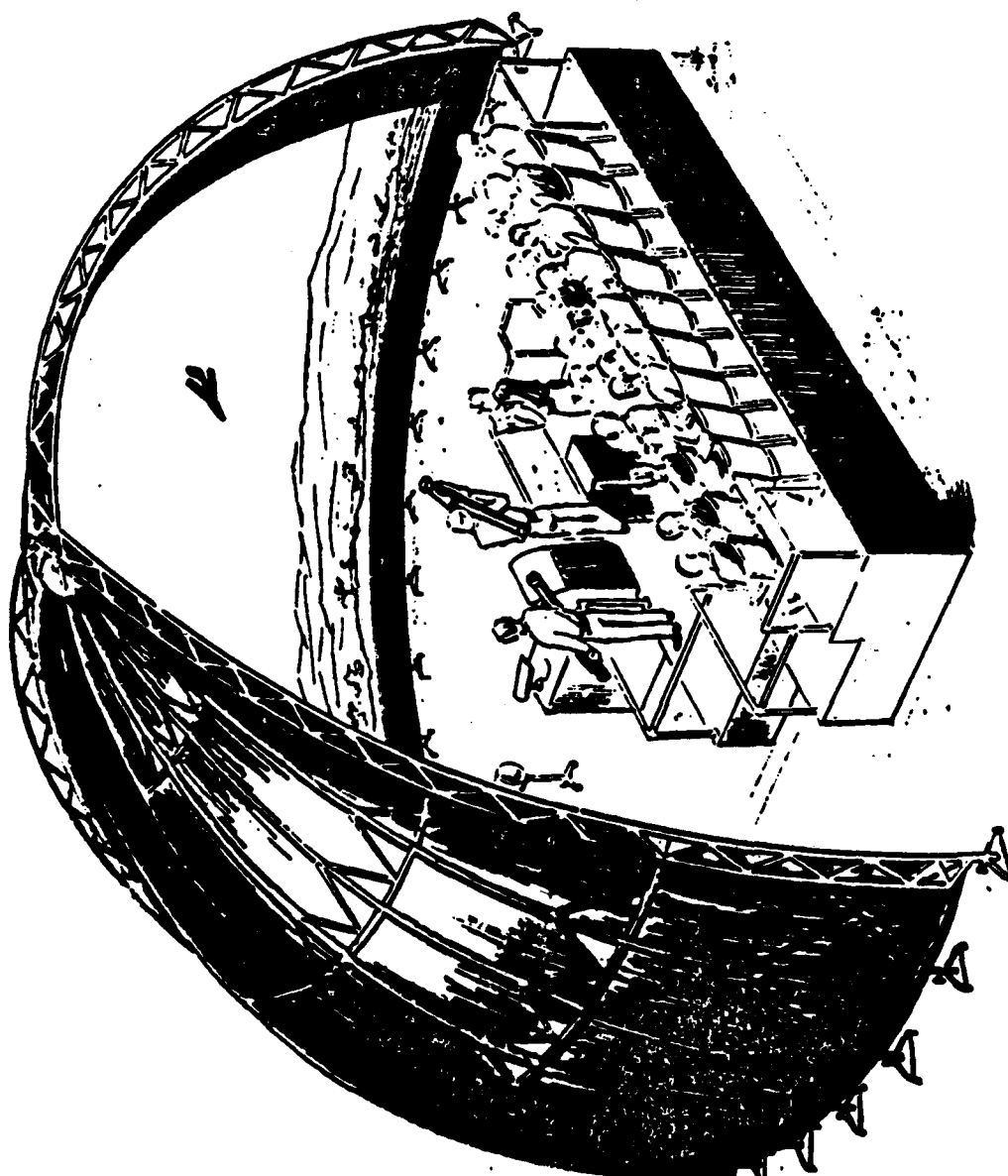


Figure II-1. Training Set Moving Target Simulator M87

5. Electrical power for the THT is provided through a flexible power cord at the MTS, or a rechargeable battery may be used when the device is used in the field for tracking live aircraft. Cooling for the IR sensor is provided by freon which is released from a hand-pumped pressure chamber within the THT. The power supply or battery must be partially removed and re-inserted between engagements to simulate removal of the expanded BCU in a tactical system. The cooling system will operate for 5 or more successive THT engagements before repumping, whereas the tactical system is cooled by a small canister of freon in the BCU.

6. Following activation of the THT, the indicator panel will indicate when acquisition of IR is achieved. The gunner will also receive an audible tone when acquisition is achieved as with the tactical system. Following acquisition and while continuing to track, the gunner must uncage the gyro to permit the THT to automatically track the IR source. The indicator panel indicates when automatic track is attained and the gunner also receives a shift in tone level through the audio transducer. The time to proceed with the firing sequence is based on the range ring (RR) profile which is to determine when the target is within the engagement zone or the effective range of the REDEYE Weapon System. The MTS reels also provide coded data to the instructor's console which will indicate when the respective target is within acquisition range, and the hold fire, resume fire, or cease fire points of the flight path. These points correspond to the range and flight path for each of the six performance categories (small/large jet, small/large helicopter, small/large prop) taught with the RR profile.

7. Following determination to fire, the gunner must super-elevate and select the proper lower sight reticle (left, center, or right) to maintain track of the target. (The indicator panel also indicates when approximately 17 degrees super-elevation has been achieved.) At the time the fire trigger is pulled, an audible beep will indicate successful completion of the engagement. In addition the panel will indicate all steps were conducted properly. However, if the sequence was interrupted before firing, such as by a momentary loss of track, an audible warbling tone will be transmitted to the gunner, and the panel will indicate the point of interruption. The gunner may reacquire the target and repeat the engagement sequence within the 31-second constraint from initial activation.

8. In summary, the MTS provides a variety of hostile aircraft presentations for gunners using the THT. The THT is a device that simulates the functions of the tactical REDEYE Weapon System to the point of firing. The indicator panel on the THT provides visual information to the instructor or monitor as to the status of completion, or point of improper action of the gunner during an engagement. Panel indications also provided the basis for grading gunner performance in the MTS for this study.

9. There are 13 MTS installations currently being used by the US Army and US Marine Corps for both institutional and unit training. Eight are located in CONUS and the remainder OCONUS. The specific locations are as follows:

- 4 - Ft. Bliss, TX
- 1 - Ft Bragg, NC
- 1 - Ft Carson, CO
- 1 - Ft. Hood, TX
- 1 - Ft. Riley, KS
- 3 - USAREUR (Germany)
- 1 - Hawaii
- 1 - Korea

10. New installations have been proposed for each of the following six locations:

- 1 - Ft Lewis, WA
- 1 - Ft Campbell, KY
- 1 - Ft Ord, CA
- 1 - Ft. Polk, LA
- 1 - Ft. Stewart, GA
- 2 - Europe

11. The 4 MTS installations at Ft. Bliss, are primarily committed for support of Army and Marine AIT at USAADS. However, unit training for the 3rd Armored Cavalry Regiment (ACR) is also supported. All of the remaining MTS are primarily for support of the units at or near the respective locations.

APPENDIX III

TRACKING HEAD TRAINER M49

The Tracking Head Trainer M49 is the primary item of the Training Set (M76) shown in Figure III-1.

- a. The Tracking Head Trainer M49 is similar in appearance to the REDEYE Weapon M41 except for a compressor actuator assembly (gas pump handle) mounted on the launch tube, two gas pressure gages visible through a plastic window in the forward launch tube, a performance indicator assembly fitted under the gyro activator coils, a battery-voltage indicator mounted in the left half of the gripstock, a gas fill port located just above the desiccant holder, a thermometer installed inside the desiccant holder, and a rubber bumper (disk assembly) fitted to the rear protective shock ring. If freon gas pressure is excessive, it will rupture a safety relief disk and vent through the rear rubber bumper assembly. The trainer's manually operated pump is used to obtain the necessary pressures required to recirculate Freon through a closed-loop coolant system to cool the seeker. The performance indicators provide a visual indication of sequential errors made by the operator.
- b. The four batteries are similar to the BCU used with the REDEYE Weapon but are about 3 inches longer and weigh 2 pounds more. A battery is capable of providing power for at least fifteen 31-second training missions without recharging.
- c. The battery charger is a compact, solid-state, trickle-type charger housed in a metal container with a hinged lid secured with two turn-key latches. Four independent receptacles receive the batteries, so charging of one (to four) does not affect the others.
- d. The shipping and storage container is an aluminum, two-piece shell with capacity for the trainer M49 and the battery charger with four batteries stored in the charger battery receptacles.

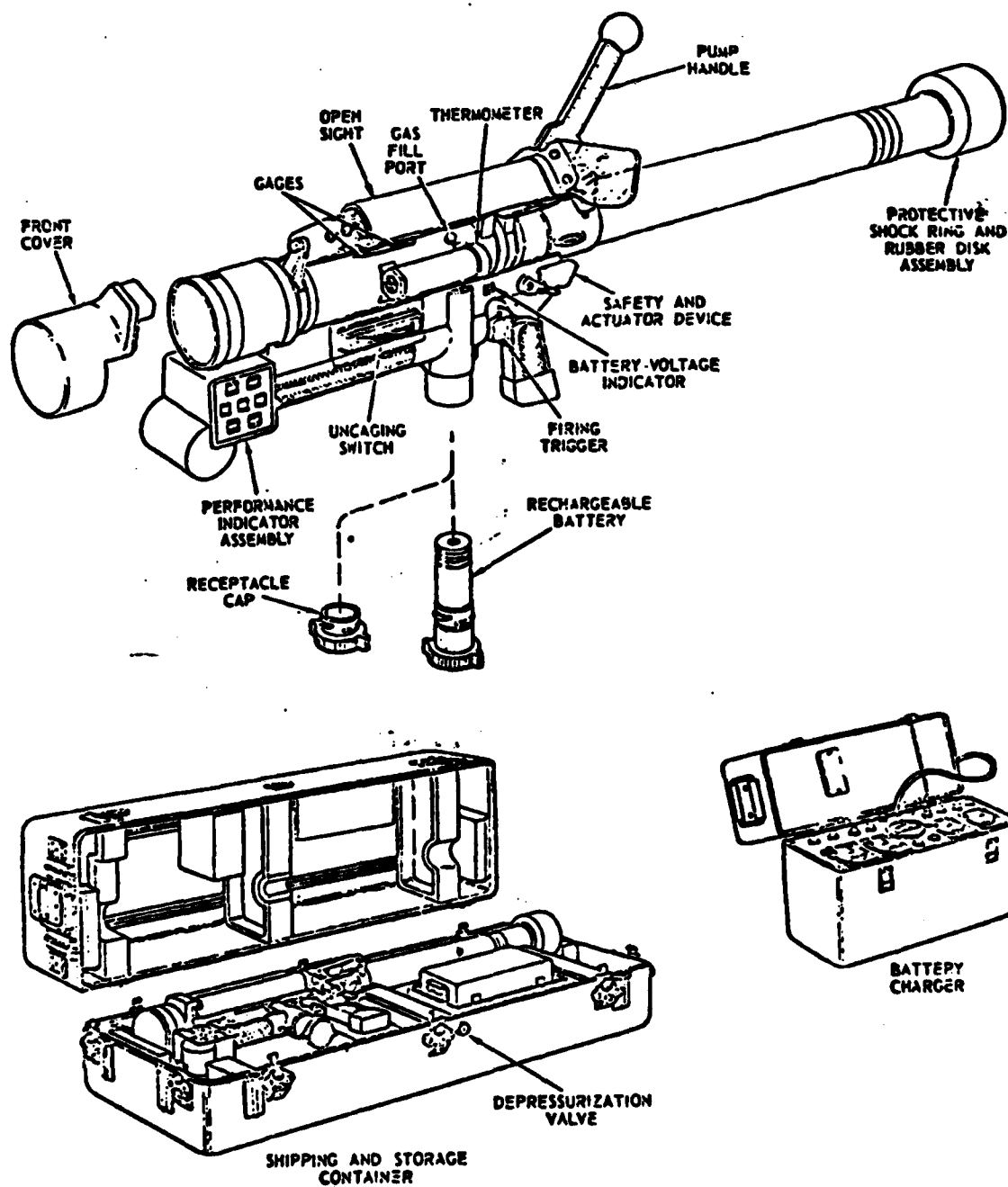


Figure III-1 The REDEYE Guided Missile Training Set M76

APPENDIX IV

RADIO CONTROLLED MINIATURE AERIAL TARGET AND BALLISTIC AERIAL TARGET SYSTEM DESCRIPTIONS

1. Radio Controlled Miniature Aerial Target (RCMAT)

a. The RCMAT used for REDEYE is a commercial model aircraft which can be used by the various air defense systems for gunnery training. The model currently used for Army AIT is the Lanier "Slow Comet," which has a 75" wing span and is 43" long. The craft provides a profile which is representative of a small prop category of live aircraft when viewed through the REDEYE Weapon range ring sight. It is capable of carrying 2 - one pound road flares (20 minute burn-time) outboard and under the wings to facilitate IR tracking at velocities ranging from 35 to 50 mph. It is flown at an altitude of approximately 120 feet on a crossing flight path 200 meters in front of the gunners. This results in tracking rates which are slightly higher than for normal small prop aircraft crossing at 1.5 km but the rates are well within the velocity range of aircraft to be engaged by REDEYE.

b. The RCMAT is flown over a course at Ft Bliss which is approximately 1 km long and crosses in front of the gunners at 200 meters range. The REDEYE Weapon sight picture at crossover is approximately 1/2 of the range ring and decreases to 1/3 at the turn. Therefore, the model is suitable for use with the THT to train REDEYE gunners to track a live target. In addition, the sight picture of the model at the close-in range is representative of a full size aircraft within the normal engagement zone.

2. Ballistic Aerial Target System (BATS)

a. A ballistic target is used for all REDEYE live round firings at the completion of Army and Marine training. Targets of the same type are used in the units for the periodic field training exercises.

b. The BATS is a low cost, booster-propelled missile that provides a 300 to 450 knot target for the REDEYE gunners. It has a broad-side area of 20 square feet and, with IR augmentation, presents an IR source compatible with REDEYE. It is also used for various other air defense systems. The range of the system varies 5000 to 12,000 feet when flown at altitudes between 300 and 2400 feet. The booster load can be varied from 3 to 5 (2.75 inch) rocket motors to produce the desired flight profile. They are normally launched from a point behind and to the side of the gunner position. The azimuth of fire is direct to provide a crossing flight path at the time of acquisition, and an outgoing path at the time of launch. The total flight time is approximately 30 seconds.

c. The BATS can be transported on 2½-ton standard military vehicle, and can be emplaced, using semi-skilled labor, in 2 hours or less with common tools. The target, less propulsion system, has a shelf life of 5 years and a probability of at least 95 percent of meeting all essential launch and flight characteristics.

APPENDIX V

ESSENTIAL ELEMENTS OF ANALYSIS (EEA)

*A. Resources to Training

- 1 EEA 1. What is the cost of individual and collective training of REDEYE personnel in units?
- 2 EEA 2. What is the cost of shadow schools for REDEYE personnel in units?
- 3 EEA 3. What is the cost of training REDEYE personnel in TRADOC schools?
- 4 EEA 4. What is the cost of exportable materials to support REDEYE training in units?
- 5 EEA 5. What is the cost of REDEYE training aids/devices (simulators)?
- 6 EEA 6. What is the delta cost associated with night or NBC training for REDEYE personnel?
- 7 EEA 7. What is the cost of training Reserve Component (RC) personnel to REDEYE ARTEP standards?
- 8 EEA 8. What is the cost of training Individual Ready Reserve (IRR) personnel to REDEYE SM standards?

**These EEAs were coordinated with the ARTS Group and are different than those listed in the Study Plan (App XIII).*

B. Training to Proficiency

- 1 EEA 1. How were current SM and ARTEP tasks developed?
- 2 EEA 2. How well does proficiency on 16P SM tasks measure a REDEYE gunner's ability to fight his weapon or perform his specific duty?
- 3 EEA 3. How well does proficiency on the ARTEP tasks measure the collective abilities to fight weapons systems or perform the unit's assigned mission?
- 4 EEA 4. What is the relationship between time formally allocated for individual REDEYE training in the units and SM tasks passed?
 - (a) Bringing entry-level personnel up to SM standards.
 - (b) Maintaining SM standards.
- 5 EEA 5. What is the relationship between SM tasks passed and the degree/intensity of employment of various REDEYE training support materials?
- 6 EEA 6. What instruction can be eliminated/reduced from BT and REDEYE AIT/OSUT without degrading REDEYE individual training proficiency? How much time is required to develop loyalty, esprit, unit morale and discipline?
- 7 EEA 7. What is the impact on the proficiency relationship to time for REDEYE gunners if 10%, 25%, or 40% of AIT training is transferred to units?
- 8 EEA 8. What is the relationship between ARTEP tasks passed and time spent on collective REDEYE training in units?
- 9 EEA 9. What is the relationship between ARTEP tasks passed and time since the last ARTEP?
- 10 EEA 10. What increases in REDEYE training proficiency can be achieved through ARTEP without the use of combat simulation training techniques?
- 11 EEA 11. What is the increase/decrease in individual REDEYE proficiency attributable to collective (ARTEP task) training in units?
- 12 EEA 12. What is the increase/decrease in collective REDEYE proficiency attributable to individual (SM tasks) training in units?

- 13 EEA 13. What are impacts on REDEYE training proficiency of working under difficult conditions--Night/NBC/lack of sleep/stress?
- 14 EEA 14. What training programs are required to insure 30%, 40%, 70% of enlisted personnel validate higher grade in SQT?
- 15 EEA 15. How does the current unit training readiness report (AR 220-1) correlate with actual REDEYE proficiency?
- 16 EEA 16. What is the relationship between SQT scores and REDEYE MOS status as stated in the current unit readiness report?
- 17 EEA 17. What changes should be made in the unit training readiness report? How could SQT and ARTEP results be modified for use in a readiness reporting system?
- 18 EEA 18. What peacetime training policies hinder the development of REDEYE gunner proficiency, such as safety requirements on live fire?
- 19 EEA 19. What REDEYE gunner proficiency is achieved through the use of shadow schools?

C. Proficiency to War Models

- 1 EEA 1. How is REDEYE training proficiency incorporated into the traditional M.F.S. (Mobility, Firepower, Survivability) formula used in war games?
- 2 EEA 2. How can we improve our capability to measure REDEYE parameter proficiency?
- 3 EEA 3. Do existing models adequately provide for variations in individual REDEYE proficiency?
- 4 EEA 4. Do existing models include provision of collective REDEYE training factors?
- 5 EEA 5. What is the performance required of REDEYE (STINGER) personnel and equipment on the mid-intensity battlefield during the mid-1980's?
- 6 EEA 6. What SM tasks can be translated directly to REDEYE proficiency parameters in current simulations?
- 7 EEA 7. What ARTEP tasks can be translated directly to REDEYE proficiency parameters in current simulations?
- 8 EEA 8. What SM tasks can be translated indirectly to REDEYE proficiency parameters in current simulations?

- 9 EEA 9. What ARTEP tasks can be translated indirectly to REDEYE proficiency parameters in current simulations?
- 10 EEA 10. Can tests be designed to be administered with SQT that would yield values for REDEYE parameters used in current simulations?
- 11 EEA 11. Can tests be designed to be administered with ARTEP that would yield values for REDEYE parameters used in current simulations?
- 12 EEA 12. Can new models be designed which directly use REDEYE training parameters?
- 13 EEA 13. How are training and human factor parameters incorporated into AMSAA REDEYE data?
- 14 EEA 14. What is the relationship between SM tasks passed and REDEYE system capability as described by MN/DT/AMSAA curves?
- 15 EEA 15. What is the relationship between ARTEP tasks passed and REDEYE system capability as described by MN/DT/AMSAA curves?
- 16 EEA 16. To what degree can the ability of the unit commander and staff to integrate combat systems (REDEYE and other SHORAD) on the battlefield be incorporated into war models?
- 17 EEA 17. How are motivation/morale related to REDEYE proficiency?

D. War Models to Combat Effectiveness

- 1 EEA 1. What is the impact, on the REDEYE contribution to combat effectiveness, of the ability of the commander and staff to successfully integrate weapons systems on the battlefield?
To integrate combat systems?
- 2 EEA 2. Can levels of REDEYE personnel training, night training, crew operations or logistics be varied in multiple runs of games to derive different battle payoffs?

E. Individual Training

- 1 EEA 1. How will increased simulator training for REDEYE affect the acquisition of training proficiency?
- 2 EEA 2. What will be the projected REDEYE learning curves with the use of new training technologies and techniques?
- 3 EEA 3. Can combinations of ITDT and simulation be used with REDEYE to improve training proficiency and combat effectiveness?
What are the resource implications?

- 4 EEA 4. What is the impact on resources and combat effectiveness associated with changes in the mix of REDEYE training programs and changes in training techniques/technology?
- 5 EEA 5. What is the minimum length of BCT required to gain basic skills and condition enlistees to the Army?
- 6 EEA 6. What is the relationship between individual and unit training for REDEYE skills?
- 7 EEA 7. What minimum skills must the REDEYE gunner have when he arrives in the unit?
- 8 EEA 8. Can crew training in the institution increase individual REDEYE gunner proficiency in the units? What is the hierarchy of learning from individual to collective by skill level?
- 9 EEA 9. What is the amount of actual time available to units to conduct REDEYE training?
- 10 EEA 10. What is the amount of training time required to optimize individual REDEYE training proficiency in units?
- 11 EEA 11. What are the resources (manpower, dollars, and time) associated with alternative institutional REDEYE training programs?
- 12 EEA 12. What are the resources associated with alternative individual REDEYE training programs in units?
- 13 EEA 13. Is there a systematic method to allocate tasks for REDEYE training between the unit and the institution? If not, can one be developed? If there is, is it being used properly?
- 14 EEA 14. What is the impact on proficiency and resources of various on-the-job (OJT) REDEYE training programs?
- 15 EEA 15. Can methods such as exportation of part of the training base (e.g., an OSUT company) to units to provide individual/crew refresher training increase REDEYE proficiency and productivity?

F. Personnel Programs

- 1 EEA 1. How does personnel stability/turbulency influence REDEYE training programs?
- 2 EEA 2. What is the feasibility of maintaining unit leadership stability for REDEYE gunners in units over an extended period of time (2-3 years)?

