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MISSION-BASED ANALYSES OF ARMOR TRAINING
REQUIREMENTS. VOLUME I. FINAL REPORT

ARI FIELD UNIT AT FORT KNOX, KENTUCKY

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A detailed analysis was conducted of armor operations to provide the basis for developing a set of platoon drills for combined individual and collective armor training. The analysis provided information on the stages of armor operations, the individual and collective tasks that are performed during each stage, training objectives for these tasks, leadership tasks that are performed during each stage, and the types of factors that affect armor operations during combat.			

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This report is in seven volumes as follows:

Volume I: Final Report
Volume II: Armor Operation Time Sequences
Volume III: Leadership Tasks Performed During Tank Platoon Operations
Volume IV: Crewman Tasks Performed During Tank Platoon Operations
Volume V: Relationships Among Collective and Individual Tasks in
Tank Platoon Operations
Volume VI: Training Objectives for Tank Platoons and Crews
Volume VII: Training Objectives for the XML Loader

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FOREWORD

This is Volume I of the Final Report of a project entitled Mission-Based Simulation and Training Requirements. This volume contains a description of the activities that were performed as preparation for the development of a set of platoon battle drills for combined individual and collective armor training. The other volumes of the Final Report are Volume II: Armor Operation Time Sequences; Volume III: Leadership Tasks Performed During Tank Platoon Operations; Volume IV: Crewman Tasks Performed During Tank Platoon Operations; Volume V: Relationships Among Collective and Individual Tasks in Tank Platoon Operations; Volume VI: Training Objectives for Tank Platoon and Crews; and Volume VII: Training Objectives for XM1 Loader.

The work reported here was performed at the Fort Knox Office of the Human Resources Research Organization (HumRRO), under Contract No. MDA 903-80-C-0229 with the US Army Research Institute for the Behavioral and Social Sciences (ARI). Dr. David W. Bessemer was the Contracting Officer's Technical Representative and provided administrative assistance and guidance.

James H. Harris, Richard D. Healy, and Brian J. Yore of the Human Resources Research Organization contributed significantly to the project.

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CHAPTER 1

INTRODUCTION

The requirement to attain and sustain higher levels of combat readiness in armor units has created a need for improved armor training. Several steps have been taken to meet this need including the development of new simulators and training devices, and an increased emphasis upon unit training. A major obstacle to the improvement of armor training, however, is the lack of sufficient training time. Tank crewmen must not only receive training in individual combat skills, they must prepare for Skill Qualification Tests, practice crew gunnery, perform maintenance, and conduct numerous tasks unrelated to training. The recent emphasis on collective training has created additional scheduling problems since the same tank crewmen must also participate in ARTEP exercises, crew drills, and platoon gunnery exercises.

Although it may have been assumed that the new simulators and training devices would help to alleviate this problem by enabling training time to be reduced, it is more likely they will cause training time to be increased. This is because the function of the simulators and training devices is to increase combat readiness rather than to enable the current readiness standards to be met in less time.

One possible solution to this problem is to combine individual and collective training. This could be accomplished by providing only enough individual training to enable armor crewmen to participate in collective training exercises. Additional training on individual tasks could then be given during collective training exercises. The additional practice necessary to attain the required performance standards on individual skills would be provided during collective training rather than during individual training. This procedure could result in significant time savings since the crew members could continue to practice individual tasks while learning to perform collective tasks.

Characteristics of Efficient Combined Training

A combined individual and collective training program must have certain characteristics if it is to be an efficient training technique. These characteristics are as follows:

- a. Simultaneous Practice. An efficient training program must enable tank crewmen to practice their individual crewman tasks while they are practicing collective tasks. This would serve three functions. First, it would enable the crewmen to reach the required performance standards on the individual tasks on which the standards had not previously been met. Second, it would provide the practice necessary to sustain the required level of performance once it is reached. Finally, it would enable the unit to reach the required level of performance on the collective tasks.

- b. Assessment of Performance. An efficient training program must contain provisions for measuring the adequacy of performance so that performance deficiencies can be detected. This would be an especially difficult problem in combined individual and collective training since assessments would be required for the performance of both individual and collective tasks. The fact that many of the tasks would be performed inside the turret would make observation difficult, especially during a collective training exercise. Scorers located in the tank could interfere with the performance of crew duties, while scorers located outside of the tank would not be able to observe what is happening inside the vehicle. This problem can be solved to some extent by automated scoring techniques or by the use of simulators.
- c. Remediation of Performance Deficiencies. Once performance deficiencies are detected during training, there must be provisions for correcting them. In a combined training program, provisions must be made for correcting deficiencies in the performance of both individual and collective tasks. Remediation of performance deficiencies in the performance of individual tasks, however, creates unusual problems during collective training. It may be necessary for a unit to wait until one individual learns to perform a task to the required performance level. If the entire unit repeats the task instead, then an entire unit must perform the task even though only one individual shows a deficiency. In order to maximize efficiency, some remediation of individual tasks may be required outside of the combined training exercise.
- d. Repetition. If individuals and units are to receive an opportunity to practice tasks until they reach the required performance standards, then the training exercises must be short enough so that they can be repeated. A training exercise that requires several hours and substantial support to conduct cannot easily be repeated. On the other hand, an exercise that is too short would provide less opportunity to practice a variety of individual tasks. In addition, extremely short exercises would probably fail to provide a suitable context for the performance of collective tasks since they would not reflect the combat environment in which the tasks would normally be performed. In addition, there would be less opportunity for practicing the transition from one task to another during a short exercise.
- e. Leadership Training. Leadership actions and commands determine many of the events that occur during combat and play a major role in determining the outcome of combat. For this reason, it is important to provide training for unit leaders during combined individual and collective training. Leaders in armor units, such as platoon leaders, platoon sergeants, and tank commanders, are required to make combat

decisions based upon the military situation in which their units are fighting. Once these decisions are made, commands must be issued and tank crewmen must react to these commands. Efficient armor training must provide an opportunity for these leaders to learn to react to different combat situations and to control the reactions of their troops. In addition, the tank crewmen must be provided an opportunity to react to the various commands that can be issued by their leaders.

- f. Combat Relevance. If combat readiness is to be attained and maintained effeciently, it is important that the tasks that are learned during combined training are those that would actually be performed during combat. When training time is limited, the skills that are taught and practiced should be those that are most likely to ensure survival and the success of the mission.
- g. Minimum of Support. Because of the high costs involved in conducting training, it is important that combined individual and collective training be designed so that only a minimum of support is required. The greater the amount of fuel, ammunition, and equipment that are required to conduct training, the less likely it will be that training exercises will actually be repeated until required performance standards are met. This problem can be overcome to some extent by using trainers and simulators whenever possible. It can also be overcome by conducting small scale training exercises whenever possible that do not require extensive support.
- h. Suitability for Use with Training Devices and Simulators. As training becomes increasingly expensive, and as military equipment becomes more costly and increasingly complex, there will be greater dependence upon the use of training devices and simulators for training. Any training program designed for combined individual and collective training must therefore be suitable for both training in the field as well as on devices and simulators.

Platoon Battle Drills

One type of training exercise that could meet most of all of these requirements is the platoon battle drill. During the drill, a tank platoon would perform an exercise corresponding to a particular stage of combat. This would enable the individual crewmen to practice individual tasks while the crews and the platoon received training on collective tasks. Performance could be assessed by assigning observers to each of the vehicles or by the use of instrumentation. Remediation of collective tasks could be conducted through repetition of the exercise; remediation of individual tasks could be performed either during these repetitions or could be conducted outside of the context of the drill. Leaders could be trained by repeating each drill under a variety of different situations corresponding to those likely to occur in actual combat. In this manner, they would receive practice in making combat

decisions based on the combat situation, and they could practice the implementation of these decisions through command, control, and communications. By preparing drills that correspond to actual stages of combat, their combat relevance can be assured. The support required to conduct the drills would be minimized by restricting the scope of the drills to relatively short stages of combat. The suitability of the drills for use with simulators would depend upon future developments in simulation. They would require, however, the use of a simulation technique in which all of the crews in a platoon could participate at once and could interact with each other.

Requirements for the Development of Platoon Battle Drills

The development of a set of platoon battle drills corresponding to stages of combat and suitable for combined individual and collective training requires extensive information on the conduct of armor operations. This information would include the following:

- . Knowledge of the tasks performed during armor operations by tank commanders, gunners, drivers, and loaders. In order to ensure that the crewman tasks designated for training are included in the drills, it would also be necessary to know during which stages of combat each task occurs. The assessment of performance would require additional information on the steps involved in the performance of each task as well as the standards.

- . Knowledge of the leadership tasks performed during armor operations by platoon leaders, platoon sergeants, and tank commanders. In order to provide leadership training during the platoon drills, it is necessary to know the leadership tasks that are performed by leaders in armor units, the stages of combat in which these tasks normally occur, and the standards by which performance is evaluated.

- . Knowledge of the situation affecting combat. To train tank crewmen to be responsive to differences in the combat situation and to train leaders to take situational factors into account when making leadership decisions, it is necessary to identify the factors affecting combat and to know their effects.

- . Knowledge of the collective tasks performed during armor operations by tank crews and tank platoons. To ensure that the collective tasks designated for training are included in the drills, it is also necessary to know during which stages of combat each task occurs. The assessment of performance would require information on the components of each collective tasks (i.e., the tasks that each crewmember must perform during a collective task) and the standards of performance.

- . Knowledge of combat operations. Detailed information of armor operations would be required to identify the stages of combat operation to which the platoon battle drills would correspond. In addition, this information would be required to identify the individual, collective, and leadership tasks that occur during different stages of combat.

Purpose and Overview

The purpose of this research was to provide the basis for the development of a set of platoon drills that can be used for combined individual and collective armor training. To accomplish this purpose, a detailed analysis was first conducted of armor operations. This analysis provided information on the stages of armor operations, the individual and collective tasks that are performed during each stage and the leadership tasks that are performed during each stage. The factors that affect armor operations during combat were identified and training objectives were prepared for individual and collective armor tasks.

The results of this research are summarized in two reports. The first report, Mission-Based Analysis of Armor Training Requirements, consists of seven volumes. This is Volume I, Final Report, and contains an overview of the entire project. Included in this volume are lists of the stages of armor operations; individual tasks performed by tank commanders, gunners, drivers, and loaders; leadership tasks performed by platoon leaders, platoon sergeants, and tank commanders; and the situational factors that affect combat operations. Also contained in this Volume are training objectives for tank commanders, gunners, and drivers supplementing those contained elsewhere. Volume II, Armor Operation Time Sequences, contains a detailed description of the analysis of armor missions and includes a series of flow diagrams depicting team and platoon operations. Volume III, Leadership Tasks Performed During Tank Platoon Operations, contains lists of the platoon leader, platoon sergeant, and tank commander tasks that occur during different stages of armor operations. Volume IV, Crewman Tasks Performed During Tank Platoon Operations, contains lists of the tank commander, gunner, driver, and loader tasks that occur during the different stages of armor operations. Volume V, Relationships Among Collective and Individual Tasks in Tank Platoon Operations, contains lists of the crew and platoon tasks that occur during these stages. Volume V also contains lists of the individual tasks comprising each crew task, and the individual and crew tasks comprising each platoon task. Volume VI, Training Objectives for Tank Platoons and Crews, contains training objectives for platoon and crew tasks. Volume VII, Training Objectives for the XM1 Loader, contains the training objectives for the tasks performed by the loader. The set of platoon drills is contained in a separate report, Platoon Battle Drills for Mission-Based Armor Training. Additional training objectives for tank commander and gunner tasks are contained in ARI Research Product, Development of Training Objectives for XM1 UCOFT, January 1980. Additional objectives for driver tasks are contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Support Plan, August 1980.

CHAPTER 2

ANALYSES OF ARMOR MISSIONS AND OPERATIONS

Armor Missions

The analysis of armor missions and operations was begun by examining the descriptions of armor operations in FM 71-1, The Tank and Mechanized Infantry Company Team, June 1977, and FM 71-2, The Tank and Mechanized Infantry Battalion Task Force, June 1977. The major purpose of the examination was to identify the missions that are performed by tank platoons and the activities that are performed during each mission. No descriptions of tank platoon missions were contained in either publication. From the descriptions of armor operations that were given, it was concluded that tank platoon activities were conducted as part of company/team missions. Company/team activities were conducted, in turn, as part of battalion missions. In each case, the activities that were performed at one echelon were conducted as part of the mission assigned to the unit at the next higher echelon. On this basis, the decision was made to begin the analysis of platoon operations with an analysis of company/team operations. A tank heavy team consisting of two tank platoons and one infantry platoon was selected as the specific type of unit for the analysis.

The first step in the analysis of the tank heavy team was to identify the different team missions. A mission was defined as a specific goal or set of goals that was assigned to a unit by the commander of the unit at the next higher echelon to enable the higher echelon unit to accomplish the goal or set of goals that was assigned to it by the commander of the unit at the next higher echelon. Since a mission represented a specific goal or set of goals, the number of potential missions that could be conducted by a unit was as large as the number of goals that could be assigned to it. To analyze all such goals was perceived to be inefficient approach to the mission analysis.

The analysis of armor missions therefore began with an analysis of the operations that were conducted during the conduct of team missions. The armor operations described in FM 71-1 and FM 71-2 were grouped into six categories -- offense, defense, assembly areas, plan operations, conduct movement, and sustaining operations. These categories were labeled "mission phases" since the activities that were performed during each cluster occurred at different times within a combat operation and represented different stages of mission performance. Offense and defense were classified as tactical mission phases since they both involved direct engagements with an enemy. The other four mission phases (i.e., assembly areas, plan operations, conduct movement, and sustaining operations) were classified as supporting mission phases since the activities performed during these phases are conducted to support offensive and defensive operations.

Analysis of Team Missions

The analysis of team missions was conducted by identifying the combat operations performed by the tank heavy team, determining the phases of these operations, and determining the sequence of activities that occur during each team operation and team operation phase. Although the purpose of this analysis was to obtain information needed to prepare a set of platoon drills for XM1 tank platoons, the analysis did not focus on units using any particular model of tank. This approach to the analysis was taken since the armor operations at the team and platoon levels did not appear to be a function of the type of tank that was used.

Identification of Team Operations. A team operation was defined as a unique cluster of coordinated activities performed by a team in order to accomplish a goal or set of goals leading to the accomplishment of the team mission. The descriptions of armor activities in FM 71-1 and FM 71-2 were examined to identify the team operations that occur during each mission phase. Twenty-one team operations were identified--six that occur during the offensive mission phase, six that occur during the defensive mission phase, and nine that occur during the supporting mission phases. The twenty-one team operations are listed in Table 1. A diagram showing the relationships among these operations is contained in Appendix B of Volume II of this report, while the normal sequence in which they would occur during combat is shown in Appendix D of Volume II.

Table 1
Team Operations Occurring During Different Mission Phases

Mission Phase(s)		
Offense	Defense	Support Mission Phases
Movement to Contact	Occupy Battle Position	Occupy Rear Assembly Area
Hasty Attack	Defend Battle Position	Occupy Forward Assembly Area
Bypass	Displace to Alternate Battle Position	Plan Offensive Operation
Holding	Withdraw	Plan Defensive Operations
Deliberate Attack	Delay	Administrative Road March
Exploitation and Pursuit	Counterattack	Tactical Road March
		Tactical Movement
		Consolidate on Objective
		Reorganize

Identification of Team Operation Phases. Once the team operations were identified, descriptions of the conduct of each operation was examined. The phases of each team operation were identified from these descriptions. A team operation phase was defined as a unique cluster of coordinated activities occurring within a team operation that was intended to accomplish a particular subgoal contributing to the success of the team operation. The phases could occur sequentially or simultaneously. When they are performed simultaneously, different elements within the team perform a unique cluster of activities at the same time. When they are performed sequentially, all of the elements within the team perform one cluster of activities at a time. The list of phases comprising each team operation is contained in Appendix A. A diagrammatic summary of the team operations and team operation phases occurring during each mission phase is contained in Appendix C of Volume II of this report.

Analysis of Team Operations. Once the team operations and their phases were identified, an analysis was conducted of the activities that occur during each team operation and team operation phase. Since the ultimate concern of the mission analysis was with the activities performed by tank platoons, the analysis of team operations focused only on tank operations. The team commander was the focal point of the analysis. From the descriptions of armor operations contained in FM 71-1, the command, control, and communications functions of the team commander were inferred and placed into the sequence in which they would normally occur during combat. The types of stimuli initiating each leadership act were also inferred from the descriptions and placed into the sequence. The activities performed subsequent to each leadership act were also inferred and placed into the sequence; these activities were either commands by the team commander or actions taken by the team commander. Finally, the team task performed in response to each command was identified and entered into the sequence. Flow diagrams summarizing these sequences of team activities are contained in Appendix E of Volume II of this report.

Analysis of Platoon Missions

The analysis of platoon missions was conducted by identifying the platoon operations that are performed during each team operation and team operation phase, determining the sequence in which these operations are performed during the team operations and team operation phases, identifying the types of tank platoons that perform each platoon operation, and analyzing the activities that occur during each platoon operation.

Identification of Platoon Operations. The descriptions of armor operations contained in FM 71-1 were examined in detail to identify the activities performed by tank platoons during the conduct of a team operation. While these descriptions often included activities conducted at the platoon level, often they did not. When no descriptions of platoon activities were contained, the activities that would be performed by the tank platoons within a team were inferred from the description of

team operations. It was in these two manners that platoon operations were identified. A platoon operation was defined as a unique set of coordinated activities performed by a platoon in order to accomplish the platoon mission. An alphabetical list of the platoon operations that were identified from the descriptions contained in FM 71-1 or that were inferred from the descriptions of team operations is contained in Appendix B.

Sequencing of Platoon Operations Within Team Operations. Once the platoon operations were identified, the information contained in the descriptions of armor operations in FM 71-1 was used to determine in which team operation phase they would occur and to place them into the correct sequence. When specific information was not contained in FM 71-1 pertaining to when a platoon operation was performed, the sequence was inferred from the descriptions of armor operations and from the results of the analysis of team operations. A list of platoon operations that occur during each team operation and team operation phase is contained in Appendix C. Diagrammatic summaries of the platoon operations occurring in each team operation and team operation phase are contained in Appendix F of Volume II of this report. A diagram showing the sequence in which the platoon operations would normally occur during combat is contained in Appendix G of Volume II.

Identification of Types of Tank Platoon Performing Each Platoon Operation. From the descriptions of team operations contained in FM 71-1 and from the results of the analyses of team operations, it became apparent that not all of the tank platoons within the team would perform each platoon operation. This occurred whenever two operations were conducted simultaneously within the team. For example, during a hasty attack one platoon was responsible for providing suppressive fire, while the other platoons conducted fire and maneuver. Therefore, it was necessary to identify the platoon or platoons conducting each of the platoon operations. This was done by labeling the type of platoon performing each operation. The two types of platoons conducting the hasty attack were labeled the "suppressive fire platoon" and the "fire and maneuver" platoon. The labels assigned to each type of platoon are shown in the diagrammatic summaries of platoon operations contained in Appendix F of Volume II.

Analysis of Platoon Operations. Once the platoon operations were identified and sequenced, and once the types of platoons were identified and labeled, an analysis was made of each platoon operation. The platoon leader as the focal point of this analysis. From the descriptions of armor operations in FM 71-1 and FM 71-2, and from the results of the analyses of team operations, the leadership activities of the platoon leader were inferred and placed into the sequence in which they would normally occur during combat. Each leadership activity consisted of three components. The first component was a stimulus that initiated the leadership action. Since the number of potential stimuli that could initiate these actions was large, only stimulus categories were specified. The METT model was used to identify the categories. The categories, therefore, were mission characteristics (M), environmental characteristics (E), terrain and weather (T), and troops available (T). Each leadership

action was initiated by one or more of these stimulus categories. The second component of each leadership action was a decision made by the platoon leader. Each decision was then followed by an action performed by the platoon leader, the third component. The actions were either commands issued to the platoon or direct actions performed by the platoon leader. In some cases a decision was followed by no action whatsoever. Following each command by the platoon leader, the ensuing platoon task was specified. It was in this manner that platoon tasks were identified.

Flow diagrams summarizing the analysis of platoon operations are contained in Appendix H of Volume II of this report. A list of the platoon tasks identified during the analyses is contained in Appendix D of the present Volume. A list of the platoon tasks that occur during each platoon operation is contained in Appendix A of Volume V.

CHAPTER 3

COLLECTIVE TASKS

The development of a set of platoon drills to be used for combined individual and collective training required that the collective tasks occurring during combat be identified, that the stages of combat in which they occur be known, that the component tasks comprising each collective task be known, and that training objectives be prepared for each task. A collective task was defined as any task requiring simultaneous or sequential coordination between two or more persons or between two or more groups of persons. Two types of collective tasks are performed by the elements within a tank platoon--platoon tasks and crew tasks.

Platoon Tasks

A platoon task is any task requiring simultaneous or sequential coordination between two or more tank crews assigned to the same platoon. Since no comprehensive lists of platoon tasks could be located, the tasks were identified during the analysis of platoon missions. The leadership activities performed by platoon leaders during each platoon operation were identified and arranged in sequence. Each leadership activity included an action that was taken by the platoon leader in response to a stimulus. Among the possible actions that could be taken by platoon leaders were commands. Platoon tasks were identified by determining the actions that would be taken by a platoon in response to each platoon leader command. A total of 114 platoon tasks were identified in this manner, and they are listed in Appendix D.

Platoon Tasks Occurring During Each Platoon Operation. Since platoon tasks were identified during the analysis of platoon operations, the platoon tasks occurring during each platoon operation were known. Lists of the platoon tasks occurring during each platoon operation are contained in Appendix A of Volume V of the present report. The context in which the tasks occur are shown in the platoon operation flow diagrams contained in Appendix H of Volume II of the present report.

Components of Platoon Tasks. The activities comprising a platoon task can be of two types--individual tasks or crew tasks. Since the platoon tasks were identified during the analysis of platoon operations, there were no existing descriptions of the individual and crew tasks comprising each platoon task. The components of each platoon task were therefore inferred from the nature of the task. Lists of individual and crew tasks that are performed during each platoon task are contained in Appendix C of Volume V of the present report.

Training Objectives for Platoon Tasks. Training objectives for each of the 114 platoon tasks were prepared and are contained in Appendix A of Volume VI. Each training objective was organized into four parts--(1) conditions, (2) initiating stimulus, (3) actions, and (4) standards. The "conditions" portion of each objective provided information on the level of performance; the tools, equipment and material needed by the platoon to perform the task; the combat environment in which the task is performed;

and the supervision and assistance that is available to the platoon during the performance of the task. The level of performance is always the tank platoon. The list of tools, equipment, and material contain only special supplies not normally possessed by the tank platoon. The environment provided information pertaining to the team operation, team operation phase, and platoon operation during which the task is normally performed. Supervision and assistance pertains to the role of the platoon leader during the performance of the task.

The initiating stimulus is the specific stimulus or event that causes the task to be performed. The "actions" portion of the training objective describes the activities that are conducted by the platoon during the performance of the task. The "standards" portion of the objective provides information pertaining to the method of measuring the speed at which the task is performed (time) and the adequacy of the performance (accuracy). In all cases only the dimensions for measurement are provided, but not the specific standard. Time is always measured from the onset of an initiating stimulus to the completion of the task. Accuracy is always measured by the degree of correspondence between the actions that ought to be performed and the actions that are actually performed (process evaluation). Standards pertaining to the match between the actual products of task performance and the products of performance that are indicative of success (product evaluation) are not given. Product evaluation is normally conducted when assessing qualifications, while process evaluation is normally conducted when diagnosing performance. Since it was deemed unlikely that platoon qualifications would be assessed during a combined individual and collective training exercise, standards suitable for product evaluation were not prepared.

Crew Tasks

A crew task is any task requiring simultaneous or sequential coordination between two or more members of the same tank crew. Since the analysis of armor missions was not conducted below the platoon level, crew tasks were not directly identified during the analysis. To identify these tasks, therefore, descriptions of armor operations contained in FM 71-1, FM 71-2, and FM 17-12, Tank Gunnery, March 1977, were examined. Crew tasks were identified by determining which of the tasks described in these sources could be performed only by coordination between two or more members of the same tank crew. Thirty-one crew tasks were identified and are listed in Appendix E.

Crew Tasks Occurring During Each Platoon Operation. To determine which crew task would normally be performed during each platoon operation, the platoon leader commands issued during a platoon operation were examined. The crew tasks that would be performed in response to each command were inferred. Lists of crew tasks performed during each platoon operation are contained in Appendix B of Volume V of the present report.

Components of Crew Tasks. Since crew tasks were inferred from descriptions of armor operations, there were no existing lists of the tank commander, gunner, driver, and loader tasks that comprise each crew task. The individual tasks that would be performed during each crew task were therefore inferred from available descriptions of armor operations. The tank commander, gunner, driver, and loader tasks performed during each crew task are listed in Appendix D of Volume V.

Training Objectives for Crew Tasks. Training objectives for each of the thirty-one crew tasks were prepared and are contained in Appendix B of Volume VI. They were organized in a manner similar to those prepared for platoon tasks.

The "conditions" portion of each objective provides information on the level of performance and the combat environment in which the task is performed. The level of performance is always the tank crew. The environment section lists the platoon operations during which the task is normally performed.

The initiating stimulus is the specific stimulus or event that causes the crew task to be performed. The "actions" portion of the training objective contains lists of the tasks performed by each crew-member during the performance of the crew task. As in the training objectives for platoon tasks, the "standards" contain time and accuracy dimensions.

CHAPTER 4

INDIVIDUAL TASKS

The development of a set of platoon drills to be used for combined individual and collective training requires that the individual tasks occurring during combat be identified, that the stages of combat in which they occur be known, and that training objectives for each task be prepared.

Identification of Individual Tasks

The individual tasks performed during combat operations by tank commanders, gunners, and drivers were identified in preparation for an evaluation of the XML Unit Conduct of Fire Trainer (UCOFT) and the Driver Trainer. The sources that were used to identify these tasks were DEP 9-2350-225-10-1, Operator's Manual for Tank, Combat, Full-Track, 105MM Gun, XML, October 1978 with changes 1 and 2, and TM 9-2350-255-10, Operator's Manual for Tank, Combat, Full-Track, 105MM Gun, XML, January 1980. Additional tank commander, gunner, and driver tasks were identified from 19K Armor Crewman Basic Armor Training (BAT) Tasks prepared by the Armor School at Fort Knox. In addition, loader tasks were identified from the January 1980 XML Operator's Manual and from the BAT list. Lists of the individual tasks performed by tank commanders, gunners, drivers, and loaders are contained in Appendix F.

Individual Tasks Occurring During Each Platoon Operation

Since the analysis of armor operations was not conducted below platoon level, the individual tasks performed during each platoon operation could not be identified from the analysis. Therefore, the crewman tasks that would be performed during each platoon operation were inferred from the platoon leader commands identified during the analysis of platoon operations. The tank commander, gunner, driver, and loader tasks performed during each platoon operation are listed in Appendixes A-D in Volume IV of this report.

Training Objectives for Individual Tasks

Training objectives for the tank commander and gunner were prepared in preparation for the evaluation of the XML UCOFT. They are contained in ARI Research Product, Development of Training Objectives for XML UCOFT, January 1980. Additional training objectives for tank commander tasks that were not included in that report are contained in Appendix H, while those for gunner tasks are contained in Appendix I. Training objectives for the driver were prepared in preparation for the evaluation of the Driver Trainer and are contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Support Plan, August 1980. Additional training objectives for driver tasks that were not included in the research product are contained in Appendix J. Training objectives for the loader were prepared and are contained in the Appendix of Volume VII. An index showing the location of the training objective for each tank commander, gunner, driver, and loader task is contained in Appendix G.

Each training objective was organized into four parts - (1) condition/stimulus, (2) action, (3) measurement, and (4) references. The "condition/stimulus" portion of each objective provides system state information, the location of the crewman when the task begins, and the stimulus that initiates the performance of the task. System state information corresponds to the traditional "conditions" aspect of objectives; it refers to any circumstance that could be expected to alter the quality of productivity of the task being performed. System state information is presented twice within each module. It is provided in the condition/stimulus portion of each objective and near the beginning of each module in a table that summarizes the system states for all tasks contained within the module. When training objectives were prepared for tank commander, gunner, and driver tasks that were not contained in the two ARI Research Products, a new table was prepared summarizing the module. These new tables are included in Appendixes H, I, and J.

The "action" portion of each objective describes the steps involved in the performance of the task. The use of this information in assessing performance accuracy is described below.

The "measurement" portion of each objective provides information pertaining to the method for measuring the speed at which the task is performed (time) and the adequacy of the performance (accuracy). Time and accuracy information are presented separately for the measurement of performance during learning and the measurement of performance when learning is expected to be complete.

Measurement During Learning. During learning, time is always measured from the onset of an initiating stimulus to the completion of the last step. This is specified in the training objective for each task. Accuracy is measured by determining the match between the steps listed in the "action" section of the training objective and the steps actually performed by the loader when doing the task. This, too, is specified in the training objective for each task.

