AD A061226

DDC FILE COPY

ARI TECHNICAL REPORT
TR-78-A29

Trial Implementations of the Tank Crewman Skills Training Program (TCST)

LEVEL II

R. E. O'Brien, W. J. Crum, R. D. Healy,
J. H. Harris, and W. C. Osborn

Human Resources Research Organization (HumRRO)
300 North Washington Street
Alexandria, Virginia 22314

DDC
RECEIVED
NOV 15 1978
F

SEPTEMBER 1978

Contract DAHC 19-76-C-0001
Monitored by Donald F. Haggard
Chief, ARI Field Unit at Fort Knox, Ky.

Prepared for

U.S. ARMY RESEARCH INSTITUTE
for the BEHAVIORAL and SOCIAL SCIENCES
5001 Eisenhower Avenue
Alexandria, Virginia 22333

Approved for open release; distribution unlimited

U. S. ARMY RESEARCH INSTITUTE
FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the Deputy Chief of Staff for Personnel

JOSEPH ZEIDNER
Technical Director

WILLIAM L. HAUSER
Colonel, US Army
Commander

Research accomplished
under contract to the Department of the Army

Human Resources Research Organization

NOTICES

DISTRIBUTION: Primary distribution of this report has been made by ARI. Please address correspondence concerning distribution of reports to: U. S. Army Research Institute for the Behavioral and Social Sciences, ATTN: PERI-P, 5001 Eisenhower Avenue, Alexandria, Virginia 22333.

FINAL DISPOSITION: This report may be destroyed when it is no longer needed. Please do not return it to the U. S. Army Research Institute for the Behavioral and Social Sciences.

NOTE: The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: TR-78-A29 (19) (12) ARI	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): TRIAL IMPLEMENTATIONS OF THE TANK CREWMAN SKILLS TRAINING PROGRAM (TCST) (6) (14) HUMRRO	5. TYPE OF REPORT & PERIOD COVERED: Final Report (9) May 1977-June 1978,
	6. PERFORMING ORG. REPORT NUMBER: HumRRO-FR-WD(KY)-78-3
7. AUTHOR(s): Richard E. O'Brien, William J. Crum, Richard D. Healy, James H. Harris, and William C. Osborn (10)	8. CONTRACT OR GRANT NUMBER(s): DAHC 19-76-C-0001 (15)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Human Resources Research Organization (HumRRO) 300 North Washington Street Alexandria, Virginia 22314	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 2Q762722A764 (16)
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Ave., Alexandria, Va 22233	12. REPORT DATE: September 1978 (11)
	13. NUMBER OF PAGES: 163
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): -- (12) 168p.	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for open release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

--

18. SUPPLEMENTARY NOTES

Work performed by HumRRO, Fort Knox Office, P.O. Box 293, Fort Knox, Kentucky 40121, and monitored by Donald F. Haggard, Chief of the ARI Field Unit at Fort Knox.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Armor	Tank Gunnery
Tanks	Skills Training
M60A1	Skills Testing

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report describes the adaptation of a modular, performance based, individually-paced tank crewman skills training program (TCST) for trial implementation in five different tank crew train-up situations: (1) mobilization train-up of active and reserve crewmen in a training center environment, (2) mobilization train-up of training center crews,

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

405 200

(3) individual readiness training of armor crewmen preparing for unit gunnery training, (4) accelerated training of tank crew replacements, and (5) accelerated refresher training of experienced crews deprived of regular gunnery training.

The procedure typically involved: (a) adapting TCST to the training situation, (b) planning training implementation, (c) pre-testing, (d) delivering training, (e) administering a crew gunnery criterion test, and (f) post-testing individual skills. The training was administered by unit trainers under supervision of the project staff. Data was collected on individual skill proficiency, crew gunnery performance, and trainee opinions of the program.

Two of the five studies produced positive results. In one, the training center active and reserve mobilization train-up, TCST produced trainee skill levels and opinions superior to those resulting from two alternative programs. In the other, the accelerated tank crew replacement training, TCST was used successfully in rapidly preparing non-11E soldiers to fill in as gunners and loaders on a gunnery qualification test--a Table VIII test in which the crews with replacements performed as well as experienced intact crews. Results of the other three trial implementations were inconclusive.

A need exists for some kind of TCST to be used in preparing combat ready crews. The TCST program has a number of promising features, but needs further development. Of particular importance is the need for detailed trainer guidance on how to plan, schedule and deliver training.

BRIEF

REQUIREMENT

The requirement to be met by the work reported here was to adapt a modular, performance-based, individually-paced tank crewman skills training program (TCST)--originally developed for use with reserve components--for evaluation in a variety of tank crew train-up situations.

PROCEDURE

The program was implemented on a trial basis in five settings: (1) mobilization train-up of active and reserve crewmen in a training center environment, (2) mobilization train-up of training center crews, (3) individual readiness training of armor crewmen preparing for unit gunnery training, (4) accelerated training of tank crew replacements, and (5) accelerated refresher training of experienced crews deprived of regular gunnery training. Each study was intended to represent a different set of training conditions under which tank crewmen would be preparing for combat. In each instance the basic program was modified to accomodate: (a) crewman task requirements dictated by the gunnery criterion test to be used, (b) trainee background, (c) available training time, and (d) training conditions, such as the availability of ranges, subcaliber devices, and service ammunition.

In most cases the procedure involved: (a) adapting TCST to the training situation, (b) planning training implementation, (c) pre-testing, (d) delivering training, (e) administering a crew gunnery criterion test, and (f) post-testing individual skills. The training was typically administered by unit trainers under supervision of the project staff. Data was collected on individual skill proficiency, crew gunnery performance, and trainee opinions of the program.

FINDINGS

Success of TCST in the five trial settings was modest. Two of the five studies produced what could be considered positive results. In one, the training center active and reserve mobilization train-up, TCST produced trainee skill levels and opinions superior to those resulting from two alternative programs. In the other, the accelerated tank crew replacement training, TCST was used successfully in rapidly preparing non-11E soldiers to fill in as gunners and loaders on a gunnery qualification test--a Table VIII test in which the crews with replacements performed as well as experienced intact crews. Results of the remaining three trial runs were inconclusive.

A need exists for some kind of TCST to be used in preparing combat ready crews. Results of the training trials indicate that, despite the supplementary training given, no group of crews--experienced or inexperienced, with or without recent gunnery training--demonstrated a level of crew gunnery proficiency that could be considered combat ready.

The TCST program has a number of promising features, but needs further development. Of particular importance is the need for implementation procedures. Detailed guidance on how to plan, schedule and deliver individual training at the unit level must be developed and validated. Without such guidance and without a commitment to the training by commanders, trainers and trainees alike, no training program of any level of excellence can hope to succeed.

USE OF FINDINGS

The TCST program, with further development, has promise as a flexible program of tank crew training, adaptable in length to a variety of training conditions and trainee experience.

PREFACE

This is the Final Report for Task 4 of a four-task project entitled, "Continuation of Tank Systems Skills and Training Structure." The report describes the trial implementation of a Tank Crewman Skills Training Program in five different training settings.

The work reported here was performed at the Fort Knox Office of the Human Resources Research Organization (HumRRO), under Contract No. DAHC 19-76-C-0001 with the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). The training studies conducted were in support of the Army Training Studies Group work program.

Donald F. Haggard was the Contracting Officer's Technical Representative. He provided administrative assistance, valuable criticism, and substantive suggestions for conceptualizing problems and solutions throughout the project.

HumRRO employees who worked on the project were Richard E. O'Brien, William J. Crum, Richard D. Healy, James H. Harris, and William C. Osborn.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
OBJECTIVE	2
APPROACH	3
THE TRIAL IMPLEMENTATIONS	4
1. Training Center Active and Reserve Mobilization	4
Results	8
Written Test Performance	10
Trainee Opinion	10
Discussion	14
2. Training Center Crew Mobilization Trainup	17
Results and Discussion	19
3. Field Unit Annual Gunnery Training	25
Results	32
Discussion	40
4. Accelerated Tank Crew Replacement Training	41
Approach	42
Results	47
Discussion	53
5. Accelerated Tank Crew Refresher Training	54
Approach	54

TABLE OF CONTENTS (Cont'd.)

	Page
Results	58
Discussion	58
CONCLUSIONS AND IMPLICATIONS	62
REFERENCES	66
APPENDIXES	67

LIST OF TABLES AND FIGURES

TABLE		Page
1.	BACKGROUND CHARACTERISTICS OF TRAINEES BY CREW POSITION AND TRAINING PROGRAM	7
2.	PERCENT "GO" FOR HANDS-ON POST-TESTS FOR THE THREE TRAINING PROGRAMS	9
3.	PERCENT "GO" ON SELECTED WRITTEN (TEC) POST-TEST FOR THE THREE TRAINING PROGRAMS	11
4.	RELATIVE NUMBER OF TRAINEES RESPONDING TO THE TWO FORMS OF THE OPINION QUESTIONNAIRE	13
5.	AVERAGE PERCENT OF FAVORABLE QUESTIONNAIRE RESPONSES FOR PRE- VERSUS POST-TRAINING ADMINISTRATION	13
6.	AVERAGE HANDS-ON TEST PERFORMANCE AND MOS COMPOSITION BY TRACK FOR TCST AND EBNCOC	15
7.	BACKGROUND CHARACTERISTICS OF TRAINEES IN TCST(2)/CREW TRAINING	18
8.	MEAN SCORE BY CREW POSITION ON WRITTEN (TEC) POST-TESTS FOR TCST GROUPS	20
9.	PER CENT "GO" ON HANDS-ON PRETEST FOR CADRE AND TCST(2) TRAINEES	21
10.	TANK CREW QUALIFICATION PERFORMANCE ON TASK STANDARDS	23
11.	CREW GUNNER PERFORMANCE ON TABLE VIIC	24
12.	TASKS ADDED TO TEST	26
13.	BACKGROUND CHARACTERISTICS OF TCST ANNUAL GUNNERY TRAINEES	28
14.	AVERAGE TASK PROFICIENCY BEFORE GUNNERY TRAINING	33
15.	MEAN PROPORTION OF TASKS PASSED BEFORE GUNNERY TRAINING	33
16.	AVERAGE TASK PROFICIENCY AFTER GUNNERY TRAINING	35

LIST OF TABLES AND FIGURES (Cont'd.)

TABLE		Page
17.	MEAN PROPORTION OF TASKS PASSED AFTER GUNNERY TRAINING	35
18.	AVERAGE TASK PROFICIENCY BEFORE AND AFTER GUNNERY TRAINING FOR CREWMEN TESTED BOTH TIMES	36
19.	MEAN PROPORTION OF TASKS PASSED BEFORE AND AFTER GUNNERY TRAINING FOR CREWMEN TESTED BOTH TIMES	36
20.	CORRELATION OF TANK COMMANDER, GUNNER, AND CREW READINESS TEST SCORES WITH TABLE VIII PERFORMANCE	38
21.	MEAN NUMBER OF SHIFTS IN OPINION FROM BEFORE TO AFTER TRAINING	40
22.	DISTRIBUTION OF MOS FOR TCST REPLACEMENT TRAINEES	45
23.	BACKGROUND CHARACTERISTICS OF TCST	45
24.	AVERAGE TABLE VIII SCORES FOR CREWS WITH NON-11E REPLACEMENTS AND FOR INTACT CREWS	48
25.	AVERAGE TASK PROFICIENCY OF REPLACEMENT VERSUS REGULAR GUNNER AND LOADER TRAINEES	50
26.	PROPORTION OF TASKS PASSED BY REPLACEMENT VERSUS REGULAR GUNNER AND LOADER TRAINEES	50
27.	CORRELATION OF READINESS TEST SCORES AND TABLE VIII SCORES FOR GUNNER AND LOADER REPLACEMENTS	51
28.	CORRELATION OF READINESS TEST SCORES AND TABLE VIII SCORES FOR CREWS (N=10) CONTAINING REPLACEMENT GUNNERS AND LOADERS	51
29.	RELATIVE NUMBER OF CREWS QUALIFYING ON TABLE VIII BY TRAINING GROUP AND TRAINING WEEK	59
30.	AVERAGE NUMBER OF TABLE VIII ENGAGEMENTS SUCCESSFULLY FIRED BY TRAINING GROUP AND TRAINING WEEK	59
31.	PROPORTION OF TABLE VIII ENGAGEMENTS SUCCESSFULLY FIRED DURING THE DAY AND NIGHT BY TRAINING GROUP AND WEEK	60

LIST OF TABLES AND FIGURES (Cont'd.)

FIGURE		Page
1.	Overview of three-day TCST accelerated gunner/loader replacement training.	44

TRIAL IMPLEMENTATIONS OF THE TANK CREWMAN SKILLS TRAINING PROGRAM (TCST)

INTRODUCTION

The Tank Crewman Skills Training Program (TCST) originated in response to a need for new Reserve Component training. Armor and Cavalry National Guard units have, since the wind-down of Vietnam and the advent of the volunteer Army, been undergoing change in the areas of equipment, training resources, and personnel. Older tanks are being replaced with newer models; costs of fuel, ammunition and real estate are increasing; and the background of reservists has become more varied, with relatively fewer new recruits and relatively more experienced soldiers shifting from active duty to reserve or National Guard status. Results of a survey of Armor and Cavalry National Guard units[1] led to development of training plans for operating and maintaining the M48A5 tank. The major factors that guided training development were: (a) minimal dependence on skills learned outside the program; (b) being deliverable, as much as possible, at armories; (c) increased use of subcaliber devices; and (d) use of pre-tests to diagnose areas of performance deficiency. The program consisted of performance tests and training modules addressing functional groups of 105 crewman tasks identified as critical to gunnery performance on Table VIII and related crew drills and skills deemed important by the Armor School. Tests and training modules are divided into five packages, one for each crew position and one for the crew. The program was designed around the time, terrain and resource constraints that typify Reserve Component training. It is performance-based, criterion-referenced and individually managed. Training Extension Course (TEC) lessons and existing training devices, along with specifications for other devices and material, are designated for use. The program uses individual diagnostic pretesting to determine training needs, and proceeds from individual skills to

---

[1] O'Brien, R.E., Ford, J.P., and Boldovici, J.A. Armor and Cavalry National Guard Training Constraints. Alexandria, Virginia: U.S. Army Research Institute for the Behavioral and Social Sciences, 1977.

crew skills. The complete training program is reported elsewhere.[1] A synopsis is given in Appendix A.

An evaluation of the Reserve Component Training Program is currently underway in a National Guard Armored Division. Early in its development, however, the program was identified by the Army Training Studies Group (ARTS) as potentially useful in settings other than the Reserve Component environment. These potential applications included:

- Mobilization train-up of active and reserve tank crews in a training center environment.
- Individual readiness training of armor crewmen preparing for unit gunnery training.
- Accelerated training of tank crew replacements.
- Accelerated refresher training of experienced crews deprived of annual gunnery exercises.

The modular-structure and performance-based features of the original program enable its adaptation to a variety of training conditions and trainee backgrounds. This report describes five such trial implementations of the program, currently termed "Tank Crewman Skills Training" or TCST.

OBJECTIVE

The overall purpose of the work reported here was to develop and evaluate variations of TCST in terms of training effectiveness and trainee acceptance. Specific objectives included determining if:

- TCST led to improved performance on crew live-fire exercises.
- Individual skills trained in TCST are relevant to crew live-fire skills.

---

[1]Harris, J.H., Osborn, W.C., and Boldovici, J.A. Reserve Component Training for Operating and Maintaining the M48A5 Tank. Alexandria, Virginia: U.S. Army Research Institute for the Behavioral and Social Sciences, 1977.

- TCST can be delivered effectively in different training environments; where training time, trainee background and training resources vary.
- TCST is viewed favorably by trainees and trainers.
- The cost of delivering TCST is reasonable.[1]

APPROACH

Five training studies were carried out in an attempt to meet these objectives. Each of the studies was intended to represent a different set of training conditions under which tank crewmen would be preparing for combat. The studies were:

1. Training Center Active and Reserve Mobilization Trainup. A mixture of active duty and reserve crewmen assigned to the Armor Training Center received approximately one week of individual skills training, in TCST or one of two other mobilization training programs.
2. Training Center Crew Mobilization Training. Twenty M60A1 tank crews assigned to the Armor Training Center received one week of the individual skills portion of TCST in preparation for a two-week period of crew training.
3. Field Unit Annual Gunnery Training. Tank crewmen in a divisional FORSCOM battalion received the individual skills portion of TCST in preparation for their annual gunnery training.
4. Accelerated Tank Crew Replacement Training. Soldiers that were not tank crewmen received three days of TCST in preparation for them to serve as replacement gunners and loaders in regular tank crews.
5. Accelerated Tank Crew Refresher Training. Crews in an experienced tank company that had not recently participated in annual gunnery training received either one or three days of TCST as refresher training.

---

[1]Training cost estimates for three of the programs are given in Appendix O.

Modification of TCST was necessary for each of the trial implementation. Adaptation of the original program to the M60A1 tank was required for all applications, which entailed relatively minor changes in content to accomodate task relevant equipment differences. Other changes were made to adapt to trainee background, available training time, and training conditions, such as the availability of ranges, subcaliber devices and service ammunition for gunnery training.

The reader should note at the outset that the assorted training trials reported here in no way represent systematic variations of training conditions relevant to the design of TCST. In most cases, limited planning time and resources and the urgency of on-going training schedules precluded the kind of controlled intervention one strives for in program evaluation. Live-fire criterion tests were not comparable from study to study; those who delivered the training differed in background and familiarity with TCST; of those who scored the hands-on readiness tests, some were trained in test administration and some were not, and some were more closely involved with the performance of trainees than others. In short, study objectives, training procedures and evaluation criteria were adapted to the physical and personnel resources available in each case.

THE TRIAL IMPLEMENTATIONS

1. Training Center Active and Reserve Mobilization

This study involved the tryout of three training programs assembled for the purposes of armor crew mobilization and transition training. The programs are summarized as follows:

- Tank Crewman Skills Training (TCST). As described above, this program represented a modification of that designed for armor reserve components to use in training operation and maintenance of the M48A5 tank. The individual training portion of the program covered 105 crewman tasks identified as "critical" in terms of their relevance to Table VIII exercises and other crew skills designated as important by the Armor School. The tasks were divided into four training packages, one for each crew position. A package consisted of readiness tests and training modules addressing functional groups of job tasks. The training is performance-based and individually managed, though some of the knowledge training (TEC Lessons) was group paced. With the minor modifications in task procedures necessary to adapt to the M60A1 tank, and to accomodate three principal tracks (Driver, Loader/Gunner, and Tank Commander), the program was implemented. A trainee took only one of the three tracks.

- Expanded Basic NCO Course (EBNCOC). This program consisted of lesson plans from the Armor Basic NCO Course supplemented by selected TCST modules. The training covered essentially the same tasks as TCST, was similarly divided into three tracks, and included both knowledge and hands-on training. This program differed chiefly from TCST in two respects: 1) knowledge training (TEC lessons) was self-paced, and 2) the Readiness Tests were given on a post-training basis only.

- Self-Managed Mobilization Training Program (SMMT). This program enlarged the scope of armor tasks covered, and featured a self-management approach to training. Approximately 30 tasks were included which were not covered in the two other programs. Many of the additional tasks represented areas of tank crew performance emphasized in the Armor Tank Force Management Study: NBC, recovery operations, communications, extinguishing fires, and camouflage, cover and concealment. The program consisted of a set of training objectives, hands-on criterion tests, resource materials (FMs, TMs, TEC Lessons, etc.), and a course map designating a recommended order for taking the modules. A trainee selected

one of ten module clusters, read the objectives for the first module, studied whatever available resource material he wished, and reported for testing when he thought he was ready. In contrast to the other programs, this training was not tracked; trainees were responsible for tasks pertaining to all four crew positions.

Trainee Groups. Trainee groups were comprised of active duty soldiers from the USATCA's 1st and 4th Training Brigades and the 194th Armored Brigade, and reservists from the 100th Training Division. Group background characteristics are summarized in Table 1.

The three groups of trainees appeared dissimilar in important respects. From the standpoint of experience, TCST trainees seemed to have an edge over the other two groups: they tended to be predominantly active duty soldiers with more years in service and of slightly higher average rank; over 40% held the primary MOS of 11-E. The group receiving the Expanded BNCO training, while comparable in terms of the relative number of active duty soldiers, were proportionately under represented by men with the 11-E MOS (14%). Soldiers undergoing the SMMT program were typically reservists (82%) with fewer years service, although nearly half (46%) held the Armor Crewman's primary MOS.

To the extent that one associates trainability in this context with a background of active duty experience as an 11-E, the TCST group appeared to have an edge on the other groups going into the training. Such differences in composition of the three trainee groups are pertinent to interpreting results of the training evaluation.

TABLE 1

BACKGROUND CHARACTERISTICS OF TRAINEES
BY CREW POSITION AND TRAINING PROGRAM

		TRAINEE CHARACTERISTICS					
TRAINING PROGRAM	TRAINING CREW	NUMBER OF TRAINEES	GRADE (MEDIAN)	PMOS (% 11E)	COMPONENT (% ACTIVE)	AGE (MEAN)	YEARS SERVICE (MEAN)
TCST	Driver	10	E-7	0 %	100 %	32	14.2
	Gunner/ Loader	10	E-6	10 %	60 %	30.6	6.3
	Tank Cmdr.	14	E-5	93 %	93 %	27.5	6.4
	All	34	E-6	41 %	85 %	29.7	8.3
EBNCOC	Driver	16	E-5	31 %	81 %	27.6	3.5
	Gunner/ Loader	13	E-6	8 %	100 %	30.8	10.4
	Tank Cmdr.	17	E-5	0 %	88 %	26.1	5.1
	All	46	E-5	14 %	89 %	27.9	6.0
SMMT	All	24	E-5	46 %	18 %	29.4	3.4

Training Delivery. Training was administered by training center cadre who, depending on the particular program involved, administered diagnostic pre-tests, supervised remedial training, and conducted all readiness (criterion) testing. Soldiers assigned to TCST or EBNCOC spent up to a week preparing for post-test evaluation; those participating in SMMT were alloted two weeks for preparation.

Results

Hands-On Test Performance. Principal training results are given in terms of hands-on post-test comparisons among the three groups. TCST and EBNCOC groups received the same hands-on post-tests, and to enable comparison with SMMT trainees the latter were administered a sample of the same hands-on tests. Comparisons involving SMMT trainees were possible for tasks in the loader and driver areas only.

Results of the hands-on testing are shown in Table 2. With exception of loader tasks in the Mission Preparation area, performance of TCST trainees was uniformly high, ranging from 81% to 100% "GO." Overall performance of EBNCOC trainees was moderately high. Of the 12 possible test compairsons between TSCT and EBNCOC, the former group scored higher on eight and lower on three; performance was at a maximum for both groups on the remaining test. Only two of these apparent differences were found to be statistically reliable, however, both in favor of TCST trainees. Areas of significant difference were Weapons Maintenance (loader) and M85 Operation and Maintenance (TC): All TCST trainees passed these two tests, whereas "GO" rates for EBNCOC trainees were 57% and 71%, respectively.

Hands-on performance of the SMMT group was low, and significantly so, in the three areas tested (Combat Loading, Replenisher Tape Reading, and the driver's Before Operation Checks). The combined pass rate of TCST and EBNCOC groups was approximately 95% on these tests, where only about half of the SMMT trainees scored "GO."