- 3 EEA 3. What is the affect of peacetime attrition in REDEYE training, both in the unit and in the institution?
- 4 EEA 4. What changes are expected in enlistment criteria? How will this impact on individual REDEYE training requirements in the training base?
- 5 EEA 5. Are enlistees' sense of values more critical to training proficiency than intellectual aptitude?
- 6 EEA 6. What is the availability of Army eligibles?
- 7 EEA 7. What should be the eligiblity criterion in terms of age, mental, physical, and education?
- 8 EEA 8. Should the time required to learn the REDEYE MOS skill be tied to the length of service contract?
- 9 EEA 9. What is the correlation between motivation and mental category?
- 10 EEA 10. What is the REDEYE knowledge decay factor for each mental category?
- 11 EEA 11. What time differential will be required to train low mental category personnel to desired levels of REDEYE proficiency?
- 12 EEA 12. What additional resources will be needed to train low mental category personnel to desired level of REDEYE proficiency?
- 13 EEA 13. What is the feasibility of the assignment of individuals to the REDEYE MOS by mental category?
- 14 EEA 14. What is the impact of individual motivation on acquiring/retaining REDEYE proficiency?
- 15 EEA 15. What are the battlefield and training program implications of REDEYE NCO/leadership shortages and grade mismatch?
- 16 EEA 16. What are the battlefield and training program implications of REDEYE gunner replacements flow?

G. Unit Training Support in Resources

- 1 EEA 1. What is the relationship between REDEYE training proficiency and: equipment available/equipment required, ammo available/ammo required, POL available/POL required, training time available/training time required, and instructor-student ratio?

- 2 EEA 2. What REDEYE unit training programs have to be eliminated/reduced as a result of 30% decrements in various resources? What is the effect of training equipment storage procedures similar to those employed by GSFG?
- 3 EEA 3. If units employing REDEYE are decremented 30% equipment, what is the impact on REDEYE training proficiency, combat effectiveness, resources, and unit moral/motivation?
- 4 EEA 4. What is the impact on unit and individual REDEYE gunner proficiencies of national conservation programs? (e.g., 50% reduction in POL)
- 5 EEA 5. What is the impact on individual REDEYE proficiency resulting from limited access to training devices?
- 6 EEA 6. What is the impact on individual/collective REDEYE proficiency of limited local training areas and constrained major training areas?

H. Reserve Component Training

- 1 EEA 1. What level of REDEYE proficiency can be achieved for RC units prior to deployment?
- 2 EEA 2. What individual and collective REDEYE training programs are required to achieve proficiency in RC units prior to deployment?
- 3 EEA 3. What are the resources required to achieve REDEYE proficiency in RC units prior to deployment?
- 4 EEA 4. How do all the other excursions influence RC REDEYE combat effectiveness, training programs, and associated resources?
- 5 EEA 5. Can the RC REDEYE training system respond to mobilization requirements without revision?
- 6 EEA 6. What is the relationship between training, proficiency, and REDEYE personnel retention in the RC?
- 7 EEA 7. What is the relationship of individual REDEYE training to collective REDEYE training in the RC in sustaining proficiency?
- 8 EEA 8. What is the cost of training REDEYE gunners in RC units to ARTEP standards?
- 9 EEA 9. How would variations from the current 38 days of annual/reserve training impact on the combat effectiveness of REDEYE gunners?

- 10 EEA 10. How much annual training time is required to sustain REDEYE gunners in RC units at ARTEP standards?
- 11 EEA 11. What is the cost of training the IRR (Individual Ready Reserve) REDEYE gunners to SM standards?
- 12 EEA 12. How much training time is required annually to sustain IRR REDEYE gunners to SM standards?
- 13 EEA 13. What are the required resources of alternative training to improve the premobilization REDEYE training of RC personnel (Officer/NCO/E1-E4)?
- 14 EEA 14. What is the level of REDEYE training readiness of an average roundout battlaion, D + 30, D + 60 unit?
- 15 EEA 15. What ARTEP level should be required for REDEYE gunners in those units which would not be committed until after D + 60? What training programs and associated resources would be required?
- 16 EEA 16. How much increase in REDEYE proficiency can be achieved in 30 days? At what echelon should reserves be employed? What REDEYE training programs and resources are required to maintain the appropriate premobilization REDEYE proficiencies?
- 17 EEA 17. Can simulations be played to a D + 30 and D + 60 scenario and can war games be set at a D + 30/ D + 60 scenario with REDEYE?

APPENDIX VI

REDEYE LAUNCH SIMULATOR (RELS)

The REDEYE Launch Simulator (RELS)-(Figure VI-1) was conceived and developed by the Brunswick Defense Division, to provide a means for training REDEYE gunners without having to fire the actual weapon.

a. The RELS employs a standard REDEYE launcher to fire inert projectiles. The launcher is modified to incorporate the standard REDEYE seeker mounted to the gripstock to incorporate all the acquisition functions of the operational missile. The RELS projectile incorporates a shortened REDEYE eject motor, and is ballasted to effect the same center of gravity as the live rocket. The use of the REDEYE eject motor provides the projectile dynamics and spin in flight the same as the operational missile through the initial launch phase. The RELS round is simply loaded and is retained in the launch tube with a torque screw (Figure VI-2).

b. Features of using RELS in training include:

- (1) Permitting tracking and firing on aircraft fly-overs.
- (2) Functional sequence and operating procedures the same as the REDEYE weapon.
- (3) Firing sound, pressure, launch dynamics and projectile flight identical to the REDEYE weapon through the eject phase (300 ft).
- (4) Reduced firing costs to that incurred with the use of the tactical weapon.

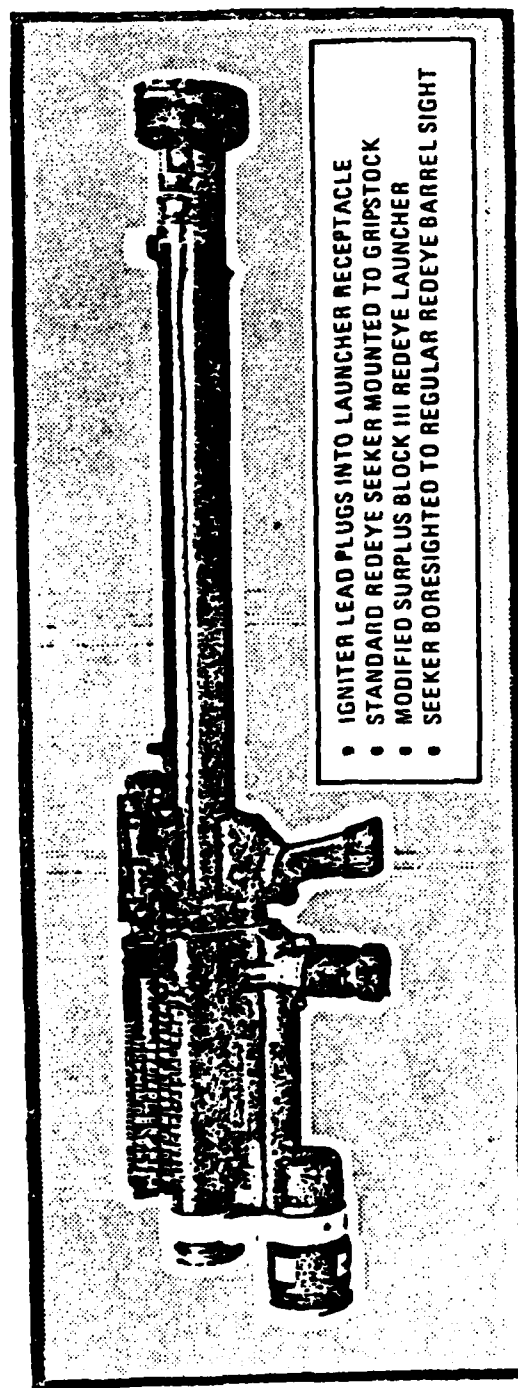


Figure VI-1. The REDEYE Launch Simulator (RELS)

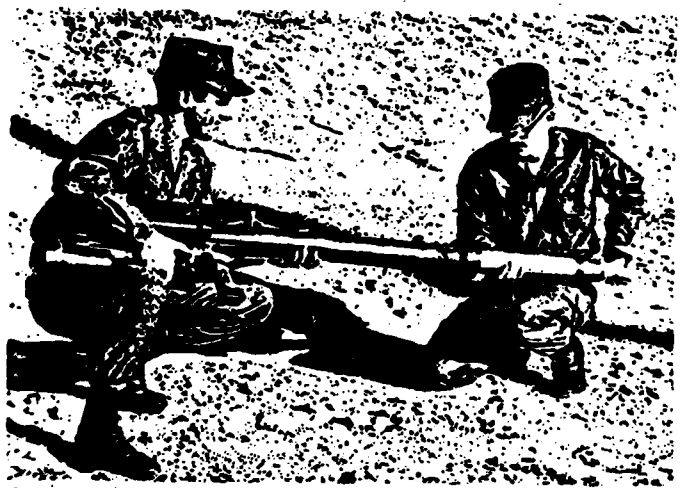


Figure VI-2 Loading the REDEYE Launch Simulator (RELS)

APPENDIX VII

TARGET ALERT DATA DISPLAY SET (TADDs)

1. The TADDs (Figure VII-1) is located at supported CHAPARRAL, VULCAN, or REDEYE fire units. It receives and displays location and tentative identity of aerial targets within the Forward Area Alerting Radar's (FAAR) area of surveillance. The TADDs display consists of a grid containing 49 squares (a 7 by 7 grid). Indicators on the TADDs appear within the proper square when an encoded message is received over the RFDL from the FAAR. A green disc appears for a friend; an orange disc appears for an unknown.* Either, or both discs may appear in a square as called for by the FAAR. A similar grid of 49 squares appears on the control indicator of the FAAR.
2. Normally the center square on both grids is the location of the FAAR. During emplacement of the TADDs, the operator determines in which square the TADDs is located and marks it on the TADDs grid with a marking pencil (supplied with the TADDs). The operator can thus derive approximate distance and direction of the target from the TADDs which will assist him to visually locate the target in the air.
3. When it is desired to obtain a longer range display of targets in a given direction, the origin of the sweep display may be moved to any of the grid squares neighboring on the center grid square. Whenever the sweep origin is offset in this manner, each TADDs using information from the particular FAAR must be notified of the offset and change the FAAR location on the TADDs. Orientation can thus be maintained. This offset could be used to obtain earlier warning in the direction of forced or anticipated attack, coverage of an area not otherwise reached by any FAAR, or operation close to an obstruction (such as a hill) that negates low-level searching in that particular direction.

**The technical literature on the TADDs names the orange disc a "FOE" indicator and it is exposed when the FOE pushbutton on the FAAR control indicator is pressed. A foe indication is transmitted for one of two reasons: the aircraft failed to respond to the IFF challenge or provided an incorrect response. Although this failure on the part of the aircraft indicates that it is not a true friend, it does not indicate that it is a true enemy. It could be a friend whose IFF responder is not working properly. Consequently, exposure of a foe indicator on the TADDs indicates an unknown in that square, not necessarily an enemy. Final determination as friend or foe must be based on visual inspection of each target by the fire unit leader.*

1. Antenna
2. BAT and Reset/
Self-Test Switch
3. S-Meter (indicates
battery strength)
4. Power Switch
5. Address Control
6. Band A or Band B
7. Ready/Off Switch
8. Volume Control

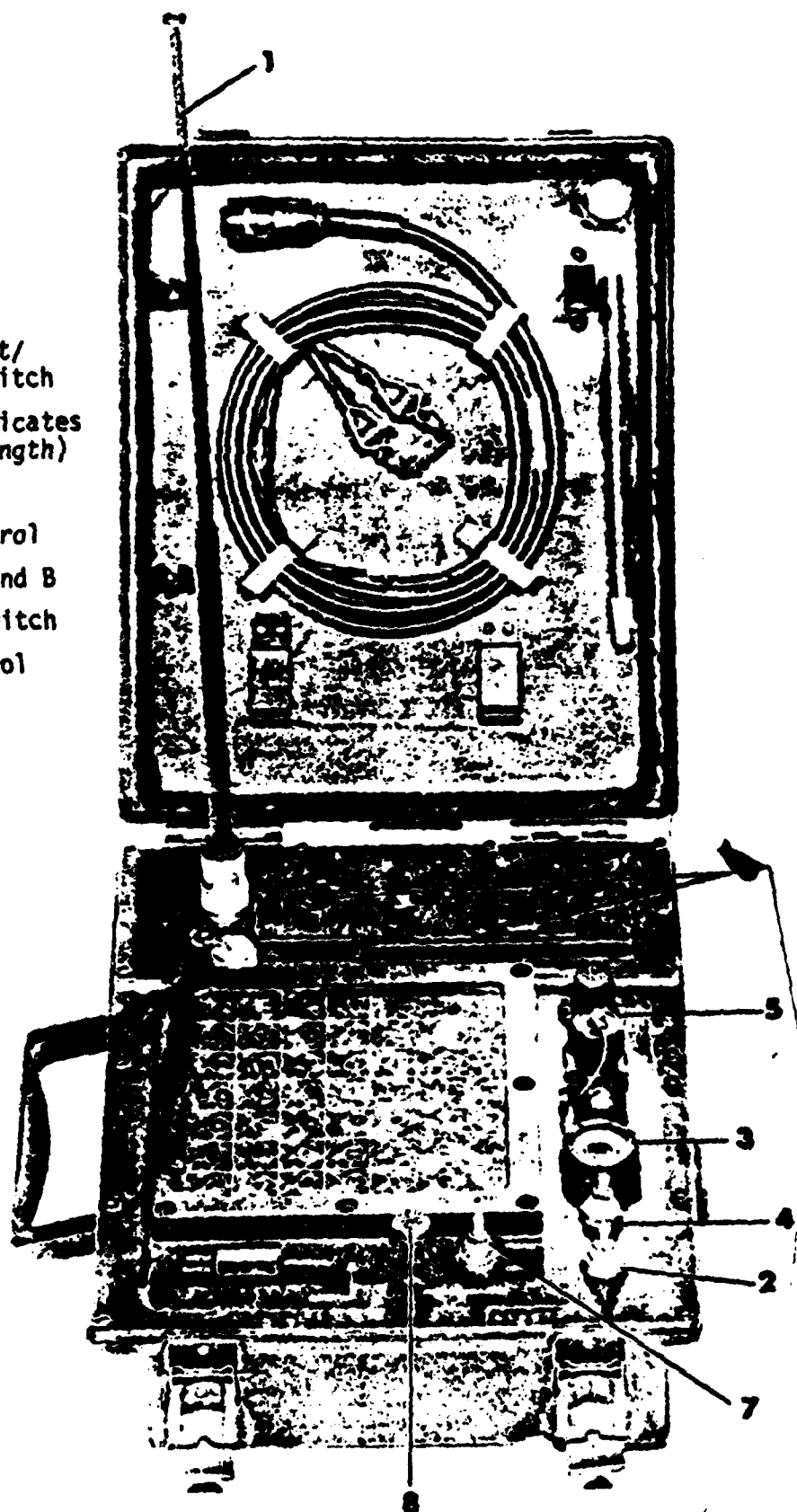


FIGURE VII-1 Target Alert Data Display Set (TADDs)

APPENDIX VIII

DIVISIONS AND ORGANIZATIONAL ELEMENTS EVALUATED

<u>1. MARINE CORPS</u>		<u>GUNNERS TESTED</u>
MASS-2, MACG-18	Okinawa, Japan	21
MASS-3, MACG-38	El Toro, Ca	22
3D LAAM Bn, MACG-28	Cherry Point, NC	<u>19</u>
	TOTAL	62
<u>2. NATIONAL GUARD - UNITS</u>		
49TH ARM DIV (TEXAS)	El Paso, Tx	6
218th INF BDE (South Carolina)	Ft Bragg, NC	<u>22</u>
	TOTAL	28
<u>3. NATIONAL GUARD - ANNUAL TRAINING (AT)</u>		
<u>CLASSES</u>		
11		21
12		18
13		18
14		23
17-18		17
19		<u>12</u>
	TOTAL	109

4. 1ST INF DIV - FT RILEY, KS

GUNNERS TESTED

1/2 INF	14
1/28 INF	10
1/4 CAV	11
1/7 FA	11
2/63 ARM	4
4/63 ARM	<u>16</u>

TOTAL	66

5. 2D INF DIV - KOREA

1/9 INF	10
1/17 INF	3
1/23 INF	4
1/31 INF	7
1/32 INF	3
1/38 INF	7
2/9 INF	7
1/15 FA	2
1/38 FA	8
2/17 FA	5
6/37 FA	8
4/7 CAV	4
1/72 ARM	8
2/61 AD	<u>4</u>

TOTAL	80

6. <u>3D INF DIV - WUERZBURG, GERMANY</u>		<u>GUNNERS TESTED</u>
4/73 ARM	TOTAL	11
7. <u>4TH INF DIV - FT CARSON, CO</u>		
1/19 FA		8
1/20 FA		4
1/27 FA		4
1/29 FA		10
1/8 INF		6
1/10 INF		12
1/11 INF		8
1/12 INF		6
1/22 INF		5
1/10 CAV		7
1/77 ARM		6
2/34 ARM		10
4/40 ARM		5
6/32 ARM		<u>9</u>
	TOTAL	100

8. 5TH INF DIV (MECH) - FT POLK, LA

GUNNERS TESTED

1/61 INF	12
1/40 ARM	9
3/77 ARM	2
3/10 INF	2
3/11 INF	8
3/70 ARM	9
2/21 FA	7
3/19 FA	3
3/21 FA	10
4/12 CAV	<u>11</u>

TOTAL 73

9. 7TH INF DIV - FT ORD, CA

1/51 ADA

TOTAL 56

10. 8TH INF DIV - BAD KRUEZNACH, GERMANY

GUNNIERS TESTED

1/13 INF	3
1/39 INF	6
1/87 INF	1
2/13 INF	11
2/28 INF	10
2/87 INF (MECH)	9
1/68 ARM	11
2/68 ARM	4
3/68 ARM	11
4/69 ARM	8
1/83 FA	5
2/81 FA	9
2/83 FA	2
3/16 FA	4
1/59 AD	1
3/8 CAV	<u>9</u>

TOTAL 104

11. 9TH INF DIV - FT LEWIS, WA

1/67 ADA	TOTAL	56

12. 24TH INF DIV - FT STEWART, GA.

2/19 INF	2
3/19 INF	1
2/21 INF	2
2/34 INF	<u>1</u>

TOTAL 6

13. 25TH INF DIV - SCHOFIELD BKS, HI

GUNNERS TESTED

1/5 INF

6

1/4 INF

12

1/19 INF

11

1/21 INF

7

1/27 INF

10

1/8 FA

6

2/11 FA

7

3/13 FA

4

3/4 CAV

11

1/62 ADA

14

TOTAL

88

14. 82D ABN DIV - FT BRAGG, NC

A BTRY

24

B BTRY

27

C BTRY

35

D BTRY

14

1/6 FA

8

1/39 FA

7

TOTAL

115

15. 101ST ABN DIV - FT CAMPBELL, KY

GUNNERS TESTED

1/501 INF	7
1/502 INF	3
1/503 INF	2
1/506 INF	3
2/503 INF	6
2/17 CAV	4
2/31 FA	4
3/319 FA	1
1/321 FA	<u>1</u>
TOTAL	31

16. BERLIN BDE - BERLIN, GERMANY

2/6 INF	12
3/6 INF	9
4/6 INF	<u>10</u>
TOTAL	31

17. 1ST AR DIV - ANSBACH, GERMANY

GUNNERS TESTED

1/1 CAV	12
1/13 ARM	7
1/35 ARM	7
1/37 ARM	8
2/37 ARM	8
2/81 ARM	14
3/35 ARM	9
2/59 AD	1
1/22 FA	5
1/94 FA	3
6/14 FA	3
1/6 INF	15
1/46 INF	7
1/51 INF	8
1/52 INF	<u>4</u>
TOTAL	111

18. 2D ARM DIV - FT HOOD, TX

GUNNERS TESTED

1/14 FA	6
1/16 FA	6
1/78 FA	9
1/92 FA	6
1/41 INF	16
1/50 INF (Tested At Vilseck, Germany)	12
2/50 INF	10
2/58 INF	3
2/1 CAV	14
1/66 ARM	11
3/67 ARM	<u>2</u>

TOTAL 83

19. 3D ARM DIV - FRANKFURT, GERMANY

3/28 INF	1
3/36 INF	3
1/32 ARM	1
2/32 ARM	1
1/40 ARM	1
3/61 AD	<u>4</u>

TOTAL 11

20. 3D ACR - FT BLISS, TX

GUNNERS TESTED

1/3 HHT	10
2/3 HHT	8
3/3 HHT	9
3 HHT (HQ)	<u>8</u>

TOTAL	35

21. 1ST CAV DIV - FT HOOD, TX

1/8 CAV	8
1/9 CAV	8
2/7 CAV	5
5/7 CAV	10
1/21 FA	4
1/82 FA	6
2/19 FA	5
1/68 ADA	<u>38</u>

TOTAL	84

22. 32D AD COM - DARMSTADT, GERMANY

3/60 AD (HAWK)	TOTAL	18

<u>23. V CORPS; NON-DIVISIONAL COMBAT AND SUPPORT</u>		<u>GUNNERS TESTED</u>
1/11 ACR (FULDA)		2
1/36 FA (8 ID SUPPORT)		4
2/5 FA		1
2/20 FA (WEISBADEN)		6
2/75 FA (8 ID SUPPORT)		1
3/37 FA (8 ID SUPPORT)		5
6/9 FA (8 ID SUPPORT)		<u>1</u>
	TOTAL	20
<u>24. VII CORPS; NON-DIVISIONAL COMBAT AND SUPPORT</u>		
1/70 ARM		10
1/18 FA		<u>5</u>
	TOTAL	15
<u>25. ARMY AIT CLASSES - FT BLISS, TX</u>		
44		39
45		26
46		22
47		12
48		<u>23</u>
	TOTAL	122

SUMMARY

<u>UNIT DESIGNATION*</u>	<u>NUMBER TESTED</u>
1. MARINE CORPS	62
2. NATIONAL GUARD (UNITS)	28
3. NATIONAL GUARD (AT)	109
4. 1ST INF DIV	66
5. 2D INF DIV	80
6. 3D INF DIV	11
7. 4TH INF DIV	100
8. 5TH INF DIV	13
9. 7TH INF DIV	56
10. 8TH INF DIV	104
11. 9TH INF DIV	56
12. 24TH INF DIV	6
13. 25TH INF DIV	88
14. 82D ABN DIV	115
15. 101ST ABN DIV	31
16. BERLIN BDE	31
17. 1ST ARM DIV	111
18. 2D ARM DIV	83
19. 2D ARM DIV	11
20. 3D ACR	35
21. 1ST CAV DIV	84
22. 32D AD COM	18

*The numerical sequence assigned to divisions does not equate to those assigned on the ARTS data listings.