Measurement Following Learning. As in the measurement of time during learning, time following learning is normally measured from the onset of the initiating stimulus to the completion of the last step. This is specified in the training objective for each task. Accuracy, however, is not measured following learning as it is during learning. During learning, when it can be assumed that crewman will be unable to successfully perform the entire task, the main concern is with the degree of correspondence between the steps required to perform the task and the steps actually followed by the crewman when attempting to perform the task. Accuracy is measured, therefore, by determining the match between the actual products of task performance and the products of performance that are indicative of success. To enable this judgment to be made, the products of successful performance are presented in the training objective for each task.

The "references" portion of each objective indicates the documents and pages where the task descriptions were found.

Individual Tasks Common to All Crewmen

In addition to the individual tasks performed by tank commanders, gunners, drivers, and loaders, there are individual tasks that can be performed by any tank crewman. These tasks, which were obtained from the BAT task list, are contained in Appendix K.

Correspondence to BAT Tasks

Appendix L contains a table showing the crewman tasks corresponding to the armor crewmen tasks listed in 19K Armor Crewman Basic Armor Training (BAT) Tasks prepared by the Armor School.

CHAPTER 5

LEADERSHIP TASKS

Leadership activities in a tank platoon are performed by the platoon leader, the platoon sergeant, and each of the tank commanders. Platoon battle drills corresponding to different stages of combat can serve as a useful context in which to train leadership skills. At a more basic level, these leaders can practice communication and control during the different drills or during repetitions of the same drill. At a more sophisticated level, the leaders can receive training in the decision making functions of leadership by participating in the drills during a variety of combat situations. The use of simulators could facilitate such training by making it easier to repeat each drill under a variety of different combat situations.

The training of leadership skills during platoon battle drills requires information on the leadership activities performed by platoon leaders, platoon sergeants, and tank commanders during each stage of combat. It also requires knowledge of how these activities are affected by combat situations. Since prior analyses of the tasks performed by platoon leaders, platoon sergeants, and tank commanders were oriented toward equipment rather than toward command and control functions of leadership, the information required to incorporate leadership training into a combined individual and collective training program is lacking. Therefore, the leadership tasks performed by platoon leaders, platoon sergeants, and tank commanders were identified, as a first step in the development of a training program incorporating leadership skills. In addition, the leadership tasks performed during each platoon operation were identified since these operations would serve as the basis for the development of the platoon battle drills.

Platoon Leader Tasks

Identification of Platoon Leader Tasks. The leadership tasks performed by platoon leaders were identified during the analyses of platoon missions. The first step in each analysis was to identify the type of stimulus that would initiate a leadership action. The METT system was used as the model for identifying stimulus types. Once an initiating stimulus was identified, the next step was to identify the alternative decisions that could be made by the platoon leader. Each alternative was then examined to determine the platoon leader action that would normally follow it. Some decisions were normally followed by commands, while others were normally followed by direct actions that were taken by the platoon leader. In addition, some decisions were normally not followed by any leadership actions at all by the platoon leader. The commands and direct actions were identified as leadership tasks performed by the platoon leader. A list of these tasks is contained in Appendix M.

Platoon Leader Tasks Performed During Each Platoon Operation. Since the platoon leader tasks were identified during an analysis of platoon operations, the tasks occurring during each platoon operation were known. Lists of the platoon leader tasks normally performed during each platoon operation are contained in Appendix A of Volume III of this report.

Platoon Sergeant Tasks

The platoon sergeant serves two different leadership roles in the platoon in addition to his role as a tank commander. One leadership role is to serve as the acting platoon leader during the absence of the platoon leader. This role is normally served only during the supporting mission phases and not during offense or defense. The other role is to serve as the section leader. While the four-tank XML platoon may operate as a single element rather than as two separate sections, the platoon sergeant tasks that would be performed in this role were identified in the event that the platoon operates in sections.

Identification of Platoon Sergeant Tasks Performed as Acting Platoon Leaders. Since the platoon sergeant would only serve as an acting platoon leader during the supporting mission phases, the tasks performed in this role would be those performed by the platoon leader during the supporting mission phases. These tasks were identified during the analysis of platoon operations and are listed in Appendix N.

Platoon Sergeant Tasks Performed as Acting Platoon Leader During Each Platoon Operation. Since the platoon leader tasks were identified during an analysis of platoon operations, the platoon leader tasks performed during each platoon operation were known. The platoon sergeant tasks performed as acting platoon leader during each platoon operation would be the same as those performed by the platoon leader and are contained in Appendix B of Volume III of this report.

Identification of Platoon Sergeant Tasks Performed as Section Leader. To identify the leadership tasks performed by the platoon sergeant as a section leader, the platoon leader commands issued during each platoon operation were examined. The leadership actions that would be performed by the section leader in response to each command were inferred. A list of these tasks is contained in Appendix O.

Platoon Sergeant Tasks Performed as Section Leader Performed During Each Platoon Operation. Since the platoon sergeant tasks performed as a section leader were identified by examining the platoon leader commands issued during each platoon operation, the tasks performed during each platoon operation were known. These are contained in Appendix C of Volume III of this report.

Tank Commander Tasks

Identification of Tank Commander Leadership Tasks. As in the identification of the platoon sergeant tasks performed as section leader, tank commander leadership tasks were identified by inferring how the tank commander would respond to each platoon leader command issued during a platoon operation. A list of these tasks is contained in Appendix P.

Tank Commander Leadership Tasks Performed During Each Platoon Operation. Since the tank commander leadership tasks were identified by inferring the tank commander responses to platoon leader commands issued during each platoon operation, the tasks performed during each platoon operation were known. These are contained in Appendix D of Volume III of this report.

CHAPTER 6

COMBAT SITUATIONS

The importance of training armor leaders and crewmen on how to react to different combat situations is magnified by the likelihood that the battlefield of the 1980s will reflect a quantum increase in complexity and intensity. Threat forces will have a numerical superiority in personnel and equipment, and will possess a wide spectrum of sophisticated weaponry. Any attack in the Central Region of NATO is expected to be sudden and swift, and can include nuclear, chemical, biological and electronic warfare weapons. Super-sophisticated weapons, such as hunter-killer satellites, may also appear upon the battlefield in the 1980s.

Because of the speed and complexity of combat during this period, it has become especially important that armor personnel be trained to react to the different combat situations they may face. Platoon battle drills offer a unique opportunity for conducting such training. Since the drills are relatively short training exercises, they can be repeated under a variety of different situations. Platoon leaders, platoon sergeants, and tank commanders can receive experience in responding differently to these situations, while tank crewmen can receive training in performing under different combat conditions. The use of simulators for armor training further increases the opportunity for training soldiers to react to different combat situations by expanding the number of combat situations that can be introduced during training, by reducing costs, and by eliminating risks.

Identification of Factors Affecting Combat

To identify the types of combat situations that will affect armor operations in the 1980s, interviews were conducted with personnel at Fort Knox, Kentucky and a literature review was conducted.

Interviews. Interviews were conducted with representatives from the Directorate of Armor Doctrine, the Support Division of Command and Staff, the Platoon Tactics Division of Command and Staff, the Studies Division of the Directorate of Combat Development, and the Collective Training Branch of the Directorate of Training Development. The purpose of each interview was to determine how the respondents viewed the battlefield of the 1980s from the perspective of the offices they represented. Selected summaries of these interviews are contained in Appendix Q.

Literature Review. Articles pertaining to combat in the 1980s, particularly to armor operations, were reviewed in the 1976-1980 issues of the following journals:

- . International Defense Review
- . Armor
- . International Armies and Weapons
- . Ground Defense International

In addition, planning papers, field manuals, and other documents pertaining to combat in the 1980s were examined. Selected summaries of these reviews are contained in Appendix R.

Situational Factors Affecting Armor Operations

From the results of the literature review, forty-two sets of factors affecting armor operations were identified. The sets were then sorted into four clusters--U.S. factors, enemy factors, environmental factors, and combat outcome factors. A list of these factors is contained in Appendix S. The U.S. factors affecting armor operations included the type of equipment that would be available to U.S. forces; the availability of fuel, ammunition, replacement personnel, and maintenance; the mode of infantry participation (i.e., mounted or dismounted); and mission requirements. Of particular importance would be the type and combination of tanks and infantry fighting vehicles. High speed vehicles, such as the XM1 or the M2 and M3, would lose much of their effectiveness when combined with slower vehicles such as the M60 or the M113. The type of missiles that will be available and the particular gun that is mounted on the XM1 will affect the range at which enemy targets can be hit and the probability that a target will be destroyed, if hit. The availability of fuel, ammunition, replacement personnel, and maintenance will determine to a great extent the degree to which resources can be expended. Whether the infantry is mounted or dismounted will affect fire power, speed of movement, and vulnerability to enemy fire. Mission requirements will determine the extent to which American forces can act with lack of constraint; the more important it is to prevent casualties and losses, the more conservative the military operations will have to be conducted.

Enemy factors include the size and type of enemy force, their equipment, their tactics, amount of support available, the type of combat (i.e., conventional or nonconventional), and a cluster of unknown factors that cannot be anticipated prior to actual combat. The type of enemy unit opposing an American force will determine the strength of the enemy force and the type of equipment they will use. The particular type of tank and infantry fighting vehicles used by the enemy will affect their speed of movement, firing power, ability to fire accurately at night and on the move, and other combat related factors. Their mode of attack and tactical movement will affect the responses that must be made during the defense. The intensity of artillery and air support will influence the vulnerability of American forces to these threats. The use of non-conventional warfare, such as nuclear and chemical, will affect our own susceptibility to new weapon systems and will control our own use of these weapon systems. Unknown enemy improvements can result from lack of accurate intelligence and could affect target detection, fire power, movement, and many other factors.

Environmental factors include the conditions under which combat can take place. The condition of the soil, for example, can affect the trafficability of both our own vehicles and those of the enemy. Slope of land, vegetation density, illumination, and precipitation will affect both movement and detectability. Extreme temperatures may affect the operation of both man and equipment, while obstacles and roads will affect movement of forces. The width and depth of the battlefield will also affect the utilization of man and equipment.

Combat outcome factors are situations that occur as a result of combat itself. Included are losses to equipment and personnel, loss of support, fatigue and command losses, remaining amount of ammunition, fuel, and maintenance equipment.

The Battlefield of the 1980s

The following is a summary of the characteristics of the European battleground envisioned in the 1980s. Comparisons are made between NATO and Warsaw Pact Forces.

Geopolitical Factors. The geopolitical situation envisioned during this time frame will be a continuation of the confrontation between the Warsaw Pact and NATO Alliance nations.

. The major thrust of the Warsaw Pact forces will be to maintain political stability among its member nations while creating political instability and dissension among NATO members. The Warsaw Pact will continue to seek opportunities to dominate Western Europe by political or military means.

. The NATO thrust will be the continued improvement of military readiness, limited financial assistance to satellite nations, and public condemnation of Warsaw Pact third party terrorist and subversive activities.

Terrain. The Central Region of NATO is characterized by rolling terrain, dense coniferous forests, river obstacles, sprawling urban areas, and an excellent roadnet. The normal rainfall is moderate, snowfall is moderate to heavy, and a dense fog covers much of the area until mid-morning during the late fall, winter, and early spring seasons.

. Attacking Warsaw Pact forces will be able to covertly assemble assault units in large forests, move forward under the cover of darkness, and extend their forward progress under the cover of dense fog. The existing roadnet in the area of operations will enhance movement, communications, command and control, and combat and service support.

. The area of operations favors the defense. However, the forward defense concept which is now practiced by NATO negates maximizing the defensive capabilities of the existing terrain. NATO forces shall detect unusual assembling or configurations of Warsaw Pact forces in sufficient time to permit them to occupy defensive positions and to take necessary defensive precautions. Attacking forces will be channelized by obstacles, barriers, and tactical movement of defending forces. This channelization will provide opportunities to destroy or contain the attacking force.

Weaponry. Weapons available for the battlefield of the 1980s will be characterized by sophistication, accuracy, and lethality. Targets will be rapidly acquired, engaged, and destroyed. Tanks will have a stabilized main gun capable of engaging point targets while moving, increased range engagement capability, a laser rangefinder, and a thermal imaging system. Personnel carriers will mount an effective weapon system which will include missiles, main gun, and machineguns. They will also be amphibious. Missiles will be beam riding or wire guided, fired from the ground or from the air, and fired remotely and forgotten or by command guidance. Artillery pieces will have increased ranges, be capable of destroying any target on the battlefield, and employ numerous types of munitions. Anti-aircraft vehicles will be equipped with automatic firing small caliber guns, missiles, or "gatling" type machineguns. Ground weapon systems will be supported by helicopter and jet support aircraft weapon systems.

. Warsaw Pact maneuver battalions will be equipped with main battle tanks mounting an increased range stabilized main gun, amphibious personnel carriers mounting a low velocity main gun and an anti-tank guided missile system, and anti-aircraft vehicles mounting radar-controlled small caliber rapid fire guns, missiles, and machineguns. Supporting artillery will be on track vehicles and have an increased range and lethality. These maneuver battalions will be augmented by missile firing and troop carrying helicopters and a highly trained tactical air force. Supporting the combat elements will be electronic warfare units capable of destroying US tactical communications and identifying and locating US units.

. US forces will be equipped with main battle tanks mounting an increased range main gun with a stabilized, laser rangefinder, thermal imaging fire control system. Amphibious personnel carriers will have small caliber rapid firing guns, be amphibious, and provide for firing from inside the carrier during an assault. Tanks and personnel carriers will be accompanied by an anti-tank missile firing vehicle which is also equipped with a small caliber rapid firing gun. Anti-aircraft units will be equipped with radar controlled missiles or a "gatling" type machinegun. Supporting artillery will be computer directed and employ numerous types of ammunition. Mines will be laid within the battlefield by engineer dispensing vehicles or tactical aircraft. US maneuver battalions will be supported by missile firing and troop carrying helicopters and a higher trained tactical airforce. Electronic warfare measures will be a highly normal practice.

Movement. Movement on the battlefield of the 1980s will be characterized by frequent movement, night movement, fast movement, long movement, and movement with a minimum of communications.

. Warsaw Pact forces will initially move at night or under the cover of fog to enhance surprise. Once surprise is lost, they will move day or night along designated thrust lines to secure designated objectives. Due to tactical logistical support limitations, movement will be to the extent of the capabilities of the assault forces. This will be followed by a pause for logistical support to arrive or to allow second echelon or reserve units to pass through.

. US forces will move at night or under the cover of fog to enhance surprise and preserve their fighting strength. Movement will be fast, long, and frequent. Enhanced tactical logistical support will minimize halting for refueling and rearming. Electronic communications will be minimized.

Command, Control, and Communications. Command facilities will require frequent relocation to preclude detection by electronic warfare means. Commanders must exhibit initiative, issue precise and concise orders, and have a thorough knowledge of the enemy and the terrain. They will control their units from a forward location on the battlefield and from decisive points during the battle. Communications will emphasize non-electrical modes.

. Warsaw Pact forces habitually require that commanders will forward in battle and frequently at a pre-designated location within a formation. Control is exercised by adhering to a pre-designated thrust line and formation with little or no deviation. Communications will be slow due to the increased number of weapon systems and the relatively new procedure of integrating and harmonizing these systems into a fighting force.

. US forces will reflect command initiative at the lowest level and the presence of the commander at decisive points. The habitual integration of multiple weapon systems will enhance operations and minimize excessive electronic communications.

Intelligence. Information gathering activities in the 1980s will include, in addition to the familiar collection sources and modes, electronic surveillance and photography, thermal imagery, drones, and reconnaissance satellites.

. Warsaw Pact forces will use all the traditional means of gathering information about US forces; they will also employ new and highly sophisticated means. Counterintelligence measures will be employed at all levels.

. US forces will have two advantages in the intelligence war. Large quantities of information will be provided from within satellite nations by persons not in sympathy with the Warsaw Pact cause and by fighting on terrain with which they are completely familiar. In addition, troop units will be intelligence conscious both in gathering and forward information and in preventing the disclosure of information.

A Combat Scenario Depicting the Battlefield of the 1980s

The battlefield of the 1980s will be marked by relatively short and intense battles over wide front. Huge quantities of material will be destroyed and the rapid replacement of the destroyed material is critical to the continued success of the battle. The lack of a viable linear front and disrupted communications will result in hundreds of small unit isolated actions without the benefit of higher command support and guidance. The possibility of NBC warfare will increase as the battle is prolonged and as one adversary is unable to gain a decided advantage. Refugee congestion along routes will necessitate an increased emphasis on vertical envelopment measures and countermeasures.

. Warsaw Pact forces initiated hostilities under the cover of a military training exercise. They crossed the East German-West German demarcation line along four fronts: an amphibious landing in Northern Germany in the Keil Area, the North German Plain along the Madeburg-Hannover-Osnabruk line, the Hessian Corridor, and the Hof Gap along the Zwickau-Hof-Nurnburg-Stuttgart line. The main thrust was in the North German Plain and consisted initially of four Warsaw Pact armies in column. The other front forces consisted of two armies each. Warsaw Pact forces were assigned definite thrust lines and objectives. As the attack was initiated, heliborne units operating ahead of the assault forces seized strategic roadnet targets to prevent the movement of NATO

reinforcing units or to aid in the destruction of NATO defending units. As NATO theatre forces were able to finally retard and contain the attacking forces, Warsaw Pact commanders resorted to NBC weapons in an attempt to break the stalemate and restore movement to the battlefield. Following this phase of the battle, Pact mechanized forces carried the brunt of the battle because of high losses of tanks and the difficulty of sustaining the tank losses.

. NATO forces were alert to the high probability of a Warsaw Pact force attack and occupied forward defensive positions prior to the attack. Cavalry units screened the border while light forces occupied the main battle positions. Major elements of the main defense forces initially occupied new assembly areas and promptly occupied the main battle position after the opening Pact preparatory fires. The strategy of the NATO forces (and the US forces) was to deploy and contain the Pact forces until theatre reserves could be brought to bear on the battle and eventually until strategic US forces could be brought into the battle. Every effort was made to conserve personnel and equipment while constantly seeking an advantage to maximize Pact destruction at minimal risk. Air mobile units, attack helicopters, tactical aircraft, obstacle and barrier erections, and tactical actions were used to channelize Pact forces. Tactical electronic communications were minimized and the use of messengers and visual signals were optimized. Leaders at the lowest level were given broad latitude to act independently within the framework of the overall defense plan. The surprise NBC attack by the Pact caused severe personnel casualties, but arriving theatre reserves were able to occupy backup defensive positions. Retaliatory NBC attack by NATO prevent the Pact's exploitation of their NBC attack. The pre-stock of ammunition and equipment by US forces and their responsive logistical support system allowed them to maintain an effective elastic defense.

APPENDIX A

TEAM OPERATION PHASES OCCURRING DURING
EACH TEAM OPERATION BY MISSION-PHASE

OFFENSE

Movement to Contact

1. Movement Phase
2. Action on Contact Phase

Hasty Attack

1. Suppressive Fires Phase
2. Fire and Maneuver Phase

Bypass

1. Suppressive Fires Phase
2. Conduct Bypass and Continue Movement to Contact Phase

Holding

1. Occupy Hasty Defense Phase
2. Defend Position Phase

Deliberate Attack

1. Suppressive Fires Phase
2. Fire and Maneuver Phase
3. Assault Phase

Exploitation and Pursuit

1. Movement Phase
2. Action on Contact Phase

DEFENSE

Occupy Battle Position

1. Move to Battle Position Phase
2. Occupy and Organize Battle Position Phase

Defend Battle Position

1. Surveillance Phase
2. Indirect Fire Phase
3. Direct Fire Phase
4. Fire and Maneuver Phase
5. Counterattack Phase

Displace to Alternate Battle Position

1. Move to Alternate Battle Position Phase
2. Occupy and Organize Battle Position Phase

Withdraw

1. Covering Fire Phase
2. Breaking Contact Phase

Delay

1. Surveillance Phase
2. Indirect Fire Phase
3. Direct Fire Phase
4. Fire and Maneuver Phase
5. Counterattack Phase
6. Withdrawal Phase

Counterattack

1. Suppressive Fires Phase
2. Fire and Maneuver Phase

ASSEMBLY AREAS

Occupy Rear Assembly Area

1. Move Into Assembly Area Phase
2. Organize Defense of Assembly Area Phase
3. Conduct Sustaining Actions Phase

Occupy Forward Assembly Area

1. Move Into Assembly Area Phase
2. Organize Defense of Assembly Area Phase
3. Conduct Sustaining Actions Phase

PLAN OPERATIONS

Plan Offensive Operations

1. Receipt of Warning Order Phase
2. Receipt of Operation Order Phase
3. Complete Readiness Phase

Plan Defensive Operations

1. Receipt of Warning Order Phase
2. Receipt of Operation Order Phase
3. Complete Readiness Phase

CONDUCT MOVEMENT

Administrative Road March

1. Depart Old Area Phase
2. Movement Phase
3. Arrive New Area Phase

Tactical Road March

1. Depart Old Area Phase
2. Movement Phase
3. Arrive New Area Phase

Tactical Movement

1. Conduct Tactical Movement Phase

SUSTAINING OPERATIONS

Consolidate on Objective

1. Sweep Enemy from Objective Phase
2. Prepare for Enemy Counterattack Phase
3. Prepare to Continue Attack Phase

Reorganize

1. Conduct Resupply Phase
2. Perform Maintenance Phase
3. Reestablish Communications Phase
4. Reassign Personnel Phase

APPENDIX B
PLATOON OPERATIONS

PLATOON OPERATIONS

1. Arrive New Area
2. Break Contact
3. Bypass Enemy Position
4. Complete Readiness Actions
5. Conduct Fire and Maneuver
6. Conduct Platoon Sustaining Actions
7. Conduct the Assault
8. Continue Movement to Contact
9. Depart Old Area
10. Develop the Situation
11. Engage Enemy on Objective
12. Engage Targets of Opportunity
13. Immediate Action
14. Initiate Direct Fires in Platoon Sector
15. Initiate Indirect Fires in Platoon Sector
16. Initiate Suppressive Direct Fires
17. Maintain Surveillance in Platoon Sector
18. Mass Platoon Fire on Enemy Attack
19. Move Along Route
20. Move Into Platoon Area
21. Move to Cross Line of Departure
22. Move to Occupy Suppressive Fire Position
23. Move to Platoon Battle Position
24. Move to Successive Delay Position
25. Move to the Rear
26. Occupy Hasty Defensive Position
27. Occupy Platoon Battle Position
28. Occupy Suppressive Fire Position
29. Organize Defense of Platoon Area
30. Organize Platoon Battle Position
31. Organize Successive Delay Position
32. Prepare Maintenance and Emergency Repairs
33. Prepare for Enemy Counterattack
34. Prepare to Counterattack
35. Reassign Personnel
36. Receive Class I, III, and V Supplies
37. Receipt of Operation Order
38. Receipt of Warning Order
39. Reestablish Communications with TCs
40. Screening Smoke
41. Shift Suppressive Fires
42. Support Breaching Platoon
43. Support Withdrawing Platoon
44. Support Withdrawal of Lead Platoon
45. Suppress Enemy Direct Fires
46. Sweep Enemy from Objective
47. Traveling or Traveling Overwatch or Bounding Overwatch
48. Withdraw to Defensive Position

APPENDIX C

TANK PLATOON OPERATIONS OCCURRING DURING
EACH TEAM OPERATION AND TEAM OPERATION PHASE

PLATOON OPERATIONS

OFFENSE

MOVEMENT TO CONTACT

Movement Phase

1. Traveling or Traveling Overwatch or Bounding Overwatch (Lead Platoon)
2. Traveling or Traveling Overwatch or Bounding Overwatch (Following Platoon)

Action on Contact Phase

1. Immediate Action (Lead Platoon)
2. Develop the Situation (Lead Platoon)
3. Occupy Suppressive Fire Position (Following Platoon)

HASTY ATTACK

Suppressive Fires Phase

1. Engage Enemy on Objective (Suppressive Fire Platoon)
2. Shift Suppressive Fires (Suppressive Fire Platoon)

Fire and Maneuver Phase

1. Conduct Fire and Maneuver (Fire and Maneuver Platoon)
2. Conduct the Assault (Fire and Maneuver Platoon)

BYPASS

Suppressive Fires Phase

1. Engage Enemy on Objective (Suppressive Fire Platoon)
2. Suppressive Enemy Direct Fires (Suppressive Fire Platoon)

Conduct Bypass and Continue Movement to Contact Phase

1. Bypass Enemy Position (Following Platoon)
2. Continue Movement to Contact (Following Platoon)

HOLDING

Occupy Hasty Defense Phase

1. Withdraw to Defensive Position (Lead Platoon)
2. Occupy Hasty Defense Position (Following Platoon)
3. Support Withdrawal of Lead Platoon (Following Platoon)

Defend Position Phase

1. Engage Targets of Opportunity
2. Mass Platoon Fire on Enemy Attack

DELIBERATE ATTACK

Suppressive Fires Phase

1. Move to and Occupy Suppressive Fire Position (Suppressive Fire Platoon)
2. Engage Enemy on Objective (Suppressive Fire Platoon)
3. Shift Suppressive Fires (Suppressive Fire Platoon)

Fire and Maneuver Phase

1. Move to and Cross Line of Departure (Fire and Maneuver Platoon)
2. Conduct Fire and Maneuver (Fire and Maneuver Platoon)

Assault Phase

1. Support Breaching Operation (Fire and Maneuver Platoon)
2. Conduct the Assault (Fire and Maneuver Platoon)

EXPLOITATION AND PURSUIT

Movement Phase

1. Traveling or Traveling Overwatch or Bounding Overwatch (Lead Platoon)
2. Traveling or Traveling Overwatch or Bounding Overwatch (Following Platoon)

Action on Contact Phase

1. Immediate Action (Lead Platoon)
2. Develop the Situation (Lead Platoon)
3. Occupy Suppressive Fire Position (Following Platoon)

PLATOON OPERATIONS

DEFENSE

OCCUPY BATTLE POSITION

Move to Battle Position Phase

1. Move to Platoon Battle Position

Occupy and Organize Battle Position Phase

1. Occupy Platoon Battle Position
2. Organize Platoon Battle Position

DEFEND BATTLE POSITION

Surveillance Phase

1. Maintain Surveillance in Platoon Sector

Indirect Fire Phase

1. Initiate Indirect Fires in Platoon Sector

Direct Fire Phase

1. Initiate Direct Fires in Platoon Sector

Fire and Maneuver Phase

1. Conduct Fire and Maneuver

Counterattack Phase

1. Engage Enemy on Objective (Suppressive Fire Platoon)
2. Shift Suppressive Fires (Suppressive Fire Platoon)
3. Conduct Fire and Maneuver (Fire and Maneuver Platoon)
4. Conduct the Assault (Fire and Maneuver Platoon)

DISPLACE TO ALTERNATE BATTLE POSITION

Move to Alternate Battle Position Phase

1. Move to Platoon Battle Position

Occupy and Organize Battle Position Phase

1. Occupy Platoon Battle Position
2. Organize Platoon Battle Position

WITHDRAW

Covering Fire Phase

1. Screening Smoke (Initial Withdrawal Platoon)
2. Move to the Rear (Initial Withdrawal Platoon)

Breaking Contact Phase

1. Initiate Suppressive Direct Fires (Covering Platoon)
2. Screening Smoke (Covering Platoon)
3. Move to the Rear (Covering Platoon)

DELAY

Surveillance Phase

1. Maintain Surveillance in Platoon Sector

Indirect Fire Phase

1. Initiate Indirect Fires in Platoon Sector

Direct Fire Phase

1. Initiate Direct Fires in Platoon Sector

Fire and Maneuver Phase

1. Conduct Fire and Maneuver (Initial Withdrawal Platoon)
2. Conduct Fire and Maneuver (Covering Platoon)

Counterattack Phase

1. Engage Enemy on Objective (Suppressive Fire Platoon)
2. Shift Suppressive Fires (Suppressive Fire Platoon)
3. Conduct Fire and Maneuver (Fire and Maneuver Platoon)
4. Conduct the Assault (Fire and Maneuver Platoon)

Withdrawal Phase

1. Screening Smoke (Initial Withdrawal Platoon)
2. Break Contact
3. Move to Successive Delay Position
4. Organize Successive Delay Position

5. Support Withdrawing Platoon (Covering Platoon)
6. Screening Smoke (Covering Platoon)

COUNTERATTACK

Suppressive Fires Phase

1. Engage Enemy on Objective (Suppressive Fire Platoon)
2. Shift Suppressive Fires (Suppressive Fire Platoon)

Fire and Maneuver Phase

1. Conduct Fire and Maneuver (Fire and Maneuver Platoon)
2. Conduct the Assault (Fire and Maneuver Platoon)

PLATOON OPERATIONS

SUPPORT

OCCUPY REAR ASSEMBLY AREA

Move Into Assembly Area Phase

1. Move Into Platoon Area

Organize Defense of Assembly Area Phase

1. Organize Defense of Platoon Area

Conduct Sustaining Actions Phase

1. Conduct Platoon Sustaining Actions

OCCUPY FORWARD ASSEMBLY AREA

Move Into Assembly Area Phase

1. Move Into Platoon Area

Organize Defense of Assembly Area Phase

1. Organize Defense of Platoon Area

Conduct Sustaining Actions Phase

1. Conduct Platoon Sustaining Actions

PLAN OFFENSIVE OPERATIONS

Receipt of Warning Order Phase

1. Receipt of Warning Order

Receipt of Operation Order Phase

1. Receipt of Operation Order

Complete Readiness Phase

1. Complete Readiness Actions

PLAN DEFENSIVE OPERATIONS

Receipt of Warning Order Phase

1. Receipt of Warning Order

Receipt of Operation Order Phase

1. Receipt of Operation Order

Complete Readiness Phase

1. Complete Readiness Actions

ADMINISTRATIVE ROAD MARCH

Depart Old Area Phase

1. Depart Old Area

Movement Phase

1. Move Along Route

Arrive New Area Phase

1. Arrive New Area

TACTICAL ROAD MARCH

Depart Old Area Phase

1. Depart Old Area

Movement Phase

1. Move Along Route

Arrive New Area Phase

1. Arrive New Area

TACTICAL MOVEMENT

Conduct Tactical Movement Phase

1. Traveling or Traveling Overwatch or Bounding Overwatch (Lead Platoon)
2. Traveling or Traveling Overwatch or Bounding Overwatch (Following Platoon)

CONSOLIDATE ON OBJECTIVE

Sweep Enemy from Objective Phase

1. Sweep Enemy from Platoon Sector

Prepare for Enemy Counterattack Phase

1. Prepare for Enemy Counterattack

Prepare to Continue Attack Phase

1. Prepare to Continue Attack

REORGANIZE

Conduct Resupply Phase

1. Receive Class I, III and V Supplies

Perform Maintenance Phase

1. Perform Maintenance and Emergency Repairs

Reestablish Communications Phase

1. Reestablish Communications with TCs

Reassign Personnel Phase

1. Reassign Personnel

APPENDIX D
PLATOON TASKS

TANK PLATOON TASKS

1. Accelerate the attack
2. Accelerate to maximum speed
3. Camouflage tanks
4. Cease fire
5. Complete after operations maintenance
6. Complete at halt maintenance
7. Complete battle position
8. Complete bypass preparations
9. Complete communications operational checks
10. Complete emergency repairs
11. Complete readiness
12. Complete resupply
13. Complete withdrawal
14. Conduct fire and maneuver
15. Conduct movement to contact
16. Conduct passage of lines
17. Conduct pre-fire checks
18. Conduct scheduled halt
19. Conduct specified movement
20. Continue appropriate movement
21. Continue bounding overwatch
22. Continue bounding reverse overwatch
23. Continue bypass
24. Continue coil or herringbone formation
25. Continue direct fire
26. Continue fire
27. Continue fire and maneuver
28. Continue firing preparations
29. Continue frontal fire
30. Continue readiness actions
31. Continue suppressive fires
32. Continue suppressive fires on flank targets
33. Continue the assault
34. Continue the attack
35. Continue the march
36. Continue to defend position
37. Continue traveling reverse overwatch
38. Correct interval between tanks
39. Correct interval with lead platoon
40. Correct speed of tanks
41. Cross critical points
42. Cross line of departure
43. Cross phase lines
44. Cross release point
45. Cross start point
46. Deploy into defilade position
47. Deploy into overwatch position
48. Destroy enemy on objective
49. Distribute supplies
50. Engage the enemy

51. Engage enemy covering obstacles
52. Engage enemy with depth fire
53. Engage enemy with frontal fire
54. Engage surprise targets
55. Engage targets of opportunity
56. Execute bounding overwatch
57. Execute bounding reverse overwatch
58. Execute coil formation
59. Execute coil or herringbone formation
60. Execute herringbone formation
61. Execute traveling
62. Execute traveling overwatch
63. Execute traveling reverse overwatch
64. Hold covering fire position
65. Hold fire
66. Hold position
67. Initiate bypass
68. Initiate covering fire
69. Initiate displacement
70. Initiate movement
71. Initiate readiness actions
72. Initiate withdrawal
73. Join team in bypass
74. Join team on battle position
75. Join team on objective
76. Maintain alert air guards
77. Maintain battle readiness
78. Maintain covering fire
79. Maintain surveillance
80. Move into area rapidly
81. Move into assault formation
82. Move into attack formation
83. Move into attack position
84. Move into designated position
85. Move into flank position
86. Move into support position
87. Move into suppressive fire position
88. Move out in previous formation
89. Move out of attack position
90. Move tanks into firing position
91. Move tanks into hull defilade
92. Move tanks into turret defilade
93. Move tanks to good fields of fire
94. Move to position to support breaching operation
95. Move to the flank
96. Occupy assigned area
97. Occupy successive delay position
98. Open fire
99. Organize 3-man crews
100. Orient main guns
101. Pass through the breach
102. Pop smoke
103. Position tanks to cover avenues of approach
104. Post air guards

105. Post ground guards
106. Prepare alternate positions
107. Prepare hasty defense position
108. Prepare individual positions
109. Prepare range cards
110. Provide supply status
111. Reengage enemy
112. Shift suppressive fires
113. Start the assault
114. Tie in flank tanks with other team elements

APPENDIX E

CREW TASKS

CREW TASKS

1. Camouflage tank
2. Communicate with other crewmen on intercom
3. Conduct a water crossing
4. Conduct prepare-to-fire checks
5. Cross various obstacles
6. Drive tank from one position to another
7. Evacuate wounded crewmen
8. Evade an ATGM
9. Fire a multiple engagement
10. Fire a simultaneous engagement
11. Fire the coaxial machinegun
12. Fire the Cal .50 machinegun from a moving tank
13. Fire the loader's machinegun from a moving tank
14. Fire the main gun
15. Fire the main gun - emergency mode
16. Fire the main gun - manual mode
17. Maintain tank's position within the platoon
18. Perform user maintenance
19. Prepare tank after a water crossing
20. Prepare tank for biological attack
21. Prepare tank for chemical attack
22. Prepare tank for nuclear attack
23. Prepare tank for water crossing
24. Pull tank into a concealed position
25. Pull tank into a hull defilade position
26. Pull tank into a turret defilade position
27. Refuel tank
28. Resupply ammunition
29. Search for targets in assigned sector
30. Take action upon misfire (main gun)
31. Take action upon stoppage (coaxial machinegun)

APPENDIX F
INDIVIDUAL XML TASKS

TANK COMMANDER TASKS

1. Acquire targets
2. Adjust TC seat and platform
3. Boresight commander's machinegun
4. Check and adjust headspace on commander's machinegun
5. Check and adjust timing on commander's machinegun
6. Clear commander's machinegun
7. Clear misfire in commander's machinegun
8. Estimate range
9. Fire commander's machinegun
10. Fire grenade
11. Fire main gun from TC's position
12. Fire suppressive fires
13. Identify US and foreign equipment
14. Install commander's machinegun
15. Lay gun for direction
16. Load commander's machinegun
17. Load grenade launcher
18. Operate commander's hatch
19. Operate commander's power control handle
20. Operate commander's weapon station in manual mode
21. Operate commander's weapon station in power mode
22. Operate intercommunications equipment
23. Operate radio
24. Operate rangefinder
25. Perform before operations maintenance checks and services on TC's station
26. Perform misfire procedures on main gun
27. Power down and secure commander's station
28. Prepare commander's machinegun for travel
29. Prepare GPS extension for operation
30. Prepare intercommunications equipment
31. Rank targets according to potential danger
32. Remove commander's machinegun
33. Sense rounds
34. Sense rounds for another tank
35. Take immediate action for misfire of grenade launcher
36. Test commander's panel lights and switches
37. Unload grenade launcher
38. Zero commander's machinegun

GUNNER TASKS

1. Acquire targets
2. Adjust gunner's seat, browpads. and chestrest
3. Align muzzle reference sensor
4. Boresight gunner's auxiliary sight
5. Boresight gunner's primary sight
6. Boresight muzzle reference sensor
7. Boresight thermal imaging system
8. Change barrel of coaxial machinegun
9. Clear coaxial machinegun
10. Clear misfire in coaxial machinegun
11. Close ballistic shields
12. Confirm tank main gun zero
13. Elevate/depress main gun using power control handle
14. Engage targets with main gun - emergency mode
15. Engage targets with main gun - manual mode
16. Engage targets with main gun - normal mode
17. Enter gunner's station
18. Fire coaxial machinegun
19. Focus thermal imaging system for operation
20. Identify malfunctions in fire control and weapon system
21. Identify US and foreign equipment
22. Install coaxial machinegun
23. Lay on target using gunner's auxiliary sight
24. Lay on target using gunner's primary sight
25. Load coaxial machinegun
26. Manually input fire control data for auto parameters into ballistic computer
27. Manually input fire control data for manual parameters into ballistic computer
28. Manually input fire control data for toggle input parameters into ballistic computer
29. Notify TC if recommended corrective actions do not correct malfunctions in fire control and weapon system
30. Operate gas particulate system
31. Operate intercommunications equipment
32. Perform before-operations maintenance checks and services on gunner's station
33. Perform boresighting check
34. Perform cant unit check
35. Perform computer data check
36. Perform computer self-test
37. Perform crosswind sensor check
38. Perform firing circuit tests
39. Perform GPS functional check
40. Perform gun/turret drive--LOS tracking check
41. Perform lead accuracy check
42. Perform lead system check
43. Perform main gun failure to fire procedures
44. Perform superelevation check
45. Perform thermal imaging system built-in test
46. Power down and secure gunner's station

Gunner Tasks - continued

47. Prepare ballistic computer for operation
48. Prepare coaxial machinegun for travel
49. Prepare gunner's auxiliary sight for operation
50. Prepare gunner's primary sight for operation
51. Prepare intercommunications equipment
52. Prepare laser rangefinder for operation
53. Prepare main gun for travel
54. Prepare thermal imaging system for operation
55. Prepare to fire main gun
56. Range to target using LRF
57. Rank targets according to potential danger
58. Remove coaxial machinegun
59. Search for targets
60. Sense rounds
61. Stop runaway firing of coaxial machinegun
62. Take recommended actions to correct malfunctions
63. Test GPS and TIS panel lights
64. Test gunner's station caution and warning lights
65. Track targets
66. Traverse turret using power control handles
67. Verify tank main gun zero
68. Zero coaxial machinegun
69. Zero tank main gun

DRIVER TASKS

1. Acquire targets
2. Adjust track tension
3. Brake the tank
4. Check driver's instrument panel switches and guages
5. Check driver's master panel switches
6. Check turret seal and drain valves
7. Close driver's hatch
8. Close front fender
9. Complete short tracking
10. Complete silent watch duty cycle
11. Connect track
12. Decontaminate tank
13. Disconnect track
14. Do immediate action for loss of engine power
15. Do immediate action for loss of service brakes
16. Do immediate action for loss of steering
17. Do immediate action for throttle failure
18. Drive into water obstacle
19. Drive out of water obstacle
20. Drive tank across ditches
21. Drive tank across obstacles
22. Drive tank up and down hills
23. Enter driver's station
24. Exit driver's station
25. Ford shallow water
26. Identify US and foreign equipment
27. Install thrown track
28. Install water fording kit
29. Maintain correct speed
30. Make after-start checks on brakes
31. Make after-start checks on engine
32. Make after-start checks on warning and caution lights
33. Open driver's hatch and adjust driver's seat and periscope
34. Open front fender
35. Operate crew compartment fire extinguisher - automatic mode
36. Operate crew compartment fire extinguisher - manual mode
37. Operate driver's night vision viewer
38. Operate engine compartment fire extinguisher - automatic mode
39. Operate engine compartment fire extinguisher - manual mode
40. Operate gas particulate filter system
41. Operate intercommunications equipment
42. Operate outside lights
43. Operate personnel heater - fan and heater
44. Operate personnel heater - fan only
45. Operate portable fire extinguishers
46. Operate smoke generator
47. Operate tank on sand or mud
48. Operate tank on snow or ice
49. Perform after-operations checks
50. Perform at-halt maintenance checks and services
51. Perform before-operation maintenance checks and services on driver's station
52. Perform during-operations checks
53. Perform evasive maneuvers

Driver Tasks - continued

54. Place tank in motion
55. Power down hull system
56. Prepare intercommunications equipment
57. Prepare tank for operation after fording
58. Prepare tank for slave start
59. Refuel tank
60. Release track tension
61. Remove injured crewmember through loader's hatch
62. Replace front blackout marker lamp
63. Replace headlight lamp
64. Replace taillight lamp
65. Respond to LOW BAT CHARGE yellow caution light
66. Respond to LOW FUEL LEVEL yellow caution light
67. Respond to MASTER CAUTION light
68. Respond to MASTER WARNING light
69. Retrieve mired tank
70. Seek defilade position
71. Select a firing position
72. Select route providing a stable firing platform
73. Sense rounds
74. Shut down engine
75. Start dead engine
76. Start engine - aborted start
77. Start engine - normal start
78. Steer the tank
79. Take action when engine cranks but does not start
80. Take action when engine does not crank
81. Take action when engine does not shut down
82. Take action when engine operates with reduced power
83. Take action when engine shuts down automatically
84. Test and adjust driver compartment indicator lights and internal instrument lights
85. Tow disabled tank
86. Use infrared lenses

LOADER TASKS

1. Acquire targets
2. Adjust loader's seat and platform
3. Automatically operate ready ammo compartment door
4. Change the barrel on the loader's machinegun
5. Check the replenisher
6. Check the turret networks box
7. Clear the coaxial machinegun
8. Clear the loader's machinegun
9. Clear the main gun
10. Close and lock loader's hatch from the outside
11. Close the breach manually
12. Close the hull ammo compartment door
13. Close the semi-ready ammo compartment door
14. Empty the loader's machinegun spent case can
15. Enter loader's station
16. Erect crosswind sensor
17. Exit tank
18. Fire the loader's machinegun
19. Identify main gun ammunition
20. Identify US and foreign equipment
21. Install and operate loader's periscope
22. Install loader's machinegun
23. Install the loader's night vision viewer
24. Load the coaxial machinegun
25. Load the grenade launcher
26. Load the loader's machinegun
27. Load the main gun
28. Lock main gun elevation travel lock
29. Lock the turret traverse lock
30. Manually close the ready ammo compartment door
31. Manually operate ready ammo compartment door
32. Open the breach manually
33. Open the hull ammo compartment door
34. Open the semi-ready ammo compartment door
35. Operate domelight
36. Operate intercommunications equipment
37. Operate loader's panel
38. Operate the gas particulate filter system
39. Operate the loader's hatch
40. Operate the loader's night vision viewer
41. Operate the portable fire extinguisher
42. Perform before operations maintenance checks and services on loader's machinegun and 105mm gun tube
43. Perform before-ops maintenance checks and services on remote thermometer, breach group main gun mount
44. Perform the manual extraction of a round
45. Position loader's guards for firing
46. Power up loader's station
47. Prepare coaxial machinegun for travel
48. Prepare grenade launcher for travel
49. Prepare intercommunications equipment
50. Prepare loader's machinegun for travel

Loader Tasks - continued

51. Prepare gun for travel
52. Pull the external fire extinguisher handle
53. Rank targets according to potential danger
54. Remove an 105mm round from the ammo stowage racks
55. Remove the loader's machinegun
56. Remove the loader's night vision viewer
57. Remove the loader's periscope
58. Secure the loader's station
59. Stow 105mm ammo in the hull ammo compartment
60. Stow 105mm ammo in the ready ammo compartment
61. Stow 105mm ammo in the semi-ready ammo compartment
62. Stow 105mm ammo in the turret floor ready racks
63. Stow the crosswind sensor and antenna
64. Stow the loader guards
65. Unload the grenade launcher
66. Unlock main gun elevation travel lock
67. Unlock the turret traverse lock
68. Zero loader's machinegun

APPENDIX G

LOCATIONS OF TRAINING OBJECTIVES FOR TANK
COMMANDER, GUNNER, DRIVER, AND LOADER TASKS

LOCATION OF TRAINING OBJECTIVES FOR TANK COMMANDER TASKS

TANK COMMANDER TASK	TRAINING OBJECTIVE NUMBER	LOCATION ¹
1. Acquire targets	1H	APPENDIX H
2. Adjust TC seat and platform	2A	UCOFT
3. Boresight commander's machinegun	4C	UCOFT
4. Check and adjust headspace on commander's machinegun	5C	UCOFT
5. Check and adjust timing on commander's machinegun	6C	UCOFT
6. Clear commander's machinegun	1C	UCOFT
7. Clear misfire in commander's machinegun	9C	UCOFT
8. Estimate range	4H	APPENDIX H
9. Fire commander's machinegun	11C	APPENDIX H
10. Fire grenades	2D	UCOFT
11. Fire main gun from TC's position	4F	APPENDIX H
12. Fire suppressive fires	1G	APPENDIX H
13. Identify US and foreign equipment	2H	APPENDIX H
14. Install commander's machinegun	3C	UCOFT
15. Issue fire command	1F	APPENDIX H
16. Lay gun for direction	2F	APPENDIX H
17. Load commander's machinegun	7C	UCOFT
18. Load grenade launcher	1D	UCOFT
19. Operate commander's hatch	1A	UCOFT
20. Operate commander's power control handle	2B	UCOFT
21. Operate commander's weapon station in manual mode	5B	UCOFT
22. Operate commander's weapon station in power mode	4B	UCOFT
23. Operate intercommunications equipment	2I	APPENDIX H
24. Operate radio	1I	APPENDIX H
25. Operate rangefinder	3F	APPENDIX H
26. Perform before-firing checks and services	1J	APPENDIX H
27. Perform before-operations maintenance checks and services on the commander's machinegun	12C	APPENDIX H

¹ARI Research Product, Development of Training Objectives for XM1 UCOFT, January 1980, is referred to as "UCOFT" in this table.

28. Perform before-operations maintenance checks and services on TC's station	4A	UCOFT
29. Perform during-firing checks and services	2J	APPENDIX H
30. Perform post-firing checks and services	3J	APPENDIX H
31. Perform misfire procedures on main gun	7F	APPENDIX H
32. Power down and secure commander's station	1E	UCOFT
33. Prepare commander's machinegun for travel	10C	UCOFT
34. Prepare GPS extension for operation	3B	UCOFT
35. Prepare intercommunications equipment	3A	UCOFT
36. Rank targets according to potential danger	3H	APPENDIX H
37. Remove commander's machinegun	2C	UCOFT
38. Sense rounds	5F	APPENDIX H
39. Sense rounds for another tank	6F	APPENDIX H
40. Take immediate action for misfire of grenade launcher	3D	UCOFT
41. Test commander's panel lights and switches	1B	UCOFT
42. Unload grenade launcher	4D	UCOFT
43. Zero commander's machinegun	8C	UCOFT

LOCATION OF TRAINING OBJECTIVES FOR GUNNER TASKS

GUNNER TASK	TRAINING OBJECTIVE NUMBER	LOCATION ¹
1. Acquire targets	1Q	APPENDIX I
2. Adjust gunner's seat, browpads, and chestrest	2A	UCOFT
3. Align muzzle reference sensor	9C	UCOFT
4. Boresight gunner's auxiliary sight	4K	UCOFT
5. Boresight gunner's primary sight	1K	UCOFT
6. Boresight muzzle reference sensor	2K	UCOFT
7. Boresight thermal imaging system	3K	UCOFT
8. Change barrel of coaxial machinegun	8J	UCOFT
9. Clear coaxial machinegun	9J	UCOFT
10. Clear misfire in coaxial machinegun	6J	UCOFT
11. Close ballistic shields	2P	APPENDIX I
12. Confirm ballistic shields	2L	UCOFT
13. Elevate/depress main gun using power control handle	2F	UCOFT
14. Engage targets with main gun - emergency mode	2I	UCOFT
15. Engage targets with main gun - manual mode	3I	UCOFT
16. Engage targets with main gun - normal mode	2I	UCOFT
17. Enter gunner's station	1A	UCOFT
18. Fire coaxial machinegun	5J	UCOFT
19. Focus thermal imaging system picture	4B	UCOFT
20. Identify malfunctions in fire control and weapon system	1E	UCOFT
21. Identify US and foreign equipment	2Q	APPENDIX I
22. Install coaxial machinegun	2J	UCOFT
23. Lay on target using gunner's auxiliary sight	1H	UCOFT
24. Lay on targets using gunner's primary sight	7I	APPENDIX I
25. Load coaxial machinegun	3J	UCOFT
26. Manually input fire control data for auto parameters into ballistic computer	2G	UCOFT
27. Manually input fire control data for manual parameters into ballistic computer	1G	UCOFT

¹ARI Research Product, Development of Training Objectives for XM1 UCOFT, January 1980, is referred to as "UCOFT" in this table.

28. Manually input fire control data for toggle input parameters into ballistic computer	3G	UCOFT
29. Notify TC if recommended corrective actions do not correct malfunctions	3E	UCOFT
30. Operate gas particulate system	1P	APPENDIX I
31. Operate intercommunications system	3A	UCOFT
32. Perform before-operations maintenance checks and services on gunner's machinegun	10J	APPENDIX I
33. Perform before-operations maintenance checks and services on gunner's station	4A	UCOFT
34. Perform boresight check	8C	UCOFT
35. Perform cant unit check	2D	UCOFT
36. Perform computer data check	1D	UCOFT
37. Perform computer self-test	3C	UCOFT
38. Perform crosswind sensor check	10C	UCOFT
39. Perform firing circuit tests	7C	UCOFT
40. Perform GPS functional check	2C	UCOFT
41. Perform gun/turret drive--LOS tracking check	5C	UCOFT
42. Perform lead accuracy check	3D	UCOFT
43. Perform lead system check	6C	UCOFT
44. Perform main gun failure to fire procedures	4I	UCOFT
45. Perform superelevation check	4D	UCOFT
46. Perform thermal imaging system built-in test	4C	UCOFT
47. Power down and secure gunner's station	1N	UCOFT
48. Prepare ballistic computer for operation	7B	UCOFT
49. Prepare coaxial machinegun for travel	20	UCOFT
50. Prepare gunner's auxiliary sight for operation	6B	UCOFT
51. Prepare gunner's primary sight for operation	2B	UCOFT
52. Prepare intercommunications equipment	1R	APPENDIX I
53. Prepare laser rangefinder for operation	5B	UCOFT
54. Prepare main gun for travel	10	UCOFT
55. Prepare thermal imaging system for operation	3B	UCOFT
56. Prepare to fire main gun	1I	UCOFT
57. Range to target using LFR	3F	UCOFT
58. Rank targets according to potential danger	3Q	APPENDIX I
59. Remove coaxial machinegun	1J	UCOFT

60. Sense rounds	5I	APPENDIX I
61. Stop runaway firing of coaxial machinegun	7J	UCOFT
62. Take recommended actions to correct malfunctions	2E	UCOFT
63. Test GPS and TIS panel lights	1B	UCOFT
64. Test gunner's station caution and warning lights	1C	UCOFT
65. Track targets	6I	APPENDIX I
66. Traverse turret using power control handles	1F	UCOFT
67. Verify tank main gun zero	1M	UCOFT
68. Zero coaxial machinegun	4J	UCOFT
69. Zero tank main gun	1L	UCOFT

LOCATION OF TRAINING OBJECTIVES FOR DRIVER TASKS

DRIVER TASK	TRAINING OBJECTIVE NUMBER	LOCATION ¹
1. Acquire targets	1AA	APPENDIX J
2. Adjust track tension	4X	DT
3. Brake the tank	3E	DT
4. Check driver's instrument panel switches and guages	3B	DT
5. Check driver's master panel switches	1B	DT
6. Check turret seal and drain valves	3A	DT
7. Close driver's hatch	2M	DT
8. Close front fender	6X	DT
9. Complete short tracking	1W	DT
10. Complete silent watch duty cycle	1V	DT
11. Connect track	3X	DT
12. Decontaminate tank	5N	DT
13. Disconnect tank	2X	DT
14. Do immediate action for loss of engine power	1N	DT
15. Do immediate action for loss of service brakes	3N	DT
16. Do immediate action for loss of steering	2N	DT
17. Do immediate action for throttle failure	6N	DT
18. Drive into water obstacle	2Z	DT
19. Drive out of water obstacle	3Z	DT
20. Drive tank across ditches	3Q	DT
21. Drive tank over obstacles	2Q	DT
22. Drive tank up and down hills	1Q	DT
23. Enter driver's station	1A	DT
24. Exit driver's station	3M	DT
25. Ford shallow water	1Y	DT
26. Identify US and foreign equipment	2AA	APPENDIX J
27. Install thrown track	10-90	DT
28. Install water fording kit items	1Z	DT
29. Maintain correct speed	4E	APPENDIX J
30. Make after-start check on brakes	4D	DT

¹ARI Research Product, Training Materials and Data Requirements for Driver Trainer(DT) Training Test Support Plan, August 1980, is referred to as "DT" in this table.

31. Make after-start checks on engine	1D	DT
32. Make after-start checks on warning and caution lights	2D	DT
33. Open driver's hatch and adjust driver's seat and periscope	2A	DT
34. Open front fender	5X	DT
35. Operate crew compartment fire extinguisher - automatic mode	3G	DT
36. Operate crew compartment fire extinguisher - manual mode	4G	DT
37. Operate driver's night vision viewer	3K	DT
38. Operate engine compartment fire extinguisher - automatic mode	1G	DT
39. Operate engine compartment fire extinguisher - manual mode	2G	DT
40. Operate gas particulate filter system	1H	DT
41. Operate intercommunications equipment	4A	DT
42. Operate outside lights	1K	DT
43. Operate personnel heater - fan and heater	2J	DT
44. Operate personnel heater - fan only	1J	DT
45. Operate portable fire extinguishers	5G	DT
46. Operate smoke generator	1I	DT
47. Operate tank on sand or mud	2U	DT
48. Operate tank on snow or ice	1U	DT
49. Perform after-operations checks and services	12X	APPENDIX J
50. Perform at-halt maintenance checks and services	13X	APPENDIX J
51. Perform before-operations maintenance checks and services on driver's station	5A	DT
52. Perform during operations maintenance checks	11X	APPENDIX J
53. Perform evasive maneuvers	6Q	APPENDIX J
54. Perform fuel transfer procedures	8Q	APPENDIX J
55. Place tank in motion	1E	DT
56. Power down hull system	1M	DT
57. Prepare intercommunications equipment	1BB	DT
58. Prepare tank for operation after fording	4Z	DT
59. Prepare tank for slave start	1R	DT
60. Refuel tank	10X	DT
61. Release track tension	1X	DT
62. Remove injured crewmember through loader's hatch	4N	DT

63. Replace front blackout marker lamp	7X	DT
64. Replace headlight lamp	8X	DT
65. Replace taillight lamp	9X	DT
66. Respond to LOW BAT CHARGE yellow caution light	2F	DT
67. Respond to LOW FUEL LEVEL yellow caution light	3F	DT
68. Respond to MASTER CAUTION light	1F	DT
69. Respond to MASTER WARNING light	4F	DT
70. Retrieve mired tank	1T	DT
71. Seek defilade position	7Q	APPENDIX J
72. Select a firing position	4Q	APPENDIX J
73. Select route providing a stable firing platform	5Q	APPENDIX J
74. Sense rounds	3AA	APPENDIX J
75. Service precleaner	14X	APPENDIX J
76. Shut down engine	1L	DT
77. Start dead engine	2R	DT
78. Start engine - aborted start	2C	DT
79. Start engine - normal start	1C	DT
80. Steer the tank	2E	DT
81. Take action when engine cranks but does not start	2P	DT
82. Take action when engine does not crank	1P	DT
83. Take action when engine does not shut down	5P	DT
84. Take action when engine operates with reduced power	3P	DT
85. Take action when engine shuts down automatically	4P	DT
86. Test and adjust driver compartment indicator lights and internal instrument lights	2B	DT
87. Tow disabled tank	1S-7S	DT
88. Troubleshoot gas particulate filter unit	1CC	APPENDIX J
89. Troubleshoot night vision viewer	2CC	APPENDIX J
90. Troubleshoot personnel heater	3CC	APPENDIX J
91. Troubleshoot transmission	4CC	APPENDIX J
92. Use infrared lenses	2K	DT

LOCATION OF TRAINING OBJECTIVES FOR LOADER TASKS

GUNNER TASK	TRAINING OBJECTIVE NUMBER	LOCATION
1. Acquire targets	1S	VOLUME VII
2. Adjust loader's seat and platform	9A	VOLUME VII
3. Automatically operate ready ammo compartment door	1E	VOLUME VII
4. Change the barrel of the loader's machinegun	3J	VOLUME VII
5. Check the replenisher	1H	VOLUME VII
6. Check the turret networks box	1M	VOLUME VII
7. Clear the coaxial machinegun	2I	VOLUME VII
8. Clear the loader's machinegun	4J	VOLUME VII
9. Clear the main gun	3H	VOLUME VII
10. Close the lock loader's hatch from the outside	7Q	VOLUME VII
11. Close the breech manually	2G	VOLUME VII
12. Close the hull ammo compartment door	7E	VOLUME VII
13. Close the semi-ready ammo compartment door	5E	VOLUME VII
14. Empty the loader's machinegun spent case can	5J	VOLUME VII
15. Enter loader's station	5A	VOLUME VII
16. Erect crosswind sensor	1A	VOLUME VII
17. Exit tank	4Q	VOLUME VII
18. Fire the loader's machinegun	2J	VOLUME VII
19. Identify main gun ammunition	8E	VOLUME VII
20. Identify US and foreign equipment	3S	VOLUME VII
21. Install and operate loader's periscope	11A	VOLUME VII
22. Install loader's machinegun	2A	VOLUME VII
23. Install the loader's night vision viewer	10	VOLUME VII
24. Load the coaxial machinegun	1I	VOLUME VII
25. Load the grenade launcher	1L	VOLUME VII
26. Load the loader's machinegun	1J	VOLUME VII
27. Load the main gun	2H	VOLUME VII
28. Lock main gun elevation travel lock	2C	VOLUME VII
29. Lock the turret traverse lock	2D	VOLUME VII
30. Manually close the ready ammo compartment door	3E	VOLUME VII

31. Manually open the ready ammo compartment door	2E	VOLUME VII
32. Open the breech manually	1G	VOLUME VII
33. Open the hull ammo compartment door	6E	VOLUME VII
34. Open the semi-ready ammo compartment door	4E	VOLUME VII
35. Operate domelight	6A	VOLUME VII
36. Operate intercommunications equipment	1T	VOLUME VII
37. Operate loader's panel	1B	VOLUME VII
38. Operate the gas particulate filter system	1K	VOLUME VII
39. Operate the loader's hatch	4A	VOLUME VII
40. Operate the loader's night vision viewer	2O	VOLUME VII
41. Operate the portable fire extinguisher	2N	VOLUME VII
42. Perform before-operations maintenance checks and services on loader's machinegun and 105mm gun tube	3A	VOLUME VII
43. Perform before-operations maintenance checks and services on remote thermometer, breech group main gun mount	10A	VOLUME VII
44. Perform the manual extraction of a round	4H	VOLUME VII
45. Position loader's guards for firing	12A	VOLUME VII
46. Power up loader's station	7A	VOLUME VII
47. Prepare coaxial machinegun for travel	2P	VOLUME VII
48. Prepare grenade launcher for travel	4P	VOLUME VII
49. Prepare intercommunications equipment	8A	VOLUME VII
50. Prepare loader's machinegun for travel	3P	VOLUME VII
51. Prepare gun for travel	1P	VOLUME VII
52. Pull the external fire extinguisher handle	1N	VOLUME VII
53. Rank targets according to potential danger	2S	VOLUME VII
54. Remove an 105mm round from the ammo stowage racks	5F	VOLUME VII
55. Remove the loader's machinegun	6Q	VOLUME VII
56. Remove the loader's night vision viewer	3O	VOLUME VII
57. Remove the loader's periscope	2Q	VOLUME VII
58. Secure the loader's station	3Q	VOLUME VII
59. Stow 105mm ammo in the hull ammo compartment	1F	VOLUME VII
60. Stow 105mm ammo in the ready ammo compartment	2F	VOLUME VII
61. Stow 105mm ammo in the semi-ready ammo compartment	3F	VOLUME VII
62. Stow 105mm ammo in the turret floor ready racks	4F	VOLUME VII
63. Stow the crosswind sensor and antenna	5Q	VOLUME VII

64. Stow the loader guards	1Q	VOLUME VII
65. Unload the grenade launcher	2L	VOLUME VII
66. Unlock main gun elevation travel lock	1C	VOLUME VII
67. Unlock the turret traverse lock	1D	VOLUME VII
68. Zero loader's machinegun	1R	VOLUME VII

APPENDIX H

ADDITIONAL TRAINING OBJECTIVES FOR TANK COMMANDER TASKS

MODULE C. OPERATE COMMANDERS MACHINEGUN (CALIBER .50)

CONDITIONS/STIMULUS

System State: Table C, Column 1C; Commander's machinegun loaded.*
Commander Location: In Commander's station.
Initiating Stimuli: As described for each task.

ACTION

Commander will do the following tasks:

- *1C. Clear Commander's machinegun.
- *2C. Remove Commander's machinegun.
- *3C. Install Commander's machinegun.
- *4C. Boresight Commander's machinegun.
- *5C. Check and adjust headspace on Commander's machinegun.
- *6C. Check and adjust timing on Commander's machinegun.
- *7C. Load Commander's machinegun.
- *8C. Zero Commander's machinegun.
- *9C. Clear misfire in Commander's machinegun.
- *10C. Prepare Commander's machinegun for travel.
- 11C. Fire Commander's machinegun.
- 12C. Perform before operations maintenance checks and services on the Commander's machinegun.

*System state table and Tasks 1C through 10C are contained in ARI Research Product, Development of Training Objectives for XML UCOT, January 1980.

TASK 11C: FIRE THE COMMANDER'S MACHINEGUN

CONDITIONS/STIMULUS

System State: Table C*, Column 9C; Commander's machinegun loaded.
Commander Location: In Commander's station.
Initiating Stimuli: Caliber .50 machinegun fire command.

ACTION

- Commander will:
1. Load commander's machinegun (See Task 7C).
 2. Move butterfly trigger safety switch to F.
 3. Alert crew by announcing "Caliber 50".
 4. Move safety switch on CWS elevation crank to FIRE.
 5. Look through commander's sight or the unity periscope and the steel sights underneath the weapon and lay aiming point on target using CWS power or manual controls.
 6. Fire commander's weapon by pulling down on the CWS elevation crank knob. (Release knob to cease firing.)
 7. If CWS crank knob will not fire weapon, press down on butterfly trigger on weapon's backplate. (Release butterfly trigger to cease firing.)
 8. Move safety switch on CWS elevation crank to SAFE to secure from firing.
 9. Move butterfly trigger safety switch to F.
 10. When all firing is complete clear commander's weapon. (See Task 1C.)

MEASUREMENT

- Time - Between end of initiating stimulus and completion of Step 10.
- During Training:
- Accuracy - As indicated by match between steps given above and steps performed by Commander.
- Time - Between end of initiating stimulus and completion of Step 10.
- End of Training:
- Accuracy - As indicated by:
- . The machinegun firing properly without stopping or runaway firing.
 - . The machinegun being adjustable for all firing directions.
 - . The butterfly safety placed in the S position and the CWS elevation crank placed in the SAFE position.

REFERENCES

TM 9-2350-255-10; p. 2-135 and 2-136.

*System state table is contained in ARI Research Product, Development of Training Objectives for XM1 UCOFT, January 1980.

TASK 12C: PERFORM BEFORE OPERATIONS MAINTENANCE CHECKS
AND SERVICES ON THE COMMANDER'S MACHINEGUN

CONDITIONS/ STIMULUS

System State: Table C*, Column 1C; machinegun cleared.
Commander Location: In Commander's station.
Initiating Stimuli: Platoon Leader tells TC to perform before
operations maintenance checks and services
on the Caliber .50 machinegun.

ACTION

Commander will:

1. Check mounting of machinegun in the mount.
2. Check headspace and timing (See Tasks 5C and 6C).
3. Check ammunition stowage in ready box.
4. Boresight machinegun (See Task 4C).
5. Check for proper operation of weapon.
6. Change barrel as needed.

MEASUREMENT

Time - Between end of initiating stimulus and
completion of Step 6.

During Training:

Accuracy - As indicated by match between steps
given above and steps performed by
Commander.

Time - Between end of initiating stimuli and
completion of Step 6.

End of Training:

Accuracy - As indicated by:

- . Weapon being securely mounted.
- . Ammunition properly stowed in ready
box.
- . Weapon functioning properly.

REFERENCES

TM 9-2350-255-10; p. 2-53 through 2-54.

*System state table is contained in ARI Research Product, Development of
Training Objectives for XM1 UCOFT, January 1980.

MODULE F. OPERATE THE MAIN GUN

CONDITIONS/STIMULUS

System State: Table F, Column 1F, main gun empty.
Commander Location: In Commander's station.
Initiating Stimuli: As described in each task.

ACTION

Commander will do the following tasks:

- 1F. Issue fire command.
- 2F. Lay gun for direction.
- 3F. Operate rangefinder.
- 4F. Fire main gun from TC's position.
- 5F. Sense rounds.
- 6F. Sense rounds for another tank.
- 7F. Perform misfire procedures on the main gun.

TABLE F

POSITION OF CONTROLS FOR TASKS IN MODULE F
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITIONS OF CONTROLS						
	TASK						
	1F	2F	3F	4F	5F	6F	7F
VEHICLE MASTER POWER switch	ON	ON	ON	ON	ON	ON	ON
TURRET POWER switch	ON	ON	ON	ON	ON	ON	ON
Domelight	ON	ON	ON	ON	ON	ON	ON
Commander's hatch	FULL OPEN OR PROT. OPEN	FULL OPEN OR PROT. OPEN	FULL OPEN OR PROT. OPEN	FULL OPEN OR PROT. OPEN	FULL OPEN OR PROT. OPEN	FULL OPEN OR PROT. OPEN	FULL OPEN OR PROT. OPEN
POWER/MANUAL lever	POWER	POWER	POWER	POWER	POWER	POWER	POWER
Main gun elevation travel lock	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED
Turret traverse lock	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED

TASK 1F: ISSUE FIRE COMMAND

CONDITIONS/STIMULUS

System State: Table F, Column 1F, main gun empty.
Commander Location: In Commander's station.
Initiating Stimuli: Appearance of a target.

ACTION

Commander will:

1. Alert the crew by announcing: GUNNER or CALIBER .50 or M60.
2. Identify ammunition by announcing: HEP or HEAT or SABOR or BEEHIVE or BEEHIVE TIME or SMOKE or COAX.
3. Lay main gun on the target.
4. Range to target: squeeze palm switch and press laser firing button.
5. Identify the target by announcing: TANK or TRUCK or PC or CHOPPER or PLANE or TROOPS or ANTITANK.
6. Announce FIRE or AT MY COMMAND or FROM MY POSITION.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 6.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by TC.

Time - Between end of initiating stimuli and completion of Step 6.

End of Training:

Accuracy - As indicated by giving the proper fire command for the conditions present and laying the main gun on the target and ranging to the target.

REFERENCES

TM 9-2350-255-10; p. 1-36 and FM 17-12, Chapter 9.

MODULE 2F: LAY GUN FOR DIRECTION

CONDITIONS/STIMULUS

System State: Table F, Column 2F, main gun empty.
Commander Location: In Commander's station.
Initiating Stimuli: Appearance of a target.

ACTION

Commander will:

1. Grasp the power control handle with right hand and squeeze the palm switch.
2. Move power control handle left or right to traverse main gun to target.
3. Move power control handle forward or pull back on handle to lay main gun on target.
4. Look through commander's GPS extension to make final lay on target for firing.
5. Press laser firing button.

NOTE: After lasing to target remove hand from power control handle when gunner announces IDENTIFIED.

MEASUREMENT

Time - Between the end of initiating stimuli and completion of Step 5.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by TC.

Time - Between the end of initiating stimuli and completion of Step 5.

End of Training:

Accuracy - As indicated by laying the main gun on the target and the Gunner announcing identified.

REFERENCES

TM 9-2350-255-10; p. 2-127 to 2-128.

MODULE 3F: OPERATE RANGEFINDER

CONDITIONS/STIMULUS

System State: Table F, Column 3F.
Commander Location: In Commander's station.
Initiating Stimuli: The presence of a target at an unknow range.

ACTIONS

Commander will:

1. Insure GPS day ballistic door is open.
2. Insure Gunner's RANGE switch is in the ARM 1ST RTN or ARM LAST RTN position.
3. Elevate/depress and traverse the main gun to lay GPS extension reticle on the target.
4. Squeeze palm switch on Commander's power control handle and press laser firing button.

MEASUREMENT

Time - Between the end of initiating stimuli and completion of Step 4.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by TC.

Time - Between the end of initiating stimuli and completion of Step 4.

End of Training:

Accuracy - As indicated by determining the range to a target by using the laser rangefinder.

REFERENCES

TM 9-2350-255-10; p. 1-34 to 1-35 and 2-127 to 2-128.

MODULE 4F: FIRE MAIN GUN FROM TC'S POSITION

CONDITIONS/STIMULUS

System State: Table F, Column 4F; main gun empty.
Commander Location: In Commander's station.
Initiating Stimuli: Gunner cannot identify target.

ACTION

Commander will: NOTE A: Gunner announces CANNOT IDENTIFY
or TC announces FROM MY POSITION.

1. Insure AMMUNITION SELECT switch is set according to the fire command and the light is lit.
2. View through GPS extension eyepiece.
3. Grasp power control handles.
4. Squeeze palm switches.
5. Using power control handles, lay GPS extension reticle on target aiming point.
6. Range to target (See Task 3F).
7. After Loader has announced UP, announce ON THE WAY.
8. Wait one second and fire.
9. Squeeze trigger on power control handle.

NOTE B: If gun fails to fire, perform failure to fire procedures (See Task 7F).

NOTE C: Release palm switch and re-engage before laying on another target to dump automatic lead.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 9.

Accuracy - As indicated by match between steps given above and steps performed by TC.

End of Training: Time - Between end of initiating stimuli and completion of Step 9.

Accuracy - As indicated by:

- . AMMUNITION SELECT switch is set according to fire command (light is lit).
- . TC announced ON THE WAY before firing.
- . First round hits the target.

REFERENCES

TM 9-2350-255-10; p. 2-128 and 2-192 to 2-194 and FM 17-12, Chapter 9.

MODULE 5F: SENSE ROUNDS

CONDITIONS/STIMULUS

System State: Table F, Column 5F, main gun loaded.
Commander Location: In Commander's station.
Initiating Stimuli: The need to locate the first round fire in relation to the target in order to issue a subsequent fire command (Firing the main gun).

ACTIONS

Commander will: 1. Sense the round in deflection as:
LEFT or RIGHT or LINE.
2. Sense the round in range as:
OVER or SHORT or DOUBTFUL or TARGET.

NOTE A: If the Gunner has a sensing he will announce it and BOT.

3. TC remains silent and senses subsequent rounds.

NOTE B. If the Gunner does not have a sensing the TC will issue a subsequent fire command.

MEASUREMENT

Time - Between the end of initiating stimuli and completion of Step 2 or between the end of initiating stimuli and completion of Task 3.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by TC.

Time - Between the end of initiating stimuli and completion of Step 2 or between the end of initiating stimuli and completion of Task 3.

End of Training:

Accuracy - As indicated by:
. Accurate deflection sensing.
. Accurate range sensing.
. Target hit with second round.

REFERENCES

FM 17-12; Chapter 9.

TASK 6F: SENSE ROUNDS FOR ANOTHER TANK

CONDITIONS/STIMULUS

System State: Table F, Column 6F.
Commander Location: In Commander's station.
Initiating Stimuli: Request for another TC to sense rounds (firing main gun round by adjacent tank).

ACTIONS

Commander will:

1. Use binoculars to sense rounds.
2. Sense the round fired in deflection as: LEFT or RIGHT or LINE.
3. Sense the round fired in range as: OVER or SHORT or DOUBTFUL or TARGET.
4. Relay the sensing to the firing tank.

MEASUREMENT

Time - Between the end of initiating stimuli and completion of Step 4.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by TC.

Time - Between the end of initiating stimuli and completion of Step 4.

End of Training:

Accuracy - As indicated by:

- . Accurate deflection sensing.
- . Accurate range sensing.
- . Target hit with the second round.

REFERENCES

FM 17-12, Chapter 13.

TASK 7F: PERFORM MISFIRE PROCEDURES ON MAIN GUN

CONDITIONS/STIMULUS

System State: Table F, Column 7F, main gun loaded.
Commander Location: In Commander's station.
Initiating Stimuli: Main gun fails to fire.

ACTIONS

Commander will: NOTE A: Firing main gun from TC's position.

1. Announce misfire.
2. Keep main gun aimed on target.
3. Direct Gunner to perform misfire procedures on the main gun.*

NOTE B: If gun is hot and round is not removed within one minute after misfire, leave round in chamber. Have crew evacuate tank and take cover for two hours before removing the round.

MEASUREMENT

Time - Between the end of the initiating stimuli and completion of Step 3.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by TC.

Time - Between the end of the initiating stimuli and completion of Step 3.

End of Training:

Accuracy - As indicated by:

- . MISFIRE is announced when trigger is fired.
- . If gun does not fire round is removed from chamber within one minute after last trigger is fired; or if not within one minute, crew leaves tank for two hours.

REFERENCES

TM 9-2350-255-10; p. 2-128.

*Perform main gun failure to fire procedures for the Gunner are contained in Task 4I, ARI Research Product, Development of Training Objectives for XM1 UCOFT, January 1980.

MODULE G. FIRE SUPPRESSIVE FIRES

CONDITIONS/STIMULUS

System State: Table G, Commander's machinegun loaded.
Commander Location: In Commander's station.
Initiating Stimuli: Target in suppressive fires area.

ACTIONS

Commander will:

1G. Fire suppressive fires.

TABLE G

POSITION OF CONTROLS FOR TASK IN MODULE G
WHEN TASK PERFORMANCE BEGINS

<u>CONTROLS</u>	<u>POSITION OF CONTROLS</u>
VEHICLE MASTER POWER switch	ON
TURRET POWER switch	ON
POWER/MANUAL lever	POWER
ELEVATION CRANK TRIGGER SAFETY switch	SAFE
Commander's hatch	FULL OPEN

MODULE 1G: FIRE SUPPRESSIVE FIRES

CONDITIONS/STIMULUS

System State: Table G, Commander's machinegun loaded.
Commander Location: In Commander's station.
Initiating Stimuli: Need to suppress a target.

ACTIONS

Commander will:

1. Load Commander's weapon.*
2. Move butterfly trigger safety switch to F.
3. Alert crew on intercom by announcing CALIBER .50.
4. Move safety switch on CWS elevation crank to FIRE.
5. Look through the Commander's weapon sight and lay the aiming point on the target.
6. Fire a 10-20 round burst by pulling down on elevation crank handle.

NOTE A: Machinegun will fire as long as elevation crank handle is pulled.

NOTE B: If misfire occurs, perform failure to fire procedure.*

7. Adjust elevation by turning CWS elevation crank.
8. Adjust deflection by using palm switch and thumb control on the control handle.
9. Announce END OF MISSION when target is suppressed or destroyed.
10. Move safety switch on CWS elevation crank to SAFE.
11. Clear Commander's weapon.*
12. Remain alert for target latent reaction.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 11.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by TC.

Time - Between end of initiating stimuli and completion of Step 11.

End of Training:

Accuracy - As indicated by:

- . Suppressing or destroying the target.
- . Remaining alert for target latent reaction.

*Loading, clearing, and misfire procedures for the Commander's weapon are contained in Tasks 7C, 1C, and 9C of ARI Research Product, Development of Training Objectives for XML UCOFT, January 1980.

REFERENCES

TM 9-2350-255-10; p. 2-130 and 2-135 to 2-136, and FM 17-12,
Chapter 14.

MODULE H. TARGET ACQUISITION

CONDITIONS/STIMULUS

System State: Table H, Column 1H, tank in firing position.
Commander Location: In Commander's station.
Initiating Stimuli: The need to acquire targets.

ACTIONS

Commander will:

- 1H. Acquire targets.
- 2H. Identify US and foreign equipment.
- 3H. Rank targets according to potential danger.
- 4H. Estimate range.

TABLE H

POSITION OF CONTROLS FOR TASKS IN MODULE H
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS TASKS		
	1 H	2H	3H
AMPLIFIER MAIN POWER switch	NORM	NORM	NORM
AMPLIFIER POWER CIRCUIT BREAKER switch	ON	ON	ON
AMPLIFIER INTERCOM ACCENT switch	ON	ON	ON
AMPLIFIER RADIO TRANSMISSION switch	CDR + CREW	CDR + CREW	CDR + CREW
INTERCOM lever	INT ONLY	INT ONLY	INT ONLY
TURRET POWER switch	ON	ON	ON
DOMELIGHT	ON OR OFF	ON OR OFF	ON OR OFF
TURRET BLOWER switch	ON OR OFF	ON OR OFF	ON OR OFF
GUN TURRET DRIVER switch	ANY POSITION	ANY POSITION	ANY POSITION
Commander's hatch	OPEN	OPEN	OPEN

TASK 1H: ACQUIRE TARGETS

CONDITIONS/STIMULUS

System State: Table H, Column 1H.
Commander Location: In Commander's station.
Initiating Stimuli: The appearance of a target in assigned area of observation.

ACTIONS

Commander will:

1. Detect targets in assigned area of observation.
2. Identify targets in assigned area of observation.
3. Locate targets in assigned area of observation by direction and range.
4. Report targets presence and/or engage targets.

MEASUREMENTS

Time - Between end of initiating stimulus and completion of Step 4.

During Training:

Accuracy - As measured by the match between the actual conditions listed in the above steps and the Commander's responses for each step.

Time - Between end of initiating stimulus and completion of Step 4.

End of Training:

Accuracy - As indicated by:

- . The Commander detecting targets in assigned sector.
- . The Commander identifying targets in assigned sector.
- . The Commander locating targets in assigned sector.
- . The Commander reporting targets presence and/or engaging targets.

REFERENCES

FM 17-12; p. 6-1.

TASK 2H: IDENTIFY US AND FOREIGN EQUIPMENT

CONDITIONS/STIMULUS

System State: Table H, Column 2H.
Commander Location: In Commander's station.
Initiating Stimuli: The need to prevent the inadvertent engagement of friendly targets.

ACTIONS

Commander will: 1. Identify US and foreign ground equipment (vehicles).
Identify US and foreign flying equipment (aircraft).

MEASUREMENT

During Training: Time - Between US and foreign equipment appearing and beginning of report or engagement.
Accuracy - As measured by the match between the actual target conditions listed and the Commander's response in reporting or engaging the targets.

End of Training: Time - Between US and foreign equipment appearing and beginning of report or engagement.
Accuracy - As measured by the match between the actual target conditions listed and the Commander's response in reporting or engaging the targets.

REFERENCES

FM 17-12; p. 6-9.

TASK 3H: RANK TARGETS ACCORDING TO POTENTIAL DANGER

CONDITIONS/STIMULUS

System State: Table H, Column 2H.
Commander Location: In Commander's station.
Initiating Stimuli: The need to determine the most dangerous target.

ACTIONS

Commander will:

1. Identify the most dangerous target by considering:
 - . the target sees you.
 - . the target can kill you.
 - . the target is preparing to engage you.
2. Identify the dangerous target by considering:
 - . the target can kill you.
 - . the target does not see you.
3. Identify the least dangerous target by considering:
 - . the target does not have the capability of killing you but can report you to targets that can kill you.

MEASUREMENT

During Training:

Time - Between target's appearance and beginning of report or engagement.

Accuracy - As measured by the match between the actual target conditions listed in the above steps and the Commander's responses for each step.

End of Training:

Time - Between target's appearance and beginning of report or engagement.

Accuracy - As measured by targets reported and/or engagement by the Commander in describing order of threat targets present.

REFERENCES

FM 17-12; p. 6-2 and 6-3.

TASK 4H: ESTIMATE RANGE

CONDITIONS/STIMULUS

System State: Table H, Column 4H, tank in firing position.
Commander Location: In Commander's station.
Initiating Stimuli: Appearance of a target.

ACTIONS

Commander will: NOTE A: Immediate range determination method -
Recognition method.

1. Estimate range to various targets by using the criteria listed below:

<u>TARGET</u>	<u>RANGE TO TARGETS (MTRS)</u>	
	<u>NAKED EYE</u>	<u>MAGNIFICATION 7-8 POWER</u>
Tank Crew Members Troops, Machinegun, Motor Antitank Gun, Antitank Msl Lchr	500	2,000
Tank, Armored Personnel Carrier, Truck (by model)	1,000	4,000
Tank, Howitzer, APC, Truck	1,500	5,000
Armored Vehicle, Wheel Vehicle	2,000	6,000

<u>SEEMS CLOSER</u>	<u>SEEMS FARTHER</u>
. Bright clear day . Sun in front of target . Higher elevation . Large targets . Bright colors - (white, red, yellow) . Contrast . Looking across ravines, hollows, rivers, depressions . At sea	. Fog, rain, hazy twilight . Sun behind target . Lower elevation . Small targets . Dark colors . Camouflaged targets

MEASUREMENT

Time - Between end of initiating stimuli and
the announcement of the range element
in a fire command.

During Training:

Accuracy - As indicated by the match between the
range element in the fire command and
the measured distance to the target.

Time - Between end of initiating stimuli and the announcement of the range element in a fire command.

End of Training:

Accuracy - As indicated by the TC accurately estimating range to various targets at various ranges.

REFERENCES

FM 17-12; Chapter 7.

MODULE I. OPERATE COMMUNICATIONS EQUIPMENT

CONDITIONS/STIMULUS

System State: Table I, Column 1I.
Commander Location: In Commander's station.
Initiating Stimuli: The need to communicate with other crewmembers.

ACTIONS

Commander will:

- 1I. Operate radio.
- 2I. Operate intercommunications equipment

TABLE I

POSITION OF CONTROLS FOR TASKS IN MODULE I
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS TASKS	
	1I	2I
VEHICLE MASTER POWER switch	ON	ON
AMPLIFIER MAIN POWER switch	NORM	NORM
AMPLIFIER POWER CIRCUIT BREAKER switch	ON	ON
AMPLIFIER INTERCOM ACCENT switch	ON	ON
AMPLIFIER RADIO TRANSMISSION switch	CDR	CDR
INTERCOM lever	INT ONLY	INT ONLY
RECEIVER-TRANSMITTER POWER switch	LOW OR HIGH	LOW OR HIGH
DOMELIGHT	ON	ON
Commander's hatch	ANY POSITION	ANY POSITION

TASK 11: OPERATE RADIO

CONDITIONS/STIMULUS

System State: Table I, Column 11, and on operational radio intercommunications system, CVC helmet, and a predetermined frequency sit on the radio.
Commander Location: In Commander's station.
Initiating Stimuli: The need to transmit a radio message.

ACTIONS

Commander will: 1. Turn amplifier on:
 . Set VEHICLE MASTER POWER switch to ON.
 . Move MAIN POWER switch to NORM.

NOTE A: If MAIN POWER switch in in INT ONLY position, no radio transmission is possible.
 . Make sure POWER CKT BRK switch is set to ON. (POWER indicator will come on.)
 . If POWER CKT BRK switch trips to OFF reset it to ON.
 . Set INT ACCENT switch to ON or OFF.

NOTE B: INT ACCENT switch set to OFF: Intercom and radio sound levels are equal. INT ACCENT switch set to ON: radio sound level is lower than intercom.
 . Move RADIO TRANS switch to CDR + CREW, CDR ONLY or LISTENING SILENCE.

NOTE C: Switch in CDR + CREW - Entire crew can transmit on radio. Switch in CDR ONLY - Only tank commander can transmit on radio. Switch in LISTENING SILENCE - No radio transmission is possible.

2. Operate intercom box:

NOTE D: CVC helmet switch has three positions: center position to only listen to intercom or radio; push and hold forward to talk on radio; and push to the rear to talk on intercom. To operate intercom box without remote cable, shorting plug must be connected to receptacle.
 . Move intercom MONITOR switch lever to ALL or A.
 . To talk on radio push CVC helmet switch forward and hold (Switch is spring loaded and will return to center position when released.)
 . Talk into microphone and turn knob on bottom of intercom box to adjust volume.

3. Turn amplifier off:
 . Move MAIN PWR switch to OFF.
 . If not needed for other operations set VEHICLE MASTER POWER switch to OFF.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 3.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by TC.

Time - Between end of initiating stimuli and completion of Step 3.

End of Training:

Accuracy - As indicated by:

- . TC turning the radio on.
- . TC sending a message to another station.
- . TC turning radio off.

REFERENCES

TM 9-2350-255-10; p. 2-285 to 2-289.

TASK 2I: OPERATE INTERCOMMUNICATIONS EQUIPMENT

CONDITIONS/STIMULUS

System State: Table I, Column 2I.
Commander Location: In Commander's station.
Initiating Stimuli: The need to communicate with other crewmembers.

ACTIONS

Commander will: NOTE: Task 8A is executed prior to the following steps:*

1. Talk into CVC microphone and turn knob on bottom of intercom box to adjust volume.
2. Push lever on left side of CVC helmet back to the center position.

MEASUREMENT

During Training: Time - Between the end of the initiating stimulus and completion of Step 2.

Accuracy - As measured by the match between steps given above and appropriate steps performed by the TC.

End of Training: Time - Between the end of the initiating stimulus and completion of Step 2.

Accuracy - As indicated by:
. Ability to communicate with other crewmembers.

REFERENCES

TM 9-2350-255-10; p. 220.

*Task 8A is contained in ARI Final Report, Mission-Based Analyses of Armor Training Requirements, Volume VII: Training Objectives for XML Loader, February 1981.

MODULE J. PRE/DURING/POST FIRING CHECKS AND SERVICES

CONDITIONS/STIMULUS

System State: Table J, Column 1J.
Commander Location: In Commander's station
Initiating Stimuli: Need to conduct pre/during/post firing checks
and services.

ACTIONS

Commander will:

- 1J. Perform before firing checks and services.
- 2J. Perform during firing checks and services.
- 3J. Perform post firing checks and services.

TABLE J

POSITION OF CONTROLS FOR TASKS IN MODULE J
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS		
	TASK		
	1J	2J	3J
VEHICLE MASTER POWER switch	OFF	OFF	ON
TURRET POWER switch	OFF	OFF	ON
Domelight	ON	ON	ON
Commander's hatch	FULL OPEN	FULL OPEN	FULL OPEN

TASK 1J: PERFORM BEFORE FIRING CHECKS AND SERVICES

CONDITIONS/STIMULUS

System State: Table J, Column 1J, machinegun installed and cleared, tank on level ground, target with 90° corner at about 500 meters, headspace and timing gauge.
Commander Location: In Commander's station.
Initiating Stimuli: Platoon Leader tells TC to perform before firing checks and services.

ACTIONS

Commander will: Machinegun Caliber .50 MC
1. Check mounting of machinegun in mount.
2. Check headspace and timing (See Tasks 5C and 6C*).
3. Check ammunition stowage in ready box.
4. Boresight machinegun (See Task 4C*).
5. Check for proper operation of weapon.
6. Change barrels as needed.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 6.
During Training:
Accuracy - As indicated by match between steps given above and steps performed by TC.
Time - Between end of initiating stimuli and completion of Step 6.
End of Training:
Accuracy - As indicated by:
. machinegun properly mounted.
. headspace and timing correct.
. ammunition properly stowed in stowage ready box.
. machinegun boresighted.
. proper operation of the machinegun

REFERENCES

TM 9-2350-255-10; p. 2-53 to 2-54.

*Tasks 4C, 5C and 6C are contained in ARI Research Product, Development of Training Objectives for XM1 UCOFT, January 1980.

TASK 2J: PERFORM DURING FIRING CHECKS AND SERVICES

CONDITIONS/STIMULUS

System State: Table J, Column 2J.
Commander Location: In Commander's station.
Initiating Stimuli: Maintaining efficient firing operation.

ACTIONS

Commander will: Machinegun Caliber .50 M2

1. Field strip and check parts.
2. Clean and lubricate.

Commander's Panel

3. Check commander's panel for secure mounting.
4. Check operation of panel controls.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 4.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by TC.

Time - Between end of initiating stimuli and completion of Step 4.

End of Training:

Accuracy - As indicated by:

- . field strip, clean and lubricate machinegun.
- . firm mounting of commander's panel and smooth operation of panel controls.

REFERENCES

TM 9-2350-255-10; p. 2-54.

TASK 3J: PERFORM POST FIRING CHECKS AND SERVICES

CONDITIONS/STIMULUS

System State: Table J, Column 3J.
Commander Location: In Commander's station.
Initiating Stimuli: Platoon Leader tells TC to perform post firing checks and services.

ACTIONS

Commander will:

1. Check mounting grenade dischargers, cables and harness.
2. Check for damage and clean dischargers.
3. Commander's Power Control Handle
Check operation of commander's power control handle.
4. Set AUX HYDR POWER switch on commander's panel to ON.
5. Set FIRE CONTROL MODE switch on GPS to NORMAL.
6. Squeeze palm switch.
7. Check that gunner's power control handle will not work.
8. Check operation of trigger on commander's handle using firing circuit tester.
9. Commander's GPS Extension
Check commander's GPS extension view for moisture, fungus or scratches.
10. Rotate diopter setting (+2 to -6).
11. Check mounting and operation of browpad.
12. Commander's Weapon Station
Check operation of weapon station in POWER through 360° traverse.
13. Check operation of weapon station in MANUAL through 360° traverse.
14. Elevate caliber .50 machinegun from full depression (-10°) to full elevation (+65°). (During elevation test look through weapon sight. Make sure field of view follows motion of gun.)

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 14.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by TC.

Time - Between end of initiating stimuli and completion of Step 14.

End of Training:

Accuracy - As indicated by:

- . checking and servicing the grenade launcher.
- . checking the commander's power control handle.

- . checking and servicing GPS extension.
- . traversing and elevating the Cal. .50 machinegun in power and in manual through 360° traverse and -10° to +65° elevation.

REFERENCES

TM 9-2350-255-10; p. 2-54 to 2-55.

APPENDIX I

ADDITIONAL TRAINING OBJECTIVES FOR GUNNER TASKS

MODULE I. PREPARE TO FIRE MAIN GUN

CONDITIONS/STIMULUS

System State: Table I, Column 1I*. Gunner's station prepared for operation; before operations checks completed; main gun loaded (according to TC fire command); stationary and moving targets at more than 200 meters.

Gunner Location: In Gunner's station.

Initiating Stimuli: TC issues a fire command to perform prepare to fire checks.

ACTIONS

Gunner will:

- *1I. Prepare to fire main gun.
- *2I. Engage targets with main gun - normal or emergency mode.
- *3I. Engage targets with main gun - manual mode.
- *4I. Perform main gun failure to fire procedures.
- 5I. Sense rounds.
- 6I. Track targets
- 7I. Lay on target using Gunner's primary sight.

*System state, table and Tasks 1I through 4I are contained in ARI Research Product, Development of Training Objectives for XM1 UCFT, January 1980.

TASK 5I: SENSE ROUNDS

CONDITIONS/STIMULUS

System State: Table I, Column 2I* (Precision engagement).
Gunner Location: In Gunner's station.
Initiating Stimuli: The need to locate the first round fired in relation to the target in order announce TARGET or BOT. (Firing main gun.)

ACTIONS

Gunner will:

1. Sense the round in deflection as:
LEFT or RIGHT or LINE.
2. Sense the round in range as:
OVER or SHORT or DOUBTFUL ro TARGET.
3. Announce sensing.

NOTE A: If Gunner has a sensing other than TARGET he will:

4. Re-lay sight reticle on center of mass.
5. Re-range to target.
6. Fire the main gun.

NOTE B: If the Gunner's sensing is LOST the TC may issue a subsequent fire command.

MEASUREMENT

Time - Between the initiating stimuli and the completion of Step 6.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by Gunner.

Time - Between the initiating stimuli and the completion of Step 6.

End of Training:

Accuracy - As indicated by:

- . Accurate deflection sensing.
- . Accurate range sensing.
- . Target hit with second round.

REFERENCES

FM 17-12, Chapter 9.

*System state table is contained in ARI Research Product, Development of Training Objectives for XM1 UCFT, January 1980.

TASK 6I: TRACK TARGETS

CONDITIONS/STIMULUS

System State: Table I, Column 2I,* (Precision engagement).
Gunner Location: In Gunner's station.
Initiating Stimuli: TC issues a fire command for a moving target.

ACTIONS

Gunner will:

1. Firmly place head against brow pad.
2. Firmly place chest against chest rest.
3. Set FIRE CONTROL MODE switch on GPS to NORMAL.
4. Squeeze palm switches on power control handles.
5. Look through Gunner's primary sight and lay the reticle on the center of mass on the target by turning the power control handles in the direction of target movement and elevating or depressing the main gun by rotating the power control handles backward or forward.
6. When on the target track it smoothly by manipulation of the power control handles.

MEASUREMENT

Time - Between the initiating stimuli and the completion of Step 6.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by Gunner.

Time - Between the initiating stimuli and the completion of Step 6.

End of Training:

Accuracy - As indicated by the Gunner's primary sight reticle being on the center of mass of the target during tracking.

REFERENCES

TM 9-2350-255-10; p. 2-169 to 2-190 and FM 17-12-1 (Draft); p. 34.

*System state table is contained in ARI Research Product, Development of Training Objectives for XML UCOFT, January 1980.

TASK 7I: LAY ON TARGET USING GUNNER'S PRIMARY SIGHT

CONDITIONS/STIMULUS

System State: Table I, Column 2I,* (Precision engagement).
Gunner Location: In Gunner's station.
Initiating Stimuli: TC issues a fire command.

ACTIONS

Gunner will:

1. Firmly place head against brow pad.
2. Firmly place chest against chest rest.
3. Squeeze palm switches on power control handles.
4. Look through Gunner's primary sight and lay the reticle on the center of mass of the target by turning the power control handles right or left and by elevating or depressing the main gun by rotating the power control handles backward or forward.

MEASUREMENT

Time - Between the initiating stimuli and the completion of Step 4.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by Gunner.

Time - Between the initiating stimuli and the completion of Step 4.

End of Training:

Accuracy - As indicated by the Gunner laying the Gunner's primary sight reticle on the center of mass of the target.

REFERENCES

TM 9-2350-255-10; p. 2-169 to 2-170 and FM 17-12-1 (Draft); p. 34.

*System state table is contained in ARI Research Product, Development of Training Objectives for XML UCOFT, January 1980.

MODULE J. OPERATE COAXIAL MACHINEGUN (7.62 MM)

CONDITIONS/STIMULUS

System State; Table J, Column 1J; coaxial machinegun cleared.
Gunner Location: In Gunner's station.
Initiating Stimuli: TC tells Gunner to remove coaxial machinegun.

ACTIONS

Gunner will:

- *1J. Remove coaxial machinegun.
- *2J. Install coaxial machinegun.
- *3J. Load coaxial machinegun.
- *4J. Zero coaxial machinegun.
- *5J. Fire coaxial machinegun.
- *6J. Clear misfire in coaxial machinegun.
- *7J. Stop runaway firing of coaxial machinegun.
- *8J. Change barrel of coaxial machinegun.
- *9J. Clear coaxial machinegun.
- 10J. Perform before-operations maintenance checks and services on Gunner's machinegun.

TASK 10J: PERFORM BEFORE-OPERATIONS MAINTENANCE CHECKS ON
SERVICES ON GUNNER'S MACHINEGUN

CONDITIONS/STIMULUS

System State: Table J, Column 2J.*
Gunner Location: In Gunner's station.
Initiating Stimuli: TC tells Gunner to perform before-operations
maintenance checks and services on the coaxial
machinegun.

ACTIONS

- Gunner will:
1. Check coaxial machinegun for correct mounting
(See Task 2J).
 2. Check operation of a electric solenoid:
 - . Insure that coax is clear (See Task 9J).
 - . Set coax safety switch on F.
 - . Pull charging handle to rear and return it
to normal position.
 - . Tell Driver to place the VEHICLE MASTER POWER
switch in the ON position.
 - . Tell Driver or TC to turn TURRET POWER switch
to ON.
 - . Turn GUN SELECT switch to COAX.
 - . Turn FIRE CONTROL MODE switch to NORMAL.
 - . Squeeze palm switch and trigger on power control
handle.

NOTE A: If solenoid is working properly an audible
click will be heard when the trigger is
squeezed.

3. Check manual trigger:
 - . Pull charging handle to the rear and return
it to normal position.
 - . Press black rubber section on rear of solenoid.

NOTE B: An audible click will be heard when the
trigger is pressed.

4. Make sure manual safety works properly:
 - . Pull charging handle to the rear and return
it to normal position.
 - . Set coax safety switch on S.
 - . Squeeze palm switches and trigger on power
control handle and then press black rubber
section on rear of solenoid.

NOTE C: If safety is working properly an audible
click will not be heard.

*System state table is contained in ARI Research Product, Development of
Training Objectives for XM1 UCFT, January 1980.

MEASUREMENT

Time - Between the end of the initiating stimuli and completion of Step 4.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

Time - Between the end of the initiating stimuli and completion of Step 4.

End of Training:

Accuracy - As indicated by the Gunner properly completin before-operations maintenance checks and services on the coax.

REFERENCES

TM 9-2350-255-10; p. 2-56, 2-148 and 2-230 to 2-234.

MODULE P. OPERATE GAS PARTICULATE SYSTEM

CONDITIONS/STIMULUS

System State: Table p, Column 1P.
Gunner Location: In Gunner's station.
Initiating Stimuli: TC tells gunner to operate gas particulate system.

ACTIONS

Gunner will:

- 1P. Operate gas particualte system.
- 2P. Close ballistic shields.

TABLE P

POSITION OF CONTROLS FOR TASKS ON MODULE P
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS	
	TASKS	
	1P	2P
VEHICLE MASTER POWER switch	ON	ON
GAS PARTICULATE FILTER switch	OFF	OFF
Ballistic shields (door) handles	CLOSED	OPEN
Domelight	ON	ON

TASK 1P. OPERATE GAS PARTICULATE SYSTEM

CONDITIONS/STIMULUS

System State: Table P, Column 1P.
Gunner Location: In Gunner's station
Initiating Stimuli: TC tells gunner to operate gas particulate system.

ACTIONS

Gunner will: NOTE A: The precleaner assembly opening springclip must be removed by turret crewmember for gas particulate system to work.

1. Stop breathing.
2. Put on protective mask.
3. Clean on seal mask.
4. Start breathing.
5. Disconnect mike lead from connector.
6. Hook up mask mike lead to connector.
7. Insure Driver sets GAS PARTICULATE FILTER switch on Driver's master control panel to ON. (If GAS PARTICULATE light on Driver's master panel or gas particulate filter blower motor does not go on, do steps 8 through 11. If they do go on go to step 12.)
8. Have Driver check hull networks box circuit breaker, CB 22.
 - a. If circuit breaker is in ON position go to step 9.
 - b. If circuit breaker is in OFF position, wet to ON.
 - (1) If light and blower comes on go to step 12.
 - (2) If light or blower remains off go to step 9.
9. Listen for precleaner and filter motor operation.
 - a. If operating go to step 11.
 - b. If not operating go to step 10.
10. Have Driver check if precleaner and filter unit motor, cable and ground are connected.
 - a. If connected go to step 11.
 - b. If loose connect.
 - (1) If light and blower come on go to step 12.
 - (2) If light and blower remain off, go to step 11.
11. Have Driver check condition and connection of hose assembly.
 - a. If hose is pinched, remove obstructions.
 - (1) If light and blower come on, go to step 12.
 - (2) If light and blower remain off, tell TC.
 - b. If hose is disconnected, reconnect hose.
 - (1) If light and blower come on, go to step 12.
 - (2) If light and blower remain off, tell TC.

- c. If spring clip is on closed position, set to open position.
 - (1) If light and blower come on, go to step 12.
 - (2) If light and blower remain off, tell TC.
- d. If hose and spring clip are ok, tell TC.
- 12. Have Driver pull hose socket away from mount.
- NOTE B: Under arctic winter conditions put on mask (step 1 through 11), but do not connect hose socket to mask cannister (located at end of mask hose) (step 13) until air heater has been on for at least 15 minutes (step 14).
- 13. Connect hose socket to mask cannister.
- 14. If air is too cold to breath in comfort have Driver turn air heater knob clockwise until heater light is lit.
 - a. Turn knob clockwise for warmer air.
 - b. Turn knob counterclockwise for cooler air.
 - c. If gas particulate heater does not warm air, have Driver do step 15. If heater works properly go to step 16.
- 15. Driver check hull networks box circuit breaker CB 29.
 - a. If breaker is at ON position, tell TC.
 - b. If breaker is at OFF position, set to ON.
 - (1) If heater begins to work properly go to step 16.
 - (2) If heater still does not work properly, tell TC.
- 16. When gas particulate filter system is no longer needed, remove mask.
- 17. Disconnect mask intercom lead from connector on CVC helmet.
- 18. Stow mask.
- 19. Disconnect hose socket from mask cannister.
- 20. Connect hose socket to mount.
- 21. Have Driver turn heater knob counterclockwise all the way.
- 22. Have Driver set GAS PARTICULATE switch to OFF.
- 23. Have Loader put spring clip over air precleaner assembly opening.

MEASUREMENT

- Time - Between end of initiating stimuli and completion of Step 23.
- During Training:
 - Accuracy - As indicated by the match between steps given above and steps performed by Gunner.
 - Time - Between end of initiating stimuli and completion of Step 23.
 - End of Training:
 - Accuracy - As indicated by:
 - . Gunner unaffected by NBC attack.

- . GAS PARTICULATE light and blower working with GAS PARTICULATE switch in ON position.
- . Gas particulate heater warming air properly.
- . Mask stowed.
- . Hose socket connected to mount.
- . Air heater knob turned counterclockwise all the way.
- . GAS PARTICULATE switch in the OFF position.
- . Spring clip over air precleaner assembly.

REFERENCES

TM 9-2350-255-10; p. 2-295 to 2-297.

TASK 2P: CLOSE BALLISTIC SHIELDS (DOORS)

CONDITIONS/STIMULUS

System State: Table P, Column 2P.
Gunner Location: In Gunner's station.
Initiating Stimuli: TC tells Gunner to close ballistic shields.

ACTIONS

Gunner will: NOTE A: Ballistic shields (doors) are kept closed when not using the GPS.

1. To use daylight sight or laser rangefinder open the left ballistic door by grasping the DAY handle and squeezing the lever on top and turning the handle clockwise.
2. To use the Thermal Imaging System open the right ballistic door by grasping the THERMAL handle and squeezing finger lever on the top and turning handle counterclockwise.

MEASUREMENT

	Time - Between the end of the initiating stimuli and completion of Step 2.
During Training:	Accuracy - As indicated by match between steps given and steps performed by Gunner.
	Time - Between the end of the initiating stimuli and completion of Step 2.
End of Training:	Accuracy - As indicated by Gunner properly closing ballistic shields (doors) upon the TC's order.

REFERENCES

TM 9-2350-255-10; p. 2-173.

MODULE Q. TARGET ACQUISITION

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q, tank in firing position.
Gunner Location: In Gunner's station.
Initiating Stimuli: The need to acquire targets.

ACTIONS

Commander will:

- 1Q. Acquire targets.
- 2Q. Identify US and foreign equipment.
- 3Q. Rank targets according to potential danger.

TABLE Q

POSITION OF CONTROLS FOR TASKS IN MODULE Q
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS TASKS		
	1Q	2Q	3Q
AMPLIFIER MAIN POWER switch	NORM	NORM	NORM
AMPLIFIER POWER CIRCUIT BREAKER switch	ON	ON	ON
AMPLIFIER INTERCOM ACCENT switch	ON	ON	ON
AMPLIFIER RADIO TRANSMISSION switch	CDR + CREW	CDR + CREW	CDR + CREW
INTERCOM lever	INT ONLY	INT ONLY	INT ONLY
TURRET POWER switch	ON	ON	ON
DOMELIGHT	ON OR OFF	ON OR OFF	ON OR OFF
TURRET BLOWER switch	ON OR OFF	ON OR OFF	ON OR OFF
GUN TURRET DRIVER switch	ANY POSITION	ANY POSITION	ANY POSITION
Commander's hatch	OPEN	OPEN	OPEN
FIRE CONTROL MODE switch	NORM	NORM	NORM
FLTR/CLEAR/SHTR switch	FLTR or CLEAR or SHTR	FLTR or CLEAR or SHTR	FLTR or CLEAR or SHTR
MAGNIFICATION lever	3X	3X	3X
THERMAL MODE switch	STBY	STBY	STBY
Ballistic shield (door) handles	OPEN	OPEN	OPEN
THERMAL MAGNIFICATION lever	3X	3X	3X
POLARITY switch	WHITE HOT or BLACK HOT	WHITE HOT or BLACK HOT	WHITE HOT or BLACK HOT
LRF RANGE switch	SAFE	SAFE	SAFE

TASK 1Q: ACQUIRE TARGETS

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q; Stationary tank, day or night, with stationary and moving targets at ranges in excess of 200 meters.

Gunner Location: In Gunner's station.

Initiating Stimuli: Presence of a target.

ACTIONS

- Gunner will:
1. Place head against GPS browpad.
 2. Place chest against chest rest.
- DAY OPERATION
3. Look through GPS eyepiece.
 4. Sweep area by manipulating gunner's power control handles.
 5. Upon detecting a target move LRF RANGE switch to ARM 1ST RTN or ARM LAST RTN.
 6. Range to target by squeezing either palm switch on gunner's power control handle.
- DAY OR NIGHT OPERATION
7. Repeat steps 1 and 2.
 8. Insure that TRU READY light is on.
 9. Set THERMAL MODE switch to ON.
 10. Set FLTR/CLEAR/SHTR switch to SHTR.
 11. Set THERMAL MAGNIFICATION lever to 10X.
 12. Set POLARITY switch to WHITE HOT or BLACK HOT.
 13. Repeat steps 3 and 4.
 14. Turn RETICLE knob and SYMBOLS knob left or right to adjust reticle and symbols in GPS eyepiece.
 15. Turn SENSITIVITY knob until target is clear.
 16. Turn CONTRAST knob to get best image of target.
 17. Repeat steps 5 and 6.
 18. Identify target.
 19. Locate target.
 20. Report targets presence.

MEASUREMENT

- Time - Between end of initiating stimuli and completion of Step 20.
- During Training:
- Accuracy - As indicated by the match between steps given above and steps performed by Gunner.
- Time - Between end of initiating stimuli and completion of Step 20.
- End of Training:
- Accuracy - As indicated by:
- . The Gunner detecting targets in assigned sector by using the GPS only.

- . The Gunner detecting targets in assigned sector by using the GPS and the Thermal Imaging System.
- . The Gunner ranging to detected targets with the Laser Rangefinder.
- . The Gunner reporting the location of targets.
- . The Gunner identifying targets.

REFERENCES

TM 9-2350-255-10; ;. 2-192 to 2-202.

TASK 2Q: IDENTIFY US AND FOREIGN EQUIPMENT

CONDITIONS/STIMULUS

System State: Table Q, Column 2Q.
Gunner Location: In Gunner's station.
Initiating Stimuli: The need to prevent the inadvertent engagement of friendly targets.

ACTIONS

Gunner will: 1. Identify US and foreign ground equipment (vehicles).
Identify US and foreign flying equipment (aircraft).

MEASUREMENT

Time - Between the appearance of US and foreign equipment and the end of the Gunner's report.

During Training:

Accuracy - As measured by the match between the actual target conditions listed and the Gunner's report.

Time - Between the appearance of US and foreign equipment and the end of the Gunner's report.

End of Training:

Accuracy - As measured by the match between the actual target conditions listed and the Gunner's report.

REFERENCES

FM 17-12; p. 6-9.

TASK 3Q: RANK TARGETS ACCORDING TO POTENTIAL DANGER

CONDITIONS/STIMULUS

System State: Table Q, Column 3Q.
Gunner Location: In Gunner's station.
Initiating Stimuli: The need to determine the most dangerous target.

ACTIONS

- Gunner will:
1. Identify the most dangerous target by considering:
 - . the target sees you.
 - . the target can kill you.
 - . the target is preparing to engage you.
 2. Identify the dangerous target by considering:
 - . the target can kill you.
 - . the target does not see you.
 3. Identify the least dangerous target by considering:
 - . the target does not have the capability of killing you but can report you to targets that can kill you.

MEASUREMENT

Time - Between the appearance of a target and the end of the Gunner's report.

During Training:

Accuracy - As measured by the match between the actual target conditions listed in the above steps and the Gunner's response for each step.

Time - Between the appearance of a target and the end of the Gunner's report.

End of Training:

Accuracy - As measured by the Gunner's report in describing the order of threat targets present.

REFERNECES

FM 17-12; p. 6-2 and 6-3.

MODULE R. PREPARE INTERCOMMUNICATIONS EQUIPMENT

CONDITIONS/STIMULUS

System State: See Table A, Column A*.
Gunner Location: In Gunner's station.
Initiating Stimuli: Need to place the intercommunications system in operation.

ACTION

Gunner will:

1R. Prepare intercommunications equipment.

*Module A, contained in ARI Research Product, Development of Training Objectives for XM1 UCOFT, January 1980 includes tasks for preparing intercommunications equipment.

APPENDIX J

ADDITIONAL TRAINING OBJECTIVES FOR DRIVER TASKS

MODULE E. PLACE THE TANK IN MOTION

CONDITIONS/STIMULUS

System State: Table E, Column 1E; and after start checks completed.

Driver Location: In Driver's station.

Initiating Stimuli: TC tells Driver to move the tank.

ACTIONS

Driver will:

- *1E. Place the tank in motion.
- *2E. Steer the tank.
- *3E. Brake the tank.
- 4E. Maintain correct speed.

*Module E of ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980, contains tasks 1E through 3E.

TASK 4E: MAINTAIN CORRECT SPEED

CONDITIONS/STIMULUS

System State: Table E, Column 2E*.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to maintain correct speed.

ACTIONS

Driver will:

1. Put both hands on throttle handgrips.
2. Twist throttle handgrips forward or back to adjust speed.
3. Monitor vehicle speed guage to maintain correct speed.

MEASUREMENT

	Time - Between end of initiating stimuli and completion of Step 3.
During Training:	Accuracy - As indicated by match between steps given above and steps performed by Driver.
	Time - Between end of initiating stimuli and completion of Step 3.
End of Training:	Accuracy - As indicated by the Driver maintaining the directed speed.

REFERENCES

TM 9-2350-255-10; p. 2-8 and 2-99.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

MODULE Q. DRIVE TANK

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to drive the tank.

ACTIONS

Driver will:

- *1Q. Drive tank up and down hills.
- *2Q. Drive tank over obstacles.
- *3Q. Drive tank across ditches.
- 4Q. Select a firing position.
- 5Q. Select route providing a stable firing platform.
- 6Q. Perform evasive maneuvers.
- 7Q. Seek defilade position.
- 8Q. Perform fuel transfer procedure.

*Module Q of ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980, contains tasks 1Q through 3Q.

TASK 4Q: SELECT A FIRING POSITION

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q*.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to select a firing position; or TC issues a fire command which causes the Driver to select a firing position; or enemy fire causes Driver to select a firing position.

ACTIONS

Driver will:

1. Select a position which provides cover.
2. Select a position which provides concealment.
3. Select a position which provides good fields of fire.
4. Select a position which provides easy occupation and egress.
5. Move into hull down firing position.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 5.

During Training:

Accuracy - As indicated by match between steps given and steps performed by Driver.

Time - Between end of initiating stimuli and completion of Step 5.

End of Training:

Accuracy - As indicated by:

- . Occupation of a covered and concealed firing position.
- . Occupation of a position with good fields of fire.
- . Occupation of a position which is easy to enter and to exit.
- . In a hull down position.

REFERENCES

FM 17-12; p. 8-2.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

TASK 5Q: SELECT ROUTE PROVIDING A STABLE FIRING PLATFORM

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q*.
Driver Location: In Driver's station.
Initiating Stimuli: TC fire command to engage a target while on the move.

ACTIONS

Driver will: NOTE: Speed of least vibration will normally be between 5 and 15 mph. Hard surface terrain usually requires lower speed to minimize vibration than soft ground.

1. Time gear and direction changes to occur immediately after firing.
2. Keep Gunner informed of obstacles in tank's path.
3. Announce DEPRESSION or TURN as appropriate.
4. Announce STEADY after depression.
5. Maintain constant speed consistent with terrain conditions.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 5.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by Driver.

Time - Between end of initiating stimuli and completion of Step 5.

End of Training:

Accuracy - As indicated by the Driver providing a stable gun platform which results in effective fire on the target.

REFERENCES

FM 17-12; p. 10-3 and 10-4.

*System stable table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

TASK 6Q: PERFORM EVASIVE MANEUVERS

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q*.
Driver Location: In Driver's station.
Initiating Stimuli: TC announces MISSILE ATTACK and GENERATE SMOKE.

ACTIONS

Driver will:

1. Pull out and set SMOKE GENERATOR switch to ON (Light should light).
2. Take violent zig-zag action to move into smoke or attempt to find cover and concealment.
3. On command from TC pull out and set SMOKE GENERATOR switch to OFF.

NOTE: If TC announces GRENADE instead of GENERATE SMOKE Driver performs Step 2 only.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 3.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by Driver.

Time - Between end of initiating stimuli and completion of Step 3.

End of Training:

Accuracy - As indicated by evading the enemy missile.

REFERENCES

TM 9-2350-255-10; p. 2-93 and TC 17-15-14 (Draft); p. 174.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

TASK 7Q: SEEK DEFILADE POSITION

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q*.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to seek a defilade position or the tank has been fired on.

ACTIONS

Driver will: 1. Move rapidly into a position which provides:
 . cover
 . good fields of fire
 . easy occupation and egress
 . hull down firing

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 1.
During Training:
Accuracy - As indicated by match between steps given above and steps performed by Driver.
Time, - Between end of initiating stimuli and completion of Step 1.
End of Training:
Accuracy - As indicated by the Driver occupying a defilade position upon order or attack.

REFERENCES

FM 17-12; p. 8-2.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

TASK 8Q: PERFORM FUEL TRANSFER PROCEDURES

CONDITIONS/STIMULUS

System State: Table Q, Column 1Q*.
Driver Location: In Driver's station.
Initiating Stimuli: LOW FUEL LEVEL light comes on.

ACTIONS

Driver will: NOTE A. There is five seconds delay after VEHICLE MASTER POWER switch is set ON before fuel can be transferred.

NOTE B. The front fuel pump will start when selector switch is set to RIGHT FRONT or LEFT FRONT and LOW FUEL LEVEL light is lit. The pump will automatically shut off when rear tank is 3/4 full.

NOTE C. LOW FUEL LEVEL light will light when rear fuel tank is 1/4 full. Light will go out when rear tank is 3/8 full.

NOTE D. FUEL gage shows fuel level in tank selected with switch.

NOTE E. Fuel from right front tank should be used before left front should.

NOTE F. Personnel heater is supplied with fuel only from left front fuel tank and will not work when left front tank is empty.

1. Push in and set TANK SELECTOR switch to RIGHT FRONT to transfer fuel to rear tank when LOW FUEL LEVEL is lit.
2. Push in and set TANK SELECTOR switch to LEFT FRONT to transfer fuel to rear tank when right tank is nearly empty.

NOTE G. When TANK SELECTOR switch is set to REAR, fuel cannot be transferred until LOW FUEL LEVEL light comes on again.

3. Push in and set TANK SELECTOR switch to REAR during engine start and normal operation.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

MEASUREMENT

- Time - Between end of initiating stimuli and completion of Step 3.
- During Training:
- Accuracy - As indicated by match between steps given above and steps performed by Driver.
- Time - Between end of initiating stimuli and completion of Step 3.
- End of Training:
- Accuracy - As indicated by the Driver's timely transfer of fuel without loss of operational performance.

REFERENCES

TM 9-2350-255-10; p. 2-87.

MODULE X. PERFORM GENERAL MAINTENANCE

CONDITIONS/STIMULUS

System State: Table X, Column 1X.
Driver Location: In Driver's station.
Initiating Stimuli: Need for track maintenance.

ACTIONS

Driver will:

- *1X. Release track tension.
- *2X. Disconnect track.
- *3X. Connect track.
- *4X. Adjust track tension.
- *5X. Open front fender.
- *6X. Close front fender.
- *7X. Replace front blackout marker lamp.
- *8X. Replace headlight lamp.
- *9X. Replace taillight lamp.
- *10X. Refuel tank.
- 11X. Perform during-operations maintenance checks.
- 12X. Perform after-operations maintenance checks and services.
- 13X. Perform at-halt maintenance checks and services.
- 14X. Service precleaner.

*Module X of ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980, contains tasks 1X through 10X.

TABLE X

POSITION OF CONTROLS FOR TASKS IN MODULE X
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS TASKS					
	1X, 5X, 11X to 14X	2X, 3X, and 4X	6X and 10X	7X, 8X, and 9X		
TURRET Power switch	ON OR OFF	OFF	OFF	ON OR OFF		
VEHICLE MASTER Power switch	ON OR OFF	OFF	OFF	ON OR OFF		
TRANSMISSION SHIFT Control	N, D, PVT, R, L	N	N	N		
Parking Brake	RELEASED OR ENGAGED	ENGAGED	ENGAGED	ENGAGED		
Driver's Hatch Handles	OPEN OR CLOSED	CLOSED	CLOSED	OPEN OR CLOSED		
Intercommunication Monitor Switch	INT ONLY	ANY POSITION	INT ONLY	INT ONLY		
Dome Light	ON OR OFF	OFF	OFF	ON OR OFF		
LIGHT Switch	ANY POSITION	OFF	OFF	ANY POSITION		
Drain Valve Handles	CLOSED	CLOSED	CLOSED	CLOSED		
GAS PARTICULATE FILTER switch	ANY POSITION	OFF	OFF	ANY POSITION		
Air Heater control	ANY POSITION	OFF	OFF	ANY POSITION		
NIGHT PERISCOPE	ANY POSITION	OFF	OFF	ANY POSITION		
BILGE Pump	ANY POSITION	OFF	OFF	ANY POSITION		
SMOKE GENERATOR	ANY POSITION	OFF	OFF	ANY POSITION		
TACTICAL IDLE Switch	ANY POSITION	OFF	OFF	ANY POSITION		
PERSONNEL HEATER	ANY POSITION	OFF	OFF	ANY POSITION		

TASK 11X: PERFORM DURING OPERATIONS CHECKS

CONDITIONS/STIMULUS

System State: Table X, Column 1X*.
Driver Location: In Driver's station
Initiating Stimuli: Presence of abnormal responses by steering, throttle and brake controls.

ACTIONS

- Driver will:
1. Look for signs of leaks, tampering, damage, or unusual conditions on or under tank.
 2. Check steer-throttle control for freedom-of-movement. (Control should move to full right and left without binding. Control should return to center under spring tension.)
 3. Twist throttle grips rearward and release. (Grips should return under spring tension to idle position.)
 4. Check adjustment of steer-throttle control. (Control can be adjusted and secured in three driving and one stowage position.)
 5. Apply service brakes to make sure tank stops without pulling to the side.
 6. Apply parking brake, shift transmission shift selector to D, and run engine to 1450 to 1550 rpm. (Tank should not move.)

MEASUREMENT

Time - Between the end of initiating stimuli and completion of Step 6.

During Training:

Accuracy - As indicated by match between the steps given above and the steps performed by the Driver.

Time - Between the end of initiating stimuli and completion of Step 6.

End of Training:

Accuracy - As indicated by the proper checks of steering, throttle, and brake controls by the Driver.

REFERENCES

TM 9-2350-255-10; p. 2-32 and 2-42.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

TASK 12X: PERFORM AFTER-OPERATIONS MAINTENANCE CHECKS AND SERVICES

CONDITIONS/STIMULUS

System State: Table X, Column 1X*.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to perform after-operations maintenance checks and services.

ACTIONS

- Driver will:
1. Look for signs of leaks, tampering, damage or unusual conditions on or under tank. Make sure drain valves are open.
 2. Check transmission oil level. Add oil if required. Check for leaks. (See LO 9-2350-255-12.)
 3. Service precleaner grill.
 4. Check engine oil level. Add oil if required. Check for leaks. (See LO 9-2350-255-12.)
 5. Make sure hull access plates are in place and secure.
 6. Make sure rear grille doors are closed and bolts are tight.
 7. Check track tension by connecting grease gun and flexible adapter to fitting and pumping grease into fitting until grease flows from relief valve. (If adjusting link moves no more than 1/8 inch from locknut, track tension is OK. If adjusting link moves more than 1/8 inch from locknut, adjust track tension. Task 4X.)
 8. Roadwheel and Compensating Idler Hubs and Arms.
 - . Look for leaks around hub inner and outer areas.
 - . Touch-test hubs with hand, check for one hotter than others.
 - . Look at hub cap, oil level should be at the bottom of the hole. If oil level is low add oil. (See LO 9-2350-255-12.) (If oil is milky, water is present, notify organizational maintenance.)
 - . Look at upper end of arm for leaks at housing.
 - . Check arms for deep gouges or bends.
 - . Check for missing roadwheel hub rubber plugs.
 9. Shock Absorbers.
 - . Check shock absorber sight gauges for proper oil level. (Indicator ball should be between middle and top of sight gauge. (If oil level is low check for leaks before adding oil.) (See LO 9-2350-255-12.) (If oil is milky, water is present, notify organizational maintenance.)
 - . Touch-test shock absorber housing with back of hand, (If housing is colder than other shock absorber housings, shock absorber in cold housing may be broken.)

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

10. Roadwheels and Compensating Idler Wheels.
- . Check for bent, broken or missing wheels.
 - . Check that wear plates are not cracked, gouged, or missing.
 - . Make sure not more than 50 percent of rubber on wheels is chunked or separated.
 - . Check all mounting nuts and bolts.
 - . If wear plates are loose or missing, check for bent or broken center guide.

NOTE A: Proper tightening of mounting nuts and bolts should keep them from coming loose. For best results have organizational maintenance apply proper torque.

11. Torsion Bars
- . At roadwheel positions 2 through 6, use crowbar to test torsion bars. (Pry up roadwheel with crowbar. If roadwheel cannot be lifted, torsion bar is good.)
 - . At roadwheel arms 1 and 7, look for tilt of tank or lifting of roadwheel and track off ground.
12. Track Assembly
- . Check all track shoe assemblies you can see. (If time permits do a Hammer Ring Test, if time is short, do a visual inspection.)
 - . Check for missing, bent or broken centerguides and nuts.
 - . Look for missing, loose or improperly seated wedges or bolts in end connectors.
 - . Look for dead track shoes. (A dead track shoe appears out of line.)

NOTE B: Proper tightening of end connectors and center guides should keep them from coming loose. For best results have organizational maintenance apply proper torque.

NOTE C: Hammer Ring Test is not a sure test for broken or loose track components. A dull tone during the test is only an indicator of a problem, which should tell the crewman to check further. A component may give a dull tone when struck and still be good.

Hammer Ring Test - Conduct hammer ring test by opening No. 1 skirt, and conduct only on top part of track. Do not tap track components that are directly over the support roller. Move the tank as needed to test all track components. Tap end connector with ball portion of ballpen hammer. If you hear a ringing tone, connector is good. If you hear a dull tone you must tap each track pin separately. If you hear a ringing tone when tapping pins, pins may be good but end connectors may be cracked, or bolt and wedges may be loose. If you hear a dull tone, track pin

may be cracked or broken. Tap centerguide with hammer. If you hear a ringing tone centerguide is tight. If you hear a dull tone centerguide may be loose. Check for wear or damage to trackshoes. If you can see the track pins through the shoes the trackshoe must be replaced.

13. Support Roller Assembly.
 - . Look for grease leakage and missing or damaged lube fittings.
 - . Look at wheel for cracks or unusual wear.
 - . Check spindle support for missing or loose retaining pin.
 - . Check support roller hub cap for cracks, damage, grease leakage or loose fit.
 - . Touch-test hub to make sure hub is not hot.
14. Hub and Sprocket Assembly
 - . Check inner and outer sprocket for cracks or gouged teeth.
 - . Check sprocket for wear mark. (If teeth are worn to backedge of wear mark, notify organizational maintenance.)
 - . Check for missing or loose bolts.
 - . Look at hub for cracks, sharp edge gouges, and loose or missing mounting bolts.

NOTE D: Proper tightening of mounting bolts should keep them from coming loose. For best results have organizational maintenance apply proper torque.

15. Adjusting Link Assembly
 - . Check for loose or missing hardware and lube fittings.
 - . Check for loose or missing lock bolts, if tank is so equipped.
 - . If grease comes out of relief valve, check that locking collar is secure against barrel.
16. Skirt Panels, Fenders, and Mudguards
 - . Open skirts. Check hinges, latches and support struts.
 - . Check that all pins are straight and secured by ring pins or roll pins.
 - . Check skirts, fenders, and mudguards for cracks and damage. (If damaged notify organizational maintenance.)

MEASUREMENT

During Training:

Time - Between the end of initiating stimuli and completion of Step 16.

Accuracy - As indicated by match between the steps given above and the steps performed by Driver.

End of Training:

Time - Between the end of initiating stimuli and completion of Step 16.

Accuracy - As indicated by the Driver properly performing after-operations on the following:

- . general maintenance condition on or under the tank

- . transmission and engine oil levels and suspension lube levels.
- . grille doors.
- . precleaner grille.
- . track tension.
- . roadwheel and compensating idler hubs and arms.
- . shock absorbers.
- . road wheels and compensating idler wheels.
- . torsion bars.
- . track assembly.
- . support roller assembly.
- . hub and sprocket assembly.
- . adjusting link assembly.
- . skirt panels, fenders and mudguards.

REFERENCES

TM 9-2350-255-10; p. 2-32 and 2-40.

TASK 13X: PERFORM AT-HALT MAINTENANCE CHECKS AND SERVICES

CONDITIONS/STIMULUS

System State: Table X, Column 1X*.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to perform at-halt maintenance checks and services.

ACTIONS

- Driver will:
1. Look for signs of leaks, tampering, damage, or unusual conditions on or under tank.
 2. Front and Rear Fuel Tank Filler Covers and Seals.
. Check that fuel tank fill covers are in place and secure.
 3. Track Tension
. (See Task 12X, Step 7.)
 4. Roadwheel and Compensating Idler Hubs and Arms
. (See Task 12X, Step 8.)
 5. Shock Absorbers
. (See Task 12X, Step 9.)
 6. Roadwheels and Compensating Idler Wheels
. (See Task 12X, Step 10.)
 7. Torsion Bars
. (See Task 12X, Step 11.)
 8. Track Assembly
. (See Task 12X, Step 12.)
 9. Support Roller Assembly
. (See Task 12X, Step 13.)
 10. Hub and Sprocket Assembly
. (See Task 12X, Step 14.)

MEASUREMENT

- Time - Between the end of initiating stimuli and completion of Step 10.
- During Training:
- Accuracy - As indicated by match between the steps given above and the steps performed by Driver.
- Time - Between the end of initiating stimuli and completion of Step 10.
- End of Training:
- Accuracy - As indicated by the Driver properly performing at-halt maintenance checks and services on the following:
- . general maintenance condition on or under the tank.
 - . front and rear fuel tank covers and seals.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

- . track tension.
- . roadwheel and compensating idler hubs and arms.
- . shock absorbers.
- . roadwheels and compensating idler wheels.
- . torsion bars.
- . track assembly.
- . support roller assembly.
- . hub and sprocket assembly.

REFERENCES

TM 9-2350-255-10; p. 2-32 to 2-40.

TASK 14X: SERVICE PRECLEANER

CONDITIONS/STIMULUS

System State: Table X, Column 1X*.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to service precleaner.

ACTIONS

Driver will: 1. Traverse turret to service precleaner.

NOTE: This procedure is performed by turret crewmember. Another crewmember is needed to observe outside of tanks.

- . Check that turret traverse lock is unlocked.
 - . Alert crewmember outside tank to make sure area around turret is clear.
 - . Turn traverse handle until arrow near Loader's knee switch aligns with arrow on hull ammunition box support.
 - . Lock turret traverse lock.
2. Clean sponson air intake grilles.
- . Shut down engine.
 - . Set parking brake.
 - . Position turret to service precleaner and air cleaner filters.
 - . Check that turret traverse lock is locked.
 - . Remove six screws from clips using 15mm socket and handle.
 - . Take off six clips from grille.
 - . Clean dirt, leaves and other material from grille.
 - . Place grille on rear deck.
 - . Place six clips on grille.
 - . Align holes on clips and grille.
 - . Screw in and tighten six screws to clip using 15mm socket and handle.
3. Open grilles and covers.
- . Shut down engine.
 - . Set parking brake.
 - . Traverse turret so main gun is over left side of tank.
 - . Check that turret traverse lock is locked.
 - . Grasp handle on rear of precleaner cover and turn straight up.
 - . Slide handle to rear.
 - . Lift rear precleaner cover and swing it all the way open.
 - . Grasp handle on front precleaner cover.
 - . Lift front precleaner cover and swing it all the way open.

*System state table is contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980.

4. Open top deck left grille doors.
 - . Open rear precleaner cover.
 - . Grasp left rear grille door and swing all the way to rear.
 - . Grasp right rear grille door and swing all the way to rear.
5. Service precleaner.
 - . Shut down engine.
 - . Set parking brake.
 - . Traverse turret to service precleaner.
 - . Check that turret traverse lock is locked.
 - . Open grilles and covers.
 - . Inspect top of precleaner for debris. Remove leaves, twigs, dirt and other debris from top of precleaner.
 - . Check that all four latches are latched.
 - . Inspect top of precleaner and entire seal assembly for large cracks or dents. (If found notify organizational maintenance.)
 - . Close grilles and covers.
 - . Start engine.
 - . Check AIR CLEANER CLOGGED FILTER caution light. (If light stays off, continue normal operation.)
6. Close grilles and covers.
 - . Check that turret traverse lock is locked.
 - . Grasp right rear grille door and swing forward to close.
 - . Grasp left rear grille door and swing forward to close.
 - . Close rear precleaner cover.
 - . Grasp front precleaner cover handle and swing front precleaner cover right to close.
 - . Grasp rear precleaner cover handle and swing front precleaner cover right to close
 - . Slide handle forward into lock.
 - . Turn handle to side, then let go.

MEASUREMENT

- Time - Between end of initiating stimuli and completion of Step 6.
- During Training:
- Accuracy - As indicated by match between the steps given above and steps performed by Driver.
- Time - Between end of initiating stimuli and completion of Step 6.
- End of Training:
- Accuracy - As indicated by the Driver properly servicing the precleaner by:
- . Having turret traversed to service precleaner.
 - . Cleaning sponson air intake grilles.
 - . Opening grilles and covers.
 - . Opening top deck left grille doors.
 - . Servicing precleaner.
 - . Closing grilles and covers.

REFERENCES

TM 9-2350-255-10; p. 3-101 to 3-105.

MODULE AA. TARGET ACQUISITION

CONDITIONS/STIMULUS

System State: Table AA, Column 1AA; tank in firing position.
Driver Location: In Driver's station.
Initiating Stimuli: The need to acquire targets.

ACTIONS

Driver will:

- 1AA. Acquire targets.
- 2AA. Identify US and foreign equipment.
- 3AA. Sense rounds.

TABLE AA

POSITION OF CONTROLS FOR TASKS IN MODULE AA
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS		
	TASKS		
	1AA	2AA	3AA
AMPLIFIER MAIN POWER switch	NORM	NORM	NORM
AMPLIFIER POWER CIRCUIT BREAKER switch	ON	ON	ON
AMPLIFIER INTERCOM ACCENT switch	ON	ON	ON
AMPLIFIER RADIO TRANSMISSION switch	CDR + CREW	CDR + CREW	CDR + CREW
INTERCOM lever	INT ONLY	INT ONLY	INT ONLY
TURRET POWER switch	ON	ON	ON
DOMELIGHT	ON OR OFF	ON OR OFF	ON OR OFF
TURRET BLOWER switch	ON OR OFF	ON OR OFF	ON OR OFF
Commander's hatch	OPEN	OPEN	OPEN

TASK 1AA: ACQUIRE TARGETS

CONDITIONS/STIMULUS

System State: Table AA, Column 1AA; stationary tank with stationary and moving targets.
Driver Location: In Driver's station.
Initiating Stimuli: Presence of a target.

ACTIONS

Driver will:

1. Adjust periscope for target area.
2. Look into the left periscope.
3. Sweep target area by moving from left periscope, through center periscope to right periscope.
4. Repeat Step 3, but go from right to left at a greater target area range.
5. Upon detecting a target report its presence, identification, and location.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 5.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by Driver.

Time - Between end of initiating stimuli and completion of Step 5.

End of Training:

Accuracy - As indicated by:

- . The Driver detecting targets in assigned sector.
- . The Driver reporting the location of targets.
- . The Driver identifying targets.

REFERENCES

TM 9-2350-255-10; p. 2-71 and FM 17-12, Chapter 6.

TASK 2AA: IDENTIFY US AND FOREIGN EQUIPMENT

CONDITIONS/STIMULUS

System State: Table AA, Column 2AA.
Driver Location: In Driver's station.
Initiating Stimuli: The need to prevent the inadvertent engagement of friendly targets.

ACTIONS

Driver will: 1. Identify US and foreign ground equipment (vehicles).
2. Identify US and foreign flying equipment (aircraft).

MEASUREMENT

Time - Between the appearance of US and foreign equipment and the end of the Driver's report.

During Training: Accuracy - As measured by the match between the actual target conditions listed and the Driver's report.

Time - Between the appearance of US and foreign equipment and the end of the Driver's report.

End of Training: Accuracy - As measured by the match between the actual target conditions listed and the Driver's report.

REFERENCES

FM 17-12; p. 6-9.

TASK 3AA: SENSE ROUNDS

CONDITIONS/STIMULUS

System State: Table AA, Column 3AA; main gun loaded.
Driver Location: In Driver's station.
Initiating Stimuli: The need to locate the first round fired in relation to the target in order to assist the Gunner and the TC in firing the second round.

ACTIONS

- Driver will:
1. Sense the round in deflection as:
LEFT - RIGHT or LINE.
 2. Sense the round in range as:
OVER or SHORT or DOUBTFUL or TARGET.

NOTE: If Gunner has a senseing he will announce it and BOT. TC remains silent and senses subsequent rounds.

3. If Gunner and TC remain silent the Driver will announce sensing.

MEASUREMENT

Time - Between the end of initiating stimuli and completion of Step 3 or between the end of initiating stimuli and completion of Task 3.

During Training:

Accuracy - As indicated by the match between steps given above and steps performed by Driver.

Time - Between the end of initiating stimuli and completion of Step 3 or between the end of initiating stimuli and completion of Task 3.

End of Training:

Accuracy - As indicated by:

- . Accurate deflection sensing.
- . Accurate range sensing.
- . Target hit with second round.

REFERENCES

FM 17-12; Chapter 9.

MODULE BB. PREPARE INTERCOMMUNICATIONS EQUIPMENT

CONDITIONS/STIMULUS

System State: See Table A, Column 4A.*
Driver Location: In Driver's station.
Initiating Stimuli: Need to place the intercommunications system in operation.

ACTION

Gunner will:

1BB. Prepare intercommunications equipment.

*
Module A contained in ARI Research Product, Training Materials and Data Requirements for Driver Trainer (DT) Training Test Support Plan, August 1980 includes tasks for preparing intercommunications equipment.

MODULE CC. TROUBLESHOOTING

CONDITIONS/STIMULUS

System State: Table CC, Column 1CC.
Driver Location: In Driver's station.
Initiating Stimuli: Malfunction in gas particulate filter system.

ACTIONS

Driver will:

- 1CC. Troubleshoot gas particulate filter system.
- 2CC. Troubleshoot night vision viewer.
- 3CC. Troubleshoot personnel heater.
- 4CC. Troubleshoot transmission.

TABLE CC

POSITION OF CONTROLS FOR TASKS IN MODULE CC
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS TASKS			
	1CC	2CC	3CC	4CC
TURRET POWER switch	OFF	OFF	OFF	OFF
VEHICLE MASTER power switch	ON	ON	ON	ON OR OFF
TRANSMISSION SHIFT control	N	N	N	N
Parking Brake	ENGAGED OR RELEASED	ENGAGED OR RELEASED	ENGAGED OR RELEASED	ENGAGED OR RELEASED
Driver's Hatch handle	OPEN	OPEN	OPEN	OPEN
Intercommunications Monitor switch	INT ONLY	INT ONLY	INT ONLY	INT ONLY
Domelight	ON	ON	ON	ON
Light switch	OFF	OFF	OFF	OFF
Drain Valves handles	CLOSED	CLOSED	CLOSED	CLOSED
Gas Particulate Filter switch	ON	OFF	OFF	OFF
Air Heater control	ON	OFF	ON	OFF
PERSONNEL HEATER	ON	OFF	ON	OFF

TASK 1CC: TROUBLESHOOT GAS PARTICULATE FILTER SYSTEM

CONDITIONS/STIMULUS

System State: Table CC, Column 1CC.
Driver Location: In Driver's station.
Initiating Stimuli: Malfunction in gas particulate filter system.

ACTIONS

Driver will: 120*. Driver's gas particulate heater does not warm air.
1. Check hull networks box circuit breaker CB 29.

NOTE A: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 24 after completing SYMPTOM 120.
. If circuit breaker is at OFF position set to ON.
. If circuit breaker is at ON position notify organizational maintenance.

121*. Commander's gas particulate heater does not warm air.
1. Check turret networks box circuit breaker CB 2.

NOTE B: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 24 after completing SYMPTOM 121.
. If circuit breaker is at OFF position, set to ON.
. If circuit breaker is ON position, notify organizational maintenance.

122*. Gunner's gas particulate heater does not warm air.
1. Check turret networks box circuit breaker CB 3.

NOTE C: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 24 after completing SYMPTOM 122.
. If circuit breaker is at OFF position, set to ON.
. If circuit breaker is at ON position, notify organizational maintenance.

123*. Loader's gas particulate heater does not warm air.
1. Check turret networks box circuit breaker CB 4.

NOTE D: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 24 after completing SYMPTOM 123.
. If circuit breaker is at OFF position, set to ON.
. If circuit breaker is at ON position, notify organizational maintenance.

*Symptom number in TM 9-2350-255-10.

124*. Gas particulate blower motor does not work.
Step 1. Check hull networks box circuit breaker CB 22.

NOTE E: If any circuit breaker is at OFF position and
CIRCUIT BREAKER OPEN light is not lit, go to
SYMPTOM 24 after completing SYMPTOM 124.
. If circuit breaker is at OFF position, set
to ON. If motor is not working go to Step 2.
. If circuit breaker is at ON position go to
Step 2.

Step 2. Listen for blower motor operation.

- . If operating go to Step 4.
- . If not operating go to Step 3.

Step 3. Check if filter unit power cable and ground are
connected.

- . If loose, connect
- . If connected go to Step 4.

Step 4. Check condition and connection of hose assembly.

- . If hose is pinched or blocked, remove obstructions.
- . If hose is disconnected, reconnect hose.
- . If spring clip is in closed position, set to open
position.
- . If hose appears OK, notify organizational maintenance.

MEASUREMENT

Time - Between end of initiating stimuli and
completion of Symptom 124.

During Training:

Accuracy - As indicated by match between steps given
above and steps performed by Driver.

Time - Between end of initiating stimuli and
completion of Symptom 124.

End of Training:

Accuracy - As indicated by performing troubleshooting
procedures which results in the correction
of malfunctions or reporting the malfunction
to organizational maintenance.

REFERENCES

TM 9-2350-255-10; p. 3-76 to 3-78.

*Symptom number in TM 9-2350-255-10.

TASK 2CC: TROUBLESHOOT NIGHT VISION VIEWER

CONDITIONS/STIMULUS

System State: Table CC, Column 2CC.
Driver Location: In Driver's station.
Initiating Stimuli: Malfunction in night vision viewer.

ACTIONS

- Driver will: 127*. Night vision viewer does not work with night periscope switch set to ON.
- Step 1. Check night vision viewer power cable.
. If cable is not connected to night vision viewer, connect cable.
. If cable is loose, tighten.
. If cable is OK, go to Step 2.
- Step 2. Check cable connector and plug on night vision viewer.
. If connector or plug is dirty or corroded, clean and connect.
. If connector and plug are clean, connect and go to Step 3.
- Step 3. Check hull networks box circuit breaker CB 2.
- NOTE: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 24 after completing SYMPTOM 127.
. If circuit breaker is at OFF position, set to ON.
. If circuit breaker is at ON position, notify organizational maintenance.
- Step 4. Attempt to operate on battery power (If viewer operates on battery power, continue normal operation and notify organizational maintenance.)
- 128*. Night vision viewer does not work on battery power.
- Step 1. Check battery installation.
. If battery is installed in viewer wrong, install with positive (+) end first.
. If battery is installed correctly go to Step 2.
- Step 2. Check battery and contacts.
. If dirty and corroded, clean contact and replace battery.
. If viewer works continue operation.
. If viewer does not work with new battery, notify organizational maintenance.

*Symptom number in TM 9-2350-255-10.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Symptom 128.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by Driver.

Time - Between end of initiating stimuli and completion of Symptom 128.

End of Training:

Accuracy - As indicated by performing troubleshooting procedures which results in the correction of malfunctions or reporting the malfunction to organizational maintenance.

REFERENCES

TM 9-2350-255-10; p. 3-79 and 3-80.

TASK 3CC: TROUBLESHOOT PERSONNEL HEATER

CONDITIONS/STIMULUS

System State: Table CC, Column 3CC.
Driver Location: In Driver's station.
Initiating Stimuli: Malfunction of personnel heater.

ACTIONS

Driver will: 129*. Personnel heater fan does not work when personnel heater switch is set to RUN/FAN.

1. Check hull networks box circuit breaker CB 17.

NOTE A: If any circuit breaker is in OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 24 after completing SYMPTOM 129.
. If circuit breaker is at OFF position, set to ON.
. If circuit breaker is at ON position, notify organizational maintenance.

130*. Personnel heater and fan do not work when personnel heater switch is set to RUN/FAN.

- Step 1. Check left front tank fuel level.

. If tank is empty, refuel.
. If left front fuel tank has fuel, go to Step 2.

- Step 2. Check hull networks box circuit breaker CB 16 and CB 17.

NOTE B: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 16 after completing SYMPTOM 130.
. If circuit breaker is at OFF position, set to ON. If fan does not work, go to Step 3.
. If circuit breaker is at ON position, go to Step 3.

- Step 3. Check hull distribution box circuit breaker CB 7.

NOTE C: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 16 after completing SYMPTOM 130.
. If circuit breaker is at OFF position, set to ON.
. If circuit breaker is at ON position, notify organizational maintenance.

131*. Personnel heater blows cold air.

- Step 1. Check fuel level in left front tank.

. If tank is empty, refuel.
. If there is fuel in tank, go to Step 2.

*Symptom number in TM 9-2350-255-10.

Step 2. Check hull distribution box circuit breaker CB 7.

- NOTE D: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 16 after completing SYMPTOM 131.
- . If circuit breaker is at OFF position, set to ON. If heater still blows cold air, go to Step 3.
 - . If circuit breaker is at ON position, go to Step 3.

Step 3. Check hull networks box circuit breaker CB 16.

- NOTE E: If any circuit breaker is at OFF position and CIRCUIT BREAKER OPEN light is not lit, go to SYMPTOM 16 after completing SYMPTOM 131.
- . If circuit breaker is at OFF position, set to ON.
 - . If circuit breaker is at ON position, notify organizational maintenance.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Symptom 131.

During Training:

Accuracy - As indicated by match between steps given above and steps performed by Driver.

Time - Between end of initiating stimuli and completion of Symptom 131.

End of Training:

Accuracy - As indicated by performing troubleshooting procedures which result in the correction of malfunctions or reporting the malfunction go organizational maintenance.

REFERENCES

TM 9-2350-255-10; p. 3-81 and 3-82.

TASK 4CC: TROUBLESHOOT TRANSMISSION

CONDITIONS/STIMULUS

System State: Table CC, Column 4CC.
Driver Location: In Driver's station.
Initiating Stimuli: Malfunction of the transmission.

ACTIONS

Driver will: 8*: Transmission oil low light lit.

NOTE: TRANSMISSION OIL LOW light may stay on briefly after start until oil warms up.

1. Check transmission oil level (LO 9-2350-255-12).
 - . If transmission oil is low, add oil (See LO 9-2350-255-12). Reset MASTER CAUTION light and continue normal operation.
 - . If transmission oil level is OK, reset MASTER CAUTION light and continue operation. Notify organizational maintenance as soon as possible.
- 9*. Transmission oil pressure low light lit.
 - Step 1. Turn throttle to idle, stop tank and set parking brake.
 - Step 2. Set transmission control to N (neutral) (If TRANSMISSION OIL TEMP HIGH light and TRANSMISSION OIL PRESS LOW light are lit, shut down engine immediately. Notify organizational maintenance.)
 - Step 3. Check TRANSMISSION OIL CLOGGED FILTER light.
 - . If light is lit, shut down engine and notify organizational maintenance.
 - . If light is not lit go to Step 4.
 - Step 4. Check transmission oil level (See LO 9-2350-255-12).
 - . If transmission oil level is low, add oil (See LO 9-2350-255-12) and go to step 5.
 - . If transmission oil level is OK, shut down engine and notify organizational maintenance.
 - Step 5. Check TRANSMISSION OIL PRESS LOW light.
 - . If light goes off, reset MASTER WARNING light and continue normal operation.
 - . If light stays lit, or lights again, shut down engine and notify organizational maintenance.
- 10*. Transmission oil temp light lit.
 - Step 1. Reduce power for one minute.
 - . If TRANSMISSION OIL TEMP HIGH light goes off, reset MASTER WARNING light and continue normal operation.
 - . If TRANSMISSION OIL TEMP HIGH light stays lit, go to Step 2.
 - Step 2. Check BILGE PUMP switch.
 - . If BILGE PUMP switch is at OFF position, go to Step 3.

*Symptom number in TM 9-2350-255-10.

- . If BILGE PUMP switch is set to ON, move switch to OFF position.
- . Operate tank at reduced power for one minute. If TRANSMISSION OIL TEMP HIGH light goes off, continue normal operation. If TRANSMISSION OIL TEMP HIGH light stays on, go to step 3.
- Step 3. Turn throttle to idle, stop tank and set parking brake.
- Step 4. Set transmission control to N (neutral) (If TRANSMISSION OIL TEMP HIGH and TRANSMISSION OIL PRESS LOW lights lit, shut down engine immediately and notify organizational maintenance.
- Step 5. Set ENGINE TACTICAL IDLE switch to ON for 4 minutes.
- Step 6. While engine is at tactical idle speed, have a turret crewmember check right cooling fan operation by checking for air flow from right rear grilles.
 - . If fan is working, go to Step 7.
 - . If fan is not working, go to Step 8.
- Step 7. Check TRANSMISSION OIL TEMP HIGH light.
 - . If TRANSMISSION OIL TEMP HIGH light goes off within five minutes, run engine at tactical idle for two more minutes. Reset MASTER WARNING light, set engine TACTICAL IDLE switch to OFF and continue normal operation with caution and monitor MASTER WARNING light.
 - . If TRANSMISSION OIL TEMP HIGH light stays on go to Step 9.
- Step 8. Set hull networks box circuit breaker CB 18 to OFF and check TRANSMISSION OIL TEMP HIGH light.
 - . If light goes off within five minutes, set TACTICAL IDLE switch to OFF. Continue normal operation and notify organizational maintenance, as soon as possible, that cooling fan is not working.
 - . If light stays lit, set CB 18 to ON and go to Step 9.
- Step 9. Check transmission oil level (See LO 9-2350-255-10).
 - . If oil level is low, add oil (See LO 2-2350-255-10).
 - . If transmission oil level is OK, shut down engine, notify organization maintenance.

MEASUREMENT

- Time - Between end of initiating stimuli and completion of Symptom 10.
- During Training:
- Accuracy - As indicated by match between steps given above and steps performed by Driver.
- Time - Between end of initiating stimuli and completion of Symptom 10.
- End of Training:
- Accuracy - As indicated by performing troubleshooting procedures which result in the correction of malfunctions or reporting the malfunctions to organizational maintenance.

REFERENCES

TM 9-2350-255-10; p. 3-14 to 3-16.

APPENDIX K

INDIVIDUAL TASKS COMMON TO ALL TANK CREWMEN

INDIVIDUAL TASKS COMMON TO ALL TANK CREWMEN

1. Collect/Report information
2. Determine first aid to be applied to a casualty
3. Disarm a heavy anti-tank mine with or without anti-handling devices
4. Disarm a metallic anti-tank mine
5. Engage targets with a Cal. .45 pistol
6. Establish tank firing position
7. Evacuate wounded crewman
8. Give first aid for burns
9. Identify chemical agents using detector paper
10. Identify friendly and threat aircraft
11. Identify friendly and threat vehicles
12. Identify mine field markers
13. Install a heavy anti-tank mine with and without anti-handling devices
14. Install a metallic anti-tank mine
15. Install/Remove radio set
16. Load, reduce a stoppage and clear a Cal. .45 pistol
17. Locate mines by probing
18. Locate mines by visual means
19. Maintain a Cal. .45 pistol
20. Maintain operator's part of equipment record folder
21. Measure distances on a map
22. Operate radio set with intercom system
23. Perform operator maintenance on a protective mask
24. Perform operator maintenance on radio set
25. Prepare a vehicle for nuclear attack
26. Prepare CVC helmet for operation
27. Protect the wound of a casualty
28. Put on and wear a protective mask
29. Remove and install track blocks
30. Use visual signals to control movement (mounted)

APPENDIX L

ARI/HUMRRO TASKS CORRESPONDING
TO TANK CREWMAN TASKS CONTAINED
IN THE BASIC ARMOR TRAINING (BAT) LIST

CORRESPONDENCE BETWEEN BAT TASKS AND ARI/HumRRO TASKS

BAT TASKS

ARI/HumRRO TASKS

Operate Drivers station

- | | |
|---|--|
| 1. Prepare driver's station for operation | 1. Drive Module A: Prepare Driver's Station for Operation |
| 2. Perform fuel transfer procedures | 2. Driver Task 8Q: Perform fuel transfer procedures |
| 3. Start/Stop the engine | 3. Driver Task 1C: Start Engine - Normal Start
Driver Task 2C: Start Engine - Aborted Start
Driver Task 1L: Shut Down Engine |
| 4. Secure driver's station | 4. Driver Module M: Power Down and Secure Driver's Station |

Extinguish a Fire on an XML Tank

- | | |
|----------------------|--|
| 1. Extinguish a fire | 1. Driver Module M: Power Down and Secure Driver's Station |
|----------------------|--|

Troubleshoot Automotive System

- | | |
|--|---|
| 1. Troubleshoot the XML tank using driver's control panel warning and caution lights | 1. Driver Module F: Respond to Warning and Caution Lights |
| 2. Troubleshoot the XML tank engine | 2. Driver Module P: Troubleshoot Tank Engine |
| 3. Troubleshoot the XML tank transmission | 3. HumRRO Driver Task 4CC: Troubleshoot transmission |

Slave Start an XML Tank

- | | |
|----------------------------|--------------------------------------|
| 1. Slave start an XML tank | 1. Driver Module P: Slave Start Tank |
|----------------------------|--------------------------------------|

Drive an XML Tank

- | | |
|-----------------------------|---|
| 1. Operate an AN/VVS-2 | 1. Driver Task 3K: Operate Driver's Night Vision Viewer
Loader Module O: Operate the Loader's Night Vision Viewer. |
| 2. Troubleshoot an AN/VVS-2 | 2. Driver Task 2CC: Troubleshoot Night Vision Viewer |
| 3. Drive an XML Tank | 3. Drive Module E: Place the tank in Motion |

Operate Maintenance of Crew Served Weapons

- | | |
|--|--|
| 1. Clear an M240 machinegun to prevent accidental discharge | 1. Gunner Task 9J: Clear coaxial machinegun |
| 2. Perform operator maintenance on an M240 7.62mm machinegun | 2. Gunner Task 10J: Perform before-operations maintenance checks and services on gunner's machinegun |

3. Clear a Cal. .50 HBM2 machinegun to prevent accidental discharge
4. Maintain a Cal. .50 HBM2 machinegun

3. Tank Commander Task 1C: Clear Commander's machinegun
4. Tank Commander Task 12C: Perform before-operations maintenance checks and services on TC's station

Operations and Functions of Loader Station

1. Prepare loader's station for operation
2. Stow ammunition on an XM1 tank
3. Load/Unload 105mm main gun
4. Load/Unload the M250 grenade launcher
5. Operate the AN/VSS-2
6. Secure loader's station

1. Loader Module A: Prepare Loader's Station for Operation
2. Loader Module F: Operate Main Gun Ammunition Stowage Racks
3. Loader Tasks 2H: Load the main gun
Loader Tasks 3H: Clear the main gun
Loader Tasks 4H: Perform the manual extraction of a round
4. Tank Commander Module D: Operate Grenade Launcher
5. Loader Module O: Operate the Loader's Night Vision Viewer
6. Load Module Q: Power Down and Secure Loader's Station

Boresight and Zero Tank Mounted Weapons

1. Boresight the main gun
2. Zero the main gun
3. Zero the M240 machinegun (COAX)
4. Engage targets with main gun
5. Engage targets with an M240 machinegun

1. Gunner Module K: Boresight Main Gun
2. Gunner Module L: Zero Tank Main Gun
3. Gunner Task 4J: Zero coaxial machinegun
4. Gunner Task 2I: Engage targets with main gun - normal or emergency mode
5. Gunner Task 5J: Fire coaxial machinegun

Recovery of an XM1 Tank

1. Tow an XM1 tank
2. Recover an XM1 tank by a similar vehicle
3. Remove/Install track blocks

1. Driver Module S: Tow Disabled Tank
2. Driver Task 1T: Retrieve Mired Tank
- N/A

Prepare Gunner's Station for Operation

1. Prepare gunner's station for operation
2. Manually input fire control data into the computer
3. Secure gunner's station

1. Gunner Module A: Prepare Gunner's Station for Operation
2. Gunner Module G: Manually Input Fire Control Data Into Ballistic Computer
3. Gunner Task 1N: Power Down and Secure Gunner's Station

Evacuate Wounded Crewman From XM1 Tank

- | | |
|--|--|
| 1. Evacuate wounded crewmen from an XM1 tank | 1. Driver Task 4N: Remove injured crew-member through loader's hatch |
|--|--|

Perform Operator Maintenance on XM1 Periscopes

- | | |
|---|---|
| 1. Perform operator maintenance on XM1 periscopes | 1. Driver Task 2A: Open Driver's Hatch and Adjust Driver's Seat and Periscope
Driver Task 5A: Perform before-operations maintenance checks and services on Driver's Station
Loader Task 11A: Install and operate loader's periscope |
|---|---|

Maintain 105mm Main Gun

- | | |
|--|--|
| 1. Perform operator maintenance on the XM1 tank 105mm breechblock assembly | 1. Loader Task 10A: Perform before-operations maintenance checks and services on the remote thermometer, breech group main gun mount |
| 2. Clean/Service the 105mm main gun | 2. Loader Task 3A: Perform before-operations maintenance checks and services on the Loader's machinegun and the 105mm gun tube |

Troubleshoot Fire Control System

- | | |
|--|--|
| 1. Troubleshoot the fire control system on an XM1 tank | 1. Gunner Module E: Troubleshoot Fire Control and Weapon System Malfunctions |
| 2. Troubleshoot the 105mm main gun | 2. Gunner Module E: Troubleshoot Fire Control and Weapon System Malfunctions |

Troubleshoot Auxiliary Systems

- | | |
|--|--|
| 1. Troubleshoot the XM1 tank personnel heater | 1. Driver Task 3CC: Troubleshoot personnel heater |
| 2. Troubleshoot the XM1 tank gas particulate filter unit | 2. Driver Task 1CC: Troubleshoot gas particulate filter unit |

Service Precleaner on an XM1 Tank

- | | |
|-------------------------------------|---|
| 1. Service preleaner on an XM1 tank | 1. Gunner Module O: Prepare Main Gun and Coax for Travel
Tank Commander Task 10C: Prepare Commander's machinegun for travel
Loader Module P: Prepare Weapons for Travel |
|-------------------------------------|---|

Perform Preventative Maintenance Checks and Services on an XM1 Tank

- | | |
|---|---|
| 1. Perform before operations checks and services on an XM1 tank | 1. Driver Task 5A: Perform before-operations maintenance checks and services on Driver's Station
Loader Task 3A: Perform before-operations maintenance checks and services on the Loader's machinegun and the 105mm gun tube |
|---|---|

Loader Task 10A: Perform before-operations maintenance checks and services on remote thermometer, breech group main gun mount

Tank Commander Task 4A: Perform before-operations maintenance checks and services on Commander's Station

Gunner Task 4A: Perform before-operations maintenance checks and services on Gunner's Station

- | | |
|--|--|
| 2. Perform during operation checks and services on an XM1 tank | 2. Driver Task 11X: Perform during operations checks |
| 3. Perform after operation checks and services on an XM1 tank | 3. Driver Task 12X: Perform after operations checks |

Perform Prepare to Fire Checks and Services on an XM1 Tank

- | | |
|---|---|
| 1. Perform before firing checks and services on an XM1 tank | 1. Tank Commander Task 5C: Check and adjust headspace on Commander's machinegun
Tank Commander Task 6C: Check and adjust timing on Commander's machinegun
Gunner Task 10J: Perform before-operations maintenance checks and services on gunner's machinegun |
| 2. Perform during firing checks and services on an XM1 tank | 2. Tank Commander Task 2J: Perform during-firing checks and services |
| 3. Perform after firing checks and services on an XM1 tank | 3. Tank Commander Task 3J: Perform post-firing checks and services |

APPENDIX M
PLATOON LEADER TASKS

PLATOON LEADER TASKS

1. Analyze OPORD
2. Announce feeding plan
3. Announce rest plan
4. Assign alternate positions
5. Await permission to bypass
6. Await time or permission to attack
7. Await time or permission to open fire
8. Choose a course of action
9. Clarify mission
10. Complete necessary coordination
11. Complete the plan
12. Complete reconnaissance
13. Coordinate indirect fires
14. Coordinate overlapping fires
15. Coordinate overlapping observation
16. Coordinate tank sectors of fire
17. Coordinate security of flanks with other team elements
18. Designate sectors of fire
19. Designate tank targets
20. Designate targets to forward observer
21. Develop the situation
22. Direct acceleration to maximum speed
23. Direct after operations maintenance be completed
24. Direct air guards be kept alert
25. Direct air guards be posted
26. Direct alternate positions be prepared
27. Direct appropriate movement be continued
28. Direct assault be continued
29. Direct assault be started
30. Direct at-halt maintenance be completed
31. Direct attack be continued
32. Direct avenues of approach be covered
33. Direct battle position be completed
34. Direct battle readiness be maintained
35. Direct bounding overwatch be continued
36. Direct bounding overwatch be executed
37. Direct bounding reverse overwatch be continued
38. Direct bounding reverse overwatch be executed
39. Direct bypass be continued
40. Direct bypass preparations be completed
41. Direct bypass be initiated
42. Direct cease fire
43. Direct coil formation be executed
44. Direct coil or herringbone formation be continued
45. Direct coil or herringbone formation be executed
46. Direct communications be checked
47. Direct communications be reestablished
48. Direct communications operational checks be completed
49. Direct covering fires be initiated
50. Direct covering fires be maintained

Platoon Leader Tasks - continued

51. Direct covering fire position be held
52. Direct critical points be crossed
53. Direct defense of position be continued
54. Direct defensive positions be prepared
55. Direct direct fire be continued
56. Direct displacement be initiated
57. Direct emergency repairs be completed
58. Direct enemy be engaged
59. Direct enemy be engaged with depth fire
60. Direct enemy be engaged with frontal fire
61. Direct enemy covering obstacles be engaged
62. Direct enemy be reengaged
63. Direct enemy on objective be destroyed
64. Direct engagement of enemy be continued
65. Direct fire and maneuver be conducted
66. Direct fire and maneuver be continued
67. Direct fire be continued
68. Direct fire be held
69. Direct firing preparations be continued
70. Direct flank tanks be tied in with other team elements
71. Direct flank targets be engaged
72. Direct frontal fire be continued
73. Direct ground guards be posted
74. Direct herringbone formation be executed
75. Direct individual positions be prepared
76. Direct interval between tanks be corrected
77. Direct interval with lead platoon be corrected
78. Direct line of departure be crossed
79. Direct main guns be oriented
80. Direct march be continued
81. Direct movement be initiated
82. Direct movement into assault formation
83. Direct movement into assigned area
84. Direct movement into attack formation
85. Direct movement into attack position
86. Direct movement into defilade position
87. Direct movement into designated position
88. Direct movement into flank position
89. Direct movement into overwatch position
90. Direct movement into support position
91. Direct movement into suppressive fire position
92. Direct movement out of attack position
93. Direct movement to contact be continued
94. Direct movement to flank
95. Direct movement to occupy position to support breaching operation
96. Direct movement to pass through breach
97. Direct move out in previous formation
98. Direct open fire
99. Direct passage of lines be conducted
100. Direct phase lines be crossed
101. Direct position be held
102. Direct pre-fire checks be conducted
103. Direct range cards be prepared

Platoon Leader Tasks - continued

104. Direct rapid movement into area
105. Direct readiness actions be continued
106. Direct readiness actions be initiated
107. Direct readiness be completed
108. Direct release point be crossed
109. Direct resupply be completed
110. Direct scheduled halt be conducted
111. Direct smoke be popped
112. Direct specified movement be initiated
113. Direct speed of tanks be corrected
114. Direct start point be crossed
115. Direct successive delay position be occupied
116. Direct supplies be distributed
117. Direct suppressive fires be continued
118. Direct suppressive fires be shifted
119. Direct suppressive fires on flank targets be continued
120. Direct surprise targets be engaged
121. Direct surveillance be maintained
122. Direct tanks be camouflaged
123. Direct tanks be put in hull defilade
124. Direct tanks be put in turret defilade
125. Direct tanks move into firing position
126. Direct tanks move to good fields of fire
127. Direct targets of opportunity be engaged
128. Direct team in bypass be joined
129. Direct team on battle position be joined
130. Direct team on objective be joined
131. Direct the attack be accelerated
132. Direct 3-man crews be organized
133. Direct traveling be executed
134. Direct traveling overwatch be executed
135. Direct traveling reverse overwatch be continued
136. Direct traveling reverse overwatch be executed
137. Direct withdrawal be initiated
138. Direct withdrawal from suppressive fire position be completed
139. Issue FRAGO
140. Issue march order
141. Issue OPORD
142. Issue warning order
143. Make an estimate of the situation
144. Make a tentative plan
145. Meet the quartering party
146. Monitor indirect fires
147. Plan displacement
148. Prepare a fire plan
149. Provide target data to forward observer
150. Reassess tactical situation
151. Reconnoiter positions for suitability
152. Reestablish communications with TCs
153. Reestablish communications with the team

Platoon Leader Tasks - continued

154. Report crossing critical points
155. Report crossing phase lines
156. Report crossing release point
157. Report crossing start point
158. Report HAW effects
159. Request all indirect fires be massed
160. Request artillery fire and infantry support
161. Request Class I, III, and V supplies
162. Request direct covering fires
163. Request enemy position be smoked
164. Request final protective fires be continued
165. Request HAWs to open fire
166. Request illumination
167. Request indirect final protective fires
168. Request indirect fires
169. Request indirect fires be adjusted
170. Request permission to counterattack
171. Request permission to cover displacement
172. Request permission to displace
173. Request permission to fire and maneuver
174. Request permission to hold
175. Request permission to join team on battle position
176. Request permission to withdraw
177. Request preparatory fires
178. Request preparatory fires be adjusted
179. Request readiness reports
180. Request smoke be adjusted
181. Request SPOTREP
182. Request supply status
183. Request suppressive fires
184. Request suppressive fires be shifted
185. Request suppressive fires be stopped
186. Request team fire plan
187. Request team patrol reports
188. Request wire communications be installed
189. Select and announce withdrawal routes
190. Submit SITREP
191. Submit SPOTREP

APPENDIX N

PLATOON SERGEANT TASKS PERFORMED AS
ACTING PLATOON LEADER

PLATOON SERGEANT TASKS PERFORMED AS ACTING PLATOON LEADER

1. Announce feeding plan
2. Announce rest plan
3. Assign alternate position
4. Coordinate indirect fires
5. Coordinate overlapping observation
6. Coordinate security of flanks with other team elements
7. Coordinate tank sectors of fire
8. Direct after operations maintenance be completed
9. Direct air guards be kept alert
10. Direct air guards be posted
11. Direct at-halt maintenance be completed
12. Direct avenues of approach be covered
13. Direct coil or herringbone formation be executed
14. Direct communications operational checks be completed
15. Direct emergency repairs be completed
16. Direct ground guards be posted
17. Direct individual positions be prepared
18. Direct interval between tanks be corrected
19. Direct main guns be oriented
20. Direct march be continued
21. Direct movement into assigned area
22. Direct pre-fire checks be completed
23. Direct range cards be prepared
24. Direct rapid movement into area
25. Direct readiness be completed
26. Direct release point be crossed
27. Direct resupply be completed
28. Direct scheduled halt be conducted
29. Direct speed of tanks be corrected
30. Direct start point be crossed
31. Direct supplies be distributed
32. Direct tanks be camouflaged
33. Direct tanks be put in defilade position
34. Direct tanks be put in turret defilade
35. Direct 3-man crews be organized
36. Issue march order
37. Meet the quartering party
38. Reestablish communications with TCs
39. Reestablish communications with the team
40. Report crossing critical points
41. Report crossing release point
42. Report crossing start point
43. Request Class I, III, and V supplies
44. Request supply status
45. Request wire communications be installed
46. Submit SITREP

APPENDIX O

PLATOON SERGEANT TASKS PERFORMED
AS SECTION LEADER

PLATOON SERGEANT TASKS AS SECTION LEADER

1. Assign alternate positions
2. Check positions for suitability
3. Coordinate overlapping fires
4. Coordinate security of flank
5. Coordinate tank sectors of fire
6. Cover platoon Leader's section during fire and maneuver
7. Designate sectors of fire
8. Designate tank targets
9. Direct after operations maintenance be completed
10. Direct air guards be posted
11. Direct assault on assigned sector of objective
12. Direct avenues of approach be covered
13. Direct communications be checked
14. Direct emergency repairs be completed
15. Direct enemy be engaged
16. Direct enemy covering obstacles be engaged
17. Direct enemy in sector of objective be destroyed
18. Direct ground guards be posted
19. Direct immediate support of Platoon leader section
20. Direct individual positions be prepared
21. Direct interval between tanks be corrected
22. Direct interval with platoon leader's section be corrected
23. Direct main guns be oriented
24. Direct movement into assigned sector
25. Direct movement into assigned sector of coil or herringbone formation
26. Direct movement into defilade position
27. Direct movement into designated area of attack position
28. Direct movement into designated position
29. Direct movement into overwatch position
30. Direct movement into suppressive fire position
31. Direct movement to occupy position to support breaching operation
32. Direct passing of platoon leader's section when executing bounding overwatch
33. Direct passing of Platoon Leader's section when executing bounding reverse overwatch
34. Direct position be corrected while passing through breach
35. Direct position in designated assault formation be maintained
36. Direct pre-fire checks be conducted
37. Direct rapid movement into area
38. Direct section position be corrected during movement to flank
39. Direct section position in platoon formation be corrected
40. Direct speed of tanks be corrected
41. Direct surprise targets be engaged
42. Direct surveillance of assigned sector be maintained
43. Direct tanks be camouflaged
44. Direct tanks be put in turret defilade
45. Direct tanks move to good fields of fire
46. Direct targets in assigned sector be engaged

Platoon Sergeant Tasks as Section Leader - continued

47. Direct targets of opportunity be engaged
48. Direct 3-man crews be organized
49. Insure section covers assigned section of platoon depth fire action
50. Insure section covers assigned section of platoon frontal fire action
51. Insure section pops smoke on order
52. Insure section ties in with flank platoon or team elements
53. Maintain position in platoon during bypass operation
54. Maintain position in platoon during withdrawal from suppressive fire position
55. Maintain position in platoon formation during movement
56. Maintain position in platoon while joining team on objective
57. Maneuver section during fire and maneuver
58. Plan displacement
59. Shift fires to assigned sector of objective flank

APPENDIX P

TANK COMMANDER LEADERSHIP TASKS

TANK COMMANDER LEADERSHIP TASKS

1. Acquire targets
2. Analyze terrain
3. Announce feeding plan
4. Announce rest plan
5. Assign sectors of observation
6. Clarify mission
7. Designate tank targets
8. Direct after operations maintenance be completed
9. Direct air guard be kept alert
10. Direct alternate position be prepared
11. Direct at-halt maintenance be completed
12. Direct battle position be completed
13. Direct cease fire
14. Direct communications be checked
15. Direct emergency repairs be completed
16. Direct interval with other tanks be corrected
17. Direct individual positions be prepared
18. Direct main gun be oriented
19. Direct movement into assault formation
20. Direct movement into attack formation
21. Direct movement into attack position
22. Direct movement into battle position
23. Direct movement into defilade position
24. Direct movement into firing position
25. Direct movement into overwatch position
26. Direct movement into successive delay position
27. Direct movement into suppressive fire position
28. Direct movement into turret defilade position
29. Direct movement out of attack position
30. Direct movement out of defilade position
31. Direct movement out of suppressive fire position
32. Direct move out into the assault
33. Direct observation of assigned sector be maintained
34. Direct position within section be corrected
35. Direct pre-fire checks be completed
36. Direct rapid movement into assigned area
37. Direct readiness actions be continued
38. Direct readiness be conducted
39. Direct resupply be completed
40. Direct speed of tank be corrected
41. Direct surveillance in assigned sector be maintained
42. Direct tank be camouflaged
43. Engage surprise targets
44. Engage targets in assigned sector of objective
45. Engage targets in assigned sector of platoon fire technique
46. Engage targets of opportunity
47. Identify withdrawal route
48. Initiate range card preparation
49. Initiate readiness actions
50. Insure tank is not skylined

Tank Commander Leadership Tasks - continued

51. Issue OPORD
52. Monitor HAW effects
53. Monitor indirect fires
54. Organize 3-man crew
55. Post air guard
56. Post ground guard
57. Provide maintenance status to platoon leader
58. Provide supply status to platoon leader
59. Reconnoiter for best firing position
60. Report personnel status
61. Request Class I, III, and V supplies
62. Request indirect fires
63. Request indirect fires be adjusted
64. Select alternate position
65. Select good fields of fire
66. Shift fire on order
67. Submit readiness report
68. Submit SITREP
69. Submit SPOTREP
70. Tie in tank with elements on left and right
71. Wait for order to open fire

APPENDIX Q
INTERVIEW SUMMARIES

COLLECTIVE TRAINING BRANCH, DIRECTORATE OF TRAINING DEVELOPMENT

1. The Directorate of Armor Doctrine and Command and Staff were tasked to develop tactics that will threat. It will be ready in a few weeks.
2. There will probably be a change in tactics because of the XM1, the XM2, and XM3.
3. System specific training will begin prior to the delivery of the XM1.
4. An XM1 gunnery manual is planned. The manual should be ready by January and February, 1981. It will deal with such topics as thermal ranging, night fire, etc.
5. Crew drills will be the foundation for training. There will be no more tables since there will not be enough room, ammunition, or fuel. Crew drills will be mandatory; crews will have standards that will have to be met. Upon completion of crew drills, there will be dry fire, sub-caliber fire, and then main gun fire. This would be followed by platoon battle drills and company battle drills.

DIRECTORATE OF ARMOR DOCTRINE

1. The battlefield of the 1980s will include both nuclear and chemical weapons. About 15 countries now have nuclear capabilities, and the current technology will enable them to build small and efficient nuclear weapons suitable for use on the battlefield. As a result, combat is more likely to be decentralized, and brigades will have to be more self-sufficient than before. Despite the likelihood that combat will be nuclear, our new tanks are not shielded against radiation and are not suitable for chemical warfare. The only current protection against chemicals is a chemical mask, but new equipment is in the process of being developed. It may be impossible to develop suitable protection against nuclear weapons since they may be too powerful.
2. A major change in battlefield procedures involves communications. Reliance upon radio communications will be reduced since there will not be time for communications. The high speed of the new tanks will make it difficult for platoon leaders to rely upon radio for control. In addition, electronic warfare would make it possible for enemy guns to be triggered by radio communications.
3. Tank platoons will consist of four tanks. They will operate more as a platoon and less as sections. Bounding overwatch will be sped up with platoons overwatching platoons. There will be greater integration with artillery and greater use of smoke for mass movements.
4. Platoon leaders will make fewer decisions since there will not be time for decision making. More preplanning will be required. Tactics must be simple and understandable, and they must be practiced in battledrills. At the same time, there will be greater reliance upon personal initiative.
5. Brigades will be the largest size unit having a mix of M60 and XM1 tanks. At the battalion level, the tanks will be all of one type or the other. There will be 14 tanks per company--four tanks in each of three platoons and two tanks in headquarters. There will be four companies in a battalion.

STUDIES DIVISION OF THE DIRECTORATE OF COMBAT DEVELOPMENT

1. The Directorate of Armor Doctrine has developed an operational doctrine for the XM1 to be used during the OT3 at Fort Hood. It will be used as a draft supplement for FM 71-2.
2. Command and Staff wrote an OT3 scenario.
3. There is concern about the mix of M60A1, M60A3, M113, and XM1 vehicles. It will be hard to cross-attach the M113 since it cannot keep up with the XM1.
4. Knowledge of the threat assessment, particularly regarding nuclear and chemical warfare, is essential for an ARTEP. Soldiers must believe training in integrated conventional and nonconventional warfare. They must also receive training in wearing equipment.
5. An ARTEP for the XM1 will have to be written. It must be ready by the second quarter of FY 1982. Command and staff is doing a front-end analysis for the ARTEP.
6. Division 86 includes a 4-tank platoon.
7. The Organizational and Operational concept paper for the XM1 describes the four tanks of a platoon operating as a single element. However, other doctrine says that the platoon could operate in sections. The decision would be made by the platoon leader. The platoon defends and attacks. The hasty attack is the normal type of attack made by a platoon. The deliberate attack and the delay would be conducted at a higher echelon. The lowest level of integrated forces would be the battalion.
8. The role of the company commander has increased with increased reliance on bounding overwatch. This is because the company commander has a better viewpoint than the platoon leader.