TABLE 2

PERCENT "GO" FOR HANDS-ON POST-TESTS
FOR THE THREE TRAINING PROGRAMS

HANDS-ON TEST	TRAINING PROGRAM					
	TCST		EBNCOC		SMMT	
	N	% "GO"	N	% "GO"	N	% "GO"
Loader/Gunner	11		14		24	
Mission Prep.		54		--[1]		--
Cmbt. Loading		100		93		50[3]
Wpns. Mtn.		100		57[2]		--
Replen. Tape		100		93		50[3]
Opnl. Checks		91		100		--
Wpn. Prep.		100		100		--
Tact. Opns.		91		86		--
Driver	9		15		24	
Before Opns.		100		93		58[3]
Tact. Driving		100		80		--
Tank Commander	16		17			
M85		100		71[2]		--
Prep. to Fire		81		88		--
Wpns. Prep.		94		100		--
Tact. Opns.		94		88		--

[1]Not tested.
[2]Significantly smaller than corresponding percentage for TCST ($p < .05$).
[3]Significantly smaller than corresponding combined percentage for TCST and EBNCOC ($p < .05$).

Written Test Performance

A total of 29 TEC lessons with written criterion tests were available for use in the three training programs. Post tests were taken on these lessons by virtually all TCST trainees, and on a sample of 10 lessons by the SMMT group. TEC post tests, with one exception, were either not taken or not recorded for EBNCOC trainees. Data for the 9 lessons on which between-group comparisons could be made is shown in Table 3. Performance by TCST trainees on these 9 lessons depicts reasonably well the pass rate pattern over all lessons. The trend was toward higher performance by those in the Loader/Gunner Track than those in the Driver and TC Tracks, although the 35% on Vehicle Identification was the lowest percent "GO" on all TC lessons.

Noticeable in Table 3 is the uniformly low performance of the SMMT group. Few if any of the trainees passed the post-tests for those TEC lessons sampled, which indicates they knew substantially less about how to perform tasks--at least in the eight areas tested--than did the TCST group.

Trainee Opinion

To supplement performance data, trainee opinions were measured using an 18 item questionnaire (Appendix B). The questionnaire was given to each group of trainees before training began and again after it was completed. Questions pertained to the quality, pace, and accomplishments of both audio-visual and hands-on training. The substance of the questions was the same in both pre-training and post-training versions of the questionnaire. Only the verb tense changed, with the pre-training version designed to elicit expectations (e.g., "Will you like....") and the post-training version to elicit opinions (e.g., "Did you like....").

TABLE 3

PER CENT "GO" ON SELECTED WRITTEN (TEC) POSTTEST
FOR THE THREE TRAINING PROGRAMS

	TRAINING PROGRAM					
	TCST		EBNCOC		SMMT	
Written Test	N	%"GO"	N	%"GO"	N	%"GO"
Loader/Gunner						
Coax Maint.	11	73		--[1]	24	0[2]
Coax Trblsht.	11	100		--	24	4[2]
Brsgt. I	10	70		--	24	25[2]
Brsgt. II	11	73		--	24	0[2]
Prep. for Opns.	11	91		--	24	0[2]
Aux. Fire Con.	11	91		--	24	0[2]
Xenon Slt.	11	64		--	24	42
Driver						
Op. Checks	10	40		--	24	0[2]
Tank Commander						
Veh. Ident.	11	35	17	41		--

[1] - indicates test results not available.

[2] Significantly smaller than corresponding percentage for TCST ($p < .05$).

Unfortunately, because of administrative difficulties, not all trainees completed both forms of the questionnaire. Data for those that did (Table 4) were analyzed in terms of shifts in opinion from what they expected before training to what they concluded after training. Responses were coded as favorable or unfavorable and tabulated by question for each trainee group. These data are summarized in Table 5. Post-training opinions of the EBNCOC group were slightly higher overall than those of TCST (81% and 75%, and both groups held substantially more favorable views of training than did SMMT (46%). But these results should be viewed in light of trainee expectations. Notice from pre-training responses that EBNCOC trainees were much more optimistic, with 81% on the average holding favorable expectations about the forthcoming training, whereas the TCST and SMMT groups averaged 57% and 61% respectively. Since the pre-training questionnaire was given before trainees had any knowledge of the instruction they were to receive, differences in expectations probably reflect differences in group characteristics; and since the EBNCOC group was distinguished by having relatively few 11-E (14% as compared to over 40% in each of the other groups), this difference in training background may have produced the difference in expectations. In any event, it is the shifts in favorability from before to after training that are noteworthy in Table 5. The TCST group showed an average increase in response favorability of nearly 20 percentage points, indicating that they thought the training was much better than expected. SMMT trainees, on the other hand, showed an average decrease of 15 percentage points, indicating they thought their training was poorer than expected. No change was found for the EBNCOC group who apparently found their training to be about what they had expected.

TABLE 4

RELATIVE NUMBER OF TRAINEES RESPONDING TO
THE TWO FORMS OF THE OPINION QUESTIONNAIRE

TRAINING PROGRAM	NUMBER OF TRAINEES	NUMBER COMPLETING BOTH FORMS	PERCENT COMPLETING BOTH FORMS
TCST	34	19	56
EBNCOC	46	13	28
SMMT	24	21	88

TABLE 5

AVERAGE PERCENT OF FAVORABLE QUESTIONNAIRE
RESPONSES FOR PRE- VERSUS POST-TRAINING ADMINISTRATION

TRAINEE GROUP	PRE-TRAINING	POST-TRAINING
TCST	57.0	75.4[1]
EBNCOC	81.3	80.8
SMMT	60.8	45.8[1]

[1]Statistically significant shift in response favorability

Discussion

Test Performance. "Hard" comparisons among the three programs are difficult if not impossible given differences in composition of the three groups, scope of the programs, training time, and methods of instruction. No one of these factors was systematically varied relative to the others, so post-training performance data is hopelessly confounded between the three programs. The best that can be done is to highlight the similarities and differences among the programs relative to training results observed.

The TCST and EBNCOC programs were similar in scope and in training time, only moderately different in training methods, but dissimilar in background characteristics of the trainees. Both groups consisted of over 80% active duty soldiers, but were quite different in MOS mix. The TCST group consisted of 41% 11-E, which by track subdivided as follows: 0%, Driver; 10%, Loader/Gunner; 93%, Tank Commander. Only 14% of the EBNCOC trainees held the 11-E MOS: 31% of the Drivers, 8% of the Loader/Gunners, and 0% of the Tank Commanders. Is the slightly superior overall hands-on performance by the TCST group (Table 2) attributable, therefore, to variation in instructional method or to the fact the EBNCOC program had more people to put through transition training? It is difficult to say conclusively, but reference to Table 2 indicates no dramatic reversals in pattern of performance between groups from track to track despite substantial shifts in MOS composition of subgroups. That is, taking the liberty of averaging hands-on performance by track for the two groups and comparing this with the MOS breakdown by track, as shown in Table 6, reveals no noticeable association between differences in performance under the two programs and shifts in MOS composition by track. This suggests that differences in test performance are probably not attributable to MOS characteristics of the two groups. But the reader should

TABLE 6

AVERAGE HANDS-ON TEST PERFORMANCE AND MOS COMPOSITION
BY TRACK FOR TCST AND EBNCOC

	TRAINING PROGRAM			
	TCST		EBNCOC	
TRACK	%11-E	AVG.%"GO"	%11-E	AVG.%"GO"
Loader/Gunner	11	97	8	88
Driver	0	100	42	87
Tank Commander	93	92	0	87
Total Group	41	96	14	87

bear in mind that this cannot be held conclusively, particularly in light of the relatively small differences in test results.

Even less can be concluded from a comparison of SMMT with the other two programs. Although differences were large in the few areas of performance measured, SMMT was dissimilar in scope, training time, training method, as well as in background characteristics of the trainees. SMMT attempted to train a group (predominantly reservists with less than half the years of service averaged by TCST trainees) in all four duty positions (plus several additional job tasks) in no more than twice the time available for training in the other programs. Indications are that this was simply too ambitious an undertaking, since the percentage of trainees who completed SMMT averaged 66% over all task clusters. A completion rate of 52% was reported for the Gunnery cluster and for the Maintenance cluster--the two SMMT areas which covered those tasks later tested in the post-training hands-on comparison. The 52% corresponds well with the 50% - 58% SMMT "GO" rate on the three hands-on tests sampled for comparative evaluation (Table 2). Thus, completion percentages for SMMT may offer reasonable estimates of hands-on proficiency in other areas as well.

Although SMMT performance shortfall cannot be attributed to a particular cause, a word about the self-management approach to training is called for. The advantages of self-instruction or self-pacing are well recognized. But it is only as effective as the quality of instructional materials and the management of the learning situation. Developing a self-instructional/self-managed training program requires much more time, effort and expertise than do instructor mediated training programs. In the case of the SMMT program, the developer's effort and competence could not possibly offset the severely limited time for development that was available. Indeed,

it would have been remarkable if even one of the fifty-plus modules could have been designed, tested and revised in the time and with the resources allotted for all.

Results of the trainee opinion questionnaire generally supported the foregoing discussion of performance outcomes. Soldiers completing TCST found the training to be significantly better than they had expected, and those completing SMMT found theirs to be significantly worse than anticipated, even though both groups began with about the same overall level of expectation. Opinion data for EBNCOC trainees were less conclusive, since for some reason they began training with much higher expectations than the other groups.

Reasons for the poor reactions to SMMT training are probably much the same as those mentioned in connection with the lower performance of this group. SMMT trainees were responsible for learning more tasks and were given a minimum of instructional guidance. That many failed to complete training is sufficient cause for their unfavorable reaction to the program.

2. Training Center Crew Mobilization Trainup

Following tryout of the three programs of individual skills training, TCST was selected for evaluation in conjunction with a crew training program. Twenty M60A1 tank crews from the 194th Armored Brigade participated in this trial run of a complete mobilization training package. Background characteristics of the trainees are shown in Table 7.

The training was conducted over a three week period, with the first week spent in diagnostic testing and remedial training of individual skills, TCST, and the last two weeks devoted to

TABLE 7

BACKGROUND CHARACTERISTICS OF TRAINEES

IN TCST(2)/CREW TRAINING

	CREW POSITION			
CHARACTERISTICS	LOADER	DRIVER	GUNNER	TANK CDR.
Number of men	24	21	21	22
Grade (Median)	E4	E4	E4	E6
PMOS (% 11E)	88%	90%	86%	73%
Age (Mean)	20.4	22.1	24.1	30.3
Years Service (Mean)	1.8	1.8	4.5	12.1

crew training. Though the crew training was not the crew module contained in the original TCST program, it did consist of practical exercises in maintenance, fire fighting, refueling, ammunition reloading, evacuation, tactical movement, pregunnery and firing position drills, plus various dry and live fire gunnery exercises. The two major criterion measures were a tank crew qualification test and gunnery performance on Table VIIC. Training was conducted by cadre from the U.S. Army Training Center Armor.

Results and Discussion

Individual Skills. Performance in TCST was measured in terms of knowledge (TEC) test and hands-on readiness test results as with all previous individual training. Post-test results on the TEC exercises were recorded and compared with those obtained in the previous study [TCST(1)]. These data are summarized in Table 8. Performance on completion of the TEC lessons was uniformly high. The group means by crew position were over 90 indicating the crew members were well prepared from the standpoint of knowledge of their individual skills. It is also worth noting that they scored as high or higher than TCST(1) trainees on 23 of the 29 written post-tests taken by both groups, though in most cases these differences were not large enough to be statistically reliable.

Pre-test performance on the hands-on portion of training is shown in Table 9 along with comparable data for the cadre. This comparison was made because the cadre group was more similar in background to TCST(2) trainees than was the TCST(1) group. Pre-test performance was low for all but the Loaders. The overall indication was that at the start of training the trainees needed considerable work on their individual skills. The extent to which this work was accomplished is not known, however, since post-test results of hands-on training were not available.

TABLE 8

MEAN SCORE BY CREW POSITION ON
WRITTEN (TEC) POST-TESTS FOR TCST GROUPS

	TCST (1)		TCST (2)	
CREW POSITION	NUMBER OF TESTS	GROUP MEAN	NUMBER OF TESTS	GROUP MEAN
Tank Commander	8	89.0	8	90.5
Gunner	9	91.6	10	96.1
Loader	12	92.7	10	97.1
Driver	2	77.5	4	98.2

TABLE 9

PER CENT "GO" ON HANDS-ON PRETEST FOR
CADRE AND TCST(2) TRAINEES

TEST	CADRE	TCST(2)
Tank Commander		
A Before Operations Procedures	64	10[1]
C Weapons System Preparation	71	40
E Tactical Operations	50	30
Gunner		
A Before Operations Procedures	50	0[1]
C Weapons System Preparation	62	0[1]
E Tactical Operations	85	68
Loader		
A Mission Preparation	65	60
B Combat Loading	54	85
C Weapons Maintenance	73	80
D Replenisher Tape	96	100
Driver		
B Before Operations Procedures	58	40
D Tactical Driving	62	40

[1]Significantly smaller than percentage in cadre column ($p < .01$).

In terms of their reactions to the individual readiness training, TCST(2) trainees rated the program about the same as the earlier TCST(1) group. Pre-training questionnaire responses averaged about 53% favorable, and rose to 67% after training, indicating they thought that overall the program was better than expected.

Crew Training. Achievement in crew training was measured chiefly by day and night versions of the Tank Crew Qualification Test (TCQT). Performance on the TCQT is summarized in Table 10. As measured in terms of the percentage of task standards met, Table 10 shows that on the whole crew proficiency ranged from 81% to 88% on non-firing duties and from 55% to 66% on the firing exercises.

Further gunnery data were available on five crews who fired Table VIIC both before and after crew training. Engagement times, accuracy, and point scores which were averaged over engagements and crews are listed in Table 11. Substantial improvement from before to after training was evident on all measures, though, because of the few crews involved, only the improvement in time scores was found statistically significant.

It is apparent from the available data that crew training was successful in improving crew performance. The question remains as to whether that improvement was sufficient. Crew proficiency levels of over 80%, as were reported for non-gunnery skills, may be satisfactory when judged against the objectives of mobilization training. Gunnery proficiency only marginally above 50%, however, probably is not.

TABLE 10

TANK CREW QUALIFICATION PERFORMANCE ON TASK STANDARDS

STANDARD	SATISFACTORY
Day Engagements	
Main Gun	
Crew Duties	85%
Time and Hits	66%
Machinegun	
Crew Duties	81%
Time	65%
Coverage	58%
Situation Reports	88%
Night Engagements	
Crew Duties	86%
Time and Hits	55%

TABLE 11

CREW GUNNER PERFORMANCE ON TABLE VIIC

MEASURE OF PERFORMANCE	BEFORE TRAINING	AFTER TRAINING
Opening Times[1]	16.6 sec	8.4 sec[2]
Closing Times[1]	31.3 sec	19.0 sec[3]
Area Coverage	27%	60%[4]
Main Gun Hits	20%	55%[4]
Scores[1]	295 pts	653 pts[4]

[1]Least square estimates for three missing values were obtained by Yates method (Cochran and Cox, 1957). Means were computed including the estimated values.

[2]Significant decrease from Before to After ($p < .05$).

[3]Significant decrease from Before to After ($p < .01$).

[4]No significant change.

3. Field Unit Annual Gunnery Training

This trial run of TCST was conducted in an active Army tank battalion preparing for annual gunnery qualification. During the pre-test phase of the implementation, the readiness tests were administered to the battalions' tank crewmen, and appropriate remedial instruction recommended for each based on readiness test results. A post-test was administered approximately five weeks later as each crew finished firing the gunnery tables.

Before the training was implemented, however, revisions in content and delivery procedures were made. Some changes pertaining to differences in the M60A1 and M48A5 tanks had been made on-the-spot during the two previous trial runs, but time had not been available to formally revise TCST for use with the M60A1 in an active Army setting. Content changes included: replacing M2 machinegun tasks with M85 machinegun tasks; changing references to support rollers in tasks concerned with track tension checks and adjustment; and, appropriately modifying nomenclature and descriptions of gages and warning lights in the driver's compartment. Readiness tests and training module outlines were prepared for additional tasks recommended for inclusion in the program by the Armor Center. In all, the tasks added to TCST are listed in Table 12.

Modifications in guidelines for test administration and training delivery were made to take advantage of differences between active and reserve units in time and resources available for training. The bulk of these changes pertained to guidance for testing, and included: instructions for administering and scoring the written portions of the readiness tests; instructions for the officer-in-charge of conducting the hands-on readiness tests; and instructions for scorers at each hands-on test station. These guidelines are presented in Appendix C.

TABLE 12

TASKS ADDED TO TEST

CREW POSITION	TASK
Driver	. Use camouflage, cover and concealment . Prepare tank for towing
Loader	. Operate tactical FM radio
Gunner	. Charge manual elevation system
Tank Commander	. Load an M85 machinegun . Clear an M85 machinegun
All crewmen	. Check operation of M3 heater (gas particulate unit)

Trainees. A total of 54 tank crews, or 216 soldiers, from an Armored Battalion at Fort Carson participated in the training study. Pre-testing and training proceeded from a Battalion Battle Roster designating the crew and crew position of soldiers for crew gunnery qualification (Table VIII). For the most part, crews normally manning a given tank were kept intact, with crewmen serving in their normal crew position; vacant slots, created by reassignment, impending separation from service, sickness, etc., were filled by drawing additional troops from the battalion on an as needed basis--an approach that in some cases led to crewmen being assigned to positions other than they normally held. Background characteristics of the trainee group are summarized in Table 13.

Scorers. Division demands for support depleted the ranks of those experienced personnel who had originally been singled out to administer the readiness tests during the pre-test phase of the study. As the only practicable alternative, each line company was asked to detail seven soldiers to serve as scorers. The 21 individuals chosen for this role were among those assigned to gunner and tank commander positions for the training and gunnery qualification study, so they served in both roles. Their experience in armor was generally typical of other gunners and tank commanders in the battalion.

Since these scorers were not available for the post-testing phase of the study, four new scorers were provided by the Armor School and trained by the study team. These four NCOs, under direction of the research and development coordinator of USARI-Fort Knox, conducted the post-testing phase in which readiness tests were administered to crewmen on completion of Table VIII firing.

TABLE 13

BACKGROUND CHARACTERISTICS OF
TCST ANNUAL GUNNERY TRAINEES

POSITION	NUMBER OF TRAINEES	GRADE (MEDIAN)	MO. SERVICE (MEAN)	AGE (MEAN) YRS.
Driver	46	E-4	25.9	21.3
Loader	43	E-4	34.9	21.6
Gunner	54	E-4	35.8	22.4
Tank Commander	58	E-6	83.2	27.3
ALL	201	E-4	47.0	23.4

Pre-test Procedures. Pre-testing and remedial training was conducted during two one-week periods. In general, the procedure involved the study team establishing liaison with the battalion, coordinating plans for data collection, training scorers, supervising collection of the written and hands-on test data, identifying appropriate remedial instruction for each soldier, and administering background and opinion questionnaires.

Two days were spent setting up the testing site[1] and training scorers. Scorers were briefed on the purpose of the training study and the kinds of hands-on performance tests to be administered, and instructed in the general scoring procedures to be followed (Appendix C). On completion of these familiarization activities and before further intensive scorer training, all scorers were administered the written and hands-on readiness tests for the positions (i.e., gunner or tank commander) to which they had been assigned in the study proper. All then completed their scorer preparation by alternately performing and scoring the hands-on tests that they would be administering during the pre-testing phase.

Each testing day began with a group of approximately 36 soldiers receiving a briefing on the nature and purpose of the study, completing a background and training expectations questionnaire,[2] and taking the written portions of the readiness tests. On completion of this first session, they reported to the hands-on testing site where they were identified by crew position and organized into four groups. Each group was then briefed on the testing procedure, told

---

[1]Test site layout and corresponding test components are given in Appendix D.

[2]This training expectations questionnaire, along with its counterpart post-training opinion questionnaire, was a revised version of that shown in Appendix B. Revisions entailed shortening it from 18 to 11 questions, and changing the response array from five scaled alternatives to a seven-point scale of agreement.

how they would progress through the testing stations, and informed of the first station to which they were to report. At a given station the scorer read a standard set of instructions to each soldier who was to be tested at that station. An example of the instructions given for a portion of the driver's hands-on readiness tests is provided in Appendix E. Also presented in this example are the tasks on which drivers were to be examined, the conditions under which testing was to occur, and a series of notes to remind test adminstrators about specifics of the testing procedure. The test then began and continued until performance on all of the relevant tasks had been evaluated. As each task was performed, the test administrator recorded in an answer booklet whether each required step performed satisfactorily (GO), unsatisfactorily (NO GO), or whether the step was not required and not performed (NA). Items not required and therefore marked NA were those for which the appropriate test conditions could not be met, either because of lack of equipment or terrain specifics. Approximately one and a half hours were required to test loaders, gunners, and tank commanders. Driver testing required about one hour. After testing, scorers returned all test booklets to a central collection point where they were reviewed and used to identify needs for refresher training for each soldier.

It is important to note that departures from prescribed testing procedure were detected during the pre-testing phase. For example, on parts A and C of the gunner and tank commander readiness tests. the tasks were frequently "talked through" by the soldier rather than actually performed. Although scorers were constantly discouraged from using this approach, it did in fact occur frequently.

Remedial Training. A soldier's performance on both the written and hands-on portion of the readiness test determines the instructional modules he will take. The remedial training for

both the written and hands-on portions of the readiness tests was to be conducted by each line company based on the needs of each soldier as determined by his test results. Then, the soldier would take the post-test for the appropriate TEC lessons and return to the hands-on test site to be retested only on those portions on which he received remedial training.

For a variety of reasons, the most compelling of which was continued division demands for support, the line companies were not able to conduct the remedial training for the hands-on portions. After the second day of testing, therefore, the testing procedure was modified. The scorers were instructed to remediate the hands-on tasks on the spot using one-on-one performance training and then retest the soldier immediately. The remedial training for the written tests was conducted as planned.

Following pre-testing and remedial training, soldiers returned from one to three days later to Battalion Headquarters where they reassembled for the purpose of completing a post-training opinion questionnaire.

Post-test Procedure. Approximately five weeks following pre-test and remedial training--a period in which the battalion fired the gunnery tables, to include a second experimental firing of Table VIII--the readiness tests were readministered to all available crewmen. The procedure followed in conducting the post-test was much the same as for the pre-test, except that fewer soldiers were tested at a time, and the four scorers conducting the testing were better trained and better supervised.

Results

Results of the training study are given in terms of individual readiness test performance, crew performance on Table VIII and trainee reactions.

Readiness Test Performance. Of those trainees designated for the training, a total of 208 took at least one portion of the readiness test appropriate to their crew position; 196 usable hands-on test and 115 written test scores resulted. The pre-test data are summarized in Tables 14 and 15. Results are tabulated in terms of the average proportion of steps in task performance (performance measures) correctly executed (Table 14), and in terms of the average proportion of tasks passed--that is, tasks in which all steps were performed correctly--(Table 15). Scores on the hands-on portion of the test were moderate to high, with the relative number of performance measures passed ranging from .76 for the loaders, to .95 for the tank commanders; mean proportion of hands-on tasks passed was slightly lower, ranging from .60 for loaders, to .87 for tank commanders. Substantially lower was overall performance on the written portion, where, as shown in Table 15, on no more than 10% of the tasks could soldiers typically answer all questions ("performance measures") about task performance. The pattern of scores over crew positions remained much the same regardless of the subtest or measure used, with loaders scoring the lowest, tank commanders the highest, and drivers and gunners in between.

A total of 130 soldiers took part in the post-test, and of these only 63 had taken the pre-test for the duty position in which they served during Table VIII qualification and post-testing. The

TABLE 14

AVERAGE TASK PROFICIENCY[1]
BEFORE GUNNERY TRAINING

POSITION	N	PRE-OP CHECKS	WPNS MTN	TAC OPNS	TOTAL H-O	N	TOTAL WRTN	N	TOTAL TEST
Tk Cmdr	57	.95	.92	.96	.95	28	.70	60	.81
Gunner	51	.86	.86	.93	.88	38	.36	54	.68
Driver	46	.79	N/A	.94	.87	30	.48	49	.73
Loader	42	.72	.75	.79	.76	19	.29	45	.68

[1]Mean proportion of performance measures passed by task, averaged over soldiers and task areas.

TABLE 15

MEAN PROPORTION OF TASKS
PASSED BEFORE GUNNERY TRAINING

POSITION	N	PRE-OP CHECKS	WPNS MTN	TAC OPNS	TOTAL H-O	N	TOTAL WRTN	N	TOTAL TEST
Tk Cmdr	57	.86	.90	.85	.87	28	.10	60	.49
Gunner	51	.63	.69	.78	.70	38	.05	54	.37
Driver	46	.63	N/A	.81	.72	30	.07	49	.39
Loader	36	.54	.56	.69	.60	19	.03	45	.31

remaining 67 occupied other positions during the pre-test, or were new to the battalion, or were newly assigned to tanks. Post-test scores, shown in Tables 16 and 17, indicate lower overall performance than for pre-testing. With exception of loaders, whose hands-on test performance remained about the same from pre- to post-testing, hands-on scores after gunnery training fell from 10 percentage points (tank commander) to 30 percentage points (gunner) below what they were before training. That individual skill proficiency would be lower after training than before makes little sense. Such a drop in proficiency might reasonably result from any of three conditions: (a) changes in crew personnel from pre-test to post-test periods, (b) more stringent scoring of the post-test, or (c) lower motivation of soldiers during post-testing when their formal qualification firing had been completed. The first of these can be evaluated by looking at the pre-post performance of the 63 crewmen tested both times. Shifts in post-test scores for these crewmen, as shown in Tables 18 and 19, generally parallel those for the groups at large, indicating that the skill level of new crewmen (or crewmen serving in different duty positions from those in which they were originally tested) were not substantially different from that of crewmen serving in the pre-test phase only. The possibility that lower post-test scores are attributed to lower motivation following gunnery qualification is not appealing, since there was no observable evidence of reluctance or apathy on the part of soldiers tested as reported by the test administrators. The more likely explanation is that post-testing was conducted more rigorously than the pre-testing. As mentioned earlier, the NCOs who scored the post-test were from outside the test battalion and were carefully trained and supervised in administering the readiness tests, whereas, those who administered the pre-test belonged to the test battalion, also participated as trainees, and were less well trained and supervised in their role as testers. The readiness test results, however rationalized, certainly do not indicate that any

TABLE 16

AVERAGE TASK PROFICIENCY[1]
AFTER GUNNERY TRAINING

POSITION	N	PRE-OP CHECKS	WPNS MTN	TAC OPNS	TOTAL H-O	N	TOTAL WRTN	N	TOTAL TEST
Tk Cmdr	30	.86	.88	.83	.85	31	.45	31	.65
Gunner	41	.45	.43	.80	.56	41	.32	41	.44
Driver	26	.61	N/A	.64	.62	26	.48	26	.55
Loader	32	.67	.90	.79	.78	32	.26	32	.52

[1]Mean proportion of performance measures passed by task, averaged over soldiers and task areas.

TABLE 17

MEAN PROPORTION OF TASKS
PASSED AFTER GUNNERY TRAINING

POSITION	N	PRE-OP CHECKS	WPNS MTN	TAC OPNS	TOTAL H-O	N	TOTAL WRTN	N	TOTAL TEST
Tk Cmdr	30	.62	.74	.69	.68	31	.11	31	.40
Gunner	41	.22	.20	.63	.35	41	.02	41	.19
Driver	26	.36	N/A	.45	.41	26	.09	26	.25
Loader	32	.49	.59	.70	.59	32	.02	32	.31

TABLE 18

AVERAGE TASK PROFICIENCY[1] BEFORE AND AFTER
GUNNERY TRAINING FOR CREWMEN TESTED BOTH TIMES

POSITION	TEST PERIOD	N	PRE-OP CHECKS	WPNS MTN	TAC OPNS	TOTAL H-O	N	TOTAL WRTN	N	TOTAL TEST
Tk Cmdr	Before	27	.96	.97	.96	.96	15	.39	28	.80
	After		.88	.91	.85	.87		.46		.66
Gunner	Before	18	.83	.80	.90	.85	12	.37	18	.70
	After		.57	.51	.84	.64		.40		.52
Driver	Before	11	.85	N/A	.97	.91	7	.38	11	.74
	After		.63	N/A	.63	.63		.50		.56
Loader	Before	6	.68	.91	.90	.84	3	.40	6	.72
	After		.83	.90	.97	.90		.37		.62

[1]Mean proportion of performance measures passed by task, averaged over soldiers and task areas.

TABLE 19

MEAN PROPORTION OF TASKS PASSED BEFORE
AND AFTER GUNNERY TRAINING FOR CREWMEN TESTED BOTH TIMES

POSITION	TEST PERIOD	N	PRE-OP CHECKS	WPNS MTN	TAC OPNS	TOTAL H-O	N	TOTAL WRTN	N	TOTAL TEST
Tk Cmdr	Before	27	.88	.93	.84	.88	15	.10	28	.49
	After		.64	.77	.71	.71		.11		.41
Gunner	Before	18	.67	.61	.70	.66	12	.06	18	.36
	After		.29	.23	.71	.41		.04		.23
Driver	Before	11	.72	N/A	.87	.79	7	.04	11	.41
	After		.39	N/A	.43	.41		.05		.23
Loader	Before	6	.51	.81	.82	.71	3	.07	6	.39
	After		.62	.57	.82	.67		.05		.36

useful individual skills training took place in the two-week pre-test and training period that preceded regular gunnery training.

Crew Gunnery Performance. Performance of crews in gunnery qualification (Table VIII) comprises the best available criterion of the effectiveness of TCST and subsequent crew gunnery training. Data on Table VIII qualification for the test battalion was less than firm, since the battalion's objective was to continue remedial runs of the table until all crews qualified. Scores available for this report, which include some of the initial reruns of the qualification table, indicate that 22 of 54 tanks, or about 40%, achieved the 1400 points necessary for qualification. The 40% figure may be viewed as a generous estimate of first run Table VIII qualification.

Though the overall levels of both individual (hands-on post-test) and crew (Table VIII) skill suggest less than adequate training, it was assumed that the two would correlate positively; that is, crews with greater individual skill would tend to score higher on Table VIII. Thus, correlations were computed between hands-on subtest performance and Table VIII scores. This was done for tank commanders and gunners only, since they are the more critical crew positions and since so few drivers and loaders took the post-test. The correlations, presented in Table 20, offer no support of a relationship between individual skill proficiency and crew gunnery. In fact, if the coefficients could be considered statistically reliable, they would indicate a general negative relationship between individual skill and crew gunnery proficiency. Worth noting, perhaps, is the row of low positive correlations for gunner target-engagement test performance and Table VIII scores, an array which stands in contrast to the predominance of low negative coefficients. The three "significant" negative correlations are not particularly meaningful since 5% or three of the 60 correlations computed might reasonably be expected to achieve statistical

TABLE 20

CORRELATION OF TANK COMMANDER, GUNNER AND CREW READINESS TEST SCORES WITH TABLE VIII PERFORMANCE

		TABLE VIII				
POSITION	READINESS TEST	MACH. GUN	MAIN GUN	DAY	NIGHT	TOTAL
Tk Cmdr (N=28)	Pre-Op H-O	.06	-.16	-.15	-.02	-.12
	Wpns Prep H-O	-.15	-.28	-.22	-.40[1]	-.36
	Tgt Eng H-O	.11	-.28	-.44[1]	.12	-.22
	Total H-O	.01	-.31	-.37	-.12	-.30
	Total Wrtn	-.01	-.12	-.21	.09	-.09
	Total Test	.00	-.26	-.34	-.02	-.24
Gunner (N=24)	Pre-Op H-O	-.16	.06	-.03	-.13	-.11
	Wpn Prep H-O	.01	-.02	.01	-.23	-.13
	Tgt Eng H-O	.09	.18	.06	.13	.12
	Total H-O	-.02	.09	.01	-.10	-.05
	Total Wrtn	-.15	-.25	-.08	-.43[1]	-.33
	Total Test	-.09	-.04	-.02	-.27	-.19

[1]Statistically significant at the .05 level.

significance by chance. About all that can be said, on balance, is that tank commander and gunner skills, as measured by TCST readiness tests did not reliably correlate with crew gunnery proficiency on Table VIII. It cannot be determined whether this is a result of readiness test or Table VIII unreliability, or of the calculations being based on a biased sample of the battalion's crews; or whether the skills tested in TCST are in fact of no relevance to crew gunnery performance.

Trainee Opinions. The opinions of trainees involved in the pre-test and remedial training phase of the study offer another source of information regarding the merit of TCST as implemented. An 11-item training expectation/opinion (before/after) questionnaire, similar to that used in the previous studies, was administered to trainees. Because of an administrative error, only 93 of the trainees completed both the Training Expectation and Training Opinion questionnaires. The mean expectation response, when taken over the 11 items and 93 respondents, was 3.86, indicating that trainees generally expected the training to be neither particularly good nor particularly bad (3.5 being the middle of the 7-point unfavorable-favorable scale.) Though after training the average opinion of trainees rose to 4.04, the shift in favorability was not significant. Moreover, when averaged over the 11 items, the number of trainees who reported various aspects of the training to be poorer than they expected was greater than the number who shifted in the positive direction (Table 21), although this difference also was statistically unreliable. Taken item by item, only two shifts were statistically significant: one positive, indicating that trainees found that less training time than expected was spent on things they already knew; and, one negative, indicating that more time than expected was spent in the classroom. Overall, the opinion data suggests that trainees found the training to be about what they expected--ordinary.

TABLE 21

MEAN NUMBER OF SHIFTS[1] IN OPINION
FROM BEFORE TO AFTER TRAINING

POSITIVE SHIFTS	NEGATIVE SHIFTS	NO CHANGE
31.4	38.0	23.6

[1]Number of trainees, averaged over the 11 items.

Discussion

The outcome of this study suggests that TCST, as conducted, contributed nothing either to the individual proficiency of crewmen or to their ability to function effectively in a crew gunnery exercise. The best overall estimate of crewman proficiency is probably the per cent of hands-on tasks passed in the post-test, a figure averaging about 50%, and ranging from 35% for the gunners tested to 68% for the tank commanders. Such results are not inconsistent with the 40% gunnery qualification observed for the battalion.

That little useful training was conducted is not surprising in light of the trainer, training, and trainee turbulence that existed over the course of the study. The original group of tester/trainers earmarked to conduct TCST were replaced at the last minute by less experienced line-company crewmen because of preemptory battalion support requirements. For similar reasons, apparently, plans for conducting remedial training in the company areas had to be changed during pre-testing, with testers taking on the additional responsibilities of providing on-the-spot remediation. Fluctuations in the trainee sample from one phase of the study to the next severely constrained efforts to collect useful longitudinal data. These difficulties simply aggravated attempts to draw meaningful conclusions from what was, at best, a weak study design for evaluating TCST as an augmentation to battalion gunnery training.

4. Accelerated Tank Crew Replacement Training

In support of the ARTs Group study program, the Fort Knox Field Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences planned a field experiment to investigate the effects on combat readiness of turbulence among tank crewmen. One of the experimental conditions of the study involved a group of tank crews in which regular gunner and loaders were replaced by non-11E MOS soldiers who were to receive a short accelerated tank gunnery training program. The training of replacement gunners and loaders was to be accomplished using TCST, modified to accomodate constraints implicit in the following scenario:

> NATO and Warsaw Pact forces are engaged in a general war with major land battles being conducted in Western Europe. NATO tank losses have been excessive and the U.S. Army's replacement system for 11E MOS personnel is inadequate. The USAREUR Commander in Chief has established a small armor cadre in the communications zone to train available personnel as tank gunners and loaders. He also directed the divisions to provide for a short "shakedown" training period for incoming replacements prior to commitment to battle. Tank gunnery firing training devices are not available in the theatre of operations.

The constraints governing the modification and delivery of TCST were as follows:

- Tank commanders and drivers would be 11E MOS qualified personnel who had recently completed annual tank gunnery training.
- Non-11E soldiers would meet the physical and mental aptitude requirements of 11Es.
- The non-11E replacements would receive a two-day tank gunnery training program in the communication zone and a one-day training program in the combat zone.
- Tank commanders and drivers would represent an armor cadre in the communications zone and unit personnel in the combat zone.

- Limited tank gunnery training facilities would be available in both the communications and combat zones.
- Tank gunnery Table VIII would be used as the criterion of combat readiness.

These conditions were to guide the trial implementation of TCST, the purpose being to evaluate the modified program in terms of its usefulness in rapidly preparing non-11E soldiers to function effectively in a tank crew.

Approach

Conduct of the study entailed adapting TCST to the training constraints, identifying the trainee group, delivering the training, conducting a Table VIII gunnery qualification run, and administering individual readiness tests.

TCST Modification. Considering the entry level skills of the trainees and the limited training time and resources, it was necessary to limit the scope of TCST to the bare minimum gunner and loader skills essential to successful participation in Table VIII. This was accomplished by first analyzing the content of the Fort Carson Table VIII (Appendix F) and then checking gunner and loader task requirements against the tabulated gunnery engagements (Appendix G). Areas in which the Fort Carson Table VIII differed from that prescribed in FM 17-12 enabled the deletion of some tasks, since the Carson Table VIII did not include: simultaneous engagements, firing from a moving tank, range-card-lay-to-direct-fire, NBC engagements, tank commander main gun firing, IR or flare engagements.

Critical gunner and loader tasks were then organized into functional groups (Appendix H), and the groups or training modules structured to accomodate available assets. Training assets

(Appendix I), the most constrained of which were time and ammunition, dictated that the training be sequenced in terms of task complexity so that simple procedural tasks were learned first, the more skilled tasks next, the interactive aspects of crew tasks last. Also, skill development was to progress from hands-on non-firing, through "dry" and sub-caliber firing, to live firing. The acquisition of crew gunnery skill was based on intensive practice on the sub-caliber gunnery tables plus one "dry" and one live-fire run of a modified Table VII (See Appendix J). TCST training techniques were to be followed, except that no pre-testing was necessary since the trainees were known to have no previous armor experience; one-on-one performance training was the predominant method, though the loader's track began with some self-paced audio-visual knowledge training (TEC lessons). An overview of the three-day program is given in Figure 1.

Trainees. Twenty-two soldiers with Primary MOS other than 11E were identified at Fort Carson for participation in the study as replacement tank gunners and loaders. The range of MOS represented is shown in Table 22. The trainees were typically E-3s and E-4s with slightly less than 2 1/2 years of service and an average age of about 21 years (Table 23).

Trainers. Eleven experienced tank commander-driver pairs were designated as trainers of the gunner and loader replacements. All had just completed their annual gunnery training and were selected for participation in this part of the turbulence experiment because they had since lost their gunner or loader (or both) for various administrative reasons. No time was provided for training the tank commanders and drivers in how to conduct the training, so they proceeded, under supervision of the three-man research team, using the prepared materials, procedures and schedules the best they could.

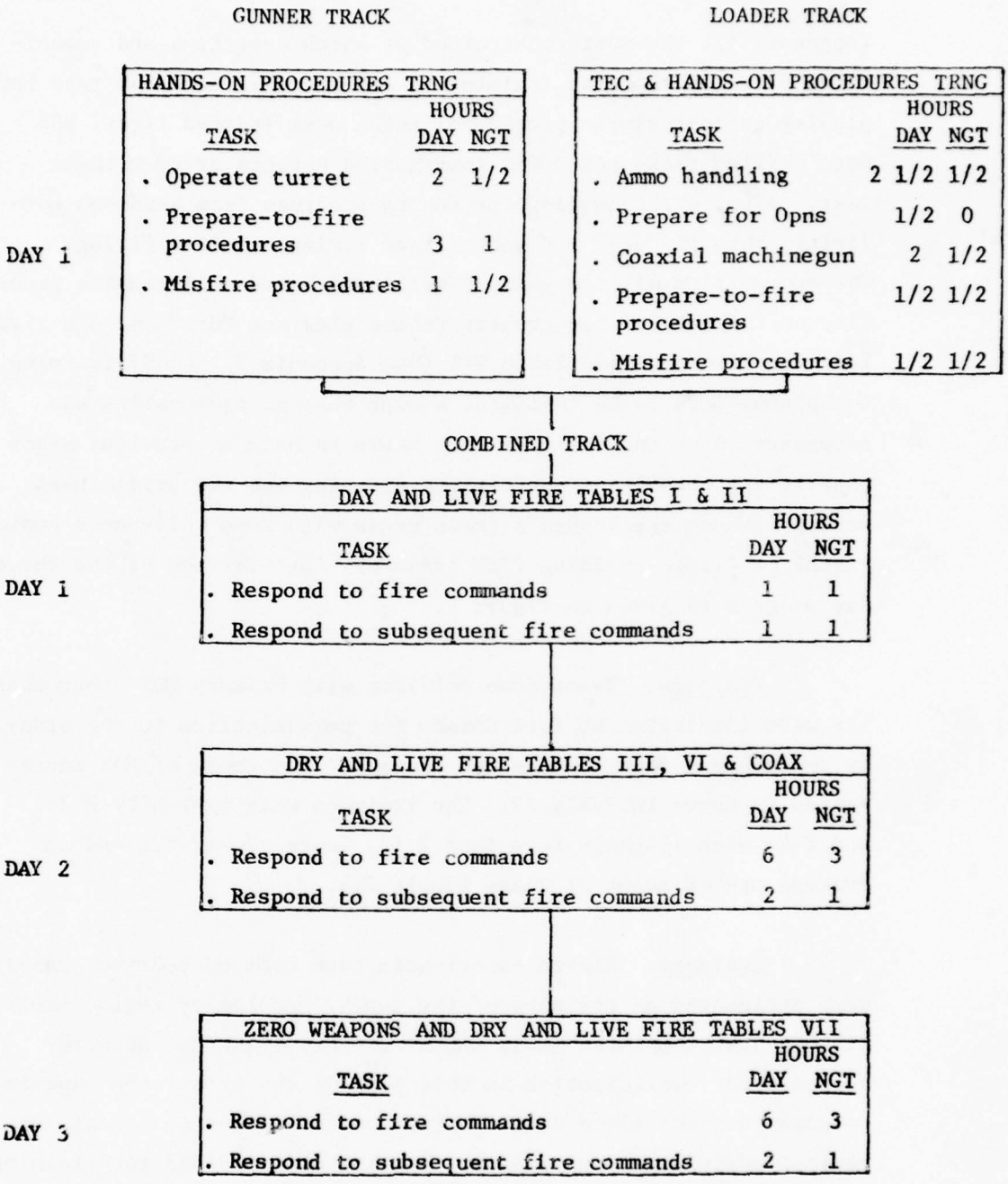

Figure 1. Overview of three-day TCST accelerated gunner/loader replacement training.

TABLE 22

DISTRIBUTION OF MOS
FOR TCST REPLACEMENT TRAINEES

PMOS	TITLE	FREQUENCY GUNNER	LOADER
00U	Race Relations Specialist	1	
05E	Voice Radio Operator	1	1
11B	Infantryman	2	1
36K	Tactical Wire Opns Specialist	1	1
63B	Wheel Vehicle Mechanic	1	
63C	Track Vehicle Mechanic		1
71L	Administrative Specialist	1	1
72E	Telecommo. Center Specialist		1
76Y	Unit Organization Surveyman	1	
94B	Food Service Specialist	1	2
95B	Military Policeman	2	2
95C	Corrections Specialist		1

TABLE 23

BACKGROUND CHARACTERISTICS
OF TCST REPLACEMENT TRAINEES

POSITION	NUMBER OF TRAINEES	GRADE (MEDIAN)	MONTHS SERVICE (MEAN)	AGE (MEAN)
Loader	11	E-3	22.8	21.4
Gunner	11	E-4	31.6	20.9

Training Procedure. Three replications of the three-day program were conducted, with eight replacements trained to fill out four crews in each of the first two replications, and the remaining six to fill out three crews in the final run of the program. The training thus spanned nine days in preparing 11 crews for qualification firing. At the beginning of the first day, the replacement trainees were assembled and two were assigned to each tank commander. After providing a brief orientation on the M60A1 tank, the tank commander designated which trainee would be the gunner and which the loader. Individual training then began, with the tank commander working with gunner, and the driver with the loader. Non-firing procedure training for the gunners was done on the tanks; for loaders some was done on the tanks and some in a weapons storage shed using TEC lessons for ammunition handling and dismounted coaxial machineguns for assembly/disassembly. After approximately six hours of procedures training, each pair of trainers brought their trainees together to begin coordinated crew practice in "dry" fire responses to fire commands. Training progressed as outlined in Figure 1 through the second day. At the end of the second day gunner and loader trainees were told that they had completed the two-day "communications zone" training program and would now be sent to a tank unit in the "combat zone." The tank commanders and drivers were commended for their efforts as a "rear area" armor training cadre. They were then redesignated as tank commanders and drivers of a tank company in the "combat zone" and alerted to receive gunner and loader replacements. Upon receiving replacements, they would have one day for "shakedown" training before being committed to "combat." At this time gunner and loader trainee teams were restructured and assigned to a new tank commander-driver team. The third day of "combat zone" training consisted of zeroing weapons and then firing Table VII, first "dry" and then live.

This training procedure was followed in each of the three replications of the three-day program.

Qualification Firing and Readiness Testing. On completing accelerated replacement training the crews fired Table VIII for qualification, after which replacement gunners and loaders were given the TCST readiness tests appropriate to their position. Readiness testing was done as part of the post-testing described in the previous study.

Results

Results of the training study are given in terms of crew performance on Table VIII, individual skill acquisition as measured by the readiness tests, and trainee reaction to the program.

Table VIII Performance. Ten of the 11 crews completed Table VIII. Scores ranged from a low of 481 to a high of 1480, with an average of 1145. Three crews fired above the 1400 minimum for qualification. Table VIII performance is summarized in Table 24 along with comparable scores from a group of intact crews who fired the same Table VIII in the same time period and under the same conditions.[1] The 11 intact crews averaged 1135 points which is essentially the same as that achieved by the crews with non-11E replacement gunners and loaders. Though both groups qualified the same number of crews (three), it should be noted that all of the intact crews completed the gunnery table, whereas one of the crews with replacements did not. An interesting trend shown in Table 24 was that the crews with replacements fired better during the day than at night. According to gunnery lore, apparently, it is considered easier to hit targets at night, at least under conditions of white light. The intact crews did fire better at night than during the day, though the difference was not statistically significant. The

[1] A more detailed account of the comparitive performance of crews involved in the turbulence study is given in: Eaton, Newell K. and Neff, Janet F. The Effects of Tank Crew Turbulence on Tank Gunnery Performance, Army Research Institute, Draft Technical Paper, June 1978.

TABLE 24

AVERAGE TABLE VIII SCORES FOR CREWS
WITH NON-11F REPLACEMENTS AND FOR INTACT CREWS

TYPE CREWS	NUMBER	DAY MNGN	DAY MHGN	DAY TOTAL[1]	NIGHT MNGN	NIGHT MHGN	NIGHT TOTAL[1]	TOTAL MNGN	TOTAL MHGN	TOTAL TOTAL[1]
Replacements	10	401	166	582	388	153	563	788	319	1145
Intact	11	329	156	510	435	165	625	764	321	1135

[1]Includes additional points for driving.

relative difference in day versus night performance for the two types of crews was not statistically significant either.

Readiness Test Performance. Performance of the replacement crewmen on the post-Table VIII readiness tests is shown in Tables 25 and 26 along with corresponding scores for regular gunners and loaders who had participated in the annual battalion gunnery training program. Using hands-on performance as the best overall indication of individual skill achievement, replacement gunners averaged 16% of the tasks and 30% of all performance measures, or slightly less than half the proficiency of regular tank gunners; loader replacements averaged 52% "GO" on the tasks and 65% of the performance measures, or about 75% - 80% as proficient as regular loaders. Individual proficiency was, as expected, even lower in areas where little or no training was given. Gunners, especially, were immersed in gunnery or target engagement training (Tactical Operations) from the start, and thus were given little practice on tasks in the areas of Pre-Operations Checks or Weapons Preparation. Loaders, who received relatively more training in the Pre-Operations and Weapons Maintenance, tended to do better in these areas on the readiness tests.

Readiness test sub-totals, when correlated with crew Table VIII scores, reveal little in the way of systematic data regarding the contribution of gunner or loader skill attainment to crew gunnery proficiency. Individual proficiency and crew gunnery tended to correlate positively for gunners and negatively for loaders (Table 27). When gunner and loader readiness test scores were combined, an overall low positive correlation with crew gunnery resulted (Table 28). Because of the small number of crewmen involved, none of these correlations--either positive or negative--were

TABLE 25

AVERAGE TASK PROFICIENCY[1] OF REPLACEMENT
VERSUS REGULAR GUNNER AND LOADER TRAINEES

POSITION	GROUP (N)	READINESS TEST					
		PRE-OP	WPNS	TAC-OP	H-O TOT	WRT TOT	TEST TOT
Gunner	Rep (11)	.20	.14	.63	.30	.18	.24
	Reg (30)	.54	.52	.81	.64	.36	.50
Loader	Rep (11)	.52	.55	.88	.65	.17	.41
	Reg (21)	.74	.91	.91	.86	.30	.58

[1]Mean proportion of performance measures passed by task, averaged over soldiers and task areas.

TABLE 26

PROPORTION OF TASKS PASSED BY REPLACEMENT
VERSUS REGULAR GUNNER AND LOADER TRAINEES

POSITION	GROUP (N)	READINESS TEST					
		PRE-OP	WPNS	TAC-OP	H-O TOT	WRT TOT	TEST TOT
Gunner	Rep (11)	.10	.05	.35	.16	.00	.08
	Reg (30)	.27	.25	.71	.41	.03	.22
Loader	Rep (11)	.40	.52	.65	.52	.02	.27
	Reg (21)	.56	.56	.79	.64	.03	.33

TABLE 27

CORRELATION OF READINESS TEST SCORES AND
TABLE VIII SCORES[1] FOR GUNNER AND LOADER REPLACEMENTS

POSITION	READINESS TEST	TABLE VIII				
		MACH GUN ENGMTS	MAIN GUN ENGMTS	DAY TOTAL	NIGHT TOTAL	TABLE VIII TOTAL
Gunner (N = 10)	H-O Total	.47	.25	.10	.42	.34
	WRT Total	-.26	.14	-.03	.06	.03
	Test Total	.31	.26	.08	.39	.31
Loader (N = 9)	H-O Total	-.27	-.40	-.44	-.26	-.39
	WRT Total	.18	-.56	-.25	-.38	-.39
	Test Total	-.13	-.54	-.44	-.36	-.47

[1]Table VIII scores for the crews in which the replacements served.

TABLE 28

CORRELATION OF READINESS TEST SCORES[1] AND
TABLE VIII SCORES FOR CREWS (N=10) CONTAINING
REPLACEMENT GUNNERS AND LOADERS

READINESS TEST		DAY TOTAL	NIGHT TOTAL	TABLE VIII TOTAL
Total H-O		.01	.36	.26
Total WRT		.08	-.13	-.06
Total Test		.05	.25	.20

[1]Gunner and loader scores averaged.

statistically significant. The reason for the difference in the trend of the correlation for gunners and loaders is not clear. Certainly gunner skills are more critical than loader in firing a gunnery table, but this does not explain the tendency toward a negative relationship for the loader. Moreover, the fact that the combined scored (Table 28) produced on balance, a positive relationship reflects only the greater variance in gunner test scores and not the relative importance of the two positions to crew gunnery.

Trainee Opinions. The pre-post training opinion questionnaire used in the previous study was not used here since those questions were couched in terms of comparisons of TCST and other armor training programs--comparisons the non-11E soldiers could not make validly. Thus, in an effort to get some indication of trainee reactions to the program without taking much time, a brief three-item questionnaire was administered before and after training. The pre [post] questions, each of which presented a five-point response scale, pertained to: (1) Whether they thought [found] that learning to fire a tank would be very easy ... very difficult, (2) whether they thought they would be able to [can] fire a tank very well ... not very well, (3) whether they thought [found] that learning to fire a tank would be [was] very interesting ... boring. Shifts in response from before to after training were generally favorable, though not significantly so. Trainees found that firing a tank was somewhat easier (mean of 2.5 on a five-point scale) than they thought it would be (3.1) before training. They also reported that they thought they were slightly better at it (2.1) than they thought they would be (2.6). Overall, they expected it to be very interesting (1.4) from the outset and, indeed, found it to be (1.4) when they had completed the program.

Discussion

The outcome of this trial run of a modified TCST program for replacement gunners and loaders was successful. The training was well received by the participants and, though individual skill attainment was only moderate, achievement in critical tasks apparently was sufficient to enable trainees to function effectively in crew gunnery exercises. When viewed relatively, crew performance was quite good overall; in terms of average score on Table VIII and number of tanks qualified, crews with replacement gunners and loaders did as well as experienced intact crews. On an absolute basis, however, neither group can be considered really well trained. A qualification figure of 27% falls considerably short of what would be termed combat ready for either group.

Two additional points relevant to the outcome of this study should be mentioned. The first pertains to the intensive schedule with which training was conducted. No more than four pairs of replacement trainees were handled during a three-day training period, each spending 12 hours a day under the tutelage of a two-man team of trainers (tank commander and driver) who in turn had nearly full-time access to a member of the training research staff. The second point pertains to the high level of motivation that prevailed throughout the course of the training. All personnel--trainees, trainers, and supervising research staff alike--were quite obviously committed to success of the experimental program. This was due in part to the novelty and challenge of the task before them, and in part to a very real concern for the danger inherent in allowing novice crewmen to participate in a live fire gunner exercise. It is likely that the intensity and commitment with which the program was carried out had as much to do with its success as did its substance and design.

5. Accelerated Tank Crew Refresher Training

This trial application of TCST involved extending the accelerated version of the program, as described in the previous study, to the refresher training of experienced tank crews who had had no recent gunnery training. The training evaluation study was modeled from the following scenario:

> A tank company, which is assigned to a tank battalion in the 2nd Armored Division, has been involved in mission support duties for an extended period and has been unable to conduct other than mandatory training. The battalion has just been alerted for emergency deployment in ten days to USAEUR. The company commander has been instructed to prepare his tank crews for deployment. He has 72 hours for refresher training. [In another situation he has 24 hours for refresher training.] The company is limited to three rounds of 105mm HEAT TP-T per crew, but had unlimited access to .50 caliber TELFARE subcaliber devices with appropriate ammunition.

A tank company assigned to support field test activities of the U.S. Army Combat Developments Experimental Command (USACDEC) at Fort Hunter-Liggett, California was available to participate in the gunnery train-up study. One-day and three-day accelerated training programs were tried out, with a newly developed Table VIII serving as the gunnery criterion test. The purpose was to compare the two programs in terms of the relative gunnery proficiency of participating crews. The priority of the one- and three-day training conditions and small number of crews available unfortunately precluded the use of a control condition.

Approach

The study was executed in five phases. First, the gunnery criterion test (Table VIII) was developed and set-up at the study site; then the one- and three-day training programs were prepared; next the trainee groups were established; training was then delivered; and, finally, the crews fired Table VIII.

Gunnery Criterion Test. Since no Table VIII gunnery range was available within reasonable distance of Hunter-Liggett, it was necessary to construct one. Consideration was given to patterning the gunnery table after the one at Fort Carson. But since it was concluded that a comparison of study results from the two sites could not be made validly anyway, a Table VIII was constructed which reflected current changes being incorporated in Armor School revisions to FM 17-12. The principal features of the new table, which grew out of the "Worldwide Tank Gunnery Conference"(WWTGC), differed from that used at Carson, with an increased emphasis on: multiple targets, simultaneous engagements, firing on the move, firing in an NBC environment, and conservation of ammunition. In addition, the scoring standards were more stringent than those for the old Table VIII.

TCST Modification. The approach taken in adapting TCST to the conditions and constraints of the training situation was much the same as that described earlier for the replacement training adaptation, except in this case analysis and revision was done for all four crew positions. First the content of the new Table VIII was analyzed (Appendix K) and crewman task requirements were checked against the tabulated gunnery engagements. This led to the addition of tasks pertaining to those new features of the WWTGC Table VIII mentioned above. Also a few basic tasks such as "Operate Intercom" or "Place Turret Into Power Operation" were deleted, since the training was targeted on experienced crewmen. The resulting tasks were organized into functional groups (Appendix L) and the groups or training modules structured to accomodate available assets (Appendix M). The principles followed in doing this were the same as described in the previous study: training progressed from individual to crew, from simple to complex, and from hands-on non-firing through "dry" sub-caliber firing, to live firing. The individual readiness tests

were used as pre-tests to diagnose each crewman's training needs. Pre-testing, individual remedial training, and crew exercises were much the same in form and content for both one- and three-day programs, the former being chiefly a condensed version of the latter. The two programs are summarized in Appendix N.

Trainees. Sixteen crews from an Armor Company assigned to USACDEC at Fort Hunter-Liggett participated in the training study. In their continuing support of field experiments, the company had not been involved in tank crew gunnery operations for the previous three years. Participation in Table IV a year ago was the only gunnery training the company had received. The crews were divided into two "equivalent" groups of eight on the basis of the tank commanders' scores on the written portion of their readiness test. One group of eight crews was then assigned to the three-day program, and the other group to the one-day program.

Training Procedure. The training and testing was conducted in two replications over two weeks. The company commander selected four of the one-day and four of the three-day crews for training and qualification firing the first week; the remaining two sub-groups of four completed the program the second week. Within each week crews in the one-day group received their day of training on the last day of the three-day program, so that the time from completion of training to Table VIII firing was the same for all crews.

Training was carried out (at least during the second week) as outlined in Appendix N. Members of the research team, including three experienced and trained armor NCOs from Fort Knox, pre-tested and provided remedial training for the tank commanders. The remaining pre-testing and training within the crews was conducted by the tank commanders under supervision of the research staff.

Training went as scheduled during the second week. The first week, however, was plagued with delays caused by difficulty in getting TELFARE devices to operate, equipment breakdowns, and recurring range fires caused by tracer ammunition. The delays were so extreme that little if any training was completed in the three-day group before their third and last day. During the third day of the first week, training proceeded reasonably well for the one-day group, with all four tank commanders being certified on their individual tasks and their crews completing Table VIIC and firing the three service rounds; crews in the three-day group also managed to complete Table VIIC and fire their service rounds. As mentioned, the training went smoothly for the two groups in the second replication.

Qualification Firing. In each week, on the day following completion of training, crews from the one- and three-day programs alternated in firing Table VIII qualification. All runs of the qualification table were carried out using separate set of tanks that had been zeroed by company personnel not participating in the study. Table VIII firing was hampered throughout by range fires and dust which made it difficult for crews to sense rounds. Moreover, night firing in the second week was carried out with severely restricted visibility caused by weather conditions retaining the smoke from the day's firing, which diffused illumination and made targets difficult to detect.

Following Table VIII it was intended that each crewman be administered an individual skills post-test. Scheduling mix-ups and loss of equipment to preemptive support activities prevented post-testing both weeks.

Results

Crew Gunnery Performance. Table VIII results for the 16 crews are given in Tables 29-31. Overall, only three of the 16 crews achieved the 70% (seven of ten "engagements"[1] successfully fired) minimum score for qualification. Of the three qualifying crews, one was from the three-day group and two were from the one-day; all were from the first week of training (Table 29). When scored in terms of the percent of total engagements successfully fired (Table 31), the average for all crews was 37%. Crews in the one-day group averaged 40%, as compared to 35% for those in the three-day group. Those participating in the first replication (Week 1) averaged 44%, and those in the second week, 31%. The one-day group did better than the three-day in the first week, but the three-day group did better than the one-day in the second week. None of these differences in performance are statistically significant, chiefly because of the few crews involved.

Trainee Opinions. Most of the trainee opinion data was lost, since the post-training questionnaire was to be given along with the readiness tests. Some of the trainees from the first week did, however, complete both the expectation and opinion (before and after) questionnaires. The nine trainees from the one-day group began with training expectations that were slightly more positive than neutral (4.6), but indicated afterwards (4.1) that the training was not quite as good as anticipated. A similar negative but statistically insignificant shift (4.9 to 4.4) occurred among the nine trainees responding in the three-day group.

Discussion

As if the small number of crews and limited time frame were not sufficiently constraining, the study was troubled throughout with

---

[1]Nine actual engagements plus ammunition conservation.

TABLE 29

RELATIVE NUMBER OF CREWS QUALIFYING ON TABLE VIII BY TRAINING GROUP AND TRAINING WEEK

TRAINING WEEK	TRAINING GROUP 3-DAY	1-DAY	TOTAL
1	1/4	2/4	3/8
2	0/4	0/4	0/8
TOTAL	1/8	2/8	3/16

TABLE 30

AVERAGE NUMBER OF TABLE VIII ENGAGEMENTS[1] SUCCESSFULLY FIRED BY TRAINING GROUP AND TRAINING WEEK

TRAINING WEEK	(N)[2]	TRAINING GROUP 3-DAY	(N)	1-DAY	(N)	TOTAL
1	(4)	3.25	(4)	4.75	(8)	4.0
2	(4)	3.0	(4)	2.5	(8)	2.75
TOTAL	(8)	3.125	(8)	3.625	(16)	3.375

[1] A total of nine engagements, six day and three night, were contained in Table VIII.

[2] (N) = number of crews.

TABLE 31

PROPORTION OF TABLE VIII ENGAGEMENTS[1] SUCCESSFULLY FIRED DURING THE DAY AND NIGHT BY TRAINING GROUP AND WEEK

TRAINING GROUP	TRAINING WEEK	TABLE VIII DAY	NIGHT	TOTAL
3-DAY	1	.333	.417	.361
	2	.458	.083	.333
1-DAY	1	.583	.417	.528
	2	.333	.167	.278
	TOTAL	.427	.271	.375

[1]A total of nine engagements, six day and three night, were contained in Table VIII.

problems of equipment, weather, and scheduling. To begin with, there was some question as to whether the matching of groups in terms of tank commander knowledge test scores actually produced two sets of crews equivalent in experience and training readiness. Informally, the company commander revealed that the one-day training group probably had better crews to start with; and across both groups, those assigned to the first week were probably better than those in the second. Background data offered some support for those speculations, in that the three-day group had slightly fewer months of tank experience than the one-day group (12 versus 14), and crews in the second week fewer than crews in the first week (9 versus 15). The extent of this effect, unfortunately, cannot even be estimated, since very little training was accomplished the first week in the three-day program, and night firing criterion scores, especially during the second week, were severely degraded by prevailing weather and smoke conditions. With these confounded effects, it is difficult if not impossible to draw conclusions about the merit of the training or the relative merit of the one- and three-day programs. Looking just at performance of the second week's crews, where training went as planned, the three-day group did better than the one-day, but no crews qualified and the difference in per cent of engagements successfully fired is too small to warrant serious interpretation.

In the face of these considerations no conclusion can be drawn or even intelligent speculation made regarding the adequacy of one day or three days of TCST for refresher training of experienced tank crews.

CONCLUSIONS AND IMPLICATIONS

Design and conduct of the five trial applications of TCST reported here were fraught with shortcomings. Limited planning time and resources and the urgency of on-going training schedules precluded the kind of controlled intervention one strives for in program evaluation. The forms of training being studied were not designed as systematic variants of TCST; trainees were often identified on the basis of availability rather than suitability; those who delivered the training differed from study to study in background, motivation, and familiarity with the program; of those who administered the readiness tests, some were well trained and some were not, and some were more closely involved with the performance of trainees than others; live-fire criterion tests were not comparable from study to study. In short, study objectives, training procedures, and evaluation criteria accomodated the physical and personnel resources available in each case. Moreover, some data were not collected that should have been, other data were incomplete, missing, or unusable. That is much the nature of field studies.

Despite these shortcomings, some conclusions and implications are warranted. Some are based on data collected and others on informal observations or "lessons learned." They are presented under the headings of training need, training results, the training program, and training implementation.

Training Need. There is no doubt about the need for some kind of TCST to be used in preparing combat ready tank crews. Results of the training trials reported here indicate that despite the training no group of crews--experienced or inexperienced, with or without recent gunnery training--demonstrated a level of crew

gunnery proficiency that could be interpreted as combat ready. Qualification rates were from about 20% to 40%; even using the more liberal measure of percent of engagements successfully fired, group performance did not range beyond 60%. The need for training to rapidly produce and maintain tank gunnery proficiency is clear.

Training Results. The success of TCST in the five trial settings was modest. Two of the five studies produced what could be considered positive results. In one, the Training Center Active and Reserve Mobilization Train-up, TCST in comparison with two other programs produced reasonable evidence of its superiority, though no gunnery criterion test was included. In the other, the Accelerated Tank Crew Replacement Training study, TCST was used successfully in quickly preparing non-11E soldiers to fill in as gunners and loaders in a gunnery qualification test, a test in which their crews performed as well as experienced intact crews. Results of the remaining three trial implementations were inconclusive at best.

The Training Program. TCST is still in need of further development and evaluation. But it's principal design features are sound and are to be recommended for any such tank crewman skills training program:

- Individual readiness training should be individualized. Since there is considerable variation in the entry level skills of trainees, it is important that each block of training be adapted to the needs of the individual. This should be diagnosed by pretesting on all skills unless trainees are known to be totally naive.
- Individual readiness training should be performance based. All training, whether knowledge or hands-on, individual or crew, should begin with a pretest to determine what the individual or crew can and can't do. Even more importantly, an individual/crew should not be advanced from a module or block of instruction until proficiency has been demonstrated in a post-test.

- Individual readiness training should be instructor managed. Self-instruction to the point of self-management is not recommended. This does not imply the need for complete one-on-one training, but it does imply at a minimum that individual entry skill-level be tested by an instructor, who then assigns trainee learning activities, periodically monitors progress, assists as necessary, and signs-off on criterion performance.

- Individual readiness training should be closely tied to crew training requirements. Individual skill requirements should be carefully derived from crew skill requirements which, in turn, should be derived from unit performance criteria, viz., Tables VIII and IX and ARTEP.

- Individual readiness training should rapidly progress to crew readiness training. Trainees should begin team exercises (two-man, three-man and full crew) just as soon as minimum qualification on individual skills is achieved. This is especially important when training time is short.

- Maximum use should be made of dry and sub-caliber firing exercises. Though the adequacy of substitutes for service firing is not yet well documented, ammunition costs discourage frequent live-fire exercises. And since repeated intensive gunnery drills are necessary to achieve proficiency, the use of dry, sub-caliber, or other simulated forms of gunnery training are recommended.

Additional work on TCST is necessary. Except for the readiness tests, the program in its present form is little more than a detailed outline for training. Many of the training aids, devices and materials recommended have not been developed. Also, variations of the program necessary to accomodate different training conditions and resources need to be more systematically planned and evaluated.

Training Implementation. The most significant implication of the work done to date with TCST pertains to strategies for implementation. The quality of a training program is probably much less

important than the care with which it is implemented or the motivation of the trainers and trainees. This was vividly illustrated in the trial run of TCST as part of an armored battalion's annual gunnery training. A new training package or program simply cannot be handed to trainers and be expected to work. Detailed guidance on how to plan, schedule and deliver this training must be documented, validated and provided along with the program. Training of trainers in both the content of the program and procedures for conducting it is absolutely imperative. And, finally, the undiluted commitment of the commander to the program must be secured. The need for training implementation strategies simply cannot be overemphasized.

REFERENCES

Eaton, N.K. and Neff, J.F. The Effects of Tank Crew Turbulence on Tank Gunnery Performance, Alexandria, Virginia: U.S. Army Research Institute for the Behavioral and Social Sciences, 1978.

Harris, J.H., Osborn, W.C., and Boldovici, J.A. Reserve Component Training for Operating and Maintaining the M48A5 Tank. Alexandria, Virginia: U.S. Army Research Institute for the Behavioral and Social Sciences, 1977.

O'Brien, R.E., Ford, J.P., and Boldovici, J.A. Armor and Cavalry National Guard Training Constraints. Alexandria, Virginia: U.S. Army Research Institute for the Behavioral and Social Sciences, 1977.

APPENDIXES

Appendix		Page
A.	Synopsis of the "Reserve Component Training for Operating and Maintaining the M48A5 Tank"	68
B.	Trainee Attitude Questionnaire	73
C.	Guidance for Administering Readiness Tests	78
D.	Hands-On Test Components and Test Station Layout for TCST Battalion Training Study	108
E.	Sample Hands-On Test (From the Driver's Readiness Test)	111
F.	Analysis of Fort Carson Table VIII Engagements	118
G.	Identification of Gunner and Loader Tasks Required in Fort Carson Table VIII Engagements	120
H.	Critical Task Clusters Comprising the Training Content for Acclerated Gunner and Loader Replacement Training	124
I.	Training Assets for Accelerated Gunner/Loader Replacement Training	129
J.	Modified Table VII Used in Accelerated Gunner and Loader Replacement Training	131
K.	Analysis of WWTGC Table VIII Engagements	133
L.	Critical Task Clusters Comprising the Training Content for Accelerated Tank Crew Refresher Training	135
M.	Training Assets for Accelerated Tank Crew Refresher Training	141
N.	Overview of the One-Day and Three-Day TCST Programs for Tank Crew Refresher Training	143
O.	Cost Data for the Field Unit Annual Gunnery Training, the Accelerated Tank Crew Replacement Training, and the Accelerated Tank Crew Refresher Training	150

APPENDIX A

SYNOPSIS OF THE "RESERVE COMPONENT TRAINING FOR OPERATING AND MAINTAINING THE M48A5 TANK"

This training was developed in an effort to help meet the needs of Armor and Cavalry National Guard units. Development proceeded in four phases as follows:

1. Priority individual and crew tasks were selected for inclusion in the program by reviewing Army literature and reports of recent research on the criticality, comprehensiveness, and representativeness of Armor tasks.

2. A Crew Interaction Performance Test was developed. It consists of functional groupings of tasks identified as noted in 1, above, and has three modules:

   . Preoperations checks.

   . Weapon systems preparation.

   . Tactical operations.

   Since the Crew Interaction Performance Test contains tasks from Gunnery Table VIII, from the crew drills in TC 17-15-5, and from the Gunnery Skills Test, successful completion of the crew test was expected to be highly predictive of performance on the other tests.

3. Readiness tests were developed for each of the four M48A5 duty positions (Driver, Loader, Gunner, Tank Commander). The individual readiness tests are used in three ways:

   . As pre-tests, they are administered to prospective trainees (AIT graduates) before training begins. The soldier then follows a particular instructional sequence, depending on results of the pre-test.

   . As end-of-course mastery tests, after soldiers complete the instructional sequence dictated by the results of the first administration.

   . Diagnostically throughout training, to identify needs for refresher instruction.

4. Outlines for training modules were written for each duty position. Each module outline contains sections on:

   - Pretraining Conditions: the conditions leading to the need for mastering the contents of the modules; for example, failure to meet the standard on part of a readiness test.
   - Objective: a global statement of the desired behavior and the conditions under which the behavior is to be demonstrated.
   - Method: a brief statement of the stimulus materials and response modes appropriate for mastery of the module.
   - Equipment and materials.
   - Estimated time.
   - Procedure: an outline of a sequence of instructional events leading to mastery of the module.
   - Notes: answers to questions that might arise on reading the outlines.

The content of the individual training portion of the program is summarized in the module and unit listing in Table A.1. Readiness tests and the crew exercise were designed around these same task areas.

TABLE A.1

MODULES AND UNITS FOR INDIVIDUAL CREWMAN TRAINING

DRIVER	LOADER
OPERATIONAL CHECKS AND SERVICES	MISSION PREPARATION (KNOWLEDGE)
TANK PREPARATION AND START-UP	Operational Checks and Services
TARGET ACQUISITION	Ammunition Handling
Target Scanning	Boresighting M219 Machinegun
Locating and Reporting Targets	MISSION PREPARATION (SKILL)
Target Range Determination (Knowledge)	COMBAT LOADING (KNOWLEDGE)
Target Range Determination (Skill)	Selecting Ammunition
Target Recognition	Loading Ammunition
TACTICAL DRIVING I	Misfire and Unloading Procedures
Varied Terrain Driving (Knowledge)	COMBAT LOADING (SKILL)
Varied Terrain Driving (Skill)	Main Gun Loading
TACTICAL DRIVING II	Misfire and Stoppage Procedures
Evasive Driving (Knowledge)	M219 MACHINEGUN MAINTENANCE (KNOWLEDGE)
Target Engagement Driving	Mounting, Loading, Dismounting the Coax
	Clearing, Disassembly and Assembly of Coax
	WEAPONS MAINTENANCE
	REPLENISHER TAPE READING
	TARGET ACQUISITION
	Target Scanning
	Locating and Reporting Targets
	Target Range Determination (Knowledge)
	Target Range Determination (Skill)
	Target Recognition

[continued]

TABLE A.1 (cont'd.)

MODULES AND UNITS FOR INDIVIDUAL CREWMAN TRAINING

GUNNER	TANK COMMANDER
BEFORE OPERATIONS PROCEDURES	BEFORE OPERATIONS PROCEDURES
WEAPON SYSTEMS PREPARATION I	M2 Machinegun Headspace and Timing (Knowledge)
Boresight Weapon Systems (Knowledge)	Before Operations Procedures (Skill)
Boresight Weapon Systems (Skill)	WEAPON SYSTEMS PREPARATION I
WEAPON SYSTEMS PREPARATION II	Boresight Weapon Systems (Knowledge)
Zero Weapon Systems (Knowledge)	Ranging Test
Zero Weapon Systems (Skill)	Boresight Weapon Systems (Skill)
TARGET ACQUISITION	WEAPON SYSTEMS PREPARATION II
Target Scanning	Zero Weapon Systems (Knowledge)
Locating and Reporting Targets	Zero Weapon Systems (Skill)
Target Range Determination (Knowledge)	TARGET ACQUISITION
Target Range Determination (Skill)	Target Scanning
Target Recognition	Locating and Reporting Targets
TACTICAL OPERATIONS	Target Range Determination (Knowledge)
Misfire Procedures (Knowledge)	Target Range Determination (Skill)
Coaxial Machinegun Engagements (Knowledge)	Target Recognition
Target Engagements (Conduct-of-Fire Devices)	TACTICAL OPERATIONS
Target Engagements (Skill)	Initial Fire Commands (Knowledge)
	Machinegun Engagements (Knowledge)
	Target Engagements (Conduct-of-Fire Devices)
	Target Engagements (Skill)

APPENDIX B

TRAINEE ATTITUDE QUESTIONNAIRE

NAME_____ UNIT_____ SSN_____

Training Expectation Questionnaire

INSTRUCTIONS: In the next few days, you will be learning to perform the duties of a tank commander, gunner, driver, or loader. The following have to do with what you expect this training to be like. Please select the one answer that is closest to what you think the training will be like, and circle the letter for that answer. The answers will not be examined individually, therefore please answer each question truthfully.

I. Audio-visual (TEC) lessons.

1. Will the audio-visual lessons be interesting?

   a. Almost always
   b. Usually
   c. Some of the time
   d. Not usually
   e. Almost never

2. Will the audio-visual lessons have any mistakes in how the duties should be performed?

   a. Almost no mistakes
   b. Few mistakes
   c. Some mistakes
   d. Many mistakes
   e. Very many mistakes

3. Will the audio-visual lessons move along at the right pace for you to learn?

   a. Much too fast
   b. Somewhat too fast
   c. About right
   d. Somewhat too slow
   e. Much too slow

4. Will you get a chance to repeat a lesson if you need it?

   a. Almost never
   b. Not very often
   c. Sometimes
   d. Usually
   e. Almost always

5. Will the objective of the lesson (what you are supposed to learn) be explained in advance?

   a. Almost never
   b. Not very often
   c. Sometimes
   d. Usually
   e. Almost always

6. Can you learn from audio-visual lessons just as well as from hands-on practice?

   a. Usually better
   b. Sometimes better
   c. About the same
   d. Sometimes worse
   e. Usually worse

7. Will the lesson post-test give a good picture of what you have learned?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Not very often
   e. Almost never

8. How much will you like the audio-visual lessons?

   a. Very much
   b. Somewhat
   c. A little
   d. Not very much
   e. Not at all

II. Hands-on practice.

1. Will the instructor do a lot of useless talking before you get a chance to try each task?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Not usually
   e. Almost never

2. Will the instructor clearly explain and demonstrate what you are supposed to do to perform each task?

   a. Almost never
   b. Not usually
   c. Sometimes
   d. Usually
   e. Almost always

3. Will the instructor make mistakes in showing you how to perform the tasks?

   a. Almost never
   b. Not usually
   c. Sometimes
   d. Usually
   e. Almost always

4. Will you get enough chances and time to practice each task?

   a. Almost never
   b. Usually not
   c. Sometimes
   d. Usually
   e. Almost always

5. Will the instructor help you out when you need help?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Usually not
   e. Almost never

6. Will you be tested or checked out on a task before you are ready?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Not usually
   e. Almost never

7. Will the performance test show what you have really learned?

   a. Almost never
   b. Not usually
   c. Sometimes
   d. Usually
   e. Almost always

8. Will your instructor be a real expert on tanks?

   a. Very much so
   b. To some extent
   c. A little bit
   d. Not very much
   e. Not at all

9. How well will you know your job on tanks when you are done?

   a. Extremely well
   b. Very well
   c. Somewhat
   d. Not very well
   e. Very poorly

10. How much will you like hands-on training and practice?

    a. Very much
    b. Somewhat
    c. A little
    d. Not very much
    e. Not at all

Training Preference: What tank duty position would you like to train for most?

   a. Tank Commander
   b. Driver
   c. Gunner
   d. Loader

NAME_____ UNIT_____ SSN_____

Training Opinion Questionnaire

INSTRUCTIONS: In the last few days, you learned to perform the duties of a tank commander, gunner, driver, or loader. The following questions have to do with what you think this training was like. Please select the one answer that is closest to what you think the training was like, and circle the letter for that answer. The answers will not be examined individually, therefore please answer each question truthfully.

I. Audio-visual (TEC) lessons.

1. Were the audio-visual lessons interesting?

   a. Almost always
   b. Usually
   c. Some of the time
   d. Not usually
   e. Almost never

2. Did the audio-visual lessons have any mistakes in how the duties should be performed?

   a. Almost no mistakes
   b. Few mistakes
   c. Some mistakes
   d. Many mistakes
   e. Very many mistakes

3. Did the audio-visual lessons move along at the right pace for you to learn?

   a. Much too fast
   b. Somewhat too fast
   c. About right
   d. Somewhat too slow
   e. Much too slow

4. Did you get a chance to repeat a lesson if you needed it?

   a. Almost never
   b. Not very often
   c. Sometimes
   d. Usually
   e. Almost always

5. Was the objective of the lesson (what you are supposed to learn) explained in advance?

   a. Almost never
   b. Not very often
   c. Sometimes
   d. Usually
   e. Almost always

6. Did you learn from audio-visual lessons just as well as from hands-on practice?

   a. Usually better
   b. Sometimes better
   c. About the same
   d. Sometimes worse
   e. Usually worse

7. Did the lesson post-tests give a good picture of what you learned?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Not very often
   e. Almost never

8. How much did you like the audio-visual lessons?

   a. Very much
   b. Somewhat
   c. A little
   d. Not very much
   e. Not at all

II. Hands-on practice.

1. Did the instructor do a lot of useless talking before you had a chance to try each task?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Not usually
   e. Almost never

2. Did the instructor clearly explain and demonstrate what you are supposed to do to perform each task?

   a. Almost never
   b. Not usually
   c. Sometimes
   d. Usually
   e. Almost always

3. Did the instructor make mistakes in showing you how to perform the tasks?

   a. Almost never
   b. Not usually
   c. Sometimes
   d. Usually
   e. Almost always

4. Did you get enough chances and time to practice each task?

   a. Almost never
   b. Usually not
   c. Sometimes
   d. Usually
   e. Almost always

5. Did the instructor help you out when you needed help?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Usually not
   e. Almost never

6. Were you tested or checked out on a task before you were ready?

   a. Almost always
   b. Usually
   c. Sometimes
   d. Not usually
   e. Almost never

7. Did the performance test show what you really learned?

   a. Almost never
   b. Not usually
   c. Sometimes
   d. Usually
   e. Almost always

8. Was your instructor a real expert on tanks?

   a. Very much so
   b. To some extent
   c. A little bit
   d. Not very much
   e. Not at all

9. How well do you know your job on tanks after this training?

   a. Extremely well
   b. Very well
   c. Somewhat
   d. Not very well
   e. Very poorly

10. How much did you like hands-on training and practice?

    a. Very much
    b. Somewhat
    c. A little
    d. Not very much
    e. Not at all

APPENDIX C

GUIDANCE FOR ADMINISTERING READINESS TESTS

OIC Instructions for
Hands-On Readiness Testing

SET-UP OF TEST SITE

1. Equipment and Scorer Allocation (Requirements for each readiness test are listed in the scorer instructions attached.)

   Station A - Gunner's and TC's Readiness Tests A.
   Gunner's and TC's Readiness Test C.
   Gunner's and TC's Readiness Tests E.
   Driver's Readiness Test D.

   . 9 tanks and 14 scorers.
   . Station A waiting point.

   Station B - Driver's Readiness Test B.
   Loader's Readiness Test A.2.
   Loader's Readiness Test B.2.
   Loader's Readiness Test C.2.

   . 6 tanks and 9 scorers
   . Station B waiting point.

2. Station Set-Up.

   Station A -

   . 5 tanks with one scorer each positioned close to the starting point of the moving course (tanks and scorers A1 through 5)*

   . 4 tanks with two scorers each positioned close to tanks A1 through A5; on level ground and in a location which affords a good field of vision to a boresight target at a range of 1200 meters and ranging targets at various distances from the vehicles. (tanks and scorers A6 through A9)

   . Waiting station A with fire barrels located between the groups of tanks.

   *Tank A5 should be assigned two scorers.

   Station B -

   . 3 tanks with two scorers each positioned close to tanks A1 through A5, on level ground and in a location which affords a good field of vision to a boresight target at a range of 1200 meters. (Tanks and scorers B1 through B3).

   . 3 tanks with one scorer each positioned near tanks B1 through B3. (Tanks and scorers B4 through B6).

   . Waiting station B with fire barrels located between the groups of tanks.

Tanks A1 through A4.

. Prepared for testing in accordance with scorer instructions for Gunner's and TC's Readiness Tests E and Driver's Readiness Test D.

Tank A5.

. Prepared for testing in accordance with scorer instructions for Gunner's and TC's Readiness Tests A, C and E and Driver's Readiness Test D.

Tanks A6 through A9.

. Prepared for testing in accordance with scorer instructions for Gunner's and TC's Readiness Tests A and C.

Tanks B1 through B3.

. Prepared for testing in accordance with scorer instructions for Driver's Readiness Test B, Loader's Readiness Test A.2 and Loader's Readiness Test C.2.

Tanks B4 through B6.

. Prepared for testing in accordance with scorer instructions for Loader's Readiness Tests B.2 and C.2.

CONDUCT OF TESTING

1. Special Instructions for Scorers.

. Instruct the scorers that, although there may be crewmen at their station waiting to be tested, they must conduct the tests according to the following schedule:

. **Station A**

	Run	Crewmen	Tests
Tank A1	1	Driver 4	Driver's Readiness Test D
		Gunner 1	Gunner's Readiness Test E
	4	Driver 4	None
		Gunner 5	Gunner's Readiness Test E
	7	Driver 3	Driver's Readiness Test D
		Gunner 8	Gunner's Readiness Test E
	10	Driver 3	None
		Gunner 3	Gunner's Readiness Test E

	Run	Crewmen	Tests
Tank A2	2	Driver 6	Driver's Readiness Test D
		Gunner 2	Gunner's Readiness Test E
	5	Driver 6	None
		Gunner 6	Gunner's Readiness Test E
	8	Driver 9	Driver's Readiness Test D
		Gunner 9	Gunner's Readiness Test E
	10	Driver 9	None
		Gunner 4	Gunner's Readiness Test E
Tank A3	2	Driver 7	Driver's Readiness Test D
		TC 2	TC's Readiness Test E
	5	Driver 1	Driver's Readiness Test D
		TC 6	TC's Readiness Test E
	8	Driver 1	None
		TC 8	TC's Readiness Test E
	11	Driver 8	None
		TC 4	TC's Readiness Test E
Tank A4	3	Driver 8	Driver's Readiness Test D
		Gunner 7	Gunner's Readiness Test E
	6	Driver 2	Driver's Readiness Test D
		TC 5	TC's Readiness Test E
	9	Driver 2	None
		TC 9	TC's Readiness Test E
	11	Driver 7	None
		TC 3	TC's Readiness Test E
Tank A5	1	Driver 5	Driver's Readiness Test D
		TC 1	TC's Readiness Test E
	4	Driver 5	None
		TC 7	TC's Readiness Test E

At the completion of this run, move the tank to a position near tanks A6 through A9.

Two tanks will conduct each 45 minute run through the course according to the following time schedule:

Run	From (Minutes after testing started)	To	Tank Numbers
1	0	45	A1&A5
2	10	55	A2&A3
3	20	65	A4
4	70	115	A1&A5
5	80	125	A2&A3
6	90	135	A4
7	120	165	A1
8	130	175	A2&A3
9	140	185	A4
10	190	235	A1&A2
11	200	245	A3&A4

	Hour	Crewmen	Tests
Tank A6	1	Gunner & TC 3	Gunner's & TC's Readiness Tests A
	2	Gunner & TC 3	Gunner's & TC's Readiness Tests C
	3	Gunner & TC 1	Gunner's & TC's Readiness Tests A
	4	Gunner & TC 1	Gunner's & TC's Readiness Tests C
Tank A7	1	Gunner & TC 4	Gunner's & TC's Readiness Tests A
	2	Gunner & TC 4	Gunner's & TC's Readiness Tests C
	3	Gunner & TC 6	Gunner's & TC's Readiness Tests A
	4	Gunner & TC 6	Gunner's & TC's Readiness Tests C
Tank A8	1	Gunner & TC 8	Gunner's & TC's Readiness Tests A
	2	Gunner & TC 8	Gunner's & TC's Readiness Tests C
	3	Gunner & TC 7	Gunner's & TC's Readiness Tests A
	4	Gunner & TC 7	Gunner's & TC's Readiness Tests C
Tank A9	1	Gunner & TC 9	Gunner's & TC's Readiness Tests A
	2	Gunner & TC 9	Gunner's & TC's Readiness Tests C
	3	Gunner & TC 2	Gunner's & TC's Readiness Tests A
	4	Gunner & TC 2	Gunner's & TC's Readiness Tests C
Tank A5	1	Run 1	
	2	Run 4	
	3	Gunner & TC 5	Gunner's & TC's Readiness Tests A
	4	Gunner & TC 5	Gunner's & TC's Readiness Tests C

. Station B

	Hour	Crewmen	Tests
Tank B1	1	Driver & Loader 1	Driver's Readiness Test B & Loader's Readiness Test A.2
	2	Driver & Loader 7	Driver's Readiness Test B & Loader's Readiness Test A.2
	3	Driver & Loader 4	Driver's Readiness Test B & Loader's Readiness Test A.2
	4	Loader 4	Loader's Readiness Test C.2
Tank B2	1	Driver & Loader 2	Driver's Readiness Test B & Loader's Readiness Test A.2
	2	Driver & Loader 8	Driver's Readiness Test B & Loader's Readiness Test A.2
	3	Driver & Loader 5	Driver's Readiness Test B & Loader's Readiness Test A.2
	4	Loader 5	Loader's Readiness Test C.2

	Hour	Crewmen	Tests
Tank B3	1	Driver & Loader 3	Driver's Readiness Test B & Loader's Readiness Test A.2
	2	Driver & Loader 9	Driver's Readiness Test B & Loader's Readiness Test A.2
	3	Driver & Loader 6	Driver's Readiness Test B & Loader's Readiness Test A.2
	4	Loader 6	Loader's Readiness Test C.2
Tank B4	1	Loaders 4 & 7	Loader's Readiness Test B.2
	2	Loader 1	Loader's Readiness Tests B.2 and C.2
	4	Loader 7	Loader's Readiness Test C.2
Tank B5	1	Loader's 5 & 8	Loader's Readiness Test B.2
	2	Loader 2	Loader's Readiness Tests B.2 and C.2
	4	Loader 8	Loader's Readiness Test C.2
Tank B6	1	Loaders 6 & 9	Loader's Readiness Test B.2
	2	Loader 3	Loader's Readiness Tests B.2 & C.2
	4	Loader 9	Loader's Readiness Test C.2

. Scorers will call for crewmembers by number at the waiting point for their station for each rotation.

2. Instructions to Crewmen.

. Brief and number the crews 1 through 9.

. Instruct the crewmembers to report to the stations listed below to begin the test and to rotate as indicated:

	First Station	When Released Rotate to
Driver 1	Tank B1	Waiting point Station A
2	Tank B2	Waiting point Station A
3	Tank B3	Waiting point Station A
4	Tank A1	Waiting point Station B
5	Tank A5	Waiting point Station B
6	Tank A2	Waiting point Station B
7	Tank A3	Waiting point Station B
8	Tank A4	Waiting point Station B
9	Waiting Point Station B	

All Drivers return to the waiting point for Station A when released from Station B testing to await a scorer's call for further testing.

		First Station	When Released Rotate to
Loader	1	Tank B1	Tank B4
	2	Tank B2	Tank B5
	3	Tank B3	Tank B6
	4	Tank B4	Waiting point Station B
	5	Tank B5	Waiting point Station B
	6	Tank B6	Waiting point Station B
	7	Waiting point Station B	Tank B4
	8	Waiting point Station B	Tank B5
	9	Waiting point Station B	Tank B6

All Loaders return to the waiting point for Station B when released from testing to await a scorer's call for further testing.

		First Station
Gunner	1	Tank A1
	2	Tank A2
	3	Tank A6
	4	Tank A7
	5	Waiting point Station A
	6	Waiting point Station A
	7	Tank A4
	8	Tank A8
	9	Tank A9

All Gunners return to the waiting point for Station A when released from testing to await a scorer's call for further testing.

		First Station
TC	1	Tank A5
	2	Tank A3
	3	Tank A6
	4	Tank A7
	5	Waiting point Station A
	6	Waiting point Station A
	7	Waiting point Station A
	8	Tank A8
	9	Tank A9

All Tank Commanders return to the waiting point for Station A when released from testing to await a scorer's call for further testing.

3. At the completion of the test, collect all score sheets from the scorers and give them to a representative of the tested company.

GENERAL INSTRUCTION TO SCORER

You have been selected to be a training manager during your unit's annual tank gunnery training program. Your task will be two-fold. Initially, you will score individual crewmembers on a readiness test designed to measure their knowledge and skill in the basic tasks for operation of a tank and its fire control systems. The results of these readiness tests will enable you to diagnose accurately the training status of each crewmember you test and to identify the tasks on which he will need instruction.

Based on your diagnosis of each crewmember's knowledge and skill, you will then select the training modules to use to fulfill the second part of your task, which is to manage his training. The objective of this program is to allow each crewmember to progress to the level of training where he can successfully perform all of the tasks in the readiness tests for his crew position.

As you can see from the job description above, your effectiveness in this program depends on how you score the readiness tests. Attached are scorer guides to assist you to set up and administer the hands-on readiness tests. These alone, however, are not enough to insure your success. The critical nature of these tests demands that all training managers have a clear understanding of the purpose of and the procedures to be used in scoring the tests.

- The readiness tests are <u>diagnostic tests</u>. Therefore, the scorer's role is <u>not</u> to determine if the crewmember passes or fails a given task. The scorer's role in the administration of the readiness tests is to determine which tasks the crewmember absolutely knows and can perform, so that

valuable training time is not wasted, and on which tasks the crewmember must train. When the readiness tests are viewed in this manner, the phrase, "close enough for government work," cannot apply. The crewmember either knows and can perform the task in an absolutely correct manner, as opposed to well enough to get by, or he needs additional training in the task. The skill of the training manager is revealed in the accuracy of his detection of training needs.

- The steps in each task in the readiness tests are taken directly from the M60A1 operator's manual. Although some of the tasks can be performed in a different manner, i.e., "shortcuts," it is necessary to require the crewmember to perform each task exactly as given in order to determine if he has absolute mastery of the skill. (This is also an excellent refresher for SQT.)

- In order to fulfill your diagnostic function, you must score the process as well as the product of each readiness task. The difference between process and product scoring is best described by considering the scoring of a tank main gun engagement. If we score the product, result, of the engagement we would determine that a target hit indicates that the crew has mastered the skills required to fire that type of an engagement. If the round missed the target, however, we would determine that the crew needs additional training to fire that type of an engagement, but we would not know which crewmember or members need the training or what training is required. By evaluating the process, i.e., the individual tasks and task steps, of the engagement, we are able to determine which crewmembers need additional training and to prescribe the training required to gain a target hit.

- The readiness tests are designed to allow the crewmember to demonstrate the ability to perform each task correctly rather than tell the scorer how the task is performed. If an individual can tell you how to lift 400 lbs. correctly, you should not be convinced that he can actually lift that weight.

All your actions as a scorer should be guided by two principles:

1. Be sure the test conditions are the same for every soldier.

2. Be sure the standard is applied evenly to every soldier.

If you administer the readiness tests in the manner described above, you will not have any difficulty in determining the training needs of each crewmember. You can then use the training modules to satisfy these needs. The result of your efforts will be reflected in your unit's high qualification scores on Table VIII.

GENERAL TEST PROCEDURES

1. Insure that the test site is properly set up and you have all the conditions and equipment specified in the scorer's instructions for the test you are going to administer.

2. Record the name, tank number, and crew position of the person you are testing on the scoresheet.

3. Read the test requirement to the crewmember and have him restate the requirement to you.

4. Evaluate and mark every task step as it is completed.

5. Assist the crewmember ONLY if (a) assistance is specified in the scorer's instructions or (b) he is doing something that endangers the equipment or himself.

6. DO NOT answer any questions about how to perform a task.

7. Answer questions about which tasks to perform by rereading the instructions or an appropriate portion of them.

8. If a crewmember stops during the test because he forgets what to do, tell him to do the best he can and do not stop the test or time.

9. If a distraction occurs during the test, record the point where it occurs and continue to score the test as if there had been no distraction. If the crewmember fails the test, determine if the distraction was the cause of his failure and decide whether to retest him.

10. At the completion of the test, record in the COMMENTS section all information which will help to determine the remedial training required.

11. Conduct or schedule remedial training.

12. Set up the station for the next test.

SCORER INSTRUCTIONS

TANK COMMANDER'S AND GUNNER'S
READINESS TESTS, PART A

PERSONNEL.

Two scorers, one gunner and one tank commander.

PREPARATION.

Insure that the following equipment and conditions are present at the test site.

1. M60A1 with BII.
   - On level ground.
   - Master Battery switch ON.
   - M85 mounted.
   - Gas Particulate Filter switch ON.
   - Turret power OFF.
2. Protective mask for each crew member (may be specified as part of the uniform).
3. One belt of dummy caliber .50 ammunition.
4. Cleaning and lubricating equipment, small arms.
5. Stop watch.

SEQUENCE OF TASKS.

The tasks should be performed in the sequence listed below:

1. Gunner - 1, 2, 3
2. Tank Commander - 1, 3, 2, 4, 5, 6, 7, 8

SCENARIO.

1. The tank commander and gunner will be tested simultaneously.
2. The gunner will perform task 2 while waiting for his M3 heater to warm.
3. The tank commander will perform task 3 while waiting for his M3 heater to warm.
4. The tank commander and gunner will perform the prepare-to-fire checks together at the tank commander's command.

SCORER POSITIONS AND INSTRUCTIONS.

1. Gunner's Scorer.

   . Position - loader's station.

   . Instructions:

   a. Check the tank and surrounding area for the gunner's traverse on his request.

   b. Check the replenisher tape at the beginning of task 2.

   c. Insert the firing circuit tester at the appropriate time in task 2.

   d. Report "DRIVER READY" and "LOADER READY" on the TC's command to REPORT.

   e. Conduct remedial training according to module G1 as required.

2. Tank Commander's Scorer.

   . Positions:

Task Number	Position
1, 3, 2	Top of Turret
4, 5, 6, 7, 8	Loader's Station

   . Instructions:

   a. Insure that the tank commander disassembles and assembles the M85 within 10 minutes each.

SCORER INSTRUCTIONS

GUNNER'S AND TANK COMMANDER'S
READINESS TESTS, PART C

PERSONNEL.

Two scorers, one gunner and one tank commander (if live zeroing is not conducted, an assistant instructor is required down range to place shot group discs over the zero panels.)

PREPARATION.

Insure that the following equipment and conditions are present at the test site:

1. M60A1 with BII.

   . On level ground.
   . Firing mechanism removed.
   . Black thread over witness lines on muzzle of main gun.
   . Binoculars.
   . Master Battery switch ON.

2. Targets

   . Boresight and zero panel (main gun) 1200 meters.
   . Zero panel M219 800 meters.
   . Boresight and zero panel (M85) 500 meters.
   . Ranging target, greater than 1200 meters range.

3. Ammunition

   . Dummy 105mm ammunition, APDS (if live firing is not conducted.)

4. Shot group discs to represent target hits if live fire is not used.

5. Opaque material with a 3/4 inch hole in line with infrared body.

SEQUENCE OF TASKS.

The gunner and tank commander will be tested simultaneously. Tasks which require interaction between crewmen are indicated by an asterisk (*). Tasks houls be performed in the sequence indicated below:

1. Gunner - 4*, 1, 2, 3, 5, 6*, 7, 8, 12*, 13*

   Tank Commander - 1*, 2, 3*, 4, 7, 8*, 9*, 10

   Interaction - Gunner - 4, 6, 12, 13,
   Tank Commander - 1, 3, 8, 9

SCENARIO.

TC - Performs task 1.

GUNNER - At the completion of TC task 1, performs tasks 4, 1, 2, 3 and 5 in order

TC - At the completion of Gunner task 4, performs task 2.

TC - Performs task 3 and informs Gunner that computer switch is OFF.

GUNNER - Performs tasks 6, 7 and 8.

TC - While gunner is performing tasks 6, 7 and 8, performs tasks 4 and 7.

GUNNER/TC- When both crewmen have completed the tasks above, Gunner and Tank Commander perform Gunner task 12 and Tank Commander task 8 together.

GUNNER/TC- Perform Gunner task 13 and Tank Commander task 9 together.

TC - Perform task 10.

SCORER POSITIONS AND INSTRUCTIONS.

1. Gunner's scorer.

. Positions:

Task Number	Position
1,2,3,4,5,6,7,8, 11,12,13	Loader's station

. Instructions:

a. Stand behind main gun as required to observe task 4 (check azimuth indicator).

b. Perform the role of the loader as requested in task 1.

c. Check appropriate sight picture at the completion of tasks 2, 6, 7, and 8.

d. Ask the gunner the elevation quadrant reading during task 5 and check the quadrant to verify the accuracy of his response.

e. Check lay of gun in task 12 prior to the Gunner traversing back to the target aiming point.

f. Act as the Loader in tasks 11 and 13.

g. Check the infinity sight lay prior to the Gunner firing a check burst.

h. Load main gun in task 12 if required.

2. Tank Commander's scorer.

. Positions:

Task Number	Position
1,2,3,4,7,8,9,10	Top of turret

. Instructions:

a. At the completion of task 2, check the coincidence reticle.

b. Check target range in task 3.

c. Check rangefinder reticle at the completion of task 4.

d. Check M85 and sight reticle alinement on boresight target at the appropriate time in task 7.

e. If required, control the assistant instructor at the appropriate times to place simulated shot group panels on the zero targets for main gun, coax and M85 zero firing simulations.

SCORER INSTRUCTIONS

DRIVER'S READINESS TEST, PART D
AND GUNNER'S READINESS TEST, PART E

PERSONNEL.

One scorer, one driver and one gunner. Take the loader, if he has passed Loader's Readiness Test Parts B.1 and B.2. He can practice loading the main gun and acquiring targets.

PREPARATION.

These tests require the following equipment and conditions:

1. Fully operational M60A1 with BII.
2. Tactical driving course including:
   - Vertical Obstacle - Approximately 30" high, but no higher than 36".
   - Ditch - Six to eight feet wide, but no wider than eight feet.
   - Steep Grade - Ideally 50% to 60%, but no more than 60%. (If a 50% to 60% grade is not available, a grade steep enough to allow the tank to descend forward with the transmission in reverse at idle speed can be used to simulate.)
   - Water Obstacle - Three to four feet deep, but no deeper than four feet.
3. Targets:
   - 2 SABOT Targets, one of which is moving.
   - 1 HEP Target.
   - 1 set of coax targets (silhouettes).
   - Moving target for driver to observe during misfire procedure.
4. Stop watch.
5. One dummy 105mm round (If loader is included, 2 SABOT and 2 HEP).

SEQUENCE OF TASKS.

The course should be arranged so that the obstacles are encountered between target engagements.

SCENARIO.

A specific scenario should be developed to suit the terrain available. A sample scenario is given below:

. Tank moves out on course.
. Driver ascends a steep grade.
. TC (scorer) instructs driver to assume a hull defilade overwatch position in the vicinity of the hill top.
. Gunner detects a stationary tank within battle-sight range.
. TC issues fire command.
. Driver descends a steep grade.
. Driver drives through a water obstacle.
. Driver detects a group of troops in the open.
. TC issues fire command.
. Driver drives through a ditch.
. TC issues a fire command to engage a moving tank.
. Driver crosses a vertical obstacle.
. Crewmember (Driver or Gunner) detects anti-tank target.
. TC issues fire command.
. TC informs gunner of misfire.

SCORER POSITIONS AND INSTRUCTIONS.

1. The scorer will conduct the readiness test from the TC's position.

2. Instructions:

   a. At some point, have the driver conduct missle evasion driving.

   b. If no loader is present, scorer assumes loader's duties.

   c. Announce misfire during one of the main gun engagements.

   d. Verify sight picture through the rangefinder each time the gunner announces ON THE WAY.

   e. Evaluate gunner's area coverage of coax target. Issue directions as required to gain full area coverage.

   f. Time each engagement from announcement of target descriptions until a correct sight picture is obtained. Gunner must obtain a correct sight picture within 10 seconds.

g. Control which crewmember detects targets by turret orientation.

h. If the loader is present, instruct him to indicate target detection by pointing, and to perform all other loader duties in the normal manner.

i. Score driver and gunner in accordance with standards in "SCORING" portion of readiness tests.

j. Conduct remedial training as required according to modules D-4.1, D-4.2, G-5.1, G-5.2, G-5.3, and G-5.4.

SCORER INSTRUCTIONS

DRIVER'S READINESS TEST, PART B
AND LOADER'S READINESS TEST, PART A.2

PERSONNEL.

Two scorers, one driver and one loader.

PREPARATION.

Insure that the following equipment and conditions are present at the test site.

1. M60A1 with BII.
   - On level ground.
   - One track loose.
   - M27 periscope dirty.
   - Driver's and Loader's protective masks. (May be prescribed as part of the uniform.)
   - All ammunition storage areas blocked except:
     7 slots in ready rack.
     1 slot in tubular storage rack.
     1 slot in bustle.
     Empty slots should correspond to ammunition stowage plan and types of dummy rounds.
   - Tools necessary for track adjustment.
   - Binoculars.
   - Coax mounted.
   - Ammunition stowage plan.
   - Tanker bar.
   - Intercom operational and 3 operational CVC helmets.
   - DA Form 2404.
2. Boresight target. (1200 meters.)
3. Dummy 105mm rounds: (Same configuration, color, markings, weight and weight distribution as an actual round.)
   - 3 APDS
   - 3 HEP
   - 2 HEAT
   - 1 APERS
4. Block of wood, 1" thick by 6" square.
5. Ruler.
6. Black thread.
7. Tape.

SEQUENCE OF TASKS.

The driver and loader will be tested simultaneously. Tasks which require interaction between crewmen are indicated below by an asterisk (*). Tasks should be performed in the sequence indicated below:

1. Driver - 1, 2, 6*, 7*, 8*, 9*, 3, 4, 5*, 10*
2. Loader - 1*, 2*, 3, 4*, 9*, 5, 6, 7, 8
3. Interaction - Driver 6 & 7 8 & 9 5 10
   Loader 1 2 4 9

SCENARIO.

DRIVER - Enters driver's station and performs tasks 1 and 2.

LOADER - Begins task 1. Tells driver to start engine at the appropriate point in task 1.

DRIVER - When requested by loader, performs tasks 6 and 7.

LOADER - Performs task 2.

DRIVER - Upon instructions from loader, performs tasks 8 and 9.

LOADER - Performs task 3.

DRIVER - When loader is finished positioning tank, performs task 3 and 4.

LOADER - At the completion of task 3, enters loader's station, turns on radio and connects CVC.

DRIVER - When completed task 4, connects CVC and performs task 5.

LOADER - When instructed by driver on intercom, performs task 4.

DRIVER/
LOADER - Performs tasks Driver 10 and Loader 9 on the TC's (scorer's) command, "PREPARE-TO-FIRE."

LOADER - Performs tasks 5, 6, 7 and 8 in order.

DRIVER - Assists in Loader task 8 by handing dummy rounds from the ground to his scorer on the tank as requested.

SCORER POSITIONS AND INSTRUCTIONS.

1. Driver's Scorer

. Positions:

Task Number	Position
1, 2	Front slope (driver's hatch open).
3 through 10	Behind breech (gun over rear deck).

. Instructions:

a. After driver requests that gun tube be rotated forward in step 3 of task 3, traverse tube forward. Then, administratively traverse back over rear deck to allow observation of driver's actions.

b. During loader's task 8, act as an assistant instructor. Receive dummy rounds from the driver's on the ground and pass them through the loader's hatch to the loader. Pass one round through the hatch primer down.

c. Score driver in accordance with standards in "SCORING" portion of readiness test.

d. Conduct remedial training according to module D-2 as required without interferring with the completion of the loader's test.

2. Loader's Scorer

. Positions:

Task Number	Position
1	Rear deck
2, 3	Ground next to track
4	Top of turret (observing through loader's hatch)
5	TC's seat and main gun bore
6, 7, 8, 9	TC's seat

. Instructions:

a. Measure track tension for loader in task 3 after being told where to measure and what clearance to attain.

b. Lay main gun close to alinement with boresight target aiming point prior to task 6 and adjust final lay as directed by loader.

c. Determine if ammunition is stowed according to ammunition storage plan.

d. Command "PREPARE-TO-FIRE" over intercom.

e. Score loader in accordance with standards in "SCORING" portion of readiness test.

f. Conduct remedial training according to module L-2 as required.

SCORER INSTRUCTIONS

LOADER'S READINESS TEST,
PART B.2

PERSONNEL.

One scorer and one loader.

PREPARATION.

Insure that the following equipment and conditions are present at the test site.

1. M60A1 with BII
   - On level ground.
   - Intercom operational.
   - Coax mounted.
2. Dummy ammunition which has the same configuration, color, markings, weight and weight distribution as service ammunition:
   - 3 APDS
   - 3 HEP
   - 2 HEAT
   - 1 APERS (Range selector fuze must be operable.)
   - Belt of dummy 7.62mm rounds (single round loaded in chamber of coax and belt loaded on top so that chambered round won't extract when weapon is charged.)
   - 105mm ammunition stowed in ready rack according to unit ammunition storage plan.
3. Stop watch.
4. Two operational CVC helmets.

SEQUENCE OF TASKS.

Fire commands which require loading the available types of dummy rounds interspersed with two or three coax commands can be given in any order at about 15 second intervals.

SCENARIO.

A suggested sequence of fire commands is:

1. Battlesight (SABOT), HEP, HEAT, COAX, HEP, MISFIRE. (Misfire provides a break in the sequence.)

2. (Reload for battlesight); APERS, SABOT (NO "CEASE FIRE"), SABOT, HEAT, COAX, STOPPALE.

SCORER POSITION AND INSTRUCTIONS.

1. The scorer will conduct the readiness test from the TC's position.

2. Instructions:

   a. Begin each fire command with the loader standing in the loader's hatch.

   b. Traverse the turret and elevate or depress the main gun slightly (no more than 15 degrees in azimuth and 5 degrees in elevation) at the beginning of each fire command to simulate laying gun for direction.

   c. Assist the loader in misfire procedures.

   d. Score the loader according to the standards in the "SCORING" portion of the readiness test.

   e. Announce "ON THE WAY" after each "UP" and check to see if loader turns on the Vent Blower.

   f. Conduct remedial training according to module L-4.1 or L-4.2, or both as required.

SCORER INSTRUCTIONS

LOADER'S READINESS TEST,
PART C.2

PERSONNEL.

One scorer and one loader.

PREPARATION.

Insure that the following equipment and conditions are present at the test site:

1. M60A1 with BII
   - Coax mounted with safety in F position.
   - Gun tube level and out of travel lock.
   - Main gun safety switch in the FIRE position.
2. Complete gun tool roll stowed according to unit loading plan.
3. Belt of dummy 7.62mm ammunition loaded in coax.
4. Cleaning equipment and lubricating oil.
5. Stop watch.
6. Wooden block (to close breech block).

SEQUENCE OF TASKS.

The readiness test should be administered in the order given.

SCENARIO.

The readiness test secenario is described in the "INSTRUCTIONS TO LOADER" portion of the readiness test.

SCORER POSITION AND INSTRUCTIONS.

1. The scorer will conduct the readiness test from the TC's position.
2. Instructions:
   a. Inform loader when time begins for each phase of the test.
   b. Do not assist loader during the test.

c. Score the loader according to the standards in the "SCORING" portion of the readiness test.

d. Conduct remedial training according to module L-6 as required.

INSTRUCTIONS FOR SCORING
TEC PRETESTS

1. These instructions apply to scoring the following Readiness Test Parts:

   . Driver's Readiness Test Parts A, C, E and F.

   . Loader's Readiness Test Parts A.1, B.1, C.1, E and F.

   . Gunner's Readiness Test Parts B and D.

   . Tank Commander's Readiness Test Parts B and D.

2. Station Set-Up: Insure you have the following items at the test site:

   . One copy of appropriate pretest (see TAB 2) per crewmember.

   . One pencil per crewmember.

   . Answer sheet for each pre-test.

   . One answer key for each pretest.

   . Sufficient seats and writing space to accomodate crewmembers being tested.

   . Stop watch.

3. Test Procedure:

   . Issue pretests.

   . Instruct the crewmember not to make any marks on the test sheet.

   . Instruct crewmembers to place their name, tank number and TEC Lesson Number in the upper right corner of the sheet of paper they will use to record their answers.

   . Instruct the crewmembers to begin answering the questions on the pretest.

   . Do not provide any assistance to the person taking the pretest.

   . Stop the test when the allotted time is reached.

   . Collect the pretests and answer sheets.

   . Score the answer sheets.

   . Determine which crewmembers met or exceeded the standard of the readiness test and which crewmembers should take TEC lessons.

4. Scoring Standards:

   . Use the answer provided on the answer sheet.

   . Do not assume that the crewmember knows anything that he does not write on his answer sheet.

   . Do not give partial credit for any answer.

APPENDIX D

HANDS-ON TEST COMPONENTS AND TEST STATION LAYOUT FOR TCST BATTALION TRAINING STUDY

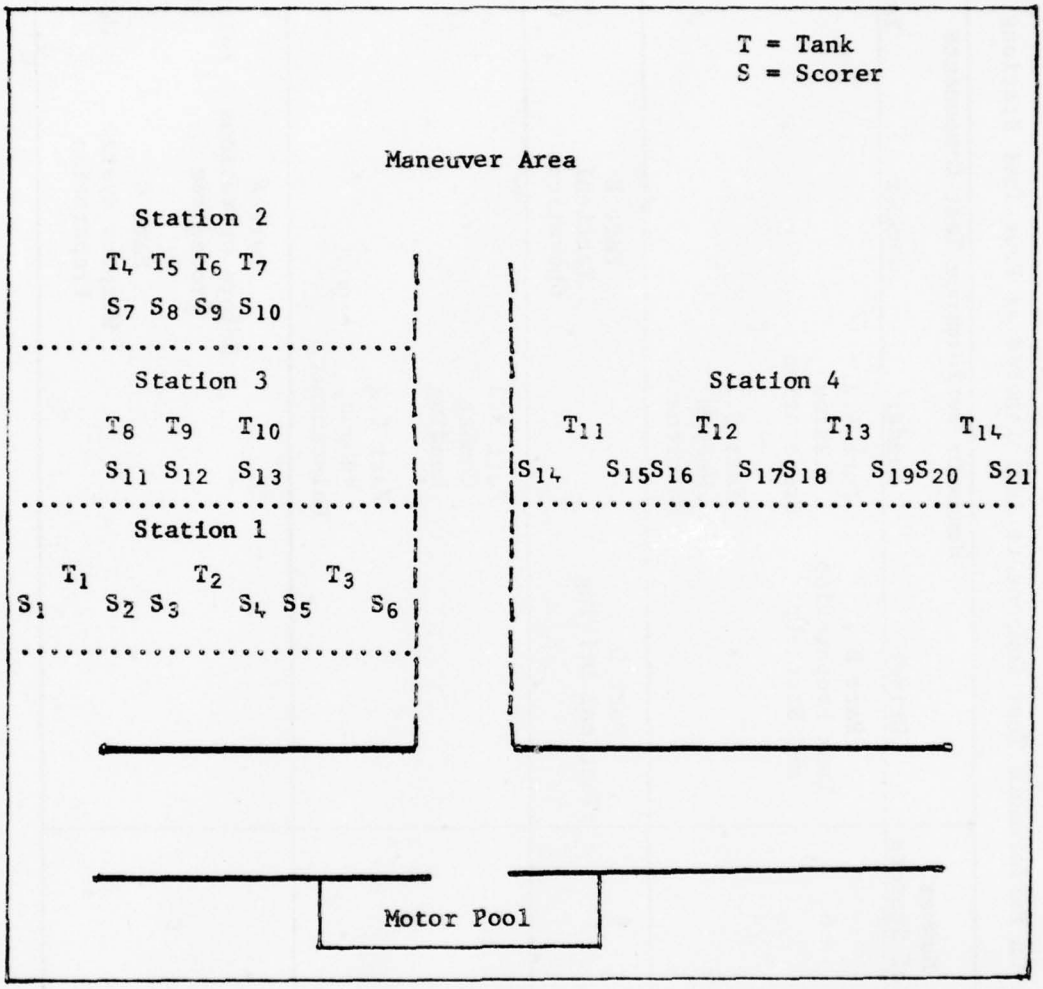

Figure D-1. Layout of four hands-on testing stations.

TABLE D-1.

Hands-On Performance Test Components Administered at Four Test Stations

Station	Number of Tanks	Number of Scorers	Hands-On Performance Test Components			
			Driver	Loader	Gunner	Tank Commander
1	3	6	Part B Tank Preparation and Start-Up	Part A.2 Mission Preparation Part C.2 Weapon Maintenance		
2	4	4	Part D Tactical Driving		Part E Tactical Operations	Part E Tactical Operations
3	3	3		Part B.2 Combat Loading Part C.2 Weapon Maintenance		
4	4	8			Part A Before Operations Procedures Part C Weapons System Preparation	Part A Before Operations Procedures Part C Weapons System Preparation

APPENDIX E

SAMPLE HANDS-ON TEST
(FROM THE DRIVER'S READINESS TEST)

DRIVER'S READINESS TEST

PART B. TANK PREPARATION AND START-UP (GARRISON/HANDS-ON)

CONDITIONS. Fully operational M60A1 situated on level ground with main gun over rear deck and drain valves open. Tank has following deficiencies: track tension loose; M24 periscope dirty and/or parts missing.

INSTRUCTIONS TO DRIVER. "Prepare the tank for driving on a night mission in an NBC environment. Your activities will include Driver requirements in checking engine/transmission oil and checking track tension. You will be scored on what you do as well as how well you do it. I will observe your performance and serve as the TC and Loader as needed."

TASKS.

Remove M27 periscope.
Perform before-operation checks and services on M24 (IR) and M27 periscopes.
Install M24 (IR) periscope.
Place M24 (IR) periscope into operation.
Start tank engine.
Perform before-operations checks and services on engine and transmission oil levels.
Place tank in motion.
Check track tension.
Perform main gun prepare-to-fire procedures from Driver's station.
Perform before operation checks and services on the gas particulate unit.