<u>UNIT DESIGNATION*</u>	<u>NUMBER TESTED</u>
23. V CORPS; NON-DIVISIONAL COMBAT AND SUPPORT	20
24. VII CORPS; NON-DIVISIONAL COMBAT AND SUPPORT	15
25. ARMY AIT	<u>125</u>
TOTAL	1518

WSTE A SUMMARY

1. ARMY AIT	71
2. MARINE AIT	16
3. 3D ACR	40
4. 4TH INF DIV	83
5. V CORPS	94
6. VII CORPS	89
7. 25TH INF DIV	56
8. MARINE UNITS	<u>42</u>
TOTAL	491
ARTS	1518
WSTE A	<u>491</u>
TOTAL	2009

*The numerical sequence assigned to divisions does not equate to those assigned on the ARTS data listings.

APPENDIX IX

QUESTIONNAIRE DESCRIPTIONS

1. Q1 AIT GENERAL INFORMATION - ATTITUDE

This questionnaire is designed to collect data on the REDEYE AIT student gunner's personal history and attitude toward the service.

2. Q2 AIT TRAINING

a. This questionnaire is designed to collect data on the REDEYE AIT student's opinion of ease of learning, quality of instruction, and amount of training of various tasks taught within the REDEYE AIT course, also the gunner's opinions on live round and REDEYE Launch Simulator (RELS) firings.

b. At the time Q1/Q2 is administered, the gunner has completed REDEYE training, has fired weapon (RELS or REDEYE) or has watched a weapon being fired, and has his duty assignment. (See Inclosure 1 for Q1 and Q2).

3. Q3 RANGE RING PROFILE

REDEYE Range Ring Proficiency Test (Q3). This test was designed to measure the proficiency of a REDEYE gunner in:

(1) Identifying the category of aircraft (small jet, large jet, small prop, large prop, large helicopter, and small helicopter).

(2) Sizing of the aircraft by the use of the range ring.

(3) After determination of the above, the gunner has enough information to apply the RRP for determination of action required, i.e., activate, fire, hold fire, resume fire, and cease fire. This test has 18 three-part questions. The last part is graded based upon the answers of the first two parts, regardless of correctness. (See Inclosure 2).

4. Q4/Q5 UNIT-GENERAL INFORMATION AND ATTITUDE

This questionnaire is intended to obtain the basic information on the background of unit gunners, demographic information on each gunner, their attitude toward the service and their job, and their assessment of the training received in their respective units. (See Inclosure 3).

5. Q6 APTITUDE TEST INFORMATION

Information was obtained from the individual service records which relates to the existing minimum requirements for training as REDEYE gunners. The AFQT, GT, OF, and FA scores were recorded for the unit test subjects in an effort to determine if there is a correlation between the test scores and various gunner performance parameters.

6. Q7 UNIT TRAINING

Unit Training Survey (Q7). This questionnaire attempts to extract existing quantitative unit training information as well as Soldiers Manual (SM) and Skill Qualification Test (SQT) information from each REDEYE gunner and will be analyzed on a comparative unit basis. It is anticipated a significant correlation will exist between quality and quantity of training and recorded gunner proficiency. (See Inclosure 4).

7. Q8 UNIT NCO TRAINING

Non-commissioned Officer (NCO) Questionnaire (Q8). The NCO questionnaire virtually addresses the same material as the REDEYE gunner questionnaire. The purpose of administering this questionnaire is to determine the tracking of a more experienced opinion with that of the REDEYE gunner's response and possibly resolve irregularities. (See Inclosure 5).

8. Q9 MTS TRACKING TEST

(a) Form Q9 is a scoring sheet used by the evaluator. This score sheet allows the evaluator to determine at what point of the tracking task sequence, if any, that a gunner may have problems while engaging an MTS target or a live aircraft using the THT.

(b) MTS Tracking Test. Each REDEYE gunner test subject is tested and scored on five consecutive MTS target passes. Reel 12 was chosen as the film to be consistently used at all locations for this test. Selection of this specific film was based on the variation of targets of opportunity in sequential blocks of five targets. Each block maintains relatively the same average target velocity and tracking difficulty level. Due to the wide range of individual REDEYE gunner proficiency levels encountered, scoring was restricted, at all test locations, to the basic gunner tasks. These specific tasks are those monitored by the THT indicator box as well as application of proper lead and a categorical breakdown of reasons why a gunner may fail to complete the required series of tasks up to and including firing. (See Inclosure 6).

9. Q10 NON-ACTIVE TRAINING

The non-active questionnaire addresses the same material as the active REDEYE gunner Questionnaire Q4/Q5. This questionnaire was administered to National Guard 16P personnel. Due to the geographic problem of testing a sufficient quantity of REDEYE gunners in a single location, a large sampling of 16P personnel were administered this questionnaire during their 1978 Annual Training (AT) period at Fort Bliss, Texas. (See Inclosure 7).

10. REDEYE LAUNCH SIMULATOR (RELS) QUESTIONNAIRE

Within this study an attempt is made to determine the feasibility of the use of RELS in the training of REDEYE gunners. This questionnaire is administered to REDEYE gunners who have fired both RELS and a live REDEYE round in this respective sequence. An attempt is made to extract from the gunner his feelings toward firing an active device:

- o Prior to firing the RELS
- o In the interim time between firing the RELS and firing a live round
- o After firing both RELS and a live round (See Inclosure 8).

11. REDEYE SECTION LEADER INTERVIEWS

An oral interview conducted with the section leaders which is designed to reinforce the gunner questionnaire responses regarding training and unique training problems within the organization. Additional areas are covered such as leadership attitude toward air defense, utilization of TADDs, and REDEYE organizational problems both in garrison and in the field. Also included are section leaders' personal recommendations for the solution of some of these inherent problems.

AIT REDEYE TRAINING (Q1/Q2)

This questionnaire is being given to men who are receiving REDEYE training in AIT as part of an analysis of REDEYE training being conducted by the US Army TRADOC Systems Analysis Activity (TRASANA), White Sands Missile Range, NM. The questionnaire consists of three sections--a Personal History section, a section dealing with your feelings about the Army, and a section about REDEYE training.

Your answers to these questions are important. They will provide information about the way men feel about REDEYE training procedures and help form the basis for improvements in current training programs. This is why we are asking you to fill out this questionnaire.

This is not a test, because there are no "wrong" answers. ALL of your answers are "right," if they reflect what you honestly know or feel about the question asked.

In keeping with the Privacy Act of 1974, please sign your name at the bottom of this cover sheet, indicating that you have no objections to completing this questionnaire. Data and identifiers (your name) are the property of TRASANA and the Army Research Institute and are to be used for administration and statistical purposes only. Full confidentiality of the responses will be maintained in the processing of this data.

Please be sure to answer every item. If you have any questions about the items, you may ask the person handing out these forms to clarify them for you. If you have any other ideas or comments, please write them on the back of the pages.

Thank you for your help.

ORGANIZATION _____

NAME _____
(Last) (First) (MI)

SSN _____

SIGNATURE _____

INSTRUCTIONS

In the following two sections, read each question and decide which answer correctly describes you or your feelings. Circle the letter in front of that answer. For example, one question asks:

What is your marital status?

- ☒ a. Single - never married
- b. Single - previously married
- c. Currently married

If you are single and have never been married, you would circle the letter "a" in front of "Single - never married."

PERSONAL HISTORY INFORMATION (Q1)

The following questions deal with background information that is needed for statistical purposes. Please read each question carefully before attempting to complete it.

1. Today's date: / /
 day month year
2. How old are you?
 - a. 17-19
 - b. 20-22
 - c. 23-25
 - d. 26-28
 - e. 29-31
 - f. 32-34
 - g. 35 or older
3. What is your marital status?
 - a. Single - never married
 - b. Single - previously married
 - c. Currently married
4. What level of education had you completed prior to entering the service?
 - a. 8 years or less
 - b. 9-10 years
 - c. 11-12 years (not high school grad)
 - d. High school graduate
 - e. Some college
 - f. College graduate
5. What is your current level of education?
 - a. 12 years or less
 - b. High school graduate
 - c. GED
 - d. Some college
 - e. College graduate
 - f. Some postgraduate
 - g. Advanced degrees
6. What was the primary reason that you enlisted in the Army?
 - a. To be a soldier and serve the country
 - b. To get travel and adventure
 - c. Because there were no good jobs at home
 - d. To get job training in the Army
 - e. To get additional high school or college education through the military
 - f. To get the cash Enlistment Bonus
 - g. Because of a problem in school, on the job, or at home
 - h. To earn an honorable discharge certificate
 - i. Other

7. What type assignment do you think you would enjoy most in the Army?

- a. Combat leader - tank, infantry, artillery, aviation
- b. Technical - mechanic, supply, communications, etc.
- c. Administrative - clerk, typist, office manager
- d. I do not have a choice

8. What were you doing when you joined the Army?

- a. Going to school or just graduated
- b. Working only part time
- c. Working full time
- d. Looking for a job

9. What was your primary place of residence during childhood?

- a. Farm
- b. Rural
- c. Small Town
- d. Small City (under 100,000)
- e. Suburban area of large city
- f. Large City (over 100,000)

GENERAL ATTITUDE (Q1)

1. The Army is:
 - a. very important for the defense of our country.
 - b. important for the defense of our country.
 - c. borderline.
 - d. unimportant for the defense of our country.
 - e. very unimportant for the defense of our country.
2. By being in the Army, I am performing an important service to my country
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
3. In order to be prepared for war, the US must have not only the most modern weapons, but also a large number of well-trained men.
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
4. Much of what is taught in the Army is simply useless information.
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
5. I don't care how well I do in the Army.
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
6. The Army has treated me:
 - a. very fairly.
 - b. fairly.
 - c. borderline.
 - d. unfairly.
 - e. very unfairly.

7. The Army is run as efficiently as most large civilian organizations.
- Strongly agree.
 - Agree.
 - Neither agree nor disagree.
 - Disagree.
 - Strongly disagree.
8. When the opportunity arises, how likely is it that you will reenlist in the Army.
- Very likely.
 - Likely.
 - Borderline.
 - Unlikely.
 - Very unlikely.
9. Promotions in the Army are based on ability.
- A great deal.
 - Quite a bit.
 - Somewhat.
 - Slightly.
 - Not at all.
10. Do you feel that what you are doing in the Army is worthwhile or not?
- I am certain it is worthwhile.
 - I think it is worthwhile.
 - I don't think it is worthwhile.
 - I am certain it is not worthwhile.
11. On the whole, do you think the Army is giving you a chance to show what you can do?
- A very good chance.
 - A fairly good chance.
 - Not much of a chance.
 - No chance at all.
 - Undecided.
12. In the Army you have to spend too much time waiting around and doing nothing.
- Strongly agree.
 - Agree.
 - Neither agree nor disagree.
 - Disagree.
 - Strongly disagree.

13. In the Army, men are treated with proper respect regardless of their rank or jobs.
- a. Strongly agree.
 - b. Agree.
 - c. Neither agree nor disagree.
 - d. Disagree.
 - e. Strongly disagree.
14. Is there more or less racial prejudice in the Army than in civilian life?
- a. More racial prejudice in Army.
 - b. About the same.
 - c. More racial prejudice in civilian life.
15. On the whole, how is the morale in your company?
- a. Very low.
 - b. Low.
 - c. Just so-so.
 - d. High.
 - e. Very high.
16. Most of the officers in the Army are well qualified for their jobs.
- a. Strongly agree.
 - b. Agree.
 - c. Neither agree nor disagree.
 - d. Disagree.
 - e. Strongly disagree.
17. Do you feel that the NCO's in charge of your work really know their stuff?
- a. All of them do.
 - b. Most of them do.
 - c. About half of them do.
 - d. Few of them do.
 - e. None of them do.
18. Most NCO's that I know are:
- a. Very understanding of their men's needs.
 - b. Understanding of their men's needs.
 - c. Borderline.
 - d. Nonunderstanding of their men's needs.
 - e. Very nonunderstanding of their men's needs.
19. Most Army officers that I know are:
- a. Very understanding of their men's needs.
 - b. Understanding of their men's needs.
 - c. Borderline.
 - d. Nonunderstanding of their men's needs.
 - e. Very nonunderstanding of their men's needs.

20. What do you think of the leadership in your battery?

- a. It's better than average.
- b. It's about average.
- c. It's poorer than average.

21. The opinions of my officers and NCO's about my performance as a soldier are very important to me.

- a. Strongly agree.
- b. Agree.
- c. Neither agree nor disagree.
- d. Disagree.
- e. Strongly disagree.

22. To what extent do your officers and NCO's give you enough information about what is going on in your unit?

- a. A great deal.
- b. Quite a bit.
- c. Somewhat.
- d. Slightly.
- e. Not at all.

23. The discipline you get in the Army is good for you.

- a. Strongly agree.
- b. Agree.
- c. Neither agree nor disagree.
- d. Disagree.
- e. Strongly disagree.

24. There is too much unnecessary harassment in the Army.

- a. Strongly agree.
- b. Agree.
- c. Neither agree nor disagree.
- d. Disagree.
- e. Strongly disagree.

25. If you try to think for yourself in the Army, you're pretty sure to get in trouble.

- a. Strongly agree.
- b. Agree.
- c. Neither agree nor disagree.
- d. Disagree.
- e. Strongly disagree.

26. The way the Army is run, it wastes a great deal of manpower.

- a. Strongly agree.
- b. Agree.
- c. Neither agree nor disagree.
- d. Disagree.
- e. Strongly disagree.

27. In my unit, there is:

- a. Almost continual harassment.
- b. Much harassment.
- c. Some harassment.
- d. Very little harassment.
- e. No harassment.

28. In my unit, the standards of military courtesy are:

- a. Very high.
- b. High.
- c. Borderline.
- d. Low.
- e. Very low.

29. In my unit, I am:

- a. Always treated like a man.
- b. Usually treated like a man.
- c. Borderline.
- d. Usually treated like a child.
- e. Always treated like a child.

REDEYE TRAINING (Q2)

Part 1

Listed below are different aspects of REDEYE training. Please rate each one on each of the three scales - Ease of Learning, Quality of Instruction, and Amount of Training - by placing an "X" in the appropriate boxes.

TYPE OF TRAINING	EASE OF LEARNING					QUALITY OF INSTRUCTION					AMOUNT OF TRAINING				
	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult	Excellent	Good	Average	Fair	Poor	Too Short	Short	Just Right	Long	Too Long
Aircraft Identification															
Command and Control															
Communications															
Map Reading															
Range-Ring-Profile															
Ranging															
Weapon Handling and Target Engagement															
Weapon System Characteristics															

In this section, please rate how important it is to be able to fire a live REDEYE round, to watch a round being fired, to fire a REDEYE Eject Launch Simulator (RELS), and to watch a RELS being fired by circling the appropriate line. Also check each reason that you think applies to the importance of firing or watching the firing of a REDEYE or RELS round.

-60 -40 -20 0 20 40 60

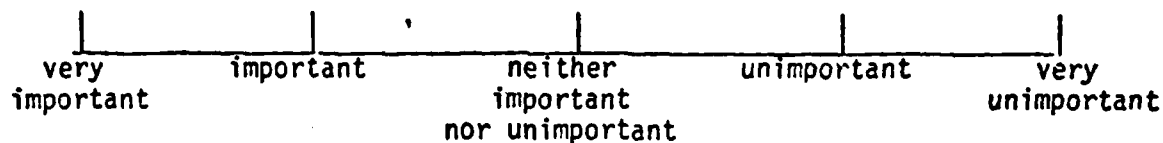
very important important neither important nor unimportant unimportant very unimportant

- ___ Learn not to flinch
- ___ Best, fastest way to know everything was done right
- ___ Builds confidence in weapon by destroying target
- ___ Reduces fear or concern about firing the weapon
- ___ Learn to keep smooth track while firing
- ___ Someone cares enough about your training to spend a lot of money
- ___ Gives a feel for combat operations

A horizontal scale with five tick marks labeled 1 through 5. Below the scale are five corresponding labels: "very important" under 1, "important" under 2, "neither important nor unimportant" under 3, "unimportant" under 4, and "very unimportant" under 5.

- ___ Learn not to flinch
- ___ Best, fastest way to know everything was done right
- ___ Builds confidence in weapon by destroying target
- ___ Reduces fear or concern about firing the weapon
- ___ Learn to keep smooth track while firing
- ___ Someone cares enough about your training to spend a lot of money
- ___ Gives a feel for combat operations

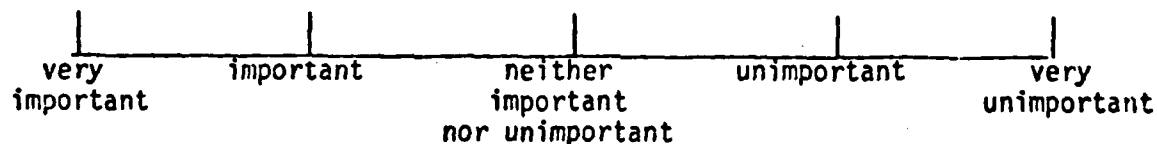
Firing a RELS is:



because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations

Watching a RELS being fired is:



because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations

Part 3

For the following statements, circle the alternative that most closely represents your feelings.

Being able to fire a REDEYE round would improve my confidence in my ability as a REDEYE gunner.

- a. Strongly agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagree

Being able to fire a RELS would improve my confidence in my ability as a REDEYE gunner.

- a. Strongly agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagree

Until one fires a REDEYE round, one doesn't really know whether they are able to do so.

- a. Strongly agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagree

It is absolutely essential that a gunner fire a live REDEYE round before he can be considered as qualified for combat operations.

- a. Strongly agree
- b. Agree
- c. Neither agree nor disagree
- d. Disagree
- e. Strongly disagree

Please comment on what you think is the best feature of REDEYE training.

Please comment on what you think is the worst feature of REDEYE training.

What part of REDEYE training do you think is the most important in preparing you for combat, and why do you think so?

REDEYE RANGE-RING PROFICIENCY TEST

NAME _____

UNIT _____

LOCATION _____

DATE _____

THIS TEST IS TO MEASURE THE PROFICIENCY OF A REDEYE GUNNER IN:

1. IDENTIFYING AIRCRAFT
(SMALL JET, LARGE JET, SMALL PROP, LARGE PROP, SMALL HELICOPTER, LARGE HELICOPTER)
2. COMPARING AIRCRAFT PROFILE TO THE RANGE-RING
(1/4, 1/3, 1/2, 2/3, 3/4, 1, 1-1/2, 2, 3, 4, 5, 6)
3. DECIDING WHEN TO "FIRE" AND "NO FIRE"

EXAMPLE PROBLEM:

INCOMING



TYPE OF AIRCRAFT _____

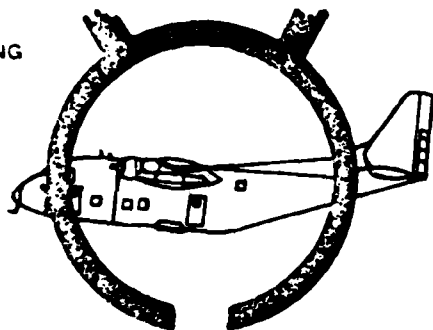
RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

EXAMPLE ANSWER: THE TYPE OF AIRCRAFT IS A LARGE PROP,
THE RANGE-RING COVERAGE IS 4 TIMES, AND SINCE IT IS
INCOMING THE REDEYE GUNNER SHOULD _____.

NOTE - CONSIDER ALL AIRCRAFT AS HOSTILE

INCOMING

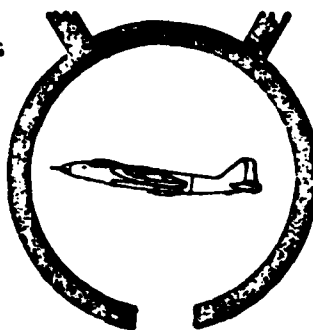


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING

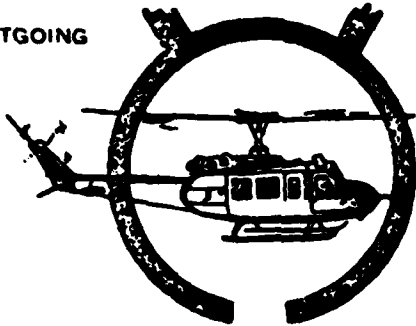


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING

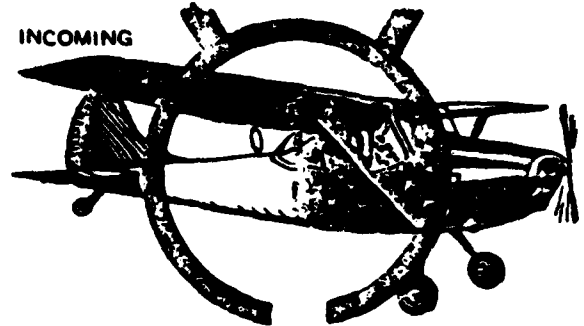


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING

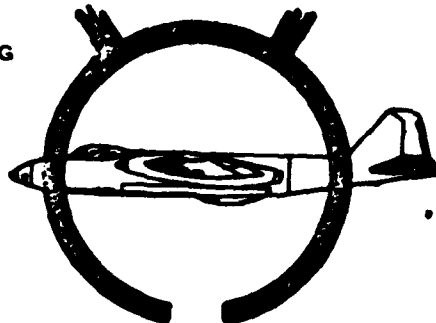


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING

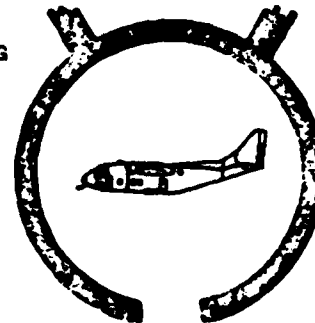


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING

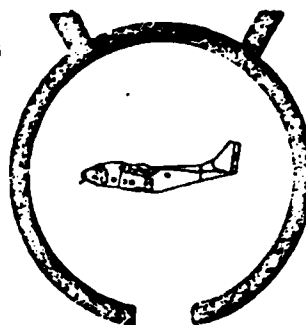


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING

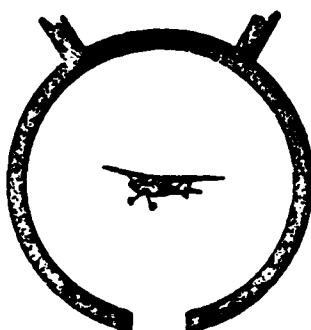


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING

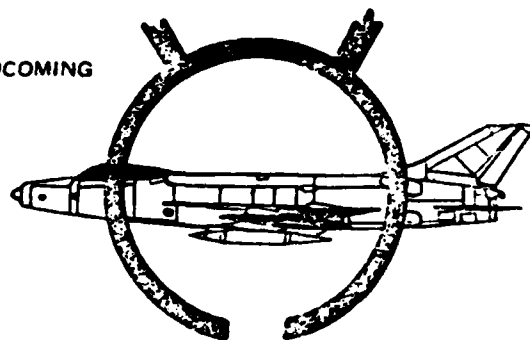


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

INCOMING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING

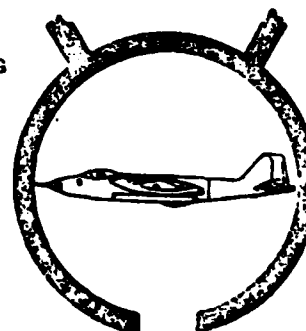


TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

OUTGOING



TYPE OF AIRCRAFT _____

RANGE-RING COVERAGE _____

FIRE/NO FIRE _____

REDEYE TRAINING EXERCISE (Q4-Q5)

This questionnaire is being given to men taking part in REDEYE training exercises as part of an analysis of REDEYE training being conducted by the US Army TRADOC Systems Analysis Activity (TRASANA), White Sands Missile Range, NM. The questionnaire consists of three sections: a Personal History section; a section dealing with your feelings about your job, your unit, the men with whom you work, and your supervisors; and a section about REDEYE training.

Your answers to these questions are important. They will provide information about the way men feel about REDEYE training procedures and help form the basis for improvements in current training programs. This is why we are asking you to fill out this questionnaire.

This is not a test, because there are no "wrong" answers. ALL of your answers are "right," if they reflect what you honestly know or feel about the questions asked.

In keeping with the Privacy Act of 1974, please sign your name at the bottom of this cover sheet indicating that you have no objections to completing this questionnaire. Data and identifiers (your name) are the property of TRASANA and the Army Research Institute and are to be used for administration and statistical purposes only. Full confidentiality of the responses will be maintained in the processing of this data.

Please be sure to answer every item. If you have any questions about the items, you may ask the person handing out these forms to clarify them for you. If you have any other ideas or comments, please write them on the back of the pages.

Thank you for your help.

ORGANIZATION _____ NAME _____
Last First MI

SSN _____ SIGNATURE _____

INSTRUCTIONS

Some of the items in this questionnaire ask you to fill in your answer in the space provided. Others ask you to check one of the alternatives. Most of the items, however, are to be answered by checking one of five statements given. For example, a response of "strongly agree" would look like this:

 X
Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

PERSONAL HISTORY INFORMATION

The following questions deal with background information that is needed for statistical purposes. Please read each question carefully before attempting to complete it.

1. Today's date: / /
 day month year
2. Duty MOS: _____
3. What is your duty job?
_____ REDEYE _____ CHAPARRAL
4. What is your pay grade?
E-1 or E-2 _____
E-3 _____
E-4 _____
E-5 or E-6 _____
E-7 or above _____
5. How long have you been in your current pay grade?
1 month or less _____ 6 months to 1 year _____
2 to 3 months _____ more than 1 year _____
4 to 5 months _____
6. How long do you have left on your current enlistment?
1 month or less _____ 6 months to 1 year _____
2 to 3 months _____ more than 1 year _____
4 to 5 months _____

7. How old are you?

17-19 _____
20-22 _____
23-25 _____
26-28 _____
29-31 _____
32-34 _____
35 or older _____

8. What is your marital status?

Single--never married _____
Single--previously married _____
Currently married _____

9. What level of education had you completed prior to entering the Army?

8 years or less _____
9-10 years _____
11-12 years (not high school grad) _____
High school graduate _____
Some college _____
College graduate _____

10. What is your current level of education?

12 years or less _____
High school graduate _____
GED _____
Some college _____
College graduate _____
Some postgraduate _____
Advanced degrees _____

11. What was your primary place of residence during childhood?

Farm _____	Small city (under 100,000) _____
Rural _____	Suburban area of large city _____
Small town _____	Large city (over 100,000) _____

GENERAL ATTITUDE

Questions 1 through 5 deal with your feelings toward the work you are going in your present job.

1. I enjoy the day-to-day work activities that make up my duty assignment.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

2. I want to work hard for the people with whom I work.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

3. The conditions I work under make me feel like doing my best.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

4. I gain a sense of accomplishment from the day-to-day activities that make up my assignment.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

5. All in all, I am satisfied with my job in the Army.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

Statements 6 through 8 deal with your feelings toward others in your section.

6. Men in my section know how to get the job done right.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

7. If a man needs help, he can usually count on others to provide it.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

8. The members of my section are a good group to work with.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

Statements 9 through 12 deal with your feelings about the way your section functions as a group.

9. Members of my section work together as a team.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

10. Members of my section help each other out.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

11. My section does high-quality work.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

12. My section does more than enough work to get by.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

Statements 13 through 18 deal with your opinions about immediate superior, that is, the one you normally report to (excluding team leader).

13. What position does he hold? (Check one).

Section Leader _____
Section Sergeant _____

14. He clearly explains what he wants me to do.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

15. He is willing to make changes in his way of doing things.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

16. He is willing to accept responsibility for mistakes made by his subordinates.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

17. He clearly explains why a particular action is needed.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

18. He is aware of his men's capabilities.

<u>Strongly</u> Agree	<u>Agree</u>	<u>Neither</u> Agree nor Disagree	<u>Disagree</u>	<u>Strongly</u> Disagree

Questions 19 and 20 deal with your career intentions regarding the Army.

19. How likely is it that you will reenlist again at the end of your current enlistment? (Check one)

0% _____	60% _____
20% _____	80% _____
40% _____	100% _____

20. Do you think that you will pursue a career in the Army? (Check one)

No, definitely not _____	Yes, perhaps _____
No, probably not _____	Yes, probably _____
Undecided _____	Yes, definitely _____

REDEYE TRAINING

PART 1

Listed below are different aspects of REDEYE training in units. Please rate each one for ease of learning, quality of instruction, and amount of training by placing an "X" in the appropriate space.

EASE OF LEARNING

1. Aircraft Identification:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

2. Command and Control:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

3. Communications:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

4. Map Reading:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

5. Range Ring Profile:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

6. Ranging:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

7. Weapon Handling and Target Engagement:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

8. Weapon System Characteristics:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

QUALITY OF INSTRUCTION

9. Aircraft Identification:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

10. Command and Control:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

11. Communications:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

12. Map Reading:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

13. Range Ring Profile:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

14. Ranging:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

15. Weapon Handling and Target Engagement:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

16. Weapon System Characteristics:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

AMOUNT OF TRAINING

17. Aircraft Identification:

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

18. Command and Control:

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

19. Communications:

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

20. Map Reading: -

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

21. Range Ring Profile:

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

22. Ranging:

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

23. Weapon Handling and Target Engagement:

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

24. Weapon System Characteristics:

<u>Too Short</u>	<u>Short</u>	<u>Just Right</u>	<u>Long</u>	<u>Too Long</u>

PART 2

For each pair, check the one activity that you think is more important for successful engagement. For instance, imagine that you are in command of REDEYE training for yourself and others. In order to improve training, select in each pair that activity that you would emphasize.

1. ☐ Aircraft identification	2. ☒ Live aircraft tracking
☐ Live aircraft tracking	☐ Target engagement sequence
3. ☐ Live REDEYE firing	4. ☐ Aircraft identification
☐ Firing the RELS	☐ Target engagement sequence
5. ☐ Live REDEYE firing	6. ☐ MTS tracking
☐ Range Ring Profile	☐ Firing the RELS
7. ☐ Range Ring Profile	8. ☐ Target engagement sequence
☐ Target engagement sequence	☐ Live REDEYE firing
9. ☐ Aircraft identification	10. ☐ Target engagement sequence
☐ Range Ring Profile	☐ MTS tracking
11. ☐ Live aircraft tracking	12. ☐ MTS tracking
☐ Firing the RELS	☐ Range Ring Profile
13. ☐ Firing the RELS	14. ☐ Live aircraft tracking
☐ Range Ring Profile	☐ Range Ring Profile
15. ☐ Live REDEYE firing	16. ☐ MTS tracking
☐ Live aircraft tracking	☐ Live aircraft tracking
17. ☐ Firing the RELS	18. ☐ Aircraft identification
☐ Aircraft identification	☐ MTS tracking
19. ☐ Live REDEYE firing	20. ☐ Firing the RELS
☐ MTS tracking	☐ Target engagement sequence
21. ☐ Aircraft identification	
☐ Live REDEYE firing	

In this part, please rate how important it is to be able to fire a live REDEYE round, to watch a round being fired, to fire a REDEYE Eject Launch Simulator (RELS), and to watch a RELS being fired by checking the appropriate space. Then, check the most important reason that you think applies to the firing or watching the firing of a REDEYE or RELS round. If you check "other", write in your reason in your own words.

Very Important	Important	Neither Important Nor Unimportant	Unimportant	Very Unimportant

2. _____ Learn not to flinch

_____ Best, fastest way to know everything was done right

_____ Builds confidence in weapon by destroying target

_____ Reduces fear or concern about firing the weapon

_____ Learn to keep smooth track while firing

_____ Someone cares enough about your training to spend a lot of money

_____ Gives a feel for combat operations

_____ Not realistic enough

_____ Does not add anything to my ability as a REDEYE gunner

Other. _____

3. Watching a REDEYE round being fired is:

Very
Important

Important

Neither
Important
Nor
Unimportant

Unimportant

Very
Unimportant

4. because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations
- ☐ Not realistic enough
- ☐ Does not add anything to my ability as a REDEYE gunner
- ☐ Other. _____

5. Firing a RELS is:

Very
Important

Important

Neither
Important
Nor
Unimportant

Unimportant

Very
Unimportant

6. because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations
- ☐ Not realistic enough
- ☐ Does not add anything to my ability as a REDEYE gunner
- ☐ Other. _____

7. Watching a RELS being fired is:

Very
Unimportant

Important

Neither
Important
Nor
Unimportant

Unimportant

Very
Unimportant

8. because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations
- ☐ Not realistic enough
- ☐ Does not add anything to my ability as a REDEYE gunner
- ☐ Other. _____

Part 4

For the following statements, check each statement that most closely represents your feelings.

Being able to fire a REDEYE round would improve my confidence in my ability as a REDEYE gunner

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

Being able to fire a RELS would improve my confidence in my ability as a REDEYE gunner

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

Until one fires a REDEYE round, one doesn't really know whether he is able to do so

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

It is absolutely essential that a gunner fire a live REDEYE round before he can be considered as qualified for combat operations.

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

PERSONAL HISTORY - PART II

1. Sex:

☐ Male

☐ Female

2. What is your height in inches? _____

3. What is your weight in pounds? _____

4. What is your preferred handedness?

☐ Left handed

☐ Right handed

5. Do you wear eye glasses?

☐ Yes.

☐ No.

PART 5

Please comment on what you think is the best feature of REDEYE training.

Please comment on what you think is the worst feature of REDEYE training.

What part of REDEYE training do you think is the most important in preparing you for combat, and why do you think so?

UNIT TRAINING SURVEY (Q7)

1. The US Army TRADOC Systems Analysis Activity (TRASANA), White Sands Missile Range, NM is conducting a survey on REDEYE Unit training as it presently exists.
2. As an aid in collecting data on Unit training, please fill out this cover sheet and the attached questionnaire as completely as you can. Your answers will be used for research and statistical purposes only and will not become part of your record.
3. In keeping with the Privacy Act of 1964, we request that you sign your name at the bottom of this cover sheet indicating that you have no objections to completing this questionnaire. Data and identifiers (your name) are the property of this organization and are to be used for administration and statistical control purposes only. Full confidentiality of the responses will be maintained in the processing of this data.

ORGANIZATION: _____

NAME _____
LAST FIRST MI

DATE _____

SIGNATURE _____

RANK _____

DUTY POSITION _____

38-1041-N
DOE

Dr. 4

1. How long have you been in your present unit (TROOP) ?
 - a. ☐ Less than 30 days.
 - b. ☐ Between 1 and 6 months.
 - c. ☐ Between 6 and 12 months.
 - d. ☐ Longer than 1 year.
2. Is your ETS (expiration term of service) date
 - a. ☐ Less than 6 months from present?
 - b. ☐ Between 6 and 12 months from present?
 - c. ☐ Between 1 and 2 years from present?
 - d. ☐ Indefinite?
3. How long have you been a member of your present REDEYE team?
 - a. ☐ Less than 30 days.
 - b. ☐ Between 1 and 6 months.
 - c. ☐ Between 6 and 12 months.
 - d. ☐ Longer than 12 months.
4. What is your MOS ?
 - a. ☐ 16P
 - b. ☐ 11B
 - c. ☐ Other _____
5. How long have you held your present MOS ?
 - a. ☐ Less than 6 months.
 - b. ☐ Between 6 and 12 months.
 - c. ☐ Longer than 1 year.

6. Where did you receive your initial REDEYE training ?

- a. ☐ Formal Advanced Individual Training (AIT) course.
- b. ☐ On the Job Training (OJT).
- c. ☐ Other (formal classes held within a unit).

7. This training completed

- a. ☐ Less than 6 months ago.
- b. ☐ Between 6 and 12 months ago.
- c. ☐ Greater than 1 year ago.

8. How are you notified of the times and locations for REDEYE unit training ?

- a. ☐ Posted on bulletin board.
- b. ☐ Verbal.
- c. ☐ Other.

9. How often is the training schedule posted or given ?

- a. ☐ Every day.
- b. ☐ Once a week.
- c. ☐ Once a month.
- d. ☐ Never.

10. How closely does your unit follow the published or verbal training schedule ?

- a. ☐ 90 - 100% of the time.
- b. ☐ 75 - 90 % of the time.
- c. ☐ 50 - 75% of the time.
- d. ☐ 25 - 50% of the time.
- e. ☐ Less than 25% of the time.

11. What percent of the time is scheduled training interrupted or postponed because other activities take priority?

- a. ☐ Never.
- b. ☐ Less than 10% of the time.
- c. ☐ 10 - 25% of the time.
- d. ☐ 25 - 50% of the time.
- e. ☐ 50 - 75% of the time.
- f. ☐ Greater than 75% of the time.

12. Have you ever seen a REDEYE round fired?

- ☐ Yes
- ☐ No

13. Have you ever fired a REDEYE round?

- ☐ Yes
- ☐ No

14. Have you ever seen a RELS (REDEYE Launch Simulator) round fired?

- ☐ Yes
- ☐ No

15. Have you ever fired a RELS (REDEYE Launch Simulator) round?

- ☐ Yes
- ☐ No

16. If you have fired one or more RELS, what is your opinion regarding the use of RELS in the training of REDEYE gunners?

- a. ☐ Would be helpful.
- b. ☐ Don't know.
- c. ☐ Would not be helpful.

17. What are the approximate number of hours per month in which you are engaged in VACR (visual aircraft recognition) drill?

- a. ☐ None.
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10.
- d. ☐ Between 10 and 15.
- e. ☐ Greater than 15.

18. What are the approximate number of hours per month in which you are engaged in range ring profile practice?

- a. ☐ None.
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10.
- d. ☐ Between 10 and 15.
- e. ☐ Greater than 15.

19. What are the approximate number of hours per month in which you are engaged in system description and operation training?

- a. ☐ None.
- b. ☐ Less than 4 hours.
- c. ☐ More than 4 hours.

20. What are the approximate number of hours per month in which you are engaged in tactical employment training?

- a. ☐ None.
- b. ☐ Less than 4 hours.
- c. ☐ More than 4 hours.

21. What are the approximate number of hours per month in which you are engaged in live tracking RCMAT (radio controlled model airplane target) with the Tracking Head Trainer (THT)?

- a. ☐ None.
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ More than 10 hours.

22. What are the approximate number of hours per month in which you are engaged in live aircraft tracking using the THT?

- a. ☐ None.
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ More than 10 hours.

23. Do you use a TVT (television trainer) mounted upon a THT during any of your live tracking exercises?

- a. ☐ Always.
- b. ☐ More than 75% of the time.
- c. ☐ 50% - 75% of the time.
- d. ☐ 25% - 50% of the time.
- e. ☐ Less than 25% of the time.
- f. ☐ Never.

24. Approximately how many hours are spent tracking aircraft images in the Moving Target Simulator (MTS) per month?

- a. ☐ None.
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ Between 10 and 15 hours.
- e. ☐ More than 15 hours.

25. Approximate number of MTS targets tracked per month.

- a. ☐ Less than 10.
- b. ☐ Between 10 and 20.
- c. ☐ More than 20.

26. MTS films most often used for tracking are:

- a. ☐ Films 11 and/or 12.
- b. ☐ Films 8 through 10.
- c. ☐ Films 3 through 7.
- d. ☐ Films 1 and 2.
- e. ☐ Don't know.

27. What percent of time while in the field is spent on non-REDEYE related tasks (KP, policing the area, etc.)?

- a. ☐ 90 to 100%.
- b. ☐ 75 to 90%.
- c. ☐ 50 to 75%.
- d. ☐ 25 to 50%.
- e. ☐ Less than 25%.

28. What percent of the REDEYE related time in the field is spent on tasks other than tracking (tactics, communications, movement, etc.)?

- a. ☐ 90 to 100%.
- b. ☐ 75 to 90%.
- c. ☐ 50 to 75%.
- d. ☐ 25 to 50%.
- e. ☐ Less than 25%.

29. What percent of the REDEYE related time in the field is actually spent on tracking?

- a. ☐ 90 to 100%.
- b. ☐ 75 to 90%.
- c. ☐ 50 to 75%.
- d. ☐ 25 to 50%.
- e. ☐ Less than 25%.

30. How many targets (live aircraft) did you track in the last field exercise?

- a. ☐ None.
- b. ☐ 1-5.
- c. ☐ 6-10.
- d. ☐ More than 10.

31. If you are a REDEYE team member how much CHAPARRAL training do you receive?

- a. ☐ None.
- b. ☐ $\frac{1}{4}$ as much as REDEYE.
- c. ☐ $\frac{1}{2}$ as much as REDEYE.
- d. ☐ $\frac{3}{4}$ as much as REDEYE.
- e. ☐ As much as REDEYE.
- f. ☐ More than REDEYE.

32. Given a choice, with which piece of equipment do you prefer to work?

- a. ☐ REDEYE.
- b. ☐ CHAPARRAL.

33. What is the reason for your preference in the above question?

34. For each of the following REDEYE-related tasks, check each task with regard to how difficult the task is for you to perform.

a. COMMUNICATIONS:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

b. ENGAGEMENT DECISION:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

c. EQUIPMENT MAINTENANCE:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

d. RANGE RING PROFILE:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

e. SMOOTH TRACKING:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

f. TACTICS:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

g. TADDs:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

h. TRACKING PROCEDURES:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

i. VISUAL AIRCRAFT RECOGNITION:

- ☐ Very difficult
- ☐ Difficult
- ☐ Average
- ☐ Easy
- ☐ Very easy

35. Based on your unit training, would you be able to engage a high-performance aircraft under tactical conditions?

- a. ☐ Yes.
- b. ☐ Not sure.
- c. ☐ No.

If you have fired a REDEYE round, answer questions 36 through 38.

36. When did you fire?

- a. ☐ Less than 30 days ago.
- b. ☐ Between 1 and 6 months ago.
- c. ☐ Between 6 and 12 months ago.
- d. ☐ Longer than a year ago.

37. What type target(s) did you fire at?

- a. ☐ BATS.
- b. ☐ RCMAT (model airplane).
- c. ☐ Other.

38. What were the results of these firings(s)? (If more than one firing, indicate so.)

- a. ☐ Hit.
- b. ☐ Tactical hit.
- c. ☐ Miss.
- d. ☐ Hardware malfunction.

39. How long has it been since you took your last Skill Qualification Test (SQT)?

- ☐ 1-3 months
- ☐ 4-6 months
- ☐ 6 months - 1 year
- ☐ greater than 1 year
- ☐ have never taken

40. What Soldier's Manual (SM) skill level have you completed at this time?

- ☐ Level One
- ☐ Level Two
- ☐ Level Three
- ☐ None

41. On your last SQT test what tasks gave you the most difficulty? Choose only one from each level listed below. If no tasks from a given level gave you difficulty leave that level blank.

a. LEVEL ONE:

- ☐ Performance of all skills required to "occupy a REDEYE position."
- ☐ Perform all skills properly to "Engage a hostile aircraft with the REDEYE."
- ☐ Perform proper action on malfunctioning REDEYE.
- ☐ Performance of all PM procedures on REDEYE.
- ☐ Categorize aircraft and apply range ring profile.
- ☐ Have not taken SQT.

b. LEVEL TWO:

- ☐ Conduct all reconnaissance tasks required to deploy REDEYE.
- ☐ Perform all tasks required to select a REDEYE position.

c. LEVEL THREE:

- ☐ To plan a REDEYE defense to support the Air Defense priorities assigned.
 - ☐ Supervising of REDEYE teams in reconnaissance, selection, and occupation of positions according to tactical situations.
 - ☐ Control REDEYE team during tactical operations by applying correct procedures for different weapons control and firing commands.
42. Truthfully: How many hours do you spend studying your SM tasks per month:
- ☐ None
 - ☐ Less than 1 hour
 - ☐ 1-4 hours
 - ☐ More than 4 hours
43. In your unit are there every any "practice" SQT examinations conducted?
- ☐ Yes
 - ☐ No
44. Of the total time your battalion is engaged in an ARTEP, what percent of this time are you serving as a REDEYE gunner or team member actively engaged in an Air Defense roll?
- ☐ 100%
 - ☐ Greater than 75%
 - ☐ 50% to 75%
 - ☐ 25% to 50%
 - ☐ Less than 25%
 - ☐ Less than 5%
 - ☐ Never participated in an ARTEP

AD-A106 325

ARMY TRAINING STUDY: TRAINING EFFECTIVENESS ANALYSIS
(TER) SUMMARY VOLUME. (U) ARMY TRAINING AND DOCTRINE
COMMAND FORT MONROE VA F J BROWN 00 AUG 70

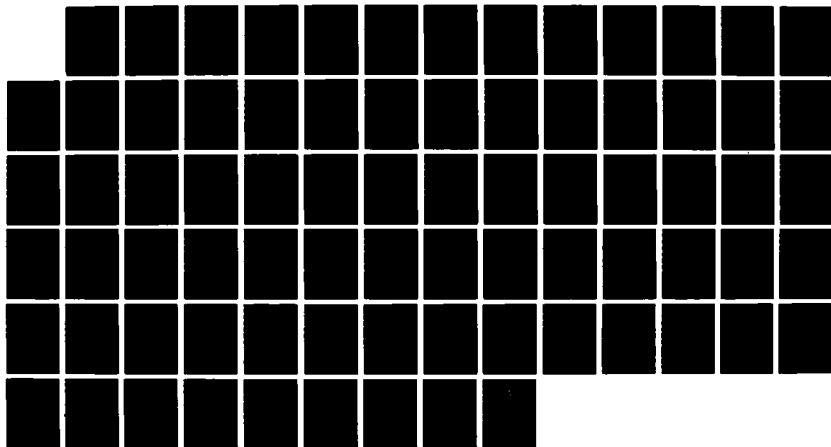
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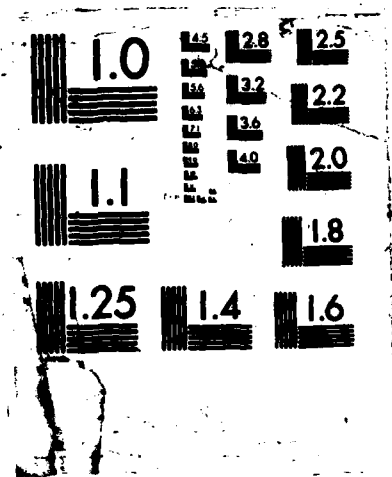
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45. If your answer to the above question is other than 100%, which one of the answers below is most applicable to your duties during the remainder of the ARTEP exercise?