SUPPORT DIVISION OF COMMAND AND STAFF

1. A study on the use of smoke has recently been completed at Dugway Proving Grounds. Information about the study can be obtained from the Deputy Director of the Material Test Directorate.
2. A 4-5 month study on the effect of smoke on present weapon systems has just been completed.
3. A field manual, FM 3-50, has been prepared in draft form by the Chemical Corps.
4. Smoke companies will be assigned to divisions by 1986.
5. The Russians will not make much use of smoke since they move too fast.

APPENDIX R
LITERATURE REVIEW SUMMARIES

ANTI-ARMOR WEAPONS

The U.S. Air Force is currently developing new munitions designed to defeat second-echelon enemy armor prior to entering combat. It is intended that these munitions would be delivered by tactical aircraft flying at or near the FEBA and would contain a new generation of warheads capable of defeating the advanced armor the Soviets are expected to have on future tanks.

Source:

Furlong, R.D.M. WAAM: The US Air Force's Next Generation of Anti-Armour Weapons. International Defense Review, 1978, 11, 1378-1379.

BMP

The BMP is a Soviet amphibious infantry fighting vehicle armed with a smooth-bore 73mm gun, a 7.62 coaxial machinegun, and a wire-guided anti-tank missile (SAGGER). It can carry a crew of 11 men.

The vehicle is only two meters in height, and presents a small target. However, it is vulnerable to enemy attack since its armor is no more than 9/16 inch thick. The frontal armor is resistant to machinegun fire and to 20-25mm rounds. All other parts of the vehicle, however, can be penetrated by 20-25mm gun fire.

The vehicle can reach a speed of 65 km/hour on highways, and 40 km/hour on normal terrain. It can reach speeds of 70-80 km/hour for short periods. The speed of the vehicle in water is 6 km/hour. The BMP has a range of at least 500 kilometers.

The range of the 73mm gun has been reported to from 800-900 meters to 1300 meters. The low muzzle velocity and the use of stabilizing fins make the rounds sensitive to crosswinds and decrease hit probabilities over long ranges. Because of the length of the ammunition, the gun must be elevated to almost its highest elevation in order to be loaded. Loading is semi-automatic. Due to complicated loading mechanisms and the lack of stabilization on the vehicle, it is difficult to load the 73mm gun and the coaxial machinegun while moving over rough terrain. It is difficult to fire either gun from a defilade position since the maximum depression of the gun is only 4 degrees. When engaging a target below the level of the vehicle, it must often sit on top of or in front of a ridge. This makes the BMP vulnerable to counterfire. The need to assume such a vulnerable position can negate the advantages of the sloped hull front. While the turret can traverse 360 degrees, there is a 30 degree area around the commander's hatch where movement of the turret can be accomplished only with the gun at maximum elevation. If there is an attempt to traverse the turret through this area when the gun is not at maximum elevation, turret movement is cut off electrically.

The missile has an effective range of from 600 to 3000 meters. The missile is slow, traveling 3,000 meters in 27 seconds. During this period, the gunner cannot watch for other targets. The missile can be fired only during daylight. Reloading is difficult, requiring at least one minute. During close contact with the enemy, loading the missile becomes an even more difficult task.

The BMP has firing ports and viewers that allow troops to fire from a moving vehicle or from short stops without leaving the vehicle. The eight heater periscopes and firing ports can accommodate two light machineguns and six automatic weapons. The vehicle also has a handheld grenade launcher that enable grenades to be launched through open hatches in the roof. The vehicle is able to produce a smoke screen by injecting diesel fuel into the hot exhaust system.

The BMP is NBC proof. In an NBC environment, the main gun and the coaxial machinegun can be fired, but the SAGGER cannot be reloaded. During nuclear explosion, there is automatic shutdown of the engine and closing of engine louvers. After the shockwave, decontaminated air can be delivered into the occupied compartment at an overpressure. Fresh air nozzles are attached to each crewman's NBC mask.

Ammunition includes 40 main gun rounds (HVAPDS, HEAT, FRAG, HE), 1000 coaxial rounds, and 4 missiles.

Night vision devices include a light intensification system on the gunner's periscope. It has a range of 800 meters, increasing to 1,000 meters during moonlight. The driver has an infra-red vision block with a range of 60 meters. The commander can replace his vision block with either an active binocular infra-red vision block or with a passive light intensification block with a range of 400 meters. An IR/white searchlight can be used at night with a range of 500-600 meters.

Variations of the BMP include a command version with additional radio equipment, a reconnaissance version, and an artillery observer's vehicle with a parabolic surveillance radar system.

Test trials are being made of an improved version of the BMP with a new engine and an advanced transmission. It is expected that the armor protection will be improved, and that there will be an improved missile system with semi-automatic guidance. Automatic homing guidance is expected by the late 1980s.

Sources:

Burtsev, Y. The Infantry Combat Vehicle. Soviet Press, 79-1, January 1979.

News in Brief. International Defense Review, 1978, 9, 1375.

New Details About the BMP. Armies & Weapons 45, 1978, 6.

Improvements to the BMP 1. International Armies and Weapons, 1979, 6, 27.

Hofmann, O.K. The Battlefield of the 1980s. International Defense Review, 1977, 10, 431-435.

Wance, D. Threat Update. Armor, 1979, 88, 29-33.

CHEMICAL WARFARE

The chemical warfare capabilities of the Soviets have been increased significantly since 1970. The increase has been aimed at both the offense and defense. Between 75,000 and 100,000 chemical warfare specialists are employed in all units down to the regimental level. Delivery systems for chemicals include some models of the Frog and the Scud. It is anticipated that tactical aircraft can deliver chemical weapons with even greater accuracy than these missiles. There is evidence that stocks of chemical weapons have been greatly expanded. It is felt that the use of chemicals would be viewed as less escalatory than the use of nuclear weapons. It is believed that NATO protective clothing is inadequate and overrestrictive.

Source:

Soviet Chemical Treat a NATO Priority. International Defense Review, 1979, 12, 11.

SMOKE

The smoke grenade launcher system on the M60 series of tanks and the XM1 tank contains 12 barrels, six on each side of the turret. Twelve smoke grenades can be fired in a single volley, or two six-round volleys can be fired separately with each volley containing three rounds from each side. The cloud produced by the smoke grenades will be 24 meters from the tank. It will have a height of 13 meters and a width of 38 meters. The smoke will be emitted in two seconds, and will have a duration of from 5 to 10 minutes.

The primary function of smoke is to assist in the self-defense against anti-tank weapons by concealing the tank from enemy gunners and by providing an opportunity to evade enemy fire. When fired upon or when detecting enemy anti-tank positions while moving in the open, the smoke grenades on the side of the vehicle facing the enemy should be fired. Rapid and evasive movement should then be taken to a covered or concealed position.

During an attack, smoke can be placed behind the attacker's maneuvering elements to cut them off from overwatch support. The attacker would place smoke in front of the defender's position to blind defensive fire without affecting the maneuvering elements.

Smoke can also be used to cause maldeployment by the defense.

If the defense were to withdraw from positions when blinded by smoke, an attacker could capitalize on this tactic. Not to withdraw, however, would be highly risky since the defensive position would be blinded. Reliance must therefore be made of scout reports; these scouts must be in position to see the enemy at all times.

The thermal sights on the XM1 allow vision through smoke. The sights are reported effective for all types of smoke except aerosol smoke. Since all smoke is aerosol, there is a contradiction in this claim. Apparently the thermal sights can be used to see through smoke, but the quality of the image is impaired.

Sources:

TC 17-15-9, Tank Self-screening Smoke Systems, January 1978.

Battreall. Counteraction to Complete Blinding of Defensive Positions.
Memo to Commanding General USAARMC & Fort Knox, 14 May 1978.

SOVIET ARMOR PROTECTION

It is believed that the Soviet T-64 and T-72 tanks incorporate advanced armor which will defeat the TOW missile as well as warheads from other anti-tank weapons such as the Dragon. Efforts to develop new armor have been known to be underway since the early 1960s, and these efforts may have led to the mass production of this armor and its employment on the T-64 and T-72.

It is also reported that new systems are being developed to provide tank crews with high immunity to neutron radiation. This would enable Soviet tanks to continue fighting during neutron bomb explosions and could limit the merits of the neutron bomb.

Sources:

Anti-Neutron Protection for Soviet Tanks. Armies & Weapons, 1979, 6, 27.

International Defense Digest. International Defense Review, 1978, 11, 1373.

SOVIET COMBAT ENGINEERS

In order to achieve a very rapid rate of advance, the Soviets place great reliance upon their engineers. Their role is to ensure that obstacles do not impede movement when near the enemy, enabling them to maneuver freely on the battlefield. Another role is to protect Soviet troops from enemy actions.

Each motorized rifle and tank regiment has an engineer company that is organic to it. Divisions have an engineer battalion, and armies have two engineer regiments. Equipment includes mine detectors, explosive charges, NBC detection equipment, and mine clearance gear.

Soviet engineers are expected to be able to prepare 100 kilometers of route per day in open country. If the enemy has made attempts to destroy or block roads and tracks, then the expected preparation distance is reduced to between 20 and 40 kilometers. If the enemy fires upon the engineers, then the strategy is to build a parallel track.

Soviet engineers are also expected to create anti-tank obstacles to hinder a counterattack during a battle. Since the location or direction of a counterattack will be known in advance, sufficient engineer reserves are kept ready to move to the point of the battlefield where they are needed.

When the Soviet main force encounters a minefield, rapid mine clearing equipment is brought up to clear minefield. The mines can be plowed when depth and position are not known. They are carefully detected and lifted only when there are no explosive or mechanical devices available. When clearing defensive minefields in front of their own positions before going on an attack, the mines are removed by hand at night. To prevent casualties among the engineers, combined arms support and artillery support is given. The standard method to clear mines during an assault is to use explosive charges and mine plows under cover of an artillery bombardment. If no support is available, or if there is too little time, then the minefields are breached by tanks equipped with mine plows or with plow and roller combinations.

Source:

Donnelly, C.N. Combat Engineers of the Soviet Army, International Defense Review, 1978, 11, 193-204.

SOVIET COMBAT HELICOPTERS

There are two variants of the Mi-24 helicopter. The newer Hind-D contains a large caliber four-barrel machinegun with all-weather sighting systems that include infra-red and low-light television. A laser rangefinder is mounted on the Hind-D. Both variants have 32-shot 57mm unguided rocket pods and four Swatter anti-tank guided missile rails. The missile guidance systems allows the utilization of air-to-ground missiles. The helicopters can also carry bombs when necessary. The unguided rocket has a range of 1200 meters and can penetrate 200mm of armor. The Swatter missile has a range of 3500 meter and can penetrate 500mm of armor.

A major role of the Mi-24 is to serve as an anti-tank weapon. They enable enemy targets to be hit when they remain out of reach of anti-aircraft weapons.

The basic helicopter formation contains four helicopters. Infrared sensors enable tanks to be seen when camouflaged and when hidden among trees. Air-defense radar can be avoided by approaching targets at an altitude of from 5-10 meters. Targets at ranges from 2,000 to 3,000 meters can be fired upon by rising to an altitude of 20 to 100 meters.

A new fire-and-forget guided missile is being developed as an anti-tank system. An optical contrast TV seeker having a range of 5 miles is also being developed.

Helicopters can provide accompanying fire for tanks and infantry fighting vehicles. They can attack as part of the forward detachments and advance guards. They can cover the rear and flanks of friendly forces and disrupt enemy movement of reserves. Helicopters can also be used to destroy small reconnaissance units.

Source:

Hansen, L.M. Soviet Combat Helicopter Operations. International Defense Review, 1978, 11, 1242-1246.

SOVIET TACTICS

Soviet tactics appear to be based on the assumption that if they are to win a war with NATO, the war must be won quickly. One basis for this is the delay, believed to be five days, that it would take for NATO before it could use tactical nuclear weapons. Another reason is the belief that speed and maneuverability would reduce their own vulnerability to enemy nuclear weapons. A third reason is that it would enable them to capture the most territory before reinforcements could arrive. The development of high speed vehicles, such as the BMP and the T-72 tank, is based on the desire for speed and maneuverability.

The Soviets will usually concentrate their forces in order to obtain local superiority. An entire division may attack on a front as narrow as 4 kilometers. On the other hand, it may attack in several sectors with the main effort being concentrated in one sector. Attacks are usually conducted in two echelons. The first echelon contains the leading assault elements required for the initial phase of the attack. The major function of the second echelon is to exploit success, although it may also be used to reinforce the attack of the first echelon, destroy pockets of resistance, repel enemy counterattacks, and replace first echelon units suffering from heavy attrition. If the first echelon is halted or repulsed during an attack, the second echelon may attack a more weakly defended area while the first echelon continues its attack. If the first echelon is successful, the second echelon may widen the breach, destroy bypassed elements, or exploit the initial success. In addition to these two echelons, there is usually a reserve which is smaller than the US reserve. The reserve for a battalion will usually be a platoon. After an immediate objective has been achieved, the first echelon will usually continue the attack with new units of the second echelon.

Suppressive Fire. An attack is usually preceded by an artillery barrage intended to neutralize and destroy enemy manpower, fire weapons, and control posts, and to make organized resistance to the attack more difficult. This barrage is intended not only to suppress weapons at the forward edge of the defense, but long-range weapons 3,000 meters to the rear. Soviet troops advance under a massed artillery and air bombardment. Tanks and APCs add direct fire when they come into range. Soviet doctrine provides guidelines for the intensity of the suppressive fire. Suppressive fire for a breakthrough of a prepared defense should contain at a minimum 100 tubes per each frontal kilometer; 80 tubes/kilometer for an attack of a hasty defense; and 40 tubes per kilometer for an attack on a minor axis.

Attacking. During the artillery barrage, company columns advance from a waiting position to the assault line. At the assault line, the companies deploy into platoon columns. Tanks will open fire on the move at the forward edge of the enemy position and the near depth of the enemy. If enemy strong points are neutralized, and if the terrain is suitable for infantry fighting vehicles, BMPs will enter the attack. If the conditions are not suitable for infantry fighting vehicles, the attack is continued in dismounted formation. The BMPs, in this case, will support the dismounted infantry from a position of cover, moving from one covered position to another.

Because of their mobility, striking power, and firepower, armored units are the fundamental unit in the attack. The tank company plays the major role. The position of each tank is predetermined and fixed. Training is given in execution of preplanned maneuvers so that these maneuvers can be conducted quickly. Signals for the execution of these maneuvers can be given by hand, flag, or radio signal.

A reported weakness of Soviet tactics lies in rigid command and control. Company commanders have no control over supporting fire or coordination of motorized infantry movements, even when the tactical situation requires change. Tank commanders are not allowed to use their radios during combat and cannot therefore report target sightings. Platoon leaders are deprived of any initiative and are unlikely to make decisions when there are sudden changes in the local situation.

Initiating the Attack. Two basic methods for initiating attacks are presented in Soviet doctrine--attacks from position in contact and attacks from the march. The attack from the march is expected to occur more often, particularly in a nuclear environment.

A Soviet march column will consist of an Advance Guard, a Main Force, and a Rear Party. The Advance Guard will represent about one-third of the total combat power within the column. Its primary function is to enable the Main Force to move unhindered, to assure that combat conditions are suitable for the commitment of the Main Force, to warn the Main Force of surprise attacks, and to prevent penetration of the Main Force by enemy reconnaissance. To enable it to perform these functions, the Advance Guard will be reinforced with artillery, tanks, air defense, and chemical/radiological elements.

The Advance Guard will itself be organized onto basic components. It will consist of a Combat Reconnaissance Patrol, and Advance Party, and an Advance Guard Main Force. The Combat Reconnaissance Patrol may be as much as 10km ahead of the Advance Party. The Patrol will consist of a motorized rifle platoon that is augmented with chemical/radiation and engineer personnel. The mission of the patrol is to provide information on enemy strength, composition, and direction of movement. To accomplish this mission, the patrol will penetrate to the enemy's main body by bypassing the enemy's advance elements. Chemical and engineering reconnaissance will also be conducted.

The mission of the Advance Party is to advance at maximum speed and to engage lead enemy elements. It will attempt to seize and hold a position until the arrival of the Advance Guard Main Force. The Advance Guard Main Force will be from 5 to 10 kilometers behind the Advance Party. The mission of the Advance Guard Main Force will be to eliminate enemy opposition, allow the march to be continued, or to fix the enemy force until the Main Force can be deployed.

The ultimate deployment of the Main Force will depend upon the outcome of the actions taken by the Advance Guard. If the actions of the Advance Guard are successful and the enemy is destroyed, the Main Force will not be deployed. If the Advance Guard is unable to achieve an immediate success, the Main Guard will continue to move forward and prepare to deploy, while the Advance Guard probes at the enemy flanks.

If the Advance Guard is unable to take further offensive action against the enemy, then it will shift to defense and repel any counterattacks until the Main Force deploys and attacks the enemy. Finally, if Advance Guard is unable to hold the enemy, the Main Force is called upon to defend against the enemy while the Advance Guard withdraws and joins the defense. Other division level forces will then be committed to the engagement.

The Rear Party will be up to platoon level in strength and will be located approximately 3 kilometers from the Advance Guard and Main Force. Depending upon the nature of the enemy threat, it may be used against the enemy flank.

Soviet Maneuvers. There are two types of Soviet maneuvers--troop formation maneuver and maneuver by fire. Troop formation maneuver involves organized movement designed to produce a more advantageous position with relation to the enemy. There are two types of troop maneuver--flanking and envelopment. Flanking involves movement to the enemy flanks and rear in a relatively shallow depth. It is conducted through gaps and breaches in the enemy formation. Envelopment is deeper, and is intended to force the enemy to turn and fight in a new direction.

Maneuver by fire involves maneuver of fire power in order to destroy the enemy. It involves utilizing the mobility of weapons and their ranges in conjunction with shifting, massing, and concentrating fire.

Echelons. In order to ensure the momentum of offensive operations, Soviet attacks are echeloned. From half to two-thirds of the forces are concentrated in the first echelon, including most of the available artillery. The second echelon may exploit the success of the first echelon, or it may be directed to attack in a new direction. It may be used to destroy enemy elements bypassed by the first echelon, to defeat counterattacks, to defeat air attacks, or to replace units of the first echelon that have lost their combat effectiveness. The commitment of the second echelon is preceded by intense fire preparation from both the artillery of the second echelon and from artillery of in-contact first echelon forces.

In addition to the first and second echelons, there will usually be a reserve element. The reserves are not usually assigned a specific mission during an attack, but are used for unanticipated contingencies.

Sources:

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Wance, D. Threat Update. Armor, 1979, 88, 29-33.

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SOVIET TANKS

T-62. The T-62 is a low-silhouette tank armed with a 115mm smooth bore gun. To achieve compactness, it has a reduced basic load, smaller depression angle, slower rate of fire, and reduced crew comfort. Despite the fact that the main gun on the T-62 is stabilized, the tank has only a limited capacity to fire on the move. The time required to fire while on the move is approximately three times greater than the time required to fire from a halt. The greater firing time while moving is due to the difficulty involved in handling ammunition from different storage points when the stabilization causes the turret to move relative to the hull. In addition to the additional loading time, firing while on the move produces lower hit probabilities.

The ability of the T-62 to fire from a hull-down position is limited by the limited angle of depression for the main gun. It is also limited by frequent breakdowns of a mechanical clutch between the engine and the gear box. This breakdown occurs in up to 40% of the tanks during the precise maneuvers to get into a hull-down position.

A flat projectory enables the gun to be fired accurately at 2100 meters without a complex fire control system. It lacks both a rangefinder and a ballistic computer.

The T-62 had been the major tank in the Soviet army. It will probably supplement the newer T-72 tank up to the mid-1980s.

T-64. The T-64 has an 125mm gun with an automatic loader and a 3-man crew. It has a new fire control system with a rangefinder and a ballistic computer. Production of the T-64 tank has been at a rate of 600 per year. The tank is fully capable of fighting while on the move. It is equipped with passive night vision devices. The frontal armor on the T-64 cannot be penetrated by the standard Dragon and TOW missiles.

T-72. The T-72 uses the same armament, fire control, and automatic loader as the T-64. Like the T-64, it has a self-entrenching device. Production of the T-72 tank has been at a rate of over 2,000 per year. The tank is reported to have high fire power, good armor protection, but an engine with insufficient power causing a lack of mobility. The tank has a lining containing lead which provides it protection against electro-magnetic pulse and neutron radiation. A modified version of the tank is expected to be produced during the mid-1980s.

T-80. The T-80 is a new main battle tank expected to be deployed during the middle to late 1980s.

Sources:

Gratzl, J. T-64: Some Thoughts on the New Soviet Battle Tank. International Defense Review, 1976, 9, 24-26.

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TANK ROUNDS

The effectiveness of the 105mm gun is being increased with the development of a new kinetic-energy, armor-defeating cartridge, the M-735. This is a first generation of a new approach to the design of kinetic energy ammunition. This development is made possible by the development of dense materials having high strength, toughness, and hardness that can withstand both launch and impact. The M-735 will increase the capability to defeat the side of armor hulls on grazing shots; on direct hits, kills will be possible at angles and ranges that previously would have only inflicted minor functional impairment. The projectile has very little spin. It is designated APFSDS (armor-piercing, fin-stabilized, discarding sabot). The combination of clean sabot separation and fin stabilization result in improved round-to-round stabilization. It has much higher hit and kill probabilities than the M-392 projectiles.

Despite these improvements, the projectile will not be able to penetrate the armor on the T-72 nor the T-80. A second-generation round, the M-774, is therefore being developed. It was scheduled for limited production in April, 1979. It was expected to have dispersion as good as that of the M-735, but with greater penetrating capability. The intent of the round was to have superior first round kill probabilities than the Soviet T-80.

The M-774 round may become obsolete by 1983 with the development of the XM833 round.

Sources:

The American APFSDS. International Armies and Weapons, 1978, 5, 23.

Leonard, O.P. A Bigger Foot Print. Armor, 1978, 87, 11-13.

US 105mm Tank Ammunition Policy Update. International Defense Review, 1979, 12, 878-879.

TOW MISSILES

Early TOW vehicle mounts consisted of the standard ground launcher fitted on the roof of the M-113 troop compartment. This left the gunner totally exposed. As an interim solution, a roll-up hood has been developed to provide some armor protection to the gunner. However, the front and rear are still left open, the vehicle silhouette is increased, and protection is given only against small caliber projectiles and splinters. No NBC protection is provided.

An improved TOW vehicle will be in production. More than 2,000 vehicles will be produced, and 1,000 of them will be deployed in Europe by April, 1981.

Sources:

Furlong, R.D.M. The Improved TOW Vehicle Kit. International Defense Review, 1977, 10, 315-317.

Improved TOW Vehicle Rolled Out. International Defense Review, 1979, 12, 480.

U.S. MISSILES

It was reported that the TOW missile is unable to defeat the Soviet T-64 and T-72 tanks. It is also unable to operate in smoke. Although modifications have been programmed for the TOW, it may be unable to defeat the new Soviet T-80 tank. The modification involves retrofitting improvements in more than 100,000 TOWs. These will be termed TOW2 missiles.

An extended range Dragon missile has been developed but not produced. The range of the new missile has been increased from 1,000 meters to 1,500 meters, and flight time has been reduced at 1,000 meters from 12 seconds to between 8 1/2 and 9 seconds.

An Improved Dragon has also been developed, but not produced. The Improved version would have the same warhead as the TOW2.

The Dragon is a medium anti-tank weapon developed for deployment by infantry platoons in rifle companies. It is tube-launched, optically tracked, and wire guided. The Dragon is the Army's first man-portable missile system that can destroy tanks and other infantry targets within a platoon area of operation. It has a reusable tracker that can accurately control the missile to 1,000 meters. The minimum range is 60 meters. It has a thermal-imaging night sight.

The Assault Breaker is a multiple-launched surface-to-surface set of bus missiles. Each missile will dispense large numbers of bomblets or terminally guided mini-missiles over enemy tank formations at ranges up to 150 km. Each bus missile should be able to halt a complete enemy tank company. Target acquisition, tracking, and mid-course guidance would be performed by aircraft flying behind the FEBA. The deployment of 2,000 ground launchers is expected by 1985.

Sources:

AUSA 1979: Crash Programs to Counter Deployed Soviet Armour. International Defense Review, 1980, 13, 89-94.

Oh, K.C. Dragon: One-Man Tank Killer. International Defense Review, 1978, 11, 1082-1085.

APPENDIX S

SITUATIONAL FACTORS AFFECTING
COMBAT OPERATIONS

U.S. FACTORS

A. Weapon System Combinations

1. M60A1-M113
2. M60A1-M2
3. M60A3-M113
4. M60A3-M2
5. XM1-M113
6. XM1-M2

B. Missiles

1. TOW1
2. TOW2

C. Gun on XM1

1. 105mm
2. 120mm

D. Fuel Availability

1. High
2. Moderate
3. Low

E. Ammunition Availability

1. High
2. Moderate
3. Low

F. Availability of Replacement Personnel

1. High
2. Moderate
3. Low

G. Availability of Maintenance

1. High
2. Moderate
3. Low

H. Infantry Mode

1. Mounted
2. Dismounted

I. Mission Requirements

1. Perform at all costs
2. Perform within designated time limits
3. Perform within designated casualty limitations

ENEMY FACTORS

A. Type of Combat Force

1. Combat Reconnaissance Patrol
2. Advance Party
3. Advance Guard Main Force
4. Advance Guard Flank Party
5. First Echelon Main Force
6. Second Echelon Main Force
7. Reserve

B. Type of Enemy Unit

1. Motorized Rifle
2. Tank

C. Size of Enemy Combat Force

1. Platoon
2. Company
3. Reinforced Company
4. Battalion
5. Reinforced Battalion
6. Other

D. Type of Enemy Tanks

1. T-54
2. T-62
3. T-72

E. Type of Enemy IFVs, APCs

1. BMP
2. BMD
3. BTR, BRDM

F. Mode of Attack

1. Hasty Attack
2. Deliberate Attack
3. Counterattack
4. Meeting Engagement

G. Tactical Movement

1. Frontal
2. Flank
3. Envelopment
4. Bypass

H. Intensity of Artillery

1. Light
2. Moderate
3. Heavy

I. Intensity of Air Attack

1. Light
2. Moderate
3. Heavy

J. Unknown Enemy Combat Improvements

1. Accuracy of Fire
2. Distance of Fire
3. Penetrability of Enemy Round
4. Speed of Vehicle
5. Target Detection Capability
6. Night Vision Capability
7. Speed of Missiles
8. Accuracy of Fire while Moving
9. Other Improvements

K. Type of Combat

1. Conventional
2. Nuclear
3. Biological
4. Chemical

ENVIRONMENTAL FACTORS

A. Soil Condition

1. Highly trafficable
2. Moderately trafficable
3. Poorly trafficable

B. Slope of Land

1. Flat
2. Gentle slopes
3. Occassional steep slopes
4. Steep

C. Vegetation Density

1. Sparse
2. Moderate
3. Occassionally heavy
4. Heavy

D. Illumination

1. Daylight-clear
2. Daylight-hazy
3. Night-moonlit
4. Night-dark

E. Visibility

1. Clear
2. Fog
3. Haze
4. Smoke
5. Snow
6. Rain

F. Precipitation

1. None
2. Light rain
3. Heavy rain
4. Light snow
5. Heavy snow

G. Temperature

1. Extremely hot
2. Moderate
3. Extremely cold

H. Obstacles

1. None
2. Mines
3. Streams
4. Rivers
5. Swamps
6. Nuclear contaminated areas
7. Chemically contaminated areas
8. Biologically contaminated areas
9. Mountains
10. Gulleys
11. Forests
12. Deep snow

I. Roads

1. Highways
2. Secondary roads
3. Unpaved roads
4. Trails

J. Width of Battlefield

K. Depth of Battlefield

COMBAT OUTCOME FACTORS

A. Tank Losses

1. None
2. One
3. Two
4. Three
5. Four

B. Crewman Losses (Injuries, Casualties)

1. TC losses
2. Gunner losses
3. Driver losses
4. Loader losses
5. Multiple crewman losses

C. Equipment Failures/Losses

1. Weapon failures
2. Movement failures
3. Communication failures
4. Multiple failures

D. Combat Outcome of Adjacent Platoons .

1. Adjacent platoons defeat enemy
2. Adjacent platoons defeated by enemy
3. Adjacent platoon outcomes undecided

E. Air Command Outcomes

1. U.S. air control
2. Enemy air control
3. Air control undecided

F. Artillery/Support Losses

1. Light
2. Moderate
3. Heavy

G. Crewman Fatigue

1. Low
2. Moderate
3. Heavy

H. Command Losses

1. Platoon sergeant
2. Platoon leader
3. Company HQ

I. Remaining Ammunition Availability

1. High
2. Moderate
3. Low

J. Remaining Fuel Availability

1. High
2. Moderate
3. Low

K. Remaining Maintenance Availability

1. High
2. Moderate
3. Low