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# Assessment of Tactical Training Methodologies

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The purpose of the research is to assess current and projected tactical training methodologies at the platoon/company leader level to identify major gaps in the state-of-the-art. Doctrinal/tactical leadership task information and media/training device information was collected from interviews with Army representatives and instructors; reviews of the literature, Army manuals and publications, and task listings; a questionnaire survey of Armor Officer Advanced Course students; and observation of tactical exercises at Ft. Knox.

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20. Abstract - Continued

First, it was found that platoon leader tasks associated with Movement to Contact, Hasty Attack, Counterattack and Passage of Lines missions were the most difficult for acquiring proficiency and for which further training is needed. Second, detrimental training environment influences such as cumbersome logistical support requirements and lack of a perceived training need threaten an effective utilization of REALTRAIN and MILES as tactical training methodologies. Third, there is an absence of state-of-the-art, low-cost tactical training devices and simulations at the small unit level for exposing leaders to tactical problems. Fourth, advances in microcomputer technology combined with new initiatives to tactical training have the potential to provide a truly integrated tactical training strategy.

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## FOREWORD

The Training Research Laboratory of the Army Research Institute for the Behavioral and Social Sciences (ARI) performs research and development in areas that can help the Army more effectively meet its training mandate. At present, there is a need for systematic research on tactical training at the small unit level which examines both the tactical leadership tasks in need of further training and the technologies (new and existing) that can be employed for enhancing tactical proficiency. To arrive at a balanced and integrated tactical training strategy, gaps or deficiencies in the state-of-the-art first need to be identified. This report identifies a number of areas where tactical training practices at the small unit level could be improved and further underscores the potential of microcomputer technology, if properly integrated, for addressing the current deficiencies.

The report should be of interest to those in the military and training development communities seeking to insure that invested efforts for improving tactical training are well targeted.

EDGAR M. JOHNSON
Technical Director

ASSESSMENT OF TACTICAL TRAINING METHODOLOGIES


## EXECUTIVE SUMMARY

Requirement:

The purpose of the research is to identify and assess deficiencies in current and projected tactical training methodologies for combat arms units at the company/platoon level.

Procedure:

Information was collected in two broad categories: a doctrine/tactical leadership task area and a media/training device area. The principal methods for collecting information included interviews with Army agency representatives and Armor School and Infantry School Instructors; a questionnaire survey of Armor Officer Advanced Course students; reviews of U.S. Army manuals, doctrinal publications, programs of instruction, lesson plans, task listings and the research literature; and on-site observation of tactical exercises for Armor Officer Branch students at Ft. Knox.

Findings:

The major findings are fourfold: (1) platoon leader tasks associated with Movement to Contact, Hasty Attack, Counterattack and Passage of Lines missions were cited as the most difficult for acquiring proficiency and for which further training is needed, (2) despite Army advances in performance-oriented training and engagement simulation techniques, detrimental training environment influences (e.g., cumbersome logistical support requirements, lack of a perceived training problem, and lack of strong endorsement) are threatening an effective utilization of REALTRAIN and MILES as tactical training methodologies, (3) there is a conspicuous absence of low-cost state-of-the-art tactical training devices at the platoon leader level capable of exposing leaders to realistic tactical problems and that can serve to maximize their field training experience, and (4) recent advances in microcomputer technology combined with new initiatives and committment to tactical training have the potential to provide a much needed and truly integrated training strategy for improving tactical proficiency at the small unit level.

Utilization of Findings:

These findings should serve as an aid to those involved in the design and implementation of institutional and unit tactical training at the small unit level.

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## INTRODUCTION

The overall purpose of the research effort is to identify methods, media, and devices supporting effective training of tactical leadership tasks for platoon leaders and company commanders of maneuver units, in preparation for field exercises. In order to systematically assess training programs and to formulate and develop media/device concepts, two main objectives guide the direction of the present work. The two objectives include: (1) an assessment of current and projected tactical training methodologies to identify deficiencies in the state-of-the-art, and (2) an identification of alternative training media and device combinations with potential to support training on a wide array of tactical tasks.

The immediate purpose of this report is to share information acquired on the first objective, the assessment of various tactical training methodologies for combat arms units below battalion level. The major focus will be on the identification of deficiencies in the state-of-the-art and the identification of promising methods and technical approaches to support tactical training at the platoon/company level.