NOTES.

a. Soldier should not be given this part of the test until he has passed PART A.

b. Remedial training on tasks failed should be provided on-the-spot, but after soldier has completed all of PART B. [See MODULE D-2.]

c. Tasks in parentheses, though not priority tasks for training, must be performed as part of the test procedure. Test administrator may therefore wish to check out and provide on-the-spot remedial training on them.

d. It is not necessary to perform the tasks in the order given; however, the steps within each task must be performed in order.

PERFORMANCE MEASURES

	Yes	No	NA
1. REMOVE THE M27 PERISCOPE			
. Loosened wing nuts on both sides of the periscope.	___	___	___
. Rotated retainers until clear of the periscope mounting lugs.	___	___	___
. Removed periscope from the bracket.	___	___	___
2. PERFORM BEFORE-OPERATIONS MAINTENANCE CHECKS AND SERVICES ON THE M24 (IR) PERISCOPE AND M27 PERISCOPE			
a. M24 (IR) Periscope			
. Inspected the M24 (IR) periscope and spare head for cracked or dirty lenses and completeness.	___	___	___
. Recorded on DA Form 2404 any damaged or unserviceable parts detected.	___	___	___
b. M27 Periscope			
. Inspected M27 periscope and spare for cracks and dirty lenses.	___	___	___
. Cleaned dirty lenses.	___	___	___
. Recorded on DA Form 2404 any damaged lenses on the M27 periscope.	___	___	___
3. INSTALL THE M24 (IR) PERISCOPE			
. Closed the Driver's hatch.	___	___	___
. Placed the Master Battery switch in the OFF position.	___	___	___
. Instructed crew member to rotate the turret so the gun tube is forward.	___	___	___
. Pulled periscope holder lid handle down with fingers of the left hand while pushing up on the lid latch with the thumb.	___	___	___
. Pushed upward and opened lid.	___	___	___
. Reached to rear of the seat and unlatched both catches on IR periscope stowage box.	___	___	___
. Removed the periscope from stowage box.	___	___	___
. Pulled up (rearward) on the elevation adjustment lever insuring bind (tension) has been released on elevation clamp and elevation clamp pivots.	___	___	___
. Loosened the jam nut on the front (forward) inside of the elevation clamp.	___	___	___
. Using both hands, position the periscope in the periscope holder.	___	___	___

	Yes	No	NA
. Pushed up on periscope until it locked in the holder. (Insured the periscope was locked in the holder before released.)	___	___	___
. Insured the elevation clamp is positioned in the periscope holder detent.	___	___	___
. Tightened the adjustment screw on front right hand inside of the elevation clamp until the elevation clamp was firmly seated in the periscope holder detent.	___	___	___
. Tightened the elevation clamp adjustment screw jam nut.	___	___	___
. Pushed elevation adjustment lever downward (forward) and locked periscope.	___	___	___
. Unscrewed dust cap from power receptable (center) location.	___	___	___
. Unscrewed power cable connecting plug from stowage receptacle on right-hand side of compartment.	___	___	___
. Threaded power cable connecting plug into periscope receptacle and hand tightened.	___	___	___
. Installed the periscope without exposing it to direct sunlight.	___	___	___
4. PLACE THE M24 (IR) PERISCOPE INTO OPERATION			
. Turned the Master Battery switch ON.	___	___	___
. Placed the Blackout Selector switch in BO DRIVE.	___	___	___
. Turned the IR switch ON.	___	___	___
. Visually checked to insure IR Indicator lamp is lit.	___	___	___
. Turned the Lighting Control switch handle to the left.	___	___	___
. Pulled the elevation adjustment lever up.	___	___	___
. Adjusted periscope elevation angle to a comfortable position by moving periscope with both hands.	___	___	___
. Pushed elevation adjustment lever down to lock the periscope in position.	___	___	___
. As necessary, loosened the two inner wingnuts on the headrest until the proper eye distance is obtained, then retightened (handtight) both wingnuts.	___	___	___
. As necessary, bent headrest to fit head contour by pulling, pushing or twisting on each side of the headrest.	___	___	___
. Allowed periscope to warm up for 5 minutes before adjusting focus.	___	___	___
. Unscrewed left and right dust caps from bottom focus controls.	___	___	___
. Rotated left and right focus control knobs until the view through each eyepiece appears with maximum sharpness.	___	___	___
. Screwed left and right dust covers back over focus control knobs and tightened finger tight.	___	___	___

5. PERFORM BEFORE OPERATIONS CHECKS AND SERVICES ON THE GAS PARTICULATE UNIT.

	Yes	No	NA
. Inspected precleaner, particulate filter unit housing, gas filter cannisters and air heater for dents, missing or loose control knob and/or pinched or blocked air hose.	___	___	___
. Wiped precleaner, particulate filter unit housing, gas filter cannisters and airheater clean with a damp rag.	___	___	___
. Ensured hose assemblies and electrical cables are tight and serviceable.	___	___	___
. Removed spring clip from air inlet openings.	___	___	___
. Placed Gas Particulate switch ON.	___	___	___
. Disconnected air duct hose from Driver's orifice connector and checked for air flow.	___	___	___
. Rotated air heater knob to ON and checked for indicator lamp operation.	___	___	___
. Checked air flow through the hose.	___	___	___
. Allowed air to warm up at least five minutes.	___	___	___
. Checked air temperature.	___	___	___
. Adjusted protective mask and attached air hose.	___	___	___
. Requested other crew members to check gas particulate operation.	___	___	___
. Removed and stowed air hose and protective mask.	___	___	___
. Rotated air heater knob to OFF and listened for audible click.	___	___	___
. Placed Gas Particulate switch OFF.	___	___	___
. Replaced spring clip to air inlet openings.	___	___	___
. Recorded on DA Form 2404 any damaged or unserviceable components.	___	___	___

6. START TANK ENGINE

. Locked hatches in open or closed position.	___	___	___
. Checked that drain valves are closed.	___	___	___
. Locked parking brakes by depressing the brake pedal and placing the transmission shift lever in PARK.	___	___	___
. Placed steering control in center position.	___	___	___
. Placed fuel shut-off valve handle to ON position.	___	___	___
. Placed fuel pumps switch in the ON position.	___	___	___
. Placed generator switch in the ON position.	___	___	___
. Placed Master Battery switch in ON position.	___	___	___
. Checked that power plant warning lamp and master control switch indicator lamp are lit.	___	___	___
. Checked to insure fuel gages are operating.	___	___	___
. Purged the fuel lines of air, if tank had not been operated within the past week.	___	___	___

	Yes	No	NA
. Depressed accelerator pedal about 2/3 to 3/4 of full displacement and firmly pressed and held starter switch until engine started (but no longer than 15 seconds).	___	___	___
. As soon as engine started, released starter switch and checked that the generator blower is operating.	___	___	___
. Allowed engine to warm up for at least three minutes at 1000 to 1200 RPM.	___	___	___
. Reduced engine RPM to idle speed (700 to 750 RPM) just prior to shifting.	___	___	___
7. PERFORM BEFORE-OPERATIONS CHECKS AND SERVICES ON TANK ENGINE AND TRANSMISSION OIL LEVELS			
. Set parking brake (on "Loader's" command to start engine).	___	___	___
. Started tank engine (on "Loader's" command to start engine).	___	___	___
. Idled engine between 1000-1200 RPM for 5 minutes.	___	___	___
. Reduced engine idle to 700-750 RPM.	___	___	___
8. PLACE TANK IN MOTION			
. Told crew members to secure hatches in the open or closed position.	___	___	___
. Turned on appropriate lights.	___	___	___
. Depressed accelerator to disengage the accelerator lock.	___	___	___
. Released accelerator.	___	___	___
. Depressed brake pedal and moved transmission shift lever to NEUTRAL with engine idle speed at 700-750 RPM.	___	___	___
. Released parking brake.	___	___	___
. Maintained pressure on brake pedal and moved transmission shift lever to LOW.	___	___	___
. Released brake pedal and depressed accelerator slowly.	___	___	___
9. CHECK TRACK TENSION			
. Moved vehicle forward on level hard surface and, when signaled by Loader, coasted to a stop without applying brakes.	___	___	___
. Made final forward adjustments (without applying brakes) in response to Loader signals in order to aline a track link on #2 support roller.	___	___	___

10. PERFORM PREPARE-TO-FIRE PROCEDURES

	Yes	No	NA
. Lowered seat for closed hatch driving.	___	___	___
. Closed and locked Driver's hatch.	___	___	___
. Turned master control switch to ON.	___	___	___
. Started engine on TC's command, "CHECK FIRING SWITCHES."	___	___	___
. Reported "DRIVER READY" on TC's command, "REPORT."	___	___	___

SCORING.

To pass, soldier must have:

a. Removed M27, installed M24, and inspected both without cuing by scoring.

b. Been checked "Yes" or "NA" on each performance measure.

c. Task steps which do not apply to the situation, i.e., DA Form 2404 entries when no deficiencies are found will be scored "NA."

COMMENTS (Recommended remedial training, etc.)

PASS ____ FAIL ____

APPENDIX F

ANALYSIS OF FORT CARSON TABLE VIII ENGAGEMENTS

TABLE F.1

Fort Carson Table VIII Engagements

Table VIII A

ENGE NO	CRW MEM	WPN	FIR MOD	VEH MOT	TGT MOT	TGT TYP	TGT VIS	TGT RNG	DAY/ NGT	F/C INS	AMMO
1 D	GN	MG	BS	STA	STA	TK	VIS	12-17	D	GPD	HT
2 D	GN	MG	PRE	STA	STA	TK	VIS	18-25	D	GPD	SB
3 D	GN	MG	BS	STA	STA	TK	VIS	8-11	D	GPD	HT
4 D	GN	MG	PRE	STA	MOV	TK	VIS	12-14	D	GPD	SP
5 D	GN	MG	PRE	STA	STA	AT	VIS	16-18	D	TEL	HEP
6 D	TC	50	NP	STA	STA	TRK	VIS	6-8	D	TPD	50
7 D	GN	CX	NP	STA	STA	TPS	VIS	2-4	D	INF	762
8 D	TC	50	NP	STA	STA	TPS	VIS	12-14	D	TPD	50
9 D	GN	CX	NP	STA	MOV	TRK	VIS	4-6	D	INF	762
10 D	GN	CX	NP	STA	STA	TPS	VIS	4-6	D	INF	762

Table VIII B

1 N	GN	MG	BS	STA	STA	TK	VAL	12-17	N	GPD	SB
2 N	GN	MG	PRE	STA	STA	TK	VAL	18-25	N	GPD	HT
3 N	GN	MG	BS	STA	STA	TK	VAL	8-11	N	GPD	SP
4 N	GN	MG	BS	STA	MOV	TK	VAL	12-14	N	GPD	HT
5 N	GN	MG	BS	STA	STA	AT	VAL	16-18	N	GPD	HEP
6 N	TC	50	NP	STA	STA	TRK	VAL	4-6	N	TPD	50
7 N	GN	CX	NP	STA	STA	TPS	VAL	4-6	N	INF	762
8 N	TC	50	NP	STA	STA	TPS	VAL	12-14	N	TPD	50
9 N	GN	CX	NP	STA	MOV	TRK	VAL	8-10	N	INF	762
10 N	GN	CX	NP	STA	STA	TPS	VAL	6-8	N	INF	762

APPENDIX G

IDENTIFICATION OF GUNNER AND LOADER TASKS REQUIRED IN FORT CARSON TABLE VIII ENGAGEMENTS

TABLE G.1

GUNNER

Critical Tasks Table VIII

Task	Type Engagements						
	GN-MG-BS-STA-STA-GPD	GN-MG-PRE-STA-STA-GPD	GN-MG-PRE-STA-MOV-GPD	GN-MG-PRE-STA-STA-TEL	GN-MG-BS-STA-MOV-GPD	GN-CX-NP-STA-STA-INF	GN-CX-NP-STA-MOV-INF
1. Turns on turret power.	x	x	x	x	x	x	x
2. Turns on main gun switch	x	x	x	x	x		
3. Turns on coax switch						x	x
4. Indexes ammunition into ballistic computer	x	x	x	x	x	x	x
5. Selects HEP reticle.				x			
6. Announces IDENTIFIED.	x	x	x	x	x	x	x
7. Announces CANNOT IDENTIFY.							
8. Lays crosshair at center of target base.	x						
9. Lays crosshair at center of target vulerability.		x	x				
10. Lays rangeline at center of target vulnerability				x			
11. Lays circle reticle at center of target.						x	
12. Applies leadline in direction of target apparent motion.			x		x		
13. Lays crosshair leadline at center of base of target.					x		
14. Lays circle reticle at interpolated leadline of target.							x
15. Makes final precise lay.	x	x	x	x	x		
16. Announces ON THE WAY.	x	x	x	x	x	x	x
17. Fires main gun.	x	x	x	x	x		
18. Fires coax.						x	x
19. Adjust coax burst for point target							x
20. Adjust coax burst for area target.						x	
21. Lays coax for direction on edge of target.						x	
22. Locates target in unity window or periscope.	x	x	x	x	x	x	x
23. Observes target after firing	x	x	x	x	x	x	x
24. Announces sensing	x	x	x	x	x	x	x
25. Apply BOT.	x	x	x	x	x		
26. Apply range change correction.				x			
27. Apply mil change correction.		x	x				
28. Apply target form correction.	x				x		
29. Adjust coax burst on point target.							
30. Adjust coax burst on area target.							
31. Adjust coax burst on moving target.							
32. Operates tank intercom.	x	x	x	x	x	x	x
33. Manually elevate, depress, and traverse main gun.							
34. Prepares periscope for operation.	x	x	x		x		

TABLE G.1

GUNNER

Critical Tasks Table VIII (continued)

Task	Type Engagements						
	GN-MG-BS-STA-STA-GPD	GN-MG-PRE-STA-STA-GPD	GN-MG-PRE-STA-NOV-GPD	GN-MG-PRE-STA-STA-TEL	GN-MG-BS-STA-NOV-GPD	GN-CX-NP-STA-STA-INF	GN-CX-NP-STA-NOV-INF
35. Prepares telescope for operation.				x			
36. Places turret into power operation.	x	x	x	x	x	x	x
37. Traverses, elevates, and depresses main gun in power.	x	x	x	x	x	x	x
38. Places ballistic computer into operation.	x	x	x	x	x	x	x
39. Checks firing triggers.	x	x	x	x	x	x	x
40. Boresights periscope and telescope.	x	x	x	x	x		
41. Indexes ammunition in computer for boresight.	x	x	x	x	x		
42. Announces GUNNER READY.	x	x	x	x	x	x	x
43. Apply immediate action in case of main gun failure to fire.	x	x	x	x	x		
44. Apply immediate action in case of coax failure to fire.						x	x

TABLE G.2

LOADER

Critical Tasks Table VIII

	Task	Type Engagements						
		GN-MG-BS-STA-GPD	GN-MG-PRE-STA-GPD	GN-MG-PRE-STA-MOV-GPD	GN-MG-PRE-STA-STA-TEL	GN-MG-BS-STA-MOV-GPD	GN-CX-NP-STA-STA-INF	GN-CX-NP-STA-MOV-INF
1.	Unlock ammo ready rack.	x	x	x	x	x		
2.	Selects correct ammunition.	x	x	x	x	x		
3.	Loads main gun.	x	x	x	x	x		
4.	Places main gun safety in fire position.	x	x	x	x	x		
5.	Places coax safety in fire position.						x	x
6.	Announces UP.	x	x	x	x	x	x	x
7.	Loads coax.						x	x
8.	Stand clear of breech.							
9.	Identifies types of ammunition.	x	x	x	x	x	x	x
10.	Stows ammunition.	x	x	x	x	x	x	x
11.	Operates tank intercom.	x	x	x	x	x	x	x
12.	Reads replenisher tape.	x	x	x	x	x		
13.	Unload coax.							
14.	Remove coax from tank.							
15.	Dissemble coax.							
16.	Assemble coax.							
17.	Check operation of coax.							
18.	Mount coax in tank.							
19.	Disassembles and assembles coax.						x	x
20.	Mounts coax in tank.						x	x
21.	Opens breech and inspects tube and chamber.	x	x	x	x	x		
22.	Checks coax mount and solenoid.						x	x
23.	Inspects stowed ammunition.	x	x	x	x	x	x	x
24.	Positions circuit tester in breech.	x	x	x	x	x		
25.	Cocks coax.						x	x
26.	Unlocks turret.	x	x	x	x	x	x	x
27.	Places boresight threads on muzzle of main gun.	x	x	x	x	x		
28.	Report LOADER READY.	x	x	x	x	x	x	x
29.	Apply immediate action to reduce stoppage of coax.						x	x
30.	Rotates main gun misfired round.	x	x	x	x	x		
31.	Unloads main gun misfired round.	x	x	x	x	x		
32.	Selects second round	x	x	x	x	x		

APPENDIX H

CRITICAL TASK CLUSTERS COMPRISING THE TRAINING CONTENT FOR ACCELERATED GUNNER AND LOADER REPLACEMENT TRAINING

GUNNER

Critical Task Clusters

1. OPERATE TURRET.

   a. Operate tank intercom.
   b. Manually elevate, depress, and traverse main gun.
   c. Prepare gunner's periscope for operation.
   d. Prepare gunner's telescope for operation.
   e. Place turret into power operation.
   f. Elevate, depress, and traverse main gun in power.
   g. Place ballistic computer into operation.

2. PERFORM PREPARE-TO-FIRE PROCEDURES.

   a. Turn main gun switch ON.
   b. Check firing trigger.
   c. Turn coax switch ON.
   d. Check firing trigger.
   e. Elevate and depress main gun in power.
   f. Traverse main gun in power.
   g. Check ballistic computer operation.
   h. Boresight periscope and telescope.
   i. Index ammunition into computer for boresight.
   j. Announce GUNNER READY.
   k. Direct fire procedures (see cluster 4)

3. PERFORM MISFIRE PROCEDURES.

   a. Apply immediate action in case of main gun failure to fire.
   b. Apply immediate action in case of coax failure to fire.

4. RESPOND TO FIRE COMMANDS.

   a. Turn on turret power.
   b. Turn on main gun switch.
   c. Turn on coax firing switch.
   d. Index ammunition into ballistic computer.
   e. Select HEP reticle.
   f. Announce IDENTIFIED.
   g. Announce CANNOT IDENTIFY.
   h. Lay crosshair at center of target face.
   i. Lay crosshair at center of target vulnerability.
   j. Lay rangeline at center of target vulnerability.
   k. Lay circle reticle at center of target.
   l. Applies lead in direction of apparent target motion.
   m. Lay crosshair leadline at center of base of target.
   n. Lay circle reticle at interpolated leadline of target.
   o. Make final precise lay.
   p. Announce ON THE WAY.

GUNNER

Critical task Clusters (continued)

q. Fire main gun.
r. Fire coax.
s. Adjust coax burst for point target.
t. Adjust coax burst for area target.
u. Lay coax for direction at edge of target.
v. Locates target in unity window or periscope.
w. Observes target after firing.
x. Announces BOT.
y. Apply BOT

5. RESPOND TO SUBSEQUENT FIRE COMMANDS.

a. Apply range change correction.
b. Apply mil change correction.
c. Apply target form correction.
d. Adjust coax burst on point target.
e. Adjust coax burst on area target.
f. Adjust coax burst on moving target.

LOADER

Critical Task Clusters

1. AMMUNITION HANDLING.

   a. Identify tank ammunition.
   b. Stow tank ammunition.
   c. Load main gun.
   d. Load coax.

2. PREPARATION FOR OPERATION.

   a. Operate tank intercom.
   b. Read replenisher tape.
   c. Check stowage of ammunition.

3. COAXIAL MACHINEGUN.

   a. Unload coax.
   b. Remove coax from tank.
   c. Disassemble coax.
   d. Assemble coax.
   e. Check operation of coax.
   f. Mount coax in tank.

4. PERFORM PREPARE-TO-FIRE PROCEDURES.

   a. Check replenisher tape.
   b. Open breech and inspect tube and chamber.
   c. Check coax mount and solenoid.
   d. Inspect stowed ammunition.
   e. Place main gun safety switch to FIRE.
   f. Position circuit tester in breech.
   g. Cock coax.
   h. Unlock turret.
   i. Place boresight threads on muzzle.
   j. Report LOADER READY.

5. PERFORM MISFIRE PROCEDURES.

   a. Apply immediate action to reduce stoppage of coax.
   b. Rotate main gun misfired round.
   c. Unload main gun misfired round.

LOADER

Critical Task Clusters (continued)

6. RESPOND TO FIRE COMMANDS.

   a. Unlock ammunition ready rack.
   b. Select correct ammunition.
   c. Load main gun.
   d. Place main gun safety in fire position.
   e. Place coax safety in fire position.
   f. Loads coax.
   g. Announce UP.
   h. Stand clear of breech.
   i. Select second round.

7. RESPOND TO SUBSEQUENT FIRE COMMAND.

   a. Continue to load main gun.

APPENDIX I

TRAINING ASSETS FOR ACCELERATED GUNNER/LOADER REPLACEMENT TRAINING

TRAINING ASSETS

1. Time. Three days, twenty-four hours of daylight and twelve hours of darkness would be available for training four tank crews.

2. Personnel.

   Crew personnel: four qualified TCs and drivers, and four non-11E gunners and loaders for each three-day period.

   Support personnel: One OIC/Safety Officer, two assistant instructors, one target operator, one radio operator, one medic, two truck drivers, small ammo/target detail, and three study team supervisors.

3. Equipment. Four M60A1 tanks, one searchlight tank, one quarter ton and one 5-ton truck, two moving target vehicles, one ambulance, four stop watches, necessary targets, and two radios.

4. Facilities. One Table VII range with capabilities for firing subcaliber Tables I, II, III, VI, VII, and a special coax table.

5. Training Devices and Aids. One Beseler Cue/See, appropriate TEC tapes, six rounds dummy 105-mm ammunition, and short linked belts of empty 7.62 and .50 caliber machinegun ammunition.

6. Ammunition. Each crew was allocated 455 rounds 7.62 tracer, 2100 rounds 7.62 (4-1 linked), 200 rounds .50 caliber (4-1 linked), two rounds 105-mm HEP-TP-T, four rounds 105-mm TPDS-T, and eight rounds 105-mm HEAT-TP-T (four for zeroing) of ammunition.

APPENDIX J

MODIFIED TABLE VII USED IN ACCELERATED GUNNER AND LOADER REPLACEMENT TRAINING

TABLE J.1

Table VII Engagements

NO	CRW MEM	WPN	FIR MOD	VEH MOT	TGT MOT	TGT TYP	TGT VIS	TGT RGN	DAY/ NGT	FC INS	AMMO
1 D	GN	MG	PRE	STA	MOV	TK	VIS	12-14	D	GPD	HT
2 D	GN	MG	PRE	STA	STA	TK	VIS	12-14	D	GPD	SB
3 D	GN	MG	PRE	STA	STA	AT	VIS	14-18	D	TEL	HEP
4 D	TC	50	NP	STA	STA	HEL	VIS	9-10	D	TPD	50
5 D	GN	CX	NP	STA	STA	ST	VIS	4-8	D	INF	762
6 D	TC	50	NP	STA	STA	TPS	VIS	14-16	D	TPD	50
7 D	GN	CX	NP	STA	MOV	TRK	VIS	6-8	D	INF	762
8 D	GN	CX	NP	STA	STA	TPS	VIS	6-8	D	INF	762
1 N	GN	MG	BS	STA	MOV	TK	VAL	12-14	N	GPD	HT
2 N	GN	MG	BS	STA	STA	TK	VAL	8-11	N	GPD	SP
3 N	TC	50	NP	STA	STA	HEL	VAL	9-10	N	TPD	50
4 N	GN	CX	NP	STA	STA	ST	VAL	4-8	N	INF	762
5 N	TC	50	NP	STA	STA	TPS	VAL	14-16	N	TPD	50
6 N	GN	CX	NP	STA	MOV	TRK	VAL	6-8	N	INF	762
7 N	GN	CX	NP	STA	STA	TPS	VAL	6-8	N	INF	762

Table VIII Engagements Not Fired on Table VII (Because of Ammunition Restrictions)

Day	Night
1 HEAT	1 HEAT
1 SABOT	1 SABOT
	1 HEP

Ammunition Allocations

	7.62 (4-1 linked)	.50 cal (4-1 linked)	105mm HEP-TPT	105mm HEAT-TP-T	105mm TPDS-T
Table VII	500	200	2	4	4
Table VIII	520	200	4	8	8

APPENDIX K

ANALYSIS OF WWTGC TABLE VIII ENGAGEMENTS

TABLE E.1

WITCC TABLE VIII ENGAGEMENTS

TABLE VIII A (Day)

ENGE NO	TASK/CONDITION	RANGE (METERS)	WPN(S)	AMMO	VEH MOT	TGT MOT	ILLUM (NIGHT)
1	Tank (HULLDOWN) Stabilized Mode	1000-1200	MG	TPDS-T	10 MPH	STA	---
2	Two Tanks	1800-2000	MG	TPDS-T	STA	STA	---
	BRDM	1000-1200	Cal.50	Cal.50	STA	STA	---
3	Three Tanks	900-1000	MG	HEAT-TP-T	STA	STA	---
4	RPG Team	300-400	COAX	7.62	STA	STA	---
	ATGM Team	900-1100	Cal.50	Cal.50	STA	STA	---
	Troops	1200-1500	Cal.50	Cal.50	STA	STA	---
5	Moving Tank	1200-1600	MG	TPDS-T	STA	MOV	---
	Stationary Tank NBC Environment	1200-1600	MG	TPDS-T	STA	STA	---
6	Troops	600-800	COAX	7.62	STA	STA	---
	Moving BRDM	800-1100	Cal.50	Cal.50	STA	MOV	---

TABLE VIII B (Night)

ENGE NO	TASK/CONDITION	RANGE (METERS)	WPN(S)	AMMO	VEH MOT	TGT MOT	ILLUM (NIGHT)
7	Two Tanks (1 HULLDOWN)	800-1200	MG	HEAT-TP-T	STA	STA	IR
	Troops	800-1200	Cal.50	Cal.50	STA	STA	IR
	NBC Environment Range-card to Direct Lay						
8	Troops	600-800	COAX	7.62	STA	STA	IR
	BRDM	1200-1400	Cal.50	Cal.50	STA	STA	IR
	NBC Environment						
9	Moving Tank	1200-1600	MG	TPDS-T	STA	MOV	Flare
	Stationary Tank	1200-1600	MG	TPDS-T	STA	STA	Flare
10	Ammo Conservation						

APPENDIX L

CRITICAL TASK CLUSTERS COMPRISING THE TRAINING CONTENT FOR ACCELERATED TANK CREW REFRESHER TRAINING

TANK COMMANDER

Critical Task Clusters

1. OPERATION OF NBC EQUIPMENT AND M85 MACHINEGUN.

   a. Check gas particulate unit.
   b. Perform prepare-to-fire procedures.
   c. Load and clear an M85 machinegun.
   d. Dismount an M85 machinegun.
   e. Disassemble an M85 machinegun.
   f. Maintain, clean and inspect an M85 machinegun.
   g. Assemble an M85 machinegun.
   h. Mount an M85 machinegun.

2. FIRING SKILLS.

   a. Prepare tank rangefinder for operation.
   b. Determine range to target with rangefinder.
   c. Lay the main gun for direction.
   d. Lay the main gun for direction while masked.
   e. Measure mil angle with the reticle of the M17 binoculars.
   f. Measure mil angle with the rangefinder reticle.

3. ADJUSTMENT OF FIRE.

   a. Sense rounds.
   b. Respond to gunner's observation, "LOST."
   c. Respond to gunner's correct sensing and "BOT."
   d. Respond to gunner's incorrect sensing.

4. TARGET ENGAGEMENTS.

   a. Acquire targets.
   b. Preset SABOT battlesight information.
   c. Engage target with main gun (Battlesight Model).
   d. Preset HEAT battlesight information.
   e. Engage target with the main gun (Precision Model).
   f. Engage multiple targets with the main gun.
   g. Simultaneously engage targets with the main gun and caliber .50 machinegun.
   h. Simultaneously engage targets with the coax and caliber .50 machinegun.

GUNNER

Critical Task Clusters

1. BEFORE OPERATIONS PROCEDURES.

   a. Check operation of gas particulate unit.
   b. Charge manual elevation system.
   c. Place turret in power operation.
   d. Prepare azimuth indicator for operation.
   e. Operate elevation quadrant.
   f. Prepare gunner's telescope for operation.
   g. Prepare gunner's periscope for operation.
   h. Perform prepare-to-fire procedures.

2. MANIPULATION.

   a. Manipulate main gun while firing through the periscope.
   b. Manipulate main gun while firing through the telescope.

3. ADJUSTMENT OF FIRE.

   a. Apply BOT method of adjustment.
   b. Apply the mil change method of adjustment.
   c. Apply the range change method of adjustment.
   d. Apply the target form method of adjustment.
   e. Apply the standard adjustment.

4. MOVING TARGETS.

   a. Engage a moving target with main gun.
   b. Apply BOT to a moving target.
   c. Apply the target form method of adjustment to a moving target.

5. TARGET ENGAGEMENTS.

   a. Acquire targets.
   b. Preset SABOT battlesight information.
   c. Engage main gun target using battlesight mode.
   d. Preset HEAT battlesight information.
   e. Engage main gun target using precision mode.
   f. Engage multiple targets with main gun.
   g. Engage target with main gun while .50 cal is firing.
   h. Engage target with coax while .50 cal is firing.

LOADER

Critical Task Clusters

1. MISSION PREPARATION.

   a. Perform before operation checks and services on engine and transmission oil levels.
   b. Stow main gun rounds.
   c. Perform prepare-to-fire procedures.
   d. Check operation of gas particulate unit.

2. COMBAT LOADING.

   a. Load main gun in response to fire commands.
   b. Ready coax in response to fire commands.
   c. Rotate round in misfire procedure.
   d. Unload unfired main gun round.
   e. Apply immediate action to reduct stoppage of an M219 machinegun.

3. WEAPONS MAINTENANCE.

   a. Unload M219 machinegun.
   b. Remove M219 machinegun from tank.
   c. Disassemble M219 machinegun.
   d. Inspect M219 machinegun.
   e. Assemble M219 machinegun.
   f. Check operation of M219 machinegun.
   g. Mount M219 machinegun in tank.
   h. Load an M219 machinegun.
   i. Disassemble breechblock.
   j. Assemble breechblock.

4. REPLENISHER TAPE READING.

   a. Determine corrective action required by replenisher tape.

DRIVER

Critical Task Clusters

1. TANK PREPARATION AND START-UP.

   a. *Remove M27 periscope.*
   b. Perform before operations check and services on M24 (IR) and M27 periscope.
   c. Install M24 (IR) periscope.
   d. Place M24 (IR) periscope into operation.
   e. Start tank engine.
   f. Perform before operations checks and services on engine and transmission oil levels.
   g. Place tank in motion.
   h. Perform prepare-to-fire checks.
   i. Perform before operations checks and services on the gas particulate unit.

2. TACTICAL DRIVING.

   a. Operate tank in neutral steer.
   b. Drive over varied terrain.
   c. Drive across a water obstacle.
   d. Perform evasive maneuvers upon enemy contact.
   e. *Drive to defilade firing position upon enemy contact.*
   f. Drive during main gun engagement.
   g. Drive during coax engagement.
   h. Drive during caliber .50 engagement.

CREW

Critical Task Clusters

1. MACHINEGUN FIRING.

   a. Boresight M219 mounted on a tank.
   b. Boresight M85 mounted on a tank.
   c. Zero M219.
   d. Zero M85.
   e. Engage multiple targets with the coax.
   f. Simultaneously engage coax and caliber .50 targets.

2. TARGET ENGAGEMENTS.

   a. Engage a main gun target in an NBC environment.
   b. Engage multiple targets with the main gun.
   c. Engage multiple targets with the coax.
   d. Simultaneously engage main gun multiple targets and a caliber .50 target.
   e. Simultaneously engage a coax target and caliber .50 targets.

3. TANK COMBAT COURSE (Table VII C).

   a. Engage main gun targets.
   b. Engage coax targets.
   c. Engage caliber .50 targets.

4. MAIN GUN FIRING.

   a. Boresight 105mm gun.
   b. Engage multiple targets with the main gun.

APPENDIX M

TRAINING ASSETS FOR ACCELERATED TANK CREW REFRESHER TRAINING

TRAINING ASSETS

1. Time.

Three-day group: Twenty-four hours of daylight and twelve hours of darkness would be available for training eight tank crews.

One-day group: Ten hours of daylight and five hours of darkness would be available for training eight tank crews.

2. Personnel.

Crew personnel: Sixteen tank crews would be available.

Support personnel: One OIC/Safety Officer, two assistant instructors, one target operator, one radio operator, one medic, two truck drivers, small ammo/target detail and one HumRRO researcher would be available to support the training. The majority of the support functions were to be performed by tank crews who were not involved in the training for that day.

3. Equipment. Eight M60A1 tanks, one 105mm Howitzer, one searchlight tank, one 1/4 ton truck, one 5-ton truck, one moving target vehicle (M113), one ambulance, four stop watches, necessary targets, and three radios.

4. Facilities. Since no tank ranges were available at Ft. Hunter-Liggett, a Table VIII course had to be constructed. The same training area was used to conduct all of the firing training. Use of the training area was controlled so as not to prematurely disclose the Table VIII course.

5. Training Devices and Aids. Two Beseler Cue/See, appropriate TEC tapes, three rounds dummy 105mm ammunition, short linked belts of empty 7.62mm and .50 caliber machinegun ammunition, and eight .50 caliber TELFARE subcaliber devices were used.

6. Ammunition. Each crew was allocated 350 rounds of Caliber .50 tracer, 46 rounds of Caliber .50 non-tracer, 1,400 rounds of Caliber .50 linked, 1,100 rounds of 7.62mm linked, 12 rounds of 105mm HEAT-T, and 15 rounds of 105mm Howitzer illuminating.

APPENDIX N

OVERVIEW OF THE ONE-DAY AND THREE-DAY TCST PROGRAMS FOR TANK CREW REFRESHER TRAINING

DAY 1

Hours	Personnel	Location	Activity	Notes
0800-0850	TC & Driver	Motor Pool	TC Readiness Test Part B-Operation of NBC Equipment and M85 Machinegun	
	Gunner	TBD	View TEC Lessons 020-171-5342 and 020-171-5341	
	Loader	TBD	View TEC Lessons 020-171-5331 and 020-171-5332	
0900-0950	TC & Driver	Motor Pool	TC Readiness Test Part C-Firing Skills TC Readiness Test Part D-Adjustment of Fire	
	Gunner	TBD	View TEC Lessons 020-171-5336 and 020-171-5337	
	Loader	TBD	View TEC Lessons 020-171-5346, 020-171-5347 and 020-171-5348.	
1000-1050	TC & Driver	Motor Pool Area	TC Readiness Test Part E-Target Engagements	
	Gunner	Motor Pool	Practice Gunner's Readiness Test Part A-Before Operations Procedures	2 Gunners per tank
	Loader	Motor Pool	Practice Loader's Readiness Test Part A-Mission Preparation	2 Loaders per tank
1100-1150	TC	Motor Pool	Remedial Training as required	
	Driver	Motor Pool	Driver's Readiness Test Part A-Tank Preparation and Start UP	Driver and Loader are tested simultaneously
	Loader	Motor Pool	Loader's Readiness Test Part A-Mission Preparation	
	Gunner	Motor Pool	Remedial Training as required	
1300-1330	Crew	Enroute	Driver's Readiness Test Part B-Tactical Driving	
1400-1450	TC & Gunner	Stony Valley Range	Gunner's Readiness Test Part B-Manipulation	
	Loader	Stony Valley Range	Loader's Readiness Test Part B-Combat Loading	
	Driver	Stony Valley Range	Range support	TEC Lessons

DAY 1 (cont'd.)

Hours	Personnel	Location	Activity	Notes
1500-1550	TC & Gunner	Stony Valley Range	Gunner's Readiness Test Part C.1-Adjustment of Fire (Principles)	
	Loader	Stony Valley Range	Loader's Readiness Test Part D- Replenisher Tape Reading	
	Driver	Stony Valley Range	Range Support	TEC Lessons
1600-1650	TC & Gunner and Loader	Stony Valley Range	Gunner's Readiness Test Part C.2-Adjustment of Fire (Application)	
	Driver	Stony Valley Range	Range Support	TEC Lessons
1800-1850	All	Stony Valley Range	Gunner's Readiness Test Part E-Target Engagements	Adjust illumination and spot searchlight tank.
1900-2030	All	Stony Valley Range	Remedial Training as required.	
2030-2100	All	Stony Valley Range	Preparation for night operations.	
2100--	All	Stony Valley Range	Gunner's Readiness Test Part B-Manipulation Gunner's Readiness Test Part C.2-Adjustment of Fire (Application) Gunner's Readiness Test Part E-Target Engagements	

DAY 2

Hours	Personnel	Location	Activity	Notes
1000-1050	All	Stony Valley Range	Remedial Training as required.	
1100-1150	TC & Gunner Loader & Driver	Stony Valley Range Stony Valley Range	Gunner's Readiness Test Part D-Moving Targets Range Support	
1300-1450	All	Stony Valley Range	Crew Readiness Test Part A-Machinegun Firing	
1500-1650	All	Stony Valley Range	Crew Readiness Test Part B-Target Engagement	
1800-1850	All	Stony Valley Range	Main Gun Firing	
1900-2000	All	Stony Valley Range	Remedial Training as required	Adjust illumination and spot search-light tank
2000-2100	All	Stony Valley Range	Preparation for ght Operations	
2100-	All	Stony Valley Range	Gunner's Readiness Test Part D-Moving Target Crew Readiness Test Part A-Machinegun Firing Crew Readiness Test Part B-Target Engage-ments	

DAY 3

Hours	Personnel	Location	Activity	Notes
0800-1100	All (3 day group)	Stony Valley Range	Crew Readiness Test Part D-Tank Combat Course	
0800-0850	TC & Driver (1 day group)	Motor Pool	TC Readiness Test Part C-Firing Skills TC Readiness Test Part D-Adjustment of Fire	Driver practice Driver's Readiness Test Part A-Tank Preparation and start up
	Gunners (1 day group)	Motor Pool	Practice Gunner's Readiness Test Part A-Before Operations Procedures	2 Gunners per tank
	Loaders (1 day group)	Motor Pool	Practice Loader's Readiness Test Part A-Mission Preparation	2 Loaders per tank
0900-0950	TC (1 day group)	Motor Pool	TC Readiness Test Part E	
	Drivers (1 day group)	Motor Pool	Driver's Readiness Test Part A-Tank Preparation and Start Up	Same tank as TC
	Loaders (1 day group)	Motor Pool	Practice Loader's Readiness Test Part B-Combat Loading	2 Loaders per tank
	Gunners (1 day group)	Motor Pool	Practice Tracking	2 Gunners per tank
1000-1030	All (1 day group)	Enroute	Driver's Readiness Test Part B-Tactical Driving	
1100-1150	All (-)	Stony Valley Range	Gunner's Readiness Test Part C.1-Adjustment of Fire (Principles)	All crews from 3 day group will be included for remedial training as required.
1200-1330	All (-)	Stony Valley Range	Gunner's Readiness Test Part C.2-Adjustment of Fire (Application)	
1330-1430	All (-)	Stony Valley Range	Gunner's Readiness Test Part D-Moving Targets	
1430-1630	All (-)	Stony Valley Range	Crew Readiness Test Part B-Target Engagements	

DAY 3 (cont'd.)

Hours	Personnel	Location	Activity	Notes
1630-1930	All	Stony Valley Range	Crew Readiness Test Part D-Tank Combat Course	
1930-2030	All (1 day group)	Stony Valley Range	Crew Readiness Test Part C-Main Gun Firing	
2100-2200	All (1 day group)	Stony Valley Range	Crew Readiness Test Part B-Target Engagements	
2200-	All	Stony Valley Range	Crew Readiness Test Part D-Tank Combat Course	

DAY 4

Hours	Personnel	Location	Activity	Notes
1000-1900	All	Stony Valley Range	Table VIII A	Firing order: Alternate 3 day group crews and 1 day crews
2100-	All	Stony Valley Range	Table VIII B	

DAY 5

Hours	Personnel	Location	Activity	Notes
0800-1800	All	Motor Pool	Post Test	

APPENDIX C

COST DATA

FIELD UNIT ANNUAL GUNNERY TRAINING

ACCELERATED TANK CREW REPLACEMENT TRAINING

ACCELERATED TANK CREW REFRESHER TRAINING

FIELD UNIT ANNUAL GUNNERY TRAINING
COST DATA FOR 54 CREWS

The cost of the Field Unit Annual Gunnery Training Program including personnel, ammunition, and petroleum was:

Personnel	
Crewmen	$ 36,407.88
Support	126,596.01
Research	1,870.56
TOTAL	$164,874.45
Ammunition	
7.62mm	$ 22,113.00
.50 caliber	60,547.50
105mm HEP-TP-T	107,855.28
105mm HEAT-TP-T	193,058.64
105mm TPDS-T	293,805.36
TOTAL	$677,379.78
Petroleum	
Deisel	$ 9,736.92
Mogas	110.50
TOTAL	$ 9,847.42
TOTAL COST	$852,101.65

FIELD UNIT ANNUAL GUNNERY TRAINING
DETAILED COST DATA

TYPE COST	PRETEST	TABLE V	TABLE VII	TABLE VIII	POST TEST	TOTAL
1. PERSONNEL						
Crewmen	$ 4,314.87	$ 4,692.54	$ 19,930.53	$ 4,692.55	$ 2,777.39	$ 36,407.88
Support	$ 951.56	$ 24,167.11	$ 39,032.47	$ 59,471.71	$ 2,973.16	$126,596.01
Research	$ 1,870.56	$ ---	$ ---	$ ---	$ ---	$ 1,870.56
TOTAL	$ 7,136.99	$ 28,859.65	$ 58,963.00	$ 64,164.26	$ 5,750.55	$164,874.45
2. AMMUNITION						
7.62 (4-1) linked	$ ---	$ 1,134.00	$ 15,309.00	$ 5,670.00	$ ---	$ 22,113.00
.50 cal (4-1) linked	$ ---	$ 3,912.30	$ 45,457.20	$ 11,178.00	$ ---	$ 60,547.50
105mm HEP-TP-T	$ ---	$ 8,296.56	$ 82,965.60	$ 16,593.12	$ ---	$107,855.28
105mm HEAT-TP-T	$ ---	$ 10,725.48	$128,705.76	$ 53,627.40	$ ---	$193,058.64
105mm TPDS-T	$ ---	$ 46,390.32	$170,097.84	$ 77,317.20	$ ---	$293,805.36
TOTAL	$ ---	$ 70,458.66	$442,535.40	$164,385.72	$ ---	$677,379.78
3. PETROLEUM						
Deisel	$ 129.00	$ 2,681.48	$ 5,821.77	$ 1,061.67	$ 43.00	$ 9,736.92
Mogas	$ ---	$ 25.50	$ 42.50	$ 42.50	$ ---	$ 110.50
TOTAL	$ 129.00	$ 2,706.98	$ 5,864.27	$ 1,104.17	$ 43.00	$ 9,847.42
GRAND TOTAL	$ 7,265.99	$102,025.29	$507,362.67	$229,654.15	$ 5,793.55	$852,101.65

ACCELERATED TANK CREW REPLACEMENT TRAINING
COST DATA FOR 11 CREWS

The cost of the Accelerated Tank Crew Replacement Training Program including personnel, ammunition, and petroleum was:

Personnel	
Non-11E (GNs and LDs)	$ 3,738.25
Cadre ((TCs and DVs)	4,581.55
Support	4,243.11
Research	2,421.36
TOTAL	$ 14,984.27
Ammunition	
7.62mm	$ 5,601.75
.50 caliber	1,518.00
105mm HEP-TP-T	1,690.04
105mm HEAT-TP-T	4,369.64
105mm TPDS-T	12,599.84
TOTAL	$ 25,779.27
Petroleum	
Deisel	$ 660.48
Mogas	12.50
TOTAL	$ 672.98
TOTAL COST	$ 41,436.52

ACCELERATED TANK CREW REFRESHER TRAINING
COST DATA FOR 16 CREWS

The cost of the Accelerated Tank Crew Refresher Training Program including personnel, ammunition, and petroleum was:

Personnel	
Crewmen	$ 17,980.37
Support	15,678.25
Research	2,552.64
TOTAL	$ 36,211.26
Ammunition	
7.62mm	$ 2,242.80
.50 caliber	8,473.20
105mm HEAT-TP-T	11,917.20
105mm TPDS-T	25,772.40
105mm Illum.	26,897.92
TOTAL	$ 75,303.52
Petroleum	
Deisel	$ 346.58
Mogas	151.00
TOTAL	$ 497.58
TOTAL COST	$112,012.36

ACCELERATED TANK CREW REFRESHER TRAINING
DETAILED COST DATA

	3 DAY PROGRAM (8 CREWS)	1 DAY PROGRAM (8 CREWS)	TABLE VIII (16 CREWS)	POST TEST (8 CREWS)*	TOTAL
1. PERSONNEL					
Crewmen	$ 8,565.36	$ 3,378.15	$ 5,338.01	$ 698.84	$ 17,980.36
Support	$ 7,208.50	$ 4,543.10	$ 3,561.10	$ 465.56	$ 15,778.26
Research	$ 1,059.04	$ 724.40	$ 579.52	$ 89.68	$ 2,452.64
TOTAL	$ 16,832.90	$ 8,645.65	$ 9,478.63	$ 1,254.08	$ 36,211.26
2. AMMUNITION					
7.62 (4-1) linked	$ 924.00	$ 310.80	$ 1,008.00	$ ---	$ 2,242.80
.50 cal (4-1) linked	$ 3,864.00	$ 1,297.20	$ 3,312.00	$ ---	$ 8,473.20
105mm HEAT-TP-T	$ 2,383.44	$ ---	$ 9,533.76	$ ---	$ 11,917.20
105mm TPDS-T	$ ---	$ 3,436.32	$ 22,336.08	$ ---	$ 25,772.40
105mm Illum.	$ 10,086.72	$ 10,086.72	$ 6,724.48	$ ---	$ 26,897.92
TOTAL	$ 17,258.16	$ 15,131.04	$ 42,914.32	$ ---	$ 75,303.52
3. PETROLEUM					
Deisel	$ 151.36	$ 50.74	$ 101.48	$ 43.00	$ 346.58
Mogas	$ 74.00	$ 25.00	$ 50.00	$ 2.00	$ 151.00
TOTAL	$ 225.36	$ 75.74	$ 151.48	$ 45.00	$ 497.58
GRAND TOTAL	$ 34,316.42	$ 23,852.43	$ 52,544.43	$ 1,299.08	$112,012.36

* Scheduling mix-ups and preemptive support requirements prevented post-testing the second week.