- ☐ MOS related tasks other than site selection, tracking or VACR
- ☐ Non-MOS related duties
- ☐ Nothing

46. What REDEYE tasks do you feel you need more training on than you presently receive?

NCO

1. How long have you been in your present unit (TROOP) ?

- a. ☐ Less than 30 days.
- b. ☐ Between 1 and 6 months.
- c. ☐ Between 6 and 12 months.
- d. ☐ Longer than 1 year.

2. How long have you served in the capacity of a "REDEYE trainer"?

- a. ☐ Less than 30 days.
- b. ☐ Between 1 and 6 months.
- c. ☐ Between 6 and 12 months.
- d. ☐ Longer than 1 year.

3. Is most of your REDEYE training conducted

- a. ☐ on an individual basis ?
- b. ☐ on an individual team basis ?
- c. ☐ more than one REDEYE team at a time ?
- d. ☐ with several NCOs conducting training together for a group ?

4. What is your MOS ?

- a. ☐ 16P
- b. ☐ 11B
- c. ☐ Other

5. How long have you held your present MOS ?

- a. ☐ Less than 6 months.
- b. ☐ Between 6 and 12 months.
- c. ☐ Longer than 1 year.

6. Where did you receive your initial REDEYE training ?

- a. ☐ Formal Advanced Individual Training (AIT) course.
- b. ☐ On the job training (OJT)
- c. ☐ Other (formal classes held within the unit).

7. This initial REDEYE training was completed

- a. ☐ Less than 6 months ago.
- b. ☐ Between 6 and 12 months.
- c. ☐ Between 12 and 24 months.
- d. ☐ Longer than 24 months ago.

8. Have you attended formal REDEYE training since your initial training ?

- a. ☐ Yes
- b. ☐ No

9. If the answer to question 8 is yes, indicate when attended, if no, proceed to question 10.

- a. ☐ Less than 6 months ago.
- b. ☐ Between 6 and 12 months ago.
- c. ☐ Greater than 1 year ago.

10. How are you as a trainer notified regarding REDEYE training schedules and material.

- a. ☐ Verbally from higher authority.
- b. ☐ In written form from higher authority.
- c. ☐ Training schedules left to your initiative.

11. On the average how often is the training schedule up-dated or changed?

- a. ☐ Every day.
- b. ☐ Once a week.
- c. ☐ Once a month.
- d. ☐ Quarterly
- e. ☐ Other
- f. ☐ There is no formal training schedule.

12. How closely are you able to follow this training schedule considering interruptions, other priorities, etc. ?

- a. ☐ 90 - 100% of the time.
- b. ☐ 75 - 90 % of the time.
- c. ☐ 50 - 75 % of the time.
- d. ☐ 25 - 50 % of the time.
- e. ☐ Less than 25% of the time.

13. What are the approximate number of hours, per month, per trainee, devoted to VACR instruction (drill).

- a. ☐ None
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ Between 10 - 15 hours.
- e. ☐ Greater than 15 hours.

14. If VACR drill is conducted what MOI is most commonly used.

- a. ☐ GOAR kit.
- b. ☐ Live aircraft.
- c. ☐ MTS aircraft.
- d. ☐ Other.

15. What are the approximate number of hours, per month, per trainee, devoted to range ring profile practice ?

- a. ☐ None
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ Between 10-15 hours
- e. ☐ Greater than 15 hours.

16. If range ring profile review is conducted, what training method is used most often ?

- a. ☐ Verbal recall (question answer)
- b. ☐ MTS targets viewed through range ring and IR indicator monitored.
- c. ☐ Other.

17. What are the approximate number of hours, per month, spent by the trainee on REDEYE system description and operation training ?

- a. ☐ None
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ Between 10 and 15.
- e. ☐ More than 15.

18. What are the approximate number of hours, per month, per trainee, spent in tactical deployment instruction ?

- a. ☐ None
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ More than 10 hours.

19. What are the approximate number of hours per month, per trainee, spent conducting live tracking of RCNAT (Radio Controlled Model Aircraft) with the THT.

- a. ☐ None
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ More than 10 hours.

20. What are the approximate number of hours, each month, per trainee, spent on aircraft tracking ?

- a. ☐ None
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ More than 10 hours.

21. Do you use a TVT (television trainer) mounted upon a THT in your training ?

- a. ☐ Always
- b. ☐ More than 75% of the time.
- c. ☐ 50 to 75% of the time.
- d. ☐ 25 - 50% of the time.
- e. ☐ Less than 25% of the time.
- f. ☐ Never.

22. Approximately how many hours, per month, per trainee, do you train in the MTS

- a. ☐ None (If this answer is selected skip to question 26.)
- b. ☐ Less than 4 hours.
- c. ☐ Between 4 and 10 hours.
- d. ☐ Between 10 and 15 hours.
- e. ☐ More than 15 hours.

23. How many students do you usually have while instructing in the MTS ?
(total, not just the two tracking)

- a. ☐ 1 to 2
- b. ☐ 3 to 8
- c. ☐ More than 8

24. What is the approximate number of targets each of your students track per month in the MTS ?

- a. ☐ Less than 10
- b. ☐ Between 10 and 20
- c. ☐ More than 20

25. What MTS films do you use most often ?

- a. ☐ Films 11 and/or 12.
- b. ☐ Films 8 through 10.
- c. ☐ Films 3 through 7
- d. ☐ Films 1 and 2.
- e. ☐ Don't know.

26. What percent of the total time in the field is used for REDEYE training ?

- a. ☐ 90 to 100%
- b. ☐ 75 to 90%
- c. ☐ 50 to 75%
- d. ☐ 25 to 50%
- e. ☐ Less than 25%

27. What percent of the REDEYE related time in the field is actually spent on tracking ?

- a. ☐ 90 to 100%
- b. ☐ 75 to 90%
- c. ☐ 50 to 75%
- d. ☐ 25 to 50%
- e. ☐ Less than 25%

28. What is your opinion with respect to the use of RELS (REDEYE Eject Launch Simulator) as a training device ?

- a. ☐ Would be helpful.
- b. ☐ Don't know enough about RELS to form an opinion.
- c. ☐ Would not be helpful.

29. Do you feel the training received by REDEYE gunners in your unit would allow them to engage a high performance aircraft under tactical conditions ? (assume you are there !)

- a. ☐ Yes
- b. ☐ Not sure
- c. ☐ No

30. What REDEYE tasks do you feel your gunners are the weakest in?

(i.e., VACR, tracking, use of range ring profile, etc. List weakest first then the remainder in ascending order.)

ORGANIZATION _____

NAME _____

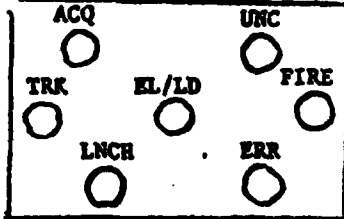
DATE _____

LAST FIRST MI

TARGET #1

REEL # MTS PASS # RCMAT PASS # A-7
 RUN # _____ HIT _____ HIT _____
 HIT _____ MISS _____ MISS _____
 MISS _____

INDICATOR BOX FLAG CONFIGURATION



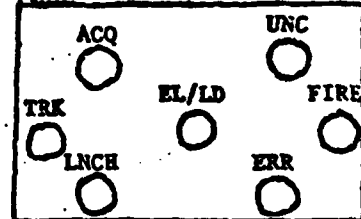
NO ENGAGE

REASON _____

TARGET #2

REEL # MTS PASS # RCMAT PASS # A-7
 RUN # _____ HIT _____ HIT _____
 HIT _____ MISS _____ MISS _____
 MISS _____

INDICATOR BOX FLAG CONFIGURATION



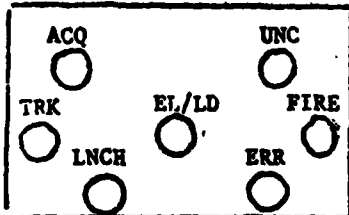
NO ENGAGE

REASON _____

TARGET #3

REEL # MTS PASS # RCMAT PASS # A-7
 RUN # _____ HIT _____ HIT _____
 HIT _____ MISS _____ MISS _____
 MISS _____

INDICATOR BOX FLAG CONFIGURATION



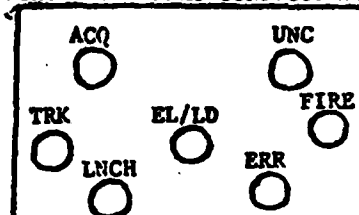
NO ENGAGE

REASON _____

TARGET #4

REEL # MTS PASS # RCMAT PASS # A-7
 RUN # _____ HIT _____ HIT _____
 HIT _____ MISS _____ MISS _____
 MISS _____

INDICATOR BOX FLAG CONFIGURATION



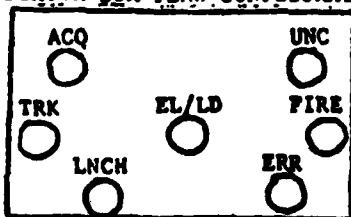
NO ENGAGE

REASON _____

TARGET #5

REEL # MTS PASS # RCMAT PASS # A-7
 RUN # _____ HIT _____ HIT _____
 HIT _____ MISS _____ MISS _____
 MISS _____

INDICATOR BOX FLAG CONFIGURATION



NO ENGAGE

REASON _____

GROUP NO. _____

EVENT (CIRCLE ONE) MTS RCMAT A-7

NON-ACTIVE

REDEYE TRAINING EXERCISE

This questionnaire is being given to men taking part in REDEYE training exercises as part of an analysis of REDEYE training being conducted by the US Army TRADOC Systems Analysis Activity (TRASANA), White Sands Missile Range, NM. The questionnaire consists of three sections: a Personal History section; a section dealing with your feelings about your job, your unit, the men with whom you work, and your supervisors; and a section about REDEYE training.

Your answers to these questions are important. They will provide information about the way men feel about REDEYE training procedures and help form the basis for improvements in current training programs. This is why we are asking you to fill out this questionnaire.

This is not a test, because there are no "wrong" answers. ALL of your answers are "Right," if they reflect what you honestly know or feel about the questions asked.

In keeping with the Privacy Act of 1974, please sign your name at the bottom of this cover sheet indicating that you have no objections to completing this questionnaire. Data and identifiers (your name) are the property of TRASANA and the Army Research Institute and are to be used for administration and statistical purposes only. Full confidentiality of the responses will be maintained in the processing of this data.

Please be sure to answer every item. If you have any questions about the items, you may ask the person handing out these forms to clarify them for you. If you have any other ideas or comments, please write them on the back of the pages.

Thank you for your help.

ORGANIZATION _____ NAME _____
Last First MI
SSN _____ SIGNATURE _____

INSTRUCTIONS

Some of the items in this questionnaire ask you to fill in your answer in the space provided. Others ask you to check one of the alternatives. Most of the items, however, are to be answered by checking one of five statements given. For example, a response of "strongly agree" would look like this:

<u>X</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Strongly	Agree	Neither	Disagree	Strongly
Agree		Agree nor		Disagree
		Disagree		

PERSONAL HISTORY INFORMATION

The following questions deal with background information that is needed for statistical purposes. Please read each question carefully before attempting to complete it.

1. Today's date: ___/___/___
 day month year
2. Duty MOS: _____
3. What is your duty job? _____
 ___ National Guard Unit ___ Reserve Unit
4. What is your pay grade?
 E-1 or E-2 ___
 E-3 ___
 E-4 ___
 E-5 or E-6 ___
 E-7 or above ___
5. How long have you been in your current pay grade?
 1 month or less ___ 6 months to 1 year ___
 2 to 3 months ___ more than 1 year ___
 4 to 5 months ___
6. How long do you have left: on your current enlistment?
 1 month or less ___ 6 months to 1 year ___
 2 to 3 months ___ more than 1 year ___
 4 to 5 months ___

7. How old are you?

17-19 _____
20-22 _____
23-25 _____
26-28 _____
29-31 _____
32-34 _____
35 or older _____

8. What is your marital status?

Single--never married _____
Single--previously married _____
Currently married _____

9. What level of education had you completed prior to entering the Army?

8 years or less _____
9-10 years _____
11-12 years (not high school grad) _____
High school graduate _____
Some college _____
College graduate _____

10. What is your current level of education?

12 years or less _____
High school graduate _____
GED _____
Some college _____
College graduate _____
Some postgraduate _____
Advanced degrees _____

11. What was your primary place of residence during childhood?

Farm _____	Small city (under 100,000) _____
Rural _____	Suburban area of large city _____
Small town _____	Large city (over 100,000) _____

NON-ACTIVE

GENERAL ATTITUDE

Questions 1 through 5 deal with your feelings toward the work you are doing in your current military job.

1. I enjoy the work activities that make up my duty assignment.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

2. I want to work hard for the people with whom I work.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

3. The conditions I work under make me feel like doing my best.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

4. I gain a sense of accomplishment from the activities that make up my assignment.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

5. All in all, I am satisfied with my job in the non-active Army.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

Statements 6 through 8 deal with your feelings toward others in your section.

6. Men in my section know how to get the job done right.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

7. If a man needs help, he can usually count on others to provide it.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

8. The members of my section are a good group to work with.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

Statements 9 through 12 deal with your feelings about the way your section functions as a group.

9. Members of my section work together as a team.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

10. Members of my section help each other out.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

11. My section does high-quality work.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

12. My section does more than enough work to get by.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

Statements 13 through 18 deal with your opinions about immediate superior, that is, the one you normally report to (excluding team leader).

13. What position does he hold? (Check one)

Section Leader _____
Section Sergeant _____

14. He clearly explains what he wants me to do.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

15. He is willing to make changes in his way of doing things.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

16. He is willing to accept responsibility for mistakes made by his subordinates

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

17. He clearly explains why a particular action is needed.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

18. He is aware of his men's capabilities.

Strongly
Agree

Agree

Neither
Agree nor
Disagree

Disagree

Strongly
Disagree

Questions 19 and 20 deal with your career intentions regarding the non-active Army.

19. how likely is it that you will reenlist again at the end of your current enlistment? (Check one)

0% 60%
20% 80%
40% 100%

20. Do you think that you will pursue a career in the Army? (Check one)

No, definitely not Yes, perhaps
No, probably not Yes, probably
Undecided Yes, definitely

REDEYE TRAINING

PART 1

Listed below are different aspects of REDEYE training in units. Please rate each one for ease of learning, quality of instruction, and amount of training by placing an "X" in the appropriate space.

EASE OF LEARNING

1. Aircraft Identification:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

2. Command and Control:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

3. Communications:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

4. Map Reading:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

5. Range Ring Profile:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

6. Ranging:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

7. Weapon Handling and Target Engagement:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

8. Weapon System Characteristics:

<u>Very Easy</u>	<u>Easy</u>	<u>Neither Easy Nor Difficult</u>	<u>Difficult</u>	<u>Very Difficult</u>

QUALITY OF INSTRUCTION

9. Aircraft Identification:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

10. Command and Control:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

11. Communications:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

12. Map Reading:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

13. Range Ring Profile:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

14. Ranging:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

15. Weapon Handling and Target Engagement:

<u>Excellent</u>	<u>Good</u>	<u>Average</u>	<u>Fair</u>	<u>Poor</u>

16. Weapon System Characteristics:

Excellent Good Average Fair Poor

AMOUNT OF TRAINING

17. Aircraft Identification:

Too Short Short Just Right Long Too Long

18. Command and Control:

Too Short Short Just Right Long Too Long

19. Communications:

Too Short Short Just Right Long Too Long

20. Map Reading:

Too Short Short Just Right Long Too Long

21. Range Ring Profile:

Too Short Short Just Right Long Too Long

22. Ranging:

Too Short Short Just Right Long Too Long

23. Weapon Handling and Target Engagement:

Too Short Short Just Right Long Too Long

24. Weapon System Characteristics:

Too Short Short Just Right Long Too Long

PART 2

For each pair, check the one activity that you think is more important for successful engagement. For instance, imagine that you are in command of REDEYE training for yourself and others. In order to improve training, select in each pair that activity that you would emphasize.

1. ☐ Aircraft identification	2. ☐ Live aircraft tracking
☐ Live aircraft tracking	☐ Target engagement sequence
3. ☐ Live REDEYE firing	4. ☐ Aircraft identification
☐ Firing the RELS	☐ Target engagement sequence
5. ☐ Live REDEYE firing	6. ☐ MTS tracking
☐ Range Ring Profile	☐ Firing the RELS
7. ☐ Range Ring Profile	8. ☐ Target engagement sequence
☐ Target engagement sequence	☐ Live REDEYE firing
9. ☐ Aircraft identification	10. ☐ Target engagement sequence
☐ Range Ring Profile	☐ MTS tracking
11. ☐ Live aircraft tracking	12. ☐ MTS tracking
☐ Firing the RELS	☐ Range Ring Profile
13. ☐ Firing the RELS	14. ☐ Live aircraft tracking
☐ Range Ring Profile	☐ Range Ring Profile
15. ☐ Live REDEYE firing	16. ☐ MTS tracking
☐ Live aircraft tracking	☐ Live aircraft tracking
17. ☐ Firing the RELS	18. ☐ Aircraft identification
☐ Aircraft identification	☐ MTS tracking
19. ☐ Live REDEYE firing	20. ☐ Firing the RELS
☐ MTS tracking	☐ Target engagement sequence
21. ☐ Aircraft identification	
☐ Live REDEYE firing	

PART 3

In this part, please rate how important it is to be able to fire a live REDEYE round, to watch a round being fired, to fire a REDEYE Eject Launch Simulator (RELS), and to watch a RELS being fired by checking the appropriate space. Then, check the most important reason that you think applies to the firing or watching the firing of a REDEYE or RELS round. If you check "other", write in your reason in your own words.

1. Firing a REDEYE round is:

Very
Important

Important

Neither
Important
Nor
Unimportant

Unimportant

Very
Unimportant

because:

2. Learn not to flinch

 Best, fastest way to know everything was done right

 Builds confidence in weapon by destroying target

 Reduces fear or concern about firing the weapon

 Learn to keep smooth track while firing

 Someone cares enough about your training to spend a lot of money

 Gives a feel for combat operations

 Not realistic enough

 Does not add anything to my ability as a REDEYE gunner

 Other. _____

3. Watching a REDEYE round being fired is:

Very
Important

Important

Neither
Important
Nor
Unimportant

Unimportant

Very
Unimportant

4. because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations
- ☐ Not realistic enough
- ☐ Does not add anything to my ability as a REDEYE gunner
- ☐ Other. _____

5. Firing a RELS is:

Very
Important

Important

Neither
Important
Nor
Unimportant

Unimportant

Very
Unimportant

6. because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations
- ☐ Not realistic enough
- ☐ Does not add anything to my ability as a REDEYE gunner
- ☐ Other. _____

7. Watching a RELS being fired is:

Very
Unimportant

Important

Neither
Important
Nor
Unimportant

Unimportant

Very
Unimportant

8. because:

- ☐ Learn not to flinch
- ☐ Best, fastest way to know everything was done right
- ☐ Builds confidence in weapon by destroying target
- ☐ Reduces fear or concern about firing the weapon
- ☐ Learn to keep smooth track while firing
- ☐ Someone cares enough about your training to spend a lot of money
- ☐ Gives a feel for combat operations
- ☐ Not realistic enough
- ☐ Does not add anything to my ability as a REDEYE gunner
- ☐ Other. _____

Part 4

For the following statements, check each statement that most closely represents your feelings.

Being able to fire a REDEYE round would improve my confidence in my ability as a REDEYE gunner

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

Being able to fire a RELS would improve my confidence in my ability as a REDEYE gunner

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

Until one fires a REDEYE round, one doesn't really know whether he is able to do so

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

It is absolutely essential that a gunner fire a live REDEYE round before he can be considered as qualified for combat operations.

Strongly
agree

Agree

Neither agree
nor disagree

Disagree

Strongly
disagree

PERSONAL HISTORY - PART II

1. Sex:

☐ Male

☐ Female

2. What is your height in inches? _____

3. What is your weight in pounds? _____

4. What is your preferred handedness?

☐ Left handed

☐ Right handed

5. Do you wear eye glasses?

☐ Yes.

☐ No.

PART 5

Please comment on what you think is the best feature of REDEYE training.

Please comment on what you think is the worst feature of REDEYE training.

What part of REDEYE training do you think is the most important in preparing you for combat, and why do you think so?

REDEYE LAUNCH SIMULATOR QUESTIONNAIRE

This questionnaire is being given to men taking part in REDEYE training exercises as part of an analysis of REDEYE training being conducted by the US Army TRADOC Systems Analysis Activity (TRASANA), White Sands Missile Range, NM. The questionnaire deals with the use of the REDEYE Launch Simulator (RELS).

Your answers to these questions are important. They will provide information about the way men feel about the RELS and help form the basis for improvements in current training programs. This is why we are asking you to fill out this questionnaire.

This is not a test, because there are no "wrong" answers. ALL of your answers are "right," if they reflect what you honestly know or feel about the questions asked.

In keeping with the Privacy Act of 1974, please sign your name at the bottom of this cover sheet indicating that you have no objections to completing this questionnaire. Data and identifiers (your name) are the property of TRASANA and are to be used for administration and statistical purposes only. Full confidentiality of the responses will be maintained in the processing of this data.

Please be sure to answer every item. If you have any questions about the items, you may ask the person handing out these forms to clarify them for you.

Thank you for your help.

ORGANIZATION _____ NAME _____
Last First MI
SSN _____ SIGNATURE _____

INSTRUCTIONS

Some of the items in this questionnaire ask you to fill in your answer in the space provided. Others ask you to check one of the alternatives. Most of the items, however, are to be answered by checking one of five statements given. For example, a response of "strongly agree" would look like this:

<u>X</u>	<u>Agree</u>	<u>Neither</u>	<u>Disagree</u>	<u>Strongly</u>
Strongly		Agree nor		Disagree
Agree		Disagree		

REDEYE LAUNCH SIMULATOR (RELS) QUESTIONNAIRE

1. Have you ever fired a live REDEYE round prior to today?

☐ Yes.

☐ No.

2. Prior to today's firing, did you think a RELS firing would be helpful to you?

☐ Yes.

☐ Not sure.

☐ No.

☐ No opinion, as I had never heard of RELS.

3. Prior to today I thought RELS would be helpful by simulating the blast, smoke, and weight change of a REDEYE.

☐ Yes.

☐ No.

4. Prior to today I thought RELS would be helpful by reducing worry or concern about firing a live REDEYE round.

☐ Yes.

☐ No.

5. How did you feel during the time period after firing RELS, but before firing a live round?

☐ Firing the RELS made me less apprehensive toward firing a live round.

☐ Made no difference; I was just as nervous firing the live round as I would have been if I had never seen a RELS.

☐ Made no difference; I was not nervous firing either RELS or live round.

6. I think that firing a RELS served to
- ☐ Reduce fear or concern about firing weapons.
 - ☐ Build confidence in REDEYE.
 - ☐ Give a feel for what to expect in combat.
 - ☐ Do nothing; it is not realistic enough.
 - ☐ Add nothing to my ability as a REDEYE gunner.
7. After firing a RELS and a live REDEYE round, in my opinion, firing a REDEYE live round in preparation for combat is:
- ☐ Very important.
 - ☐ Important.
 - ☐ Neither important nor unimportant.
 - ☐ Unimportant.
 - ☐ Very unimportant.
8. After firing a RELS and a live REDEYE round, in my opinion, firing a RELS in preparation for combat is:
- ☐ Very important.
 - ☐ Important
 - ☐ Neither important nor unimportant.
 - ☐ Unimportant.
 - ☐ Very unimportant.
9. In your opinion, did the RELS accurately simulate a REDEYE round firing?
- ☐ Yes.
 - ☐ No.

10. If your answer to question #9 was "no," what was unrealistic about firing a RELS?

☐ Blast.

☐ Weight Change.

☐ Noise.

☐ Tracking.

11. If you had not fired a REDEYE, do you think that you would have benefited as much from firing the RELS only?

☐ Yes.

☐ No.

12. Results of your live firing were:

☐ Direct hit.

☐ Tactical kill.

☐ Weapon fired, but did not obtain a lock on target.

☐ Weapon did not fire (hang fire).

☐ I did not pull the firing trigger.

13. If you desire, please comment on this firing exercise.

APPENDIX X

CORRELATIONS

1. Army enlistees are given a series of tests designated as the Armed Services Vocational Aptitude Battery (ASVAB). This series of tests is used to derive scores for aptitude areas which are then used to determine the enlistees eligibility for given Military Occupational Specialties (MOS).

2. Aptitude areas that are determined in the ASVAB include the following:

- a. Word Knowledge (WK)
- b. Arithmetic Reasoning (AR)
- c. Space Perception (SP)
- d. General Information (GI)
- e. Automotive Information (AI)
- f. Math Knowledge (MK)
- g. Electronic Information (EI)
- h. Classification Inventory (CI)
 - (1) Classification Mechanical (CM)
 - (2) Combat Arms (CA)
 - (3) Classification Electronics (CE)
 - (4) Classification Clerical (CC)

3. Results from selected aptitude areas are combined and converted to percentiles or scores for qualification scores. The qualification scores include the following designations and combination of aptitude areas:

- a. Armed Forces Qualification Test (AFQT)
 - = WK + AR + SP
- b. Operator and Food (OF)
 - = GI + AI + CA

c. Field Artillery (FA)

$$= GI + AR + MK + EI + CA$$

d. General Technical (GT)

$$= WK + AR$$

4. The AFQT score is a percentile indicating the enlistee's standing with respect to other enlistees and is used to determine mental categories. As described in Section 11, Resources to Combat Effectiveness, no Category V personnel and only Category IVC personnel up to a limit of no more than 10 percent of the total male force are accepted for service. The mental categories and corresponding AFQT scores are shown in Table X-1.

5. To be accepted as REDEYE gunners, the enlistees must score at least 90 out of a possible 147 on the OF. There is no minimum score required on the FA and GT.

6. The AFQT, OF, FA, and GT qualification scores were collected for the REDEYE gunners monitored in the study. Correlation coefficients (r) were then calculated to determine the relationship between the REDEYE gunner's AFQT, OF, and GT qualification scores and their performance in the MTS and on the Range Ring Profile Test. These coefficients are shown in Table X-2 for AIT students and Table X-3 for tactical unit gunners.

7. The value of the correlation coefficient " r " required for a given level of significance is inversely proportional to the sample size. For example, for a sample size of 3, the value of r must be 0.997 to be significant at the significance level of 0.05, while an r value of 0.25 is required for a sample size of 63. Values of r at the 0.01 and 0.05 levels of significance may be found in Table VI of "Statistical Tables for Biological, Agricultural, and Medical Research," by Fisher and Yates, 6th Ed, Oliver and Boyd, LTD, Edinburg, 1963.

8. AIT CORRELATIONS

a. As shown in Table X-2, the correlations between the MTS performance and qualification scores are not consistently significant for the AIT students. This indicates that learning the MTS tracking skills in AIT are not dependent upon mental category.

b. The correlations between the performance on the Range Ring Profile Test and the qualification scores are all significant for the AIT students indicating a strong correlation between the RRP Test and mental categories. The correlation coefficients are higher for the more difficult parts of the RRP Test. The determination of aircraft category is the easiest

task and has the lowest coefficient while determining the size is the hardest task and has the highest coefficients. The ability to perform all three parts of the test is even more difficult for the gunners and has the highest coefficients for all three of the qualification scores examined (AFQT, OF, and GT).

9. TACTICAL UNIT CORRELATIONS

a. In contrast to the AIT, the correlation coefficients are significant for the tactical unit REDEYE gunner's MTS performance for two of the qualification scores. The AFQT and GT qualification scores versus MTS tracking performance, Table X-3, do show a significant correlation between mental category and performance while the OF score does not. These results are an indication of two possible factors.

(1) There is a significant correlation between mental category (AFQT) or general technical ability (GT) and MTS performance when the gunner has been given a chance to forget such as in a unit where there is a time lapse between his AIT training or last unit training.

(2) The OF score has no correlation with MTS performance in the tactical units. This leads to the conclusion that the OF score is a poor discriminator for preselection criteria for REDEYE gunners.

b. As shown in Table X-3, the correlations are all significant for AFQT, OF, or GT versus the results on the RRP Test. The ability to put the aircraft in the correct category had the lowest coefficient, just as in the AIT results, indicating a lower mental ability requirement than for sizing the aircraft or deciding to fire. The ability to answer all three questions correctly for each presentation had a significant correlation with AFQT and GT. The correlation with the OF score was not as significant.

TABLE X-1

MENTAL CATEGORIES AND AFQT PERCENTILE RANGES

<u>MENTAL CATEGORY</u>	<u>AFQT PERCENTILE RANGE</u>
I	93-99
II	65-92
IIIA	50-64
IIIB	31-49
IVA	21-30
IVB	16-20
IVC	10-15
V	0-9

TABLE X-2
CORRELATION COEFFICIENTS FOR AIT STUDENTS

	<u>AFQT</u>	<u>OF</u>	<u>GT</u>
MTS INITIAL P_h	+0.11	+0.102	+0.053
NO. GUNNERS	118	120	120
MTS INTERMEDIATE P_h	0.222	0.157	0.205
NO. GUNNERS	119	121	121
MTS FINAL P_h	0.073	0.028	0.054
NO. GUNNERS	114	116	116
TACTICAL A/C P_h	0.162	0.171	0.224
NO. GUNNERS	117	119	119
RRP CAT (IA)	0.325	0.203	0.232
NO. GUNNERS	117	119	119
RRP SIZE (DRRC)	0.475	0.260	0.387
NO. GUNNERS	117	119	119
RRP FIRE/NO-FIRE (AFHF)	0.461	0.247	0.377
NO. GUNNERS	117	119	119
RRP "ALL CORRECT"	0.538	0.310	0.453
NO. GUNNERS	117	119	119

r required at the 0.05 level of significance for a sample size of 102 is 0.195.

r required at the 0.05 level of significance for a sample size of 127 is 0.174.

TABLE X-3

CORRELATION COEFFICIENTS FOR TACTICAL UNIT GUNNERS

	<u>AFQT</u>	<u>OF</u>	<u>GT</u>
MTS FINAL P_h	+0.167	+0.083	+0.161
NO. GUNNERS	630	531	571
RRP CAT (IA)	0.352	0.200	0.304
NO. GUNNERS	809	699	748
RRP SIZE (DRRC)	0.423	0.215	0.334
NO. GUNNERS	809	699	748
RRP FIRE/NO-FIRE (AFHF)	0.357	0.208	0.338
NO. GUNNERS	809	699	748
RRP "ALL CORRECT"	0.474	0.253	0.405
NO. GUNNERS	809	699	748

r required at the 0.05 level of significance for a sample size of 500 or greater is 0.088.

APPENDIX XI

1. LIVE FIRING

a. REDEYE. Live REDEYE firing data were collected from the German, US Army and Marine AIT classes at Fort Bliss, Texas, and from units conducting REDEYE Annual Service Practice (ASP) firing during the time period covered by this report. Table XI-1 shows a list of all the REDEYE firings conducted during this period. Table XI-2 shows a summary of results of the live firings. Data from each REDEYE firing are grouped into four categories as follows:

- * DH - Direct Hit
- * TK - Tactical Kill
- * M - Miss
- * WM - Weapon Malfunction

A direct hit is scored when the REDEYE makes physical contact with the Ballistic Aerial Target System (BATS). A tactical kill is given when the round does not achieve a direct hit, but is qualified as a hit based on the criterion that the round narrowly missed the BATS, and a good seeker lock was usually in evidence. The narrow miss is attributed to the BATS being smaller than an actual tactical aircraft, the BATS having two infrared (IR) sources (one in the nose and one at the tail), the round tracking IR emitting debris from the BATS. A miss is a round which failed to achieve a direct hit or tactical kill due to human error or other non-missile failure. A weapon malfunction is a failed round due to a missile failure causing the round to fly erratically (fin not locked), sustainer motor not igniting, eject motor failure or any other missile abnormality.

b. REDEYE Launch Simulator (RELS). The RELS is being evaluated as a possible training device in this report. Forty-five RELS rounds were obtained for testing in conjunction with the AIT classes firing of live REDEYE and unit ASP firings conducted during the time frame of this study. Table XI-3 shows the results of all the Army RELS firings conducted in support of this study. Results of RELS firings conducted for the Marine Corps at Fort Bliss as part of their AIT training is also included in Table XI-3.

TABLE XI-1
LIVE FIRING EXERCISE

<u>UNIT</u>	<u>DATE</u>	<u>ATTEMPTS</u>	<u>DH</u>	<u>TK</u>	<u>M</u>	<u>WM</u>
AIT 3-78 (ARMY)	7 Feb 78	1	1			
AIT 4-78 (ARMY)	14 Feb 78	2	1	1		
AIT 4-78 (MARINE)	21 Feb 78	6	3	3		
AIT 4-78 (MARINE)	22 Feb 78	1	1			
AIT 5-78 (ARMY)	22 Feb 78	1	1			
AIT 6-78 (ARMY)	28 Feb 78	1			1	
AIT 7-78 (ARMY)	7 Mar 78	1		1		
AIT 8-78 (ARMY)	14 Mar 78	1		1		
AIT 9-78 (ARMY)	21 Mar 78	1	1			
AIT 5-78 (MARINE)	28 Mar 78	4	2	1		1
5TH INFANTRY (FT POLK)	29 Mar 78	6	2	3	1	
AIT 10-78 (ARMY)	4 Apr 78	1		1		
AIT 11-78 (ARMY)	11 Apr 78	1	1			
AIT (GERMAN)	11 Apr 78	10	4	6		
AIT 12-78 (ARMY)	18 Apr 78	1				1
AIT 13-78 (ARMY)	25 Apr 78	1		1		
AIT 14-78 (ARMY)	2 May 78	1	1			
USMC QUAL (Instr)	2 May 78	1	1			
AIT 15-78 (ARMY)	9 May 78	1		1		
3D ACR (FT BLISS)	9 May 78	2	1	1		

TABLE XI-1
LIVE FIRING EXERCISE

(Continued)

<u>UNIT</u>	<u>DATE</u>	<u>ATTEMPTS</u>	<u>DH</u>	<u>TK</u>	<u>M</u>	<u>WM</u>
9TH INFANTRY (FT LEWIS)	15 May 78	8		5		3
AIT 16-78 (ARMY)	16 May 78	1	1			
AIT 17-78 (ARMY)	23 May 78	1		1		
AIT 6-78 (MARINE)	23 May 78	7	1	5		1
NG 9-78	23 May 78	1				1
AIT 18-78 (ARMY)	30 May 78	1	1			
NG 10-78	30 May 78	1	1			
AIT 19-78 (ARMY)	6 June 78	1				1
NG 11-78	6 June 78	1		1		
AIT 20-78 (ARMY)	13 June 78	1		1		
NG 12-78	13 June 78	1	1			
1ST ACR (FT HOOD)	17 June 78	8	2	4		2
2ND ARMOR (FT HOOD)	17 June 78	8	2	4		2
AIT 21-78 (ARMY)	20 June 78	1		1		
NG 13-78	20 June 78	1		1		
AIT 22-78 (ARMY)	27 June 78	1	1			
NG 14-78	27 June 78	1	1			
AIT 23-78 (ARMY)	5 July 78	1		1		
NG 16-78	11 July 78	1		1		

TABLE XI-1
LIVE FIRING EXERCISE

(Continued)

<u>UNIT</u>	<u>DATE</u>	<u>ATTEMPTS</u>	<u>DH</u>	<u>TK</u>	<u>M</u>	<u>WM</u>
4TH INFANTRY (Ft Carson)	15 Jul 78	8	4	3		1
NG 17-78	18 Jul 78	1	1			
AIT 25-78 (ARMY)	18 Jul 78	1	1			
AIT 7-78 (MARINE)	25 Jul 78	3	1	2		

TABLE XI-2

LIVE FIRING SUMMARY

<u>UNIT</u>	<u>TOTAL FIRED</u>	<u>DH</u>	<u>TK</u>	<u>M</u>	<u>WM</u>
ARMY AIT	23	10	10	1	2
MARINE AIT	22	9	11	0	2
GERMAN AIT	10	4	6	0	0
NATIONAL GUARD	8	4	3	0	1
TACT UNITS	40	11	20	1	8
TOTAL	103	38	50	2	13

TABLE XI-3

RELS FIRINGS

<u>UNIT</u>	<u>DATE</u>	<u>ATTEMPTS</u>	<u>SUCCESS</u>	<u>FAILURE</u>
AIT 3-78 (ARMY)	7 Feb 78	1	1	
AIT 4-78 (ARMY)	14 Feb 78	2	2	
AIT 5-78 (ARMY)	21 Feb 78	1	1	
AIT 4-78 (MARINES)	21 Feb 78	7	7	
AIT 6-78 (ARMY)	28 Feb 78	1	1	
AIT 7-78 (ARMY)	7 Mar 78	1	1	
AIT 8-78 (ARMY)	14 Mar 78	1	1	
AIT 9-78 (ARMY)	21 Mar 78	1	1	
AIT 5-78 (MARINE)	28 Mar 78	4	4	
AIT 10-78 (ARMY)	4 Apr 78	1	1	
AIT 11-78 (ARMY)	11 Apr 78	1	1	
AIT 12-78 (ARMY)	18 Apr 78	1	1	
AIT 13-78 (ARMY)	25 Apr 78	1	1	
AIT 14-78 (ARMY)	1 May 78	1	1	
3RD ACR (ASP)	8 May 78	2	2	
AIT 15-78 (ARMY)	8 May 78	1	1	
9TH INFANTRY (ASP)	14 May 78	4	4	
AIT 16-78 (ARMY)	16 May 78	1	1	
AIT 17-78 (ARMY)	23 May 78	1	1	
AIT 6-78 (MARINE)	23 May 78	7	7	
AIT 18-78 (ARMY)	30 May 78	1	1	
NG 10-78	30 May 78	1	1	

<u>UNIT</u>	<u>DATE</u>	<u>ATTEMPTS</u>	<u>SUCCESS</u>	<u>FAILURE</u>
AIT 19-78 (ARMY)	6 June 78	1	1	
NG 11-78	6 June 78	1	1	
AIT 20-78 (ARMY)	13 June 78	1	1	
NG 12-78	13 June 78	1	1	
2ND ARM (FT HOOD)	17 June 78	4	4	
1ST CAV (FT HOOD)	17 June 78	4	4	
AIT 21-78 (ARMY)	20 June 78	1	1	
NG 13-78	20 June 78	1	1	
AIT 23-78 (ARMY)	5 July 78	1	1	
4TH INF (FT CARSON)	15 July 78	4	4	
NG M-74	18 July 78	1	1	
AIT 25-78 (ARMY)	18 July 78	1	1	
AIT 7-78 (MARINE)	25 July 78	3	3	

APPENDIX XII

REFERENCES

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2. Final Report, TRASANA, REDEYE Weapons System Training Effectiveness Analysis (WSTEA), Technical Report No. 21-77, November 1977.
3. US Field Test with Early Models of REDEYE Trainers; 1958.
4. Visual Detection of Aircraft in Daylight; C. W. Brooks; January 1956.
5. REDEYE Simulator Test, Danish Defense Research Board; March 1968.
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14. Letter Report of USARADBD Support of REDEYE Weapons System Training Effectiveness Analysis (WSTEA); 2 June 1977.
15. High and Medium Altitude Air Defense (HIMAD) Study Directive, DAMO-ROA, 1 July 1977.
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APPENDIX XIII

ARMY TRAINING STUDY - STUDY PLAN 10-77 REDEYE MAN-PORTABLE AIR DEFENSE SYSTEM (MANPADS)

1. PURPOSE

The purpose of this study is to support the Army Training Study Group (ARTSG) in developing a logical, analytic link from training resources to combat effectiveness. As directed, the REDEYE MANPADS system will be evaluated and the results presented in the ARTS final report.

2. REFERENCES

See inclosure 1.

3. TERMS OF REFERENCE

a. Problem. The Army faces constrained resources for the conduct of individual and unit training and therefore must make optimum use of the resources available to build and improve Army combat effectiveness. The REDEYE MANPADS weapons system has been chosen by the ARTSG to provide a vehicle for examining the relationships between training resources, training programs, individual and unit proficiency, war models and combat effectiveness. The results of the REDEYE ARTS coupled with the previously conducted REDEYE WSTEAs will contribute to the data base from which sound decisions can be made regarding future Army training resources and programs.

b. Impact of the Problem. The REDEYE air defense system provides air defense at the maneuver unit level. Therefore, the proficiency of the gunner directly effects the survival as well as the performance of the unit. A single enemy aircraft penetrating the defense could cause damage to Army assets which could mean the difference between winning or losing the battle. It is, therefore, imperative that gunner proficiency levels be defined and evaluated with respect to combat effectiveness. REDEYE gunner proficiency must be maintained at a level sufficient to assure survival of Army assets during a future conflict. This level must be defined to assure that gunners are neither under or over trained. REDEYE is one of the five major systems selected for consideration by the ARTSG. Therefore, the results of this study will comprise a significant portion of the information available to determine Army training requirements and their effect on combat effectiveness.

c. Objectives. The objectives of this study are:

(1) Objective 1. To determine and associate training resource costs of REDEYE with those tasks essential to sustain and fight with the system.

(2) Objective 2. To determine the relationship of training programs to proficiency. Of particular concern is the decay of proficiency as a function of time.

(3) Objective 3. To determine a methodology for utilizing variable levels of proficiency as parametric values in current war simulations.

(4) Objective 4. To develop a methodology to determine REDEYE crew effectiveness as opposed to individual task proficiency.

(5) Objective 5. To determine and improve the ability of current war models to give a measure of combat effectiveness.

(6) Objective 6. To investigate and comment on the impact on proficiency expected from varying the mix of institutional and unit training and changes in training techniques and technology.

(7) Objective 7. To describe the impact on proficiency of personnel turbulence, stability and caliber and to develop the fluctuations in proficiency due to these variables.

(8) Objective 8. To assess the benefits and costs associated with utilizing training devices (e.g., Moving Target Simulator (MTS), M49 Tracking Head Trainer (THT), Radio Controlled Miniature Aerial Target (REMAT) in lieu of other training resource requirements and the impact of reduced resources.

(9) Objective 9. To define possible intensified programs which might be offered by institutions to reserve units and the resultant impact on proficiency. Contained herein is a discussion of the proficiency contribution which result from various training devices.

(10) Objective 10. To define the interoperability impact relative to other user nations.

d. Scope. This study will:

(1) Examine and develop the costs associated with training REDEYE gunners in the institution as well as in the units.

(2) Utilize to the maximum extent possible data gathered during the REDEYE WSTEAs.

(3) Delineate the proficiency of the gunners upon graduation from the institution and in the units.

(4) Delineate the proficiency of the Army reserves before and after institutional and unit refresher training.

(5) Examine the utility of the Marine REDEYE EJECT LAUNCH SIMULATOR (RELS) as an Army training aid.

(6) Examine the Marine unit training programs to determine applicability to the Army.

(7) Develop the relationships between gunner proficiency and combat effectiveness.

e. Limits. None.

f. Assumptions. None.

g. Essential Elements of Analysis (EEA). See inclosure 2.

h. Constraints. None.

i. Measures of Training Effectiveness (MOTE).

(1) MTS - Probability of hit as scored by the Tracking Head Trainer (THT).

(2) Live Tracking Range - Probability of hit as scored by the THT.

(3) Live Firings - Probability of hit as scored by the range officer.

(4) RELS Firings - A weighted assessment, by the student trainees, as developed by the Army Research Institute.

(5) Range Ring Profile Test - Written test to demonstrate knowledge of the Range Ring Profile.

(6) Number of aircraft destroyed as a function of gunner proficiency.

(7) Number of assets lost/protected as a function of gunner proficiency.

j. Methodology. The methodology selected to support the ARTS REDEYE objectives, listed in paragraph 3c above, are centered around the major areas delineated by the ARTSG. These are:

Resources to training

Training to proficiency

Proficiency to war models

War models to combat effectiveness

Resources to combat effectiveness

Several auxiliary areas have been delineated and these also will be addressed. They are:

Individual training

Personnel programs

Unit training support in resources

Reserve Component Training

Each of these nine areas of interest are discussed below. During the ARTS program, training will be viewed to reduce both time in training and cost while maintaining or increasing gunner proficiency.

(1) Resources to training. To support this area, AIT and unit training costs will be identified and related to measured gunner proficiency in both AIT and units. Cost usage factors will be developed for the various REDEYE training devices and aids such as the MTS, RCMAT, THT, TVT, BATS, and live aircraft tracking to determine the most cost effective usage to each training device/aids. Figure 1 depicts the methodology selected to measure AIT proficiency and establish gunner forgetting curves. Unit training programs will be evaluated and related to unit gunner proficiency.

(2) Training to proficiency. To support this area SM and ARTEP tasks will be evaluated relative to the actual tasks involved in a successful REDEYE engagement. Training programs will be evaluated to determine the degree to which training supports the SM and ARTEP standards as well as those required to successfully engage a hostile aircraft. Training gunners in the institution to various levels of proficiency will be examined to determine when and at what proficiency gunners should be placed in the units. An examination will be conducted to determine if certain training is more advantageous in the institution or in the units. Gunner proficiency variations from AIT will be measured and related to unit training programs to determine the proficiency increase that could be expected from various unit training programs. This will assist in establishing where and when training should be conducted.

(3) Proficiency to war models. To support this area, existing air defense war models will be examined to determine the degree to which they support the input of training parameters. If they do not support the input of training parameters, they will be modified. These modifications will allow various levels of proficiency in the SM and ARTEP designated tasks to be evaluated. Where possible, individual SM and ARTEP tasks will be input to the simulations to determine the effect on war game results.

(4) War models to combat effectiveness. To support this area the current air threat to Europe will be modeled within the selected air defense war model. The total number of aircraft destroyed by all air defense units will be evaluated. This will allow the computation of the total MANPADS contribution to the defense in terms of aircraft destroyed and assets saved/lost by counterforce action. This is important because of the synergistic effect of air defense units (some of the aircraft destroyed by REDEYE/STINGER would have been destroyed by other air defense forces had REDEYE/STINGER not been present). The number of assets saved/lost as a result of MANPADS presence/absence does, however, change and becomes the determining factor regarding the effect of MANPADS presence and gunner proficiency. Varying gunner proficiency in the scenarios from 0 to 1.0 in .05 increments will define the relationship of gunner presence and proficiency to the number of aircraft destroyed and assets saved. This methodology is shown in Figure 2. From this, the curves shown in Figure 3 will be developed.

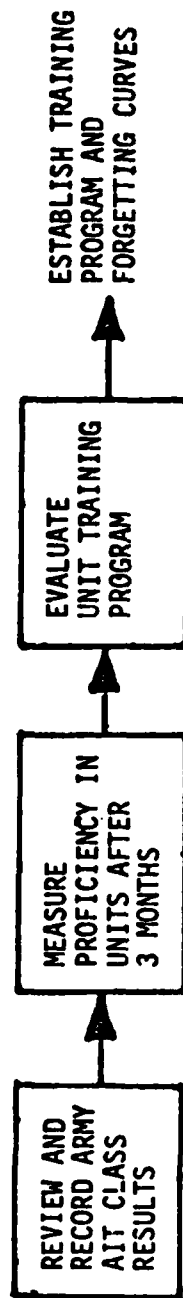


Figure 1

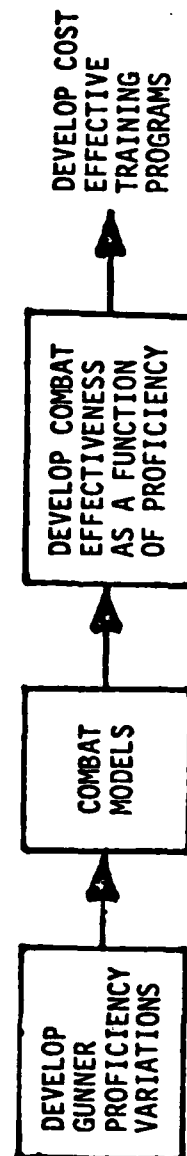


Figure 2

AIRCRAFT DESTROYED
(ASSETS SAVED)
VS
GUNNER P_h

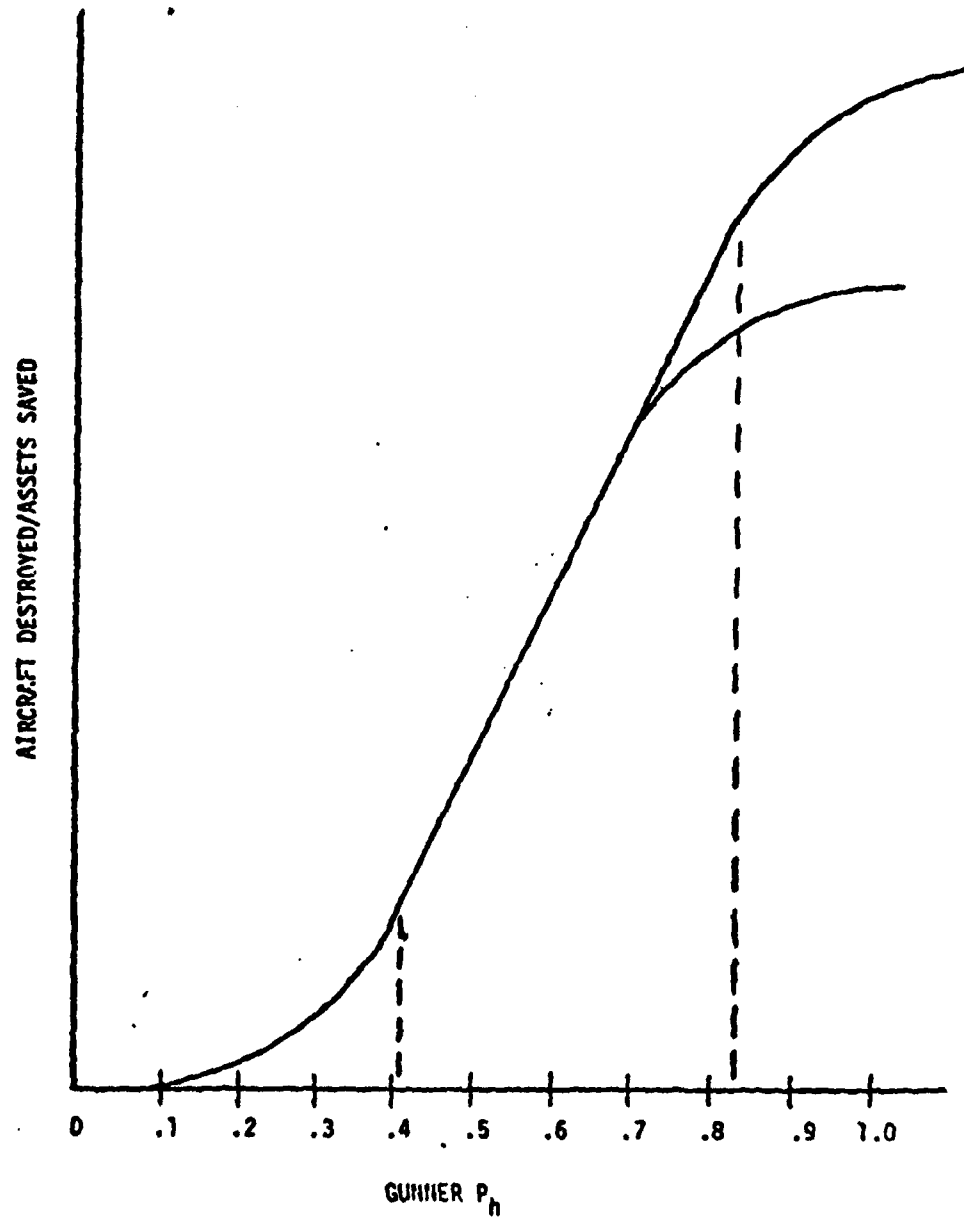


FIGURE 3

(5) Resources to combat effectiveness. To support this area, data from resources to training will be coupled with data from training to proficiency resulting in a relationship between resources and proficiency. This relationship will then be coupled with data from proficiency to combat effectiveness resulting in a relationship between resources and combat effectiveness. Figure 4 depicts this methodology.

(6) Individual training. To support this area simulator training will be examined to determine proficiency growth, retention and forgetting curves to optimize various simulator and training aids time. Training to various levels of proficiency in the institution will be examined to determine at which point in time and proficiency gunners should be placed in units. Unit training programs will be examined to determine the optimum time and training procedures to assure an effective level of gunner proficiency.

(7) Personnel programs. Personnel stability and turbulence will be examined to determine the effect on proficiency, morale, and attitudes. The skills listed in the 16P SM will be evaluated to determine if gunner pre-selection criteria should be established. Particular attention will be paid to low aptitude category personnel to determine if they can become proficient in REDEYE and what additional training time would be required.

(8) Unit training support. Unit training programs will be examined in the light of what has been learned in (1) and (2) above. Various training aids and equipment will be examined to determine if the units could utilize additional materials and time in bringing gunners to the desired level of proficiency. Unit training programs will be evaluated (Figure 5) to determine if redundant or useless material is being taught. Unit training programs, which are cost effective will be proposed if improvements can be brought about.

(9) Reserve training. Reserve units will be examined in field and prior to institutional refresher training at Fort Bliss to determine the proficiency which would exist if an armed conflict were to begin now. Reserve gunners will again be examined after refresher training to determine the maximum potential proficiency. Reserve training programs will be evaluated to determine if shortfalls and weaknesses exist. Improvements will be proposed if such are found. Training program costs will be delineated and related to current proficiency. The level of training to maintain Reserve proficiency at an acceptable level will be delineated and costs. Figure 4 relates Reserve training methodology.

4. MISSION PROFILES AND THREAT SCENARIOS

a. The REDEYE/STINGER MANPADS have been developed to counter the low altitude threat postulated through the 1980's. The STINGER, the REDEYE follow-on system, can engage higher velocity aircraft and is more immune to IR countermeasures. With the exception of the STINGER IFF capability, the

RESOURCES TO COMBAT EFFECTIVENESS

ANALYSIS METHODOLOGY

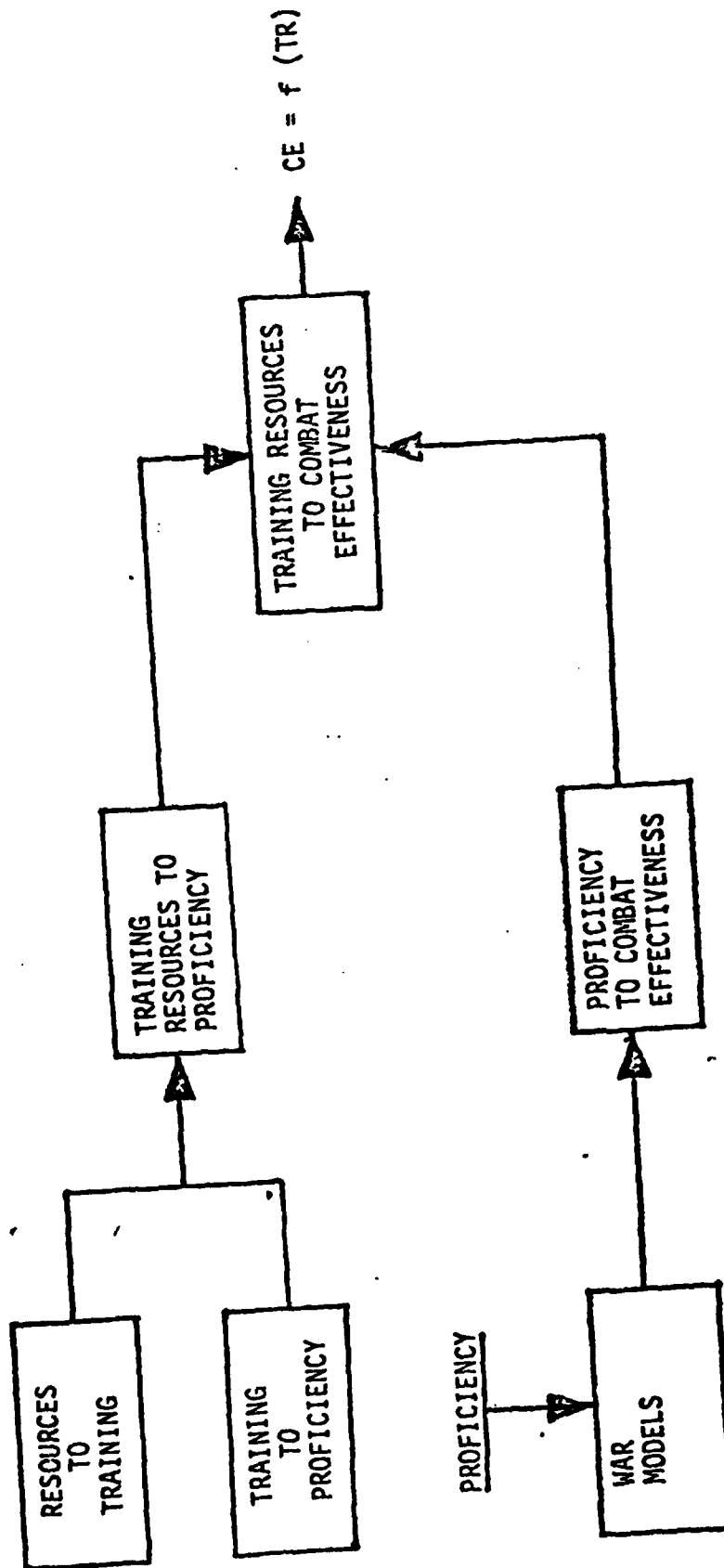


FIGURE -4

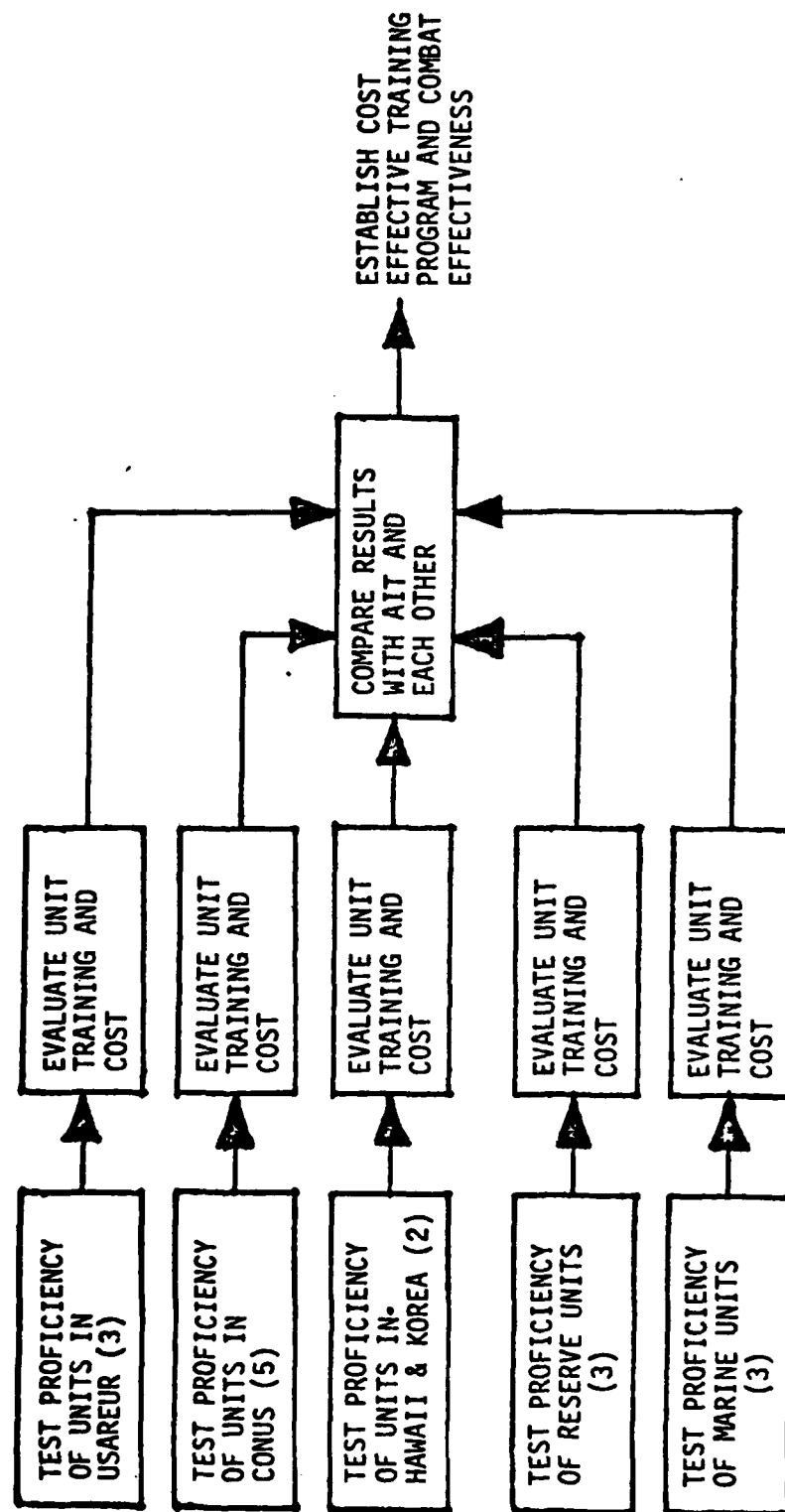


Figure 5

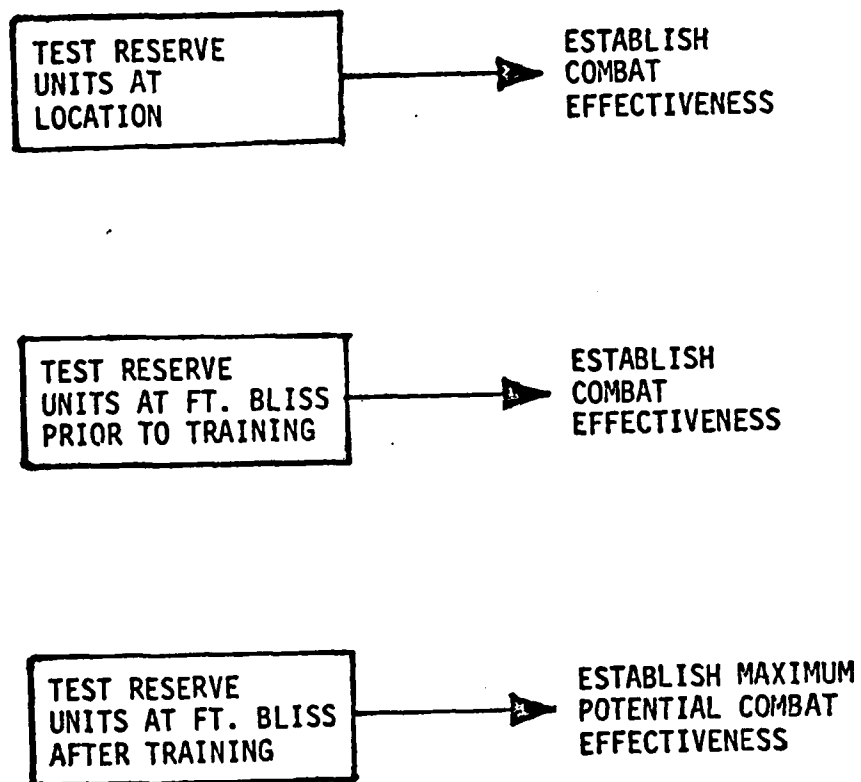


Figure .6

operational characteristics of STINGER and REDEYE are identical. The REDEYE/STINGER teams are composed of two soldiers. One mans the weapon, and the other aids in target acquisition utilizing binoculars.

b. Three different mission profiles and threat scenarios will be utilized.

(1) The first will be a high intensity, target-rich environment typical of the type that will be found in the forward maneuver elements near the FEBA. In this scenario, the gunner will experience artillery and small arms suppressive fire by the counter force. This inherently limits the number of defensive missiles that can be fired.

(2) The second scenario will be a mid-intensity attack indicative of that experienced deeper into the division area, such as that found around IHAWK/PATRIOT sites and critical assets, such as POL, SASP, etc. In this environment, there are less attack aircraft and no suppressive fires except that from the attacking aircraft.

(3) The third scenario will be a low-intensity attack such as that expected in the rear corps area around air bases. The number of attacking aircraft has been greatly reduced by forward air defense units. Suppressive fires are again eliminated.

5. REPORTING OF RESULTS

The results of this study will be reported as shown in inclosure 3.

6. ADMINISTRATION

a. The final report will be submitted to the Director, Army Training Study, Fort Belvoir, Virginia, ATCG-ATS.

b. The Project Officer at USAADS is Colonel Jerry D. Frydendall, ATSA-EV, Autovon 978-2621.

c. Resources and support requirements are as specified in the attached PCS. (Inclosure 4.)

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9. FM 44-16P, Soldiers Manual, Short Range Air Defense Artillery Missile
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ESSENTIAL ELEMENTS OF ANALYSIS (EEA)

A. Resources to Training

- 1 EEA 1. What P2 training funds are spent for individual REDEYE gunner training (SM tasks)? What are manpower and dollar costs by appropriation (OMA, MPA, PA), by program element (mission and base operations), by expense category element (personnel, supplies, equipment, travel, contractual services, other)?
- 2 EEA 2. What P2 training funds are spent on collective REDEYE gunner training (ARTEP tasks)? What are the manpower and dollar costs by appropriation (OMA, MPA, PA), by program element (mission and base operations), by expense category element (personnel, supplies, equipment, travel, contractual service, other) and by specific cost elements (POL, ammunition, repair parts, maintenance)?
- 3 EEA 3. What do REDEYE "shadow schools" cost the units in manpower and dollars?
- 4 EEA 4. What is the cost of special and contingency operations REDEYE gunner schools?
- 5 EEA 5. What is the cost of individual REDEYE gunner training in the institutions? What are the manpower and dollar costs by appropriation (OMA, MPA, PAO), by program element (mission and base operations), and by expense category element (personnel, supplies, equipment, travel, contractual services, other)?
- 6 EEA 6. What are the cost/usage factors for REDEYE training support methods (training extension courses, SM, training circulars, correspondence courses, improved technical documentation and training (ITDT), other)?
- 7 EEA 7. What are the cost/usage factors for REDEYE training devices (MTS, RCMAT, Live A/C track, THT, other)?
- 8 EEA 8. What is the cost of institutional REDEYE gunner training other than TRADOC and active duty units (e.g., DARCOM, Army health services command)?
- 9 EEA 9. What is the cost of Night/NBC REDEYE training and incremental cost associated with extended reverse cycle training?
- 10 EEA 10. What resources are required to assure continued capability to support the mobilization training requirement?

B. Training to Proficiency

- 1 EEA 1. How were current SM and ARTEP tasks developed?
- 2 EEA 2. How well does proficiency on 16P SM tasks measure a REDEYE gunner's ability to fight his weapon or perform his specific duty?
- 3 EEA 3. How well does proficiency on the ARTEP tasks measure the collective abilities to fight weapons systems or perform the unit's assigned mission?
- 4 EEA 4. What is the relationship between time formally allocated for individual REDEYE training in the units and SM tasks passed?
 - (a) Bringing entry-level personnel up to SM standards.
 - (b) Maintaining SM standards.
- 5 EEA 5. What is the relationship between SM tasks passed and the degree/intensity of employment of various REDEYE training support materials?
- 6 EEA 6. What instruction can be eliminated/reduced from BT and REDEYE AIT/OSUT without degrading REDEYE individual training proficiency? How much time is required to develop loyalty, esprit, unit morale and discipline?
- 7 EEA 7. What is the impact on the proficiency relationship to time for REDEYE gunners if 10%, 25%, or 40% of AIT training is transferred to units?
- 8 EEA 8. What is the relationship between ARTEP tasks passed and time spent on collective REDEYE training in units?
- 9 EEA 9. What is the relationship between ARTEP tasks passed and time since the last ARTEP?
- 10 EEA 10. What increases in REDEYE training proficiency can be achieved through ARTEP without the use of combat simulation training techniques?
- 11 EEA 11. What is the increase/decrease in individual REDEYE proficiency attributable to collective (ARTEP task) training in units?
- 12 EEA 12. What is the increase/decrease in collective REDEYE proficiency attributable to individual (SM tasks) training in units?

- 13 EEA 13. What are impacts on REDEYE training proficiency of working under difficult conditions--Night/NBC/lack of sleep/stress?
- 14 EEA 14. What training programs are required to insure 30%, 40%, 70% of enlisted personnel validate higher grade in SQT?
- 15 EEA 15. How does the current unit training readiness report (AR 220-1) correlate with actual REDEYE proficiency?
- 16 EEA 16. What is the relationship between SQT scores and REDEYE MOS status as stated in the current unit readiness report?
- 17 EEA 17. What changes should be made in the unit training readiness report? How could SQT and ARTEP results be modified for use in a readiness reporting system?
- 18 EEA 18. What peacetime training policies hinder the development of REDEYE gunner proficiency, such as safety requirements on live fire?
- 19 EEA 19. What REDEYE gunner proficiency is achieved through the use of shadow schools?

C. Proficiency to War Models

- 1 EEA 1. How is REDEYE training proficiency incorporated into the traditional M.F.S. (Mobility, Firepower, Survivability) formula used in war games?
- 2 EEA 2. How can we improve our capability to measure REDEYE parameter proficiency?
- 3 EEA 3. Do existing models adequately provide for variations in individual REDEYE proficiency?
- 4 EEA 4. Do existing models include provision of collective REDEYE training factors?
- 5 EEA 5. What is the performance required of REDEYE (STINGER) personnel and equipment on the mid-intensity battlefield during the mid-1980's?
- 6 EEA 6. What SM tasks can be translated directly to REDEYE proficiency parameters in current simulations?
- 7 EEA 7. What ARTEP tasks can be translated directly to REDEYE proficiency parameters in current simulations?
- 8 EEA 8. What SM tasks can be translated indirectly to REDEYE proficiency parameters in current simulations?

- 9 EEA 9. What ARTEP tasks can be translated directly to REDEYE proficiency parameters in current simulations?
 - 10 EEA 10. Can tests be designed to be administered with SQT that would yield values for REDEYE parameters used in current simulations?
 - 11 EEA 11. Can tests be designed to be administered with ARTEP that would yield values for REDEYE parameters used in current simulations?
 - 12 EEA 12. Can new models be designed which directly use REDEYE training parameters?
 - 13 EEA 13. How are training and human factor parameters incorporated into AMSAA REDEYE data?
 - 14 EEA 14. What is the relationship between SM tasks passed and REDEYE system capability as described by MN/DT/AMSAA curves?
 - 15 EEA 15. What is the relationship between ARTEP tasks passed and REDEYE system capability as described by MN/DT/AMSAA curves?
 - 16 EEA 16. To what degree can the ability of the unit commander and staff to integrate combat systems (REDEYE and other SHORAD) on the battlefield be incorporated into war models?
 - 17 EEA 17. How are motivation/morale related to REDEYE proficiency?
- D. War Models to Combat Effectiveness
- 1 EEA 1. What is the impact, on the REDEYE contribution to combat effectiveness, of the ability of the commander and staff to successfully integrate weapons systems on the battlefield? To integrate combat systems?
 - 2 EEA 2. Can levels of REDEYE personnel training, night training, crew operations or logistics be varied in multiple runs of games to derive different battle payoffs?

E. Individual Training

- 1 EEA 1. How will increased simulator training for REDEYE affect the acquisition of training proficiency?
- 2 EEA 2. What will be the projected REDEYE learning curves with the use of new training technologies and techniques?
- 3 EEA 3. Can combinations of ITDT and simulation be used with REDEYE to improve training proficiency and combat effectiveness? What are the resource implications?

- 4 EEA 4. What is the impact on resources and combat effectiveness associated with changes in the mix of REDEYE training programs and changes in training techniques/technology?
- 5 EEA 5. What is the minimum length of BCT required to gain basic skills and condition enlistees to the Army?
- 6 EEA 6. What is the relationship between individual and unit training for REDEYE skills?
- 7 EEA 7. What minimum skills must the REDEYE gunner have when he arrives in the unit?
- 8 EEA 8. Can crew training in the institution increase individual REDEYE gunner proficiency in the units? What is the hierarchy of learning from individual to collective by skill level?
- 9 EEA 9. What is the amount of actual time available to units to conduct REDEYE training?
- 10 EEA 10. What is the amount of training time required to optimize individual REDEYE training proficiency in units?
- 11 EEA 11. What are the resources (manpower, dollars, and time) associated with alternative institutional REDEYE training programs?
- 12 EEA 12. What are the resources associated with alternative individual REDEYE training programs in units?
- 13 EEA 13. Is there a systematic method to allocate tasks for REDEYE training between the unit and the institution? If not, can one be developed? If there is, is it being used properly?
- 14 EEA 14. What is the impact on proficiency and resources of various on-the-job (OJT) REDEYE training programs?
- 15 EEA 15. Can methods such as exportation of part of the training base (e.g., an OSUT company) to units to provide individual/crew refresher training increase REDEYE proficiency and productivity?

F. Personnel Programs

- 1 EEA 1. How does personnel stability/turbulency influence REDEYE training programs?
- 2 EEA 2. What is the feasibility of maintaining unit leadership stability for REDEYE gunners in units over an extended period of time (2-3 years)?

- 3 EEA 3. What is the affect of peacetime attrition in REDEYE training, both in the unit and in the institution?
- 4 EEA 4. What changes are expected in enlistment criteria? How will this impact on individual REDEYE training requirements in the training base?
- 5 EEA 5. Are enlistees' sense of values more critical to training proficiency than intellectual aptitude?
- 6 EEA 6. What is the availability of Army eligibles?
- 7 EEA 7. What should be the eligiblity criterion in terms of age, mental, physical, and education?
- 8 EEA 8. Should the time required to learn the REDEYE MOS skill be tied to the length of service contract?
- 9 EEA 9. What is the correlation between motivation and mental category?
- 10 EEA 10. What is the REDEYE knowledge decay factor for each mental category?
- 11 EEA 11. What time differential will be required to train low mental category personnel to desired levels of REDEYE proficiency?
- 12 EEA 12. What additional resources will be needed to train low mental category personnel to desired level of REDEYE proficiency?
- 13 EEA 13. What is the feasibility of the assignment of individuals to the REDEYE MOS by mental category?
- 14 EEA 14. What is the impact of individual motivation on acquiring/retaining REDEYE proficiency?
- 15 EEA 15. What are the battlefield and training program implications of REDEYE NCO/leadership shortages and grade mismatch?
- 16 EEA 16. What are the battlefield and training program implications of REDEYE gunner replacements flow?

G. Unit Training Support in Resources

- 1 EEA 1. What is the relationship between REDEYE training proficiency and: equipment available/equipment required, ammo available/ammo required, POL available/POL required, training time available/training time required, and instructor-student ratio?

- 2 EEA 2. What REDEYE unit training programs have to be eliminated/reduced as a result of 30% decrements in various resources? What is the effect of training equipment storage procedures similar to those employed by GSFG?
- 3 EEA 3. If units employing REDEYE are decremented 30% equipment, what is the impact on REDEYE training proficiency, combat effectiveness, resources, and unit moral/motivation?
- 4 EEA 4. What is the impact on unit and individual REDEYE gunner proficiencies of national conservation programs? (e.g., 50% reduction in POL)
- 5 EEA 5. What is the impact on individual REDEYE proficiency resulting from limited access to training devices?
- 6 EEA 6. What is the impact on individual/collective REDEYE proficiency of limited local training areas and constrained major training areas?

H. Reserve Training

- 1 EEA 1. What level of REDEYE proficiency can be achieved for RC units prior to deployment?
- 2 EEA 2. What individual and collective REDEYE training programs are required to achieve proficiency in RC units prior to deployment?
- 3 EEA 3. What are the resources required to achieve REDEYE proficiency in RC units prior to deployment?
- 4 EEA 4. How do all the other excursions influence RC REDEYE combat effectiveness, training programs, and associated resources?
- 5 EEA 5. Can the RC REDEYE training system respond to mobilization requirements without revision?
- 6 EEA 6. What is the relationship between training, proficiency, and REDEYE personnel retention in the RC?
- 7 EEA 7. What is the relationship of individual REDEYE training to collective REDEYE training in the RC in sustaining proficiency?
- 8 EEA 8. What is the cost of training REDEYE gunners in RC units to ARTEP standards?
- 9 EEA 9. How would variations from the current 38 days of annual/reserve training impact on the combat effectiveness of REDEYE gunners?

- 10 EEA 10. How much annual training time is required to sustain REDEYE gunners in RC units at ARTEP standards?
- 11 EEA 11. What is the cost of training the IRR (Individual Ready Reserve) REDEYE gunners to SM standards?
- 12 EEA 12. How much training time is required annually to sustain IRR REDEYE gunners to SM standards?
- 13 EEA 13. What are the required resources of alternative training to improve the premobilization REDEYE training of RC personnel (Officer/NCO/E1-E4)?
- 14 EEA 14. What is the level of REDEYE training readiness of an average roundout battlaion, D + 30, D + 60 unit?
- 15 EEA 15. What ARTEP level should be required for REDEYE gunners in those units which would not be committed until after D + 60? What training programs and associated resources would be required?
- 16 EEA 16. How much increase in REDEYE proficiency can be achieved in 30 days? At what echelon should reserves be employed? What REDEYE training programs and resources are required to maintain the appropriate premobilization REDEYE proficiencies?
- 17 EEA 17. Can simulations be played to a D + 30 and D + 60 scenario and can war games be set at a D + 30/ D + 60 scenario with REDEYE?

ARTS REPORT
FORMAT AND CONTENTS

1. INTRODUCTION
2. PURPOSE
 - a. Problem
 - b. Impact of Problem
3. OBJECTIVES
 - a. Essential Elements of Analysis
 - b. Measures of Training Effectiveness
 - c. Scope
4. MANPADS CONCEPT OF OPERATIONS
5. RESOURCES TO TRAINING ANALYSIS
 - a. Discussion of Critical Tasks
 - b. Institutional Training and Costs
 - (1) Army
 - (2) Marine
 - c. Unit Training and Costs
 - (1) Army
 - (2) Marine
 - d. Conclusions
 - e. Recommendations
6. TRAINING TO PROFICIENCY ANALYSIS
 - a. Discussion
 - b. Test Results - Institution
 - (1) Army
 - (2) Marine
 - c. Test Results - Unit
 - (1) Army
 - (2) Marine
 - d. Live Firings
 - (1) Army
 - (2) Marine
 - (3) RELS

- e. Live Tracking
 - (1) Army
 - (2) Marine
- f. Summary of Test Results
- g. Interoperability
- h. Conclusions
- i. Recommendations

7. PROFICIENCY TO WAR MODELS

- a. Discussion
- b. Air Defense War Models
 - (1) Commo
 - (2) TACOS
- c. Training Input to War Models
 - (1) SM Tasks
 - (2) ARTEP Requirements
- d. Model Modifications Required and Impact
 - (1) Modification Time
 - (2) Modification Costs
- e. Conclusions
- f. Recommendations

8. WAR MODELS TO COMBAT EFFECTIVENESS

- a. Discussion
- b. Air Threat to Ground Forces
- c. Model Results
 - (1) Effects of Proficiency Variation
 - (2) Combat Effectiveness Results
- d. Summary
- e. Conclusions
- f. Recommendations

9. RESOURCES TO COMBAT EFFECTIVENESS

- a. Discussion
- b. Resources to Proficiency
- c. Combat Effectiveness to Proficiency
- d. Resources to Combat Effectiveness Analysis
- e. Conclusions
- f. Recommendations

10. TRAINING EFFECTIVENESS - RESERVES

- a. Discussion
- b. Training in Local Units
 - (1) Classroom Training
 - (2) Hands on Training
- c. Institutional Refresher Training
- d. Reserve Training Costs

- e. Reserve Proficiency
 - (1) In Local Units
 - (2) Before Refresher Training
 - (3) After Refresher Training
- f. Conclusions
- g. Recommendations

11. PERSONNEL PROGRAMS

- a. Discussion
- b. Personnel Stability Factors
- c. Personnel Turbulence Factors
- d. Preselection Criteria for Gunners
- e. Conclusions
- f. Recommendations

12. ARTS RESULTS APPLICATION TO STINGER TRAINING

- a. Discussion
 - (1) Stinger Similarities
 - (2) Stinger Differences
- b. Training Implications
 - (1) Institution
 - (2) Unit
 - (3) Reserves
 - (4) Live Firings
 - (5) Live Tracking
- c. Conclusions
- d. Recommendations

13. STUDY CONCLUSIONS

- a. Training Effectiveness - Current
 - (1) Institution
 - (2) Unit
 - (3) Reserves
- b. Training Costs - Current
 - (1) Institution
 - (2) Unit
 - (3) Reserves
- c. Resources to Training
- d. Training to Proficiency
- e. Proficiency to War Models
- f. War Models to Combat Effectiveness
- g. Resources to Combat Effectiveness

14. STUDY RECOMMENDATIONS

- a. Proposed Institutional Training Programs
 - (1) Effectiveness

- (2) Costs
- b. Proposed Unit Training Programs
- (1) Effectiveness
- (2) Costs
- c. War Models - Training Input
- d. Combat Effectiveness

APPENDIXES

- I. MTS DESCRIPTION
- II. RCMAT, TVT AND BATS DESCRIPTIONS
- III. REDEYE THT AND RELS DESCRIPTIONS
- IV. LIVE FIRINGS, TRACKING TEST DESCRIPTIONS
- V. ESSENTIAL ELEMENTS OF ANALYSIS
- VI. TEST RESULTS
- VII. STUDY COSTING
- VIII. INTEROPERABILITY

PROJECT COORDINATION SHEET

I. PROJECT TITLE: Army Training Study (ARTS) - REDEYE

II. PROPONENT ELEMENT/POINT OF CONTACT:

Directorate of Evaluation
ATTN: ATSA-DE (COL Frydendall)
Ft. Bliss, TX 79916

III. TRASANA ELEMENT/POINT OF CONTACT:

Artillery Division
Air Defense Branch, ATAA-TBB
John D. Tubbs, AUTOVON 258-1461 (WSMR), 978-2340 (Ft. Bliss)

IV. TASK TITLE: Development of USAADS REDEYE input to the Army Training Study

V. SUMMARY DESCRIPTION: This project will determine for REDEYE/STINGER the relationship between training resources and combat effectiveness in response to the Army Training Study. The specific objectives of the study will be to examine and evaluate the following:

a. What resources are currently expended in training REDEYE, 16P in the institution and in the units gunners and what are the associated costs?

b. What is the current level of gunner proficiency attained during institutional and unit training and is this level required and/or optimum?

c. What is the relationship between training costs and combat effectiveness?

d. How is combat effectiveness effected by variations in gunner proficiency?

e. Are there revised institutional/unit training programs that will meet the required gunner proficiency at a reduced cost?

VI. GENERAL SCOPE OF WORK

a. TRASANA will:

(1) Develop an ARTS-REDEYE study plan and submit it to USAADS for approval.

(2) Perform the necessary test planning and analysis.

(3) Conduct and participate in tests to determine the level of training required to produce gunners with an acceptable level of proficiency.

(4) Develop, with USAADS, changes in the proposed training programs at the institutional and unit levels to provide adequate gunner proficiency in line with ARTS objectives.

(5) Determine the cost of current and proposed training programs in support of the ARTS objectives.

(6) Develop the relationship between training resources, gunner proficiency and combat effectiveness.

(7) Prepare the final report for USAADS approval.

b. USAADS will:

(1) Participate with TRASANA in the elements described in a. above.

(2) Coordinate with Army, Marine and other outside activities, support of agreed upon tests involving military facilities, personnel and OCONUS trips.

(3) Provide personnel on a full-time basis to coordinate and interface with TRASANA personnel during the entire study to assure that the effort is proceeding on a path which will yield a product acceptable to USAADS.

VII. SPECIFIC SCOPE OF WORK: The following areas will be addressed in the scope of this PCS.

a. The current institutional training and unit training programs will be examined to determine personnel resources, training devices and aids and total program costs.

b. The proficiency growth and final proficiency will be determined for the currently conducted institutional and unit training programs.

c. Various training programs will be examined at the institutional and unit levels to determine the sensitivity of proficiency to training time.

d. The proficiency determined in b. and c. above will be input to the COMO air defense model to determine REDEYE/STINGER effectiveness. This proficiency will be varied over a wide range to determine the battle sensitivity to gunner proficiency.

e. Where feasible, those gunners which were tested during the REDEYE WSTEAD will be retested to gain additional insight into proficiency retention. The measured proficiency will be related to current unit training and will be input to the COMO air defense model.

f. The reserve army force will be tested prior to REDEYE refresher training to determine present effectiveness and at the end of training to determine maximum potential effectiveness.

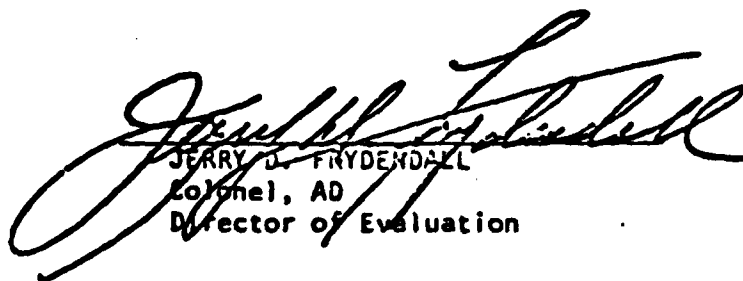
VIII. RESOURCES AND SCHEDULE

a. TRASANA will provide approximately 50 man months of effort for this project. USAADS will provide approximately 80 man months of effort to include clerical support, office facilities, and test facility coordination.

b. Schedule:

Begin Effort	15 Oct 77
Complete Draft Study Plan	1 Dec 77
Study Plan to ARTS/SSG	19 Dec 77
Internal IPR (USAADS & TRASANA)	Mar 78
Internal IPR (USAADS & TRASANA)	Jun 78
Draft Report Complete	15 Jun 78
Final Report to USAADS	1 Jul 78

IX. COORDINATION:


JERRY D. FRYDENHALL
Colonel, AD
Director of Evaluation


LEON F. GOODE, JR.
Deputy Director for
Technical Operations

APPENDIX XIV
GLOSSARY OF TERMS & ACRONYMS

A/C	Air Craft
AD	Air Defense
AFHF	Action Fire/Hold Fire
AFQT	Armed Forces Qualification Test
AIT	Advanced Individual Training
AMSAA	Army Materiel Systems Analysis Activity
ARTEP	Army Training and Evaluation Program
ARTS	Army Training Study
ARTSG	Army Training Study Group
ASM	Air To Surface Missile
ASP	Annual Service Practice
ATRM	Army Training Resource Management
ASVAB	Armed Services Vocational Aptitude Battery
BATS	Ballistic Aerial Target System
BCT	Basic Combat Training
BCU	Battery Coolant Unit
COMO	Computer Model
CONUS	Continental United States
DCD	Directorate of Combat Developments
DRRC	Determine Range Ring Coverage
EEA	Essential Elements of Analysis
FA	Field Artillery
FAAR	Forward Area Alerting Radar
FCIS	Force Cost Information System
FHMA	Family Housing Management Accounting
FORSCOM	Forces Command
GOAR	Ground Observer Aircraft Recognition
GT	General Technical
HIMAD	High To Medium Air Defense
IA	Identify Aircraft
ID	Identification
IFF	Identification Friend Foe
IH	Improved Hawk

IR	Infrared
ISR	Individual Soldier's Report
ITDT	Improved Technical Documentation and Training
IRR	Individual Ready Reserve
KM	Kilometer
LAAM	Light Anti Aircraft Missile
MASS	Marine Air Support Squadron
MACG	Marine Air Control Group
MANPADS	Man-Portable Air Defense Systems
MCA	Military Construction Appropriation
MN/DT	Materiel Need/Developmental Testing
MOS	Military Occupation Specialty
MPA	Military Pay & Allowances
MSL	Missile
MTS	Moving Target Simulator
NBC	Nuclear Biological Chemical
NCO	Non-Commissioned Officer
OCONUS	Outside Continental United States
OF	Operator and Food
OJT	On-The-Job Training
OMA	Operations and Maintenance Army
OSUT	One Station Unit Training
Ph	Proficiency
POI	Program of Instruction
POL	Petroleum, Oils, and Lubricants
RC	Reserve Component
RCMAT	Radio Controlled Miniature Aerial Target
RELS	REDEYE Launch Simulator
RRP	Range Ring Profile
SHORAD	Short Range Air Defense
SM	Soldier Manual
SQT	Skill Qualification Test
STELS	Stinger Launch Simulator
TACOS	Tactical Air Defense Computer Simulation
TADDS	Target Area Data Display System
TD	Table of Distribution
THT	Tracking Head Trainer
TRADOC	Training and Doctrine Command
TRASANA	TRADOC Systems Analysis Activity

USAADS	United States Army Air Defense School
USAF	United States Air Force
USMC	United States Marine Corps
VACR	Visual Aircraft Recognition
WSTE	Weapons System Training Effectiveness Analysis

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