### Background

The conditions and demands confronting a leader on the modern battlefield are infinitely varied and unlikely to be encountered in the same way twice. From the start, the armor or mechanized infantry platoon leader has to anticipate enemy deployment, select overwatch positions, and plan routes of movement. Furthermore, he must coordinate his elements' movements, maintain their security, and retain control during initial enemy contact. During the battle, he must process information concerning enemy contact, assess its reliability, decide upon indirect fire, and place weapon systems where they are most likely to engage appropriate targets. He must further report the enemy situation, often on the basis of degraded information, to his company commander, execute new orders, communicate with his tank commanders or squad leaders, and decisively compensate for execution failures. The platoon leader is also a vehicle commander and must expeditiously interact with his crew to optimize team performance. The unique, dynamic interplay among terrain, mission, weather, weapon systems, personnel, supplies, supporting elements, threat capability, and myriad other factors, place the platoon leader and his commander in pivotal roles where proficiency in assessing the enemy situation, making decisions under stress, and effectively executing command, control and communication ($C^3$) procedures are prerequisites for survival and mission accomplishment.

To be able to carry out the above tasks effectively, efficiently, and in rapid succession requires a mastery level of information processing and decision-making skills found in few military or civilian occupations. Mastery of this complex environment requires extensive practice on a large variety of tactical situations under realistic battlefield situations. Those adroit enough to master these skills under actual battlefield conditions are valued for their experience as combat veterans, but how does one devise a training system that will give inexperienced platoon leaders and vehicle commanders a much needed head start in mastering these same skills before their first battle? Clearly, tactical leadership at the small-unit level represents a key U.S. Army training challenge.

## Simulated Tactical Training

The origins of simulated tactical training most likely can be traced to the ancient games of Chess and Go. Both games, when played with skill, involve strategic and tactical maneuvering. Applications occurring within a military context, however, have been dated much later. In the early 1880s the Prussian Army used games consisting of large, detailed maps together with color-coded wood blocks to represent troops (Coppard, 1976). Players planned troop movements and the use of appropriate armaments. Following the game, players' actions, no doubt, were discussed and reviewed. In the years that followed, most gaming simulations were directed at high level staffs in preparation of major operations. Very seldom was the small unit leader considered a suitable target for the tactical use of games.

By the early 1970s, the importance of combat readiness, proficient use of weapon system technology, and decisive execution of tactics were recognized as essential given the conditions of the modern battlefield. The need to institute changes which would improve the quality of tactical training in the U.S. Army at the small unit level became apparent. One of these changes was the placing of greater responsibility on battalion commanders for the planning, implementation and evaluation of tactical training best suited to the unique needs of their units. Performance-oriented manuals such as FM 21-6 How to Prepare and Conduct Military Training (1975) were developed which departed from the conventional classroom-centered techniques. The new approach focused on well-defined tasks to be performed, the specification of conditions under which the tasks were carried out, and a standard for acceptable performance. The introduction of the Army Training and Evaluation Program (ARTEP) provided the conceptual framework for performance-oriented training; however, as Scott (1980) has indicated, the tactical training methods, at first, did not keep pace. Traditional tactical field training consisted of either live fire exercises utilizing stationary targets or the firing of blank rounds between opposing forces with one side programmed, by scenario, to react a certain way regardless of what the other side did. Absent, more often than not, was the complexity and dynamics of the combat environment. Stationary targets neither fire back nor take protective cover. Nor does a skilled and determined enemy maneuver in a prearranged fashion. What was needed was a performance-oriented approach to tactical training -- one that would provide credible feedback on the effectiveness of one's actions.

Engagement Simulation. A progressively sophisticated family of tactical training simulations, collectively referred to as engagement simulation (ES), evolved over the next few years as a means for overcoming the tactical deficiencies of traditional training (Root & Erwin, 1976; Root, Knerr, Severino & Word, 1979). So far, three tactical engagement simulation systems -- Squad Combat Operations Exercise (Simulation) (SCOPES), REALTRAIN, and Multiple Integrated Laser Engagement System (MILES) have been developed for Army implementation. In SCOPES, a six-powered telescope was affixed to the soldier's rifle and a three-inch high, two-digit number was printed on all sides of a helmet cover to be worn by participants. A "kill" occurred when a soldier "scoped-in" his opponent, fired a blank round, and correctly identified his opponent by number. Other small arms weapons (e.g., hand grenade, claymore mines) were simulated in conjunction with procedures for objectively recording casualties. Similar procedures were worked out for machine guns, the tank main gun, LAW, TOW, DRAGON, and anti-personnel and anti-tank mines. The capability to apply these concepts and procedures to combined arms operations became known as REALTRAIN (Shriver, Mathers, Griffin, Jones, Word, Root, & Hayes, 1975). The Armor School, Infantry School, and Army Research Institute (ARI) joined forces to publish a well known training circular, TC 71-5, REALTRAIN: Tactical Training for Combined Arms Elements, (1975). An essential feature of the REALTRAIN exercises is the After Action Review. Upon completing an exercise, the forces who participated are brought together to discuss the major incidents related to successful and unsuccessful outcomes. Feedback in the After Action Review is not solely directed at individual performance or "who shot who", but more important, focuses on the unit as a collective body.

An initial validation of REALTRAIN within a combined arms context occurred in Europe, and although not all the test results were unequivocal, the overall consensus found REALTRAIN to be a potentially effective training method (Root, Epstein, Steinheiser, Hayes, Wood, Sulzen, Burgess, Mirabella, Erwin, & Johnson III, 1976). To gather additional effectiveness information, two field experiments were conducted. With rifle squads, it was found that REALTRAIN training resulted in a higher percentage of mission accomplishment with fewer casualties, and more casualties inflicted in both attack and defense than was the case for conventionally trained squads (Banks, Hardy, Scott, Kress & Word, 1977). With armor/anti-armor teams, REALTRAIN units again achieved higher levels of performance than conventionally trained forces when tested against a standard opposing force or against one another (Scott, Meliza, Hardy, Banks & Word, 1979).

Assuming that the validation tests have not overstated the case for REALTRAIN as an effective technique for tactical training, would it not be reasonable to expect this promising technique to be eagerly embraced and widely used in operational units? As it turns out, REALTRAIN does not appear to be widely used. Scott (1980) reviews a number of implementation problems and current training environment characteristics that have hampered a truly effective utilization or REALTRAIN. Support requirements, especially the training of exercise controllers in the rules of engagement simulation, have been perceived as an added burden by company and battalion commanders. Combined with the persistent problem of personnel turbulence, it is easy to understand why a company commander is reluctant to take valuable time to train a cadre of controllers if they are likely to be reassigned to other units a few months later. Last minute competing events, often scheduled by higher echelons, can bring about the cancellation of a carefully planned and coordinated exercise. Small unit trainers who expend considerable time and resources to adequately prepare for exercises do not realize a return on their investment. With these contingencies operating, full compliance to the support requirements and enthusiastic preparation for tactical training exercises is discouraged. Given these inhibiting influences and the lack of a strong Army endorsement for its use, continued implementation of REALTRAIN is likely to remain uncertain.

New technology is often introduced long before the optimal utilization of existing technology is realized. By the close of 1983, MILES, the most recent tactical engagement simulation training system, had been implemented in most of the Army's operational units. With MILES, the use of low-powered, eye-safe lasers to simulate direct fire characteristics adds greater objectivity to the controlling process. Individuals and vehicles are girded with laser detection devices which automatically record both kill and suppressive fire beams for accurate and reliable casualty assessment, lessening the need for large numbers of controllers. Exercises are no longer restricted to daylight hours, and the range of training has been broadened to company team and battalion task force levels. The free-play, two-sided nature of combat is maintained in MILES as is the incorporation of elements of combat uncertainty and complexity along with simulation of modern weapons lethality.

The new technology no doubt will give rise to a new set of problems. Logistical support and equipment maintainability are already perceived as major administrative problems. Apart from the MILES equipment, several factors restrict the extent to which full scale engagement simulation field exercises can support tactical training. Limited availability of training areas as well as shortened training time limits the number and variety of field exercises that can be conducted. So far, the full inventory of threat capability is seldom exercised nor is the integration of combat support with company team tactics. Furthermore, poor performance by leaders in initial ES exercises (a disproportionate number of leaders are assessed as casualties in the first several minutes of the exercise) results in attenuated training benefits. Clearly, there is a need to explore possibilities for acquiring combat skills which do not require large resource and time commitments.

Battle Simulations. The use of map board games (more frequently referred to as battle simulations) do not allow leaders to practice all the tactical behaviors that they could in a field setting; however, their purpose is to provide leaders with the opportunity for engaging in the same tactical decisions and combat actions as would occur on the battlefield. The basic idea is that mastery of fundamental tactical skills before exposure to the complex performance requirements of an actual ES exercise would allow combat leaders to maximize their ES experience rather than use the ES experience for the learning of fundamentals that could be learned less expensively on the map board game. Advantages of map board games include: minimum needs for expensive hardware and support personnel, good transfer of training potential, a low-cost method for confronting a wide variety of changing tactical situations, allowance for the conduct of training during non-scheduled or informal times, and an elevated level of motivation among the participants (Shriver, Jones, Hannaman, Griffin & Sulzen, 1979; Shriver, Henriksen, Jones & Onoszko, 1980).

Through an analysis of the instructional principles underlying SCOPES and REALTRAIN, Shriver et al. (1979) constructed an infantry squad/platoon level game for two-player or multi-player use and also a combined arms platoon/company level map board game. The skill and knowledge areas on which the games provided practice consisted of direct and indirect fire weapons effects, terrain analysis, information processing of enemy cues, development of operation plans, and contingency responding in response to unexpected situations. As in combat or REALTRAIN, the leader initially receives a mission from which a operations plan is developed. The operations plan is executed against an intelligent opposing force and the only information that can be learned about enemy strength and disposition comes from subordinates. Subordinate players, in turn, report the battlefield cues provided by controllers who actually determined what can be seen or heard. Rules of play for the combined arms map board game also have been documented by Shriver, Griffin, Hannaman, & Jones (1979). Results from a field test found greater training effectiveness for an experimental group trained with the infantry board game in conjunction with special field opposition exercises and REALTRAIN exercises compared to a group trained by means of a conventional tactical training program (Root, Hayes, Word, Shriver, & Griffin, 1979).

In another study (Jones, Wylie, Henriksen, Shriver & Hannaman, 1980), three battle simulation board games were analyzed with respect to: (a) their administrative and design characteristics, (b) the degree to which the games provided leaders with an opportunity to practice leader skills identified in a preceding study (Henriksen, Jones, Hannaman, Wiley, Shriver, Hamill & Sulzen, 1980), and (c) the degree to which the games required players to perform the same actions and engage in the same decisions as they would in combat or engagement simulation exercises. The three games played and analyzed were the Tactical Opposition Exercise (TOX), Small Combat Unit Evaluation (SCUE) and Dunn-Kempf. TOX is the name given to the experimental combined arms platoon/- company level map board game described above (Shriver et al., 1979). SCUE is an experimental product adapted from TOX by ARI personnel for the forecasting of unit effectiveness in engagement simulation exercises. Dunn-Kempf is a product of the Command and General Staff College at Fort Leavenworth, Kansas and is currently available to company-size units as a training tool for company team operations. With respect to administrative and design characteristics, each game was evaluated on (a) system effectiveness for preparing players and controllers, (b) manageability of control, (c) weapons/equipment availability, (d) movement and detection realism, (e) weapons effects realism, (f) engagement realism and (g) environmental realism. With the possible exception of Dunn-Kempf, none of the games did a very good job of providing documentation for player and controller gaming preparation. For manageability of control, awkward game mechanics and length of time to play the game presented serious problems. For Dunn-Kempf, eight hours of game play were required for 30 minutes of combat. In TOX and SCUE, four hours of game play were equal to 1.5 hours of ES/combat time. Leaders are not forced in any of these games, especially Dunn-Kempf, to make the same types of rapid-pressure decisions under information overloading conditions as would occur in real combat. All three games incorporated the major weapons systems available to company team units. The degree to which the three games accounted for movement and detection realism, weapons effects realism and engagement realism was assessed oftentimes as only partially accountable. Differences were found among the three games with respect to their treatment of environmental realism. Dunn-Kempf, for example, does not require physical separation of players on the same team even though separation is commonplace in combined arms operations thus necessitating the use of radio communication. As a consequence, communication among these players is informal and conversational rather than resembling the radio communications required between unit or element leaders in a combat or ES environment. With respect to opportunities to practice leader skills and the extent to which behavioral fidelity was incorporated, the Jones et al. (1980) study gave the highest ratings to TOX and SCUE on problem solving and communication skills; whereas, Dunn-Kempf received the highest ratings for training of technical skills, such as terrain analysis. Although the manual board games have serious limitations, an article by Scharpenberg (1983) perhaps strikes the right note by suggesting that with some armor leader ingenuity and modification of game mechanics, a game like Dunn-Kempf can still impart some valuable lessons.

Low-cost, audio-visual materials also have been investigated as a means for training tactical problem-solving and decision-making skills in preparation of field exercises (Henriksen, Hannaman, Olmstead & Stein, 1981). The basic problem-solving procedure was to present students with a slide of a topographical map showing cues and degraded information of opposing force (OPFOR) activity. Together with audio narration, successive tactical scenarios are presented which simulate a progressive increase in engagement intensity. At predetermined points in the scenarios, students are required to enter in workbooks their interpretation of battlefield cues and the probable location of OPFOR elements. Students who received a three hour block of instruction with the audio-visual materials did not perform any differently on a subsequent board game exercise than students who did not receive training. It was suggested that more than a three hour block of instruction is required before these skills will transfer to another setting. Perhaps the greatest value of the audio-visual lessons was not so much their ability to impart new tactical knowledge, but instead their ability, as a low-cost means, for motivating students to use the knowledge they already have, but which lies dormant most of the time.

<u>Trend Toward Automated Battle Simulations</u>. More recently, research and development efforts have focused on ways of automating tactical training. State-of-the-art microprocessor technology and continuing improvement in the variety and quality of software is enhancing the potential of battle simulations to be used for both tactical training and research. New advanced technologies such as videodisc surrogate travel, voice recognition and synthesis, computer-generated imagery and artificial intelligence are making it more possible to simulate the complex and

dynamic conditions of the modern battlefield environment. Although computer supported battle simulations have existed for some time (e.g., CATTS, CAMMS, BATTLE), these simulations are geared to the battalion and brigade echelons and do not require players to be fully interactive with the simulation. In a recent two year project, the Army Research Institute sponsored research in support of the development of a simulation-based tactical performance and training research facility (SIMFAC) for small unit combat leaders incorporating state-of-the-art simulation technology (Olmstead, Underhill, Hannaman, Elder & Chambers, 1983). The ultimate purpose of SIMFAC was to provide ARI with the capability for using automated combat simulations to conduct research on the acquisition and retention of tactical skills, combat leader behavior, tactical training development, simulation technology, and exercise control. According to Olmstead et al. (1983), the major accomplishments of the project were (a) a detailed functional description of a first-generation, automated, interactive combat simulation, (b) identification of methods for realistically simulating human behavior and equipment performance, and (c) concepts for testing and evaluating the simulation methods and for validating the battle simulation. Other automated simulation prototype efforts, currently under initial stages of development at ARI, will be able to benefit from the requirements established in this study. At the time of writing, formal literature was not yet available for distribution on the status of these newer projects.

In a research effort sponsored by the Navy Personnel Research and Development Center (NPRDC), a computer-based system was developed and tested for investigating human performance in the conduct of anti-air warfare (AAW) operations (Kelly, Greitzer, Hershman, 1981). As is the case for the Army battlefield environment, the naval tactical environment also has become exceedingly complex and rapid-paced whereby the necessity for timely and decisive actions places various levels of command under considerable stress. Quantification of human performance limits and the design of the human-computer interface become critical issues for Combat Direction Center staff who integrate data from several sources during the detection, classification and monitoring of AAW threats (<u>Combat Direction Systems Department Organizational Manual, USS America (CV)</u>, 1978; Cullison, 1979; Halnon, 1979). A simulation of the AAW threat situation was developed and embedded in an interactive air defense game driven by a Tektronix 4051 microcomputer. Hostile air targets approaching the player's ship were simulated at one of three speeds, and task difficulty was manipulated by varying the number of targets and their arrival times. Since the ship's detection range exceeded the range of its missiles, an optimal player launch-time decision was necessary for each target to preclude launched missiles falling short of the target. The effects of a concurrent auditory monitoring task also were investigated. It was found that test subjects became proficient after three hours of practice and that the effects of task load were evidenced by a detriment in performance as the number of targets and the pace of operations increased. Performance also suffered given the introduction of the concurrent auditory monitoring task. Test subjects found the AAW analogue game challenging and attention-sustaining for extended periods of time. It was recommended that the game be used to help determine information overload conditions and how threat analysis strategies change as a function of task load. It also was suggested that game performance could be used as a dependent measure for other military research applications such as the effects of sleep loss or extended effort.

Gunnery and Target Engagement Devices. Considerable interest has focused on the Unit Conduct of Fire Trainers (U-COFTs) that have been developed for the M1 Abrams tank and the M2/3 Bradley Fighting Vehicle (Weaver & Renfrow, 1983). The U-COFT's high fidelity simulation of turret operations and fire control provide team training for tank commanders and gunners in gunnery and target engagement techniques. Program scenarios are presented through the tank sights by means of a computer-generated imagery (CGI) system which depicts threat arrays and terrain in a moderately realistic fashion. The U-COFT can be used for a variety of single tank engagements, eliminates the need for a range, provides objective feedback, and exposes the tank commander and his gunner to exercises of progressively increasing difficulty. However, with only one U-COFT issued to a battalion, crew members spend a limited amount of time on the system. Nor does the U-COFT provide for interaction with the driver, loader or other tanks. Although there are possibilities for incorporating platoon leader training in the U-COFT, full platoon interactive capability would require linking several COFTs together and extensive software development.

Another evolving technology effort is the Tank Weapons Gunnery Simulation System (TWGSS) which is a precision gunnery trainer appended to the tank for use on the range or in a tactical force-on-force exercise. Since MILES was not created for precision tank gunnery, it is now anticipated that technological advances may make it possible to integrate TWGSS with MILES so as to allow precision tank gunnery during tactical training and also provide for stand alone precision gunnery on a range.

Yet another tank gunnery device is the combat training theater or Tank Gunnery and Missile Tracking System (TGMTS) that allows a gunner to track a target on a rear projection screen mounted in front of a stationary tank (Mulligan, 1978). The line-of-sight aiming point is tracked by tank-mounted optical devices and projector console; a small computer calculates the hit point upon firing and directs a laser light to simulate the projectory and impacting round. Shortcomings of the system include ranging limitations and exclusion of engagements on the move; its advantages include good target realism, replication of engagement procedures and the under-the-hatch training environment. TGMTS has been used by USAREUR units and also appears ideally suited to Reserve Component units (Weaver & Renfrow, 1983).

Moving in the direction of low-cost gunnery trainers (and hence potentially more available) is the table-top MK-60 Tank Gunnery Trainer. The MK-60's visual system includes a projected reticle and videodisc subsystem with a microcomputer for retrieving and presenting realistic moving targets. Internal sound (e.g., gunner/commander interface) and external noise emanating from the battlefield are computer generated and comprise the auditory system. A record of the gunner's performance is computer maintained and displayed on a scoreboard. The MK-60 Tank Gunnery Trainer (as well as similar versions for a Combat Engineer

Vehicle and Bradley Fighting Vehicle Gunnery Trainer) does not have the completeness of function of a U-COFT (nor was it intended to have), but it is well adapted for training during those slack time periods (e.g., between U-COFT training and on-tank or field training exercises) that are likely to encourage skill decay (Brown, 1983a). As a result of their low cost and impressive interactive capability, a number of microprocessor-driven videodisc applications are under test and development stages within various military settings (Fletcher & Levin, 1980; Gibbons, Cavagnol & Lines, 1982; Ketner, 1982; Kimberlin, 1982; Reed, 1982; Reeves, Aggen & Held, 1982; Schroeder, 1982; Wall, 1982).

The potential high costs associated with development of a full platoon trainer or with modifying the U-COFT has lead investigators to consider alternative approaches to platoon leader tactical training. Bessemer (1980), for example, has maintained that a large investment in weapon system simulation is unnecessary for effective tactical training. Accordingly, the decision-making skills which underlie tactical proficiency depend more on processing information from a visual environment and on optimizing the use of communication channels rather than operating the weapon system. To keep costs and technical risk at acceptable levels, Bessemer advocates an incremental building block approach where the feasibility of using commercially available hardware components for meeting the visual display, communications, and control requirements of tactical training can be systematically studied.

<u>New Concepts for Tactical Training</u>. The accepted approach for designing Army training for the past twenty years has been the Instructional System Development (ISD) model where job relevance of training is guaranteed by initial specification of training objectives based upon tasks performed on the job. A carefully conducted task analysis specifies all the actions required by the task, the conditions under which the actions are to take place, and the standards or criteria that must be reached. For most technical or machine-dominant skills to which the ISD model has been applied, the end instructional products are usually step-by-step procedures for carrying out the tasks associated with those skills. If the ISD model could be applied successfully to machine-dominant jobs, where the role of the person in the man-machine system is relegated to that of an operator, the implicit assumption somehow has carried over that the model also can be applied to the more complex, cognitive-based, non-machine tasks where the role of the person is more of a decision maker or problem solver. While the ISD process has had its critics on methodological and pragmatic grounds (Montague, Ellis, & Wulfeck II, 1981; Montague & Wulfeck II, 1984; Montemerlo, 1979; Vineberg & Joyner, 1980), others have questioned its suitability with respect to the unique conditions of combat arms tactical training (Shriver, 1976; Root, Knerr, Severino and Word, 1979; Shriver, Henriksen, Jones & Onoszko, 1980; Henriksen, Hannaman, Olmstead & Stein, 1981; O'Brien & Drucker, 1983). Many of the tasks that a platoon leader performs during tactical operations are not machine-dominant nor conducive to following a step-by-step set of procedures. There is no clearly prescribed method, for example, for a leader to follow in determining the enemy's disposition and intentions; nor is there a clearly defined set of procedures for deciding among several alternative courses of action given the presumed

disposition and intentions of the enemy force. Given the behavioral and cognitive complexity of the above tasks, it indeed is doubtful to assume that the task analytic approach can identify all the critical tasks and components involved in successful mission accomplishment. Furthermore, the ISD model assumes that the conditions under which tasks are carried out will be the same for all occurrences of the task. This assumption is unwarranted in the dynamic, two-sided environment of the combat arms, characterized by infinitely changing conditions, many of which are created by the opposing force. If, given the vagaries of the combat environment, the conditions are never the same, then it is very difficult to establish predetermined performance standards. Whether or not a task is performed satisfactorily is situationally determined.

Although the limitations of the ISD model are well known to the small community of scientists and training developers that are familiar with the unique conditions of the combat arms tactical environment, so far no other conceptual framework has replaced the ISD model. Be that as it may, to help provide direction for further research and development activities, to help establish simulation and training system requirements, and to help overcome the deficiencies inherent in the ISD model, recent efforts have been directed at developing useful tactical training models and training objectives at the platoon leader level. Initially, a general REALTRAIN model or scheme (Shriver, Mathers, Griffin, Jones, Word, Root & Hayes, 1975) was proposed which essentially described the engagement simulation process. A few years later, a similar yet more elaborate model (Shriver, Henriksen, Jones & Onoszko, 1980) and training system was proposed which tied experiential (i.e., the learning that occurs in a simulated exercise), analytic (i.e., the learning that results from a reconstruction or after action review of how leader and unit actions contributed to battle outcomes) and procedural (i.e., the learning of step-by-step procedures for machine-dominant or technical skills such as acquisition of proper radio procedures) modes of learning to previously identified leader skill areas (Henriksen et al., 1980) and to key components of the proposed training system. Yet another model which identifies the types and sources of inputs as well as actions of small unit leaders in tactical situations has proved useful in providing a comprehensive set of input (e.g., friendly force activity and assets, OPFOR activity and assets, orders, environmental conditions)/ output (e.g., request or disseminate information, request support, issue orders, direct actions) relationships for establishing simulation requirements (Hannaman & Chambers, 1983; Olmstead, Underhill, Hannaman, Kraemer, Elder, Henriksen & McConnell, 1981).

O'Brien and Drucker (1983) also have made note of the difficulties in applying existing task analysis documentation to the development of training objectives for tactical leadership tasks and have developed a new format for the preparation of training objectives for tactical leadership tasks. Their format is unique in several aspects. Unlike procedural tasks, the new task format for tactical leadership tasks has a decision and command component. The decision component specifies the conditions that affect the decision to conduct the task and/or how to conduct the task, information that must be taken into account when making the decision, and principles for determining the adequacy of the decision. The command component specifies the information that must be part of the initial command or any subsequent command. The third component, an execution component, pertains to decisions that must be made during the execution of a task. Drucker and O'Brien used this new format to demonstrate how training objectives could be prepared for a number of tactical leadership tasks during Movement to Contact, Hasty Attack, Occupy Battle Position, and Defend Battle Position missions.

Identification of Leader Tasks. Concurrent with research on advanced training technology and exploration of new concepts, ARI has sponsored research to define more precisely platoon leader training requirements. Under this research, a detailed front-end analysis of tank company missions and platoon operations was conducted from which a set of platoon drills for combined individual and collective armor training was derived (O'Brien and Drucker, 1981; McAleese, Smith, and Drucker, 1981). The analyses identify tactical leadership tasks performed by company commanders, company staff, platoon sergeants and tank commanders. Noteworthy in the analyses were the number of decision-making and $C^3$ tasks -- previously unspecified in other source documentation -- required of platoon leaders, platoon sergeants and tank commanders. Subsequent research has provided guidelines for preparing armor platoon drills and tactical leadership exercises (Drucker, O'Brien & Bauer, 1982; O'Brien, Drucker & Bauer, 1982).

An important challenge faced by those in the Army training community is the requirement for soldiers to reach and sustain high levels of combat readiness given what is often insufficient training time and resources. One approach for meeting this challenge is to insure that the tasks selected for training are those that would influence the outcome of combat operations. During the development of the new format for preparing training objectives for tactical leadership tasks (O'Brien & Drucker, 1983) described briefly above, a procedure leading to the specification of 40 platoon leader tasks anchored to the outcome of combat operations was developed (Drucker, 1982). Task selection was based on the results of two assessment surveys. The first survey identified the phases of two offensive missions (Movement to Contact and Hasty Attack) and two defensive missions (Occupy Battle Position and Defend Battle Position) whose outcomes were most dependent upon the actions of the platoon leader, and whose training most required the use of enemy forces and/or coordinating friendly forces. The second survey identified the platoon operation containing the most critical tasks during these mission phases. Table 1 (in the RESULTS section of this report) provides a list of the tactical platoon leader tasks performed during these platoon operations and for which O'Brien and Drucker (1983) prepared training objectives.

With the above overview of simulated tactical training research as a point of departure, the next section of the report describes the method that was employed for a more systematic assessment of tactical training methodologies at the small unit level. Appendix G provides a further review of the literature, focusing on the training of tactical decision-making.

## METHOD

Information was collected on current and projected state-of-the-art tactical training methodologies at the platoon and company team level. The information can be sorted into two broad categories: a doctrine/tactical leadership task area and a media/device area. The principal methods for collecting information in both areas included literature searches, interviews, and observational techniques. The descriptions which follow identify the various sources of information used.

Interviews with Army Agency Representatives. Interviews were conducted with representatives of agencies responsible for policy and development of tactical training and supporting programs. These agencies included: U.S. Army Training and Doctrine Command (TRADOC), U.S. Army Training Support Center (ATSC), Project Manager - Training Devices (PM-TRADE), Directorates of Training Developments (DTD) in the Armor, Infantry, and Combined Arms Centers, and the Command, Staff, and Doctrine (CSD) departments of the Armor and Infantry Schools. A specific listing of the school or agency visited and the respective content areas appears as Appendix A. The main purpose of the interviews was to obtain information on current and projected training devices, methods, and programs not likely to be found in the published literature.

Interviews with Armor School Instructors. Also contacted were Armor School instructors to assess the extent to which critical missions and operations receive institutional training, the perceived difficulty of associated tasks, and critical tasks requiring further training.

Review of U.S. Army Manuals and Doctrinal Publications. Various How-to-Fight Field Manuals, Training Circulars, and ARTEPs were studied. These publications provided doctrinal information on unit tactical operations, weapon systems deployment, and threat capabilities. Tactical operations required for unit survivability under modern battlefield conditions such as against nuclear, biological, and chemical (NBC) threat was of interest, as was M1 tank and Division 86 doctrine. A list of publications reviewed can be found in Appendix B.

Review of Programs of Instruction (POIs) and Lesson Plans (LPs). Tank company missions, platoon operations and associated tasks as outlined in the POIs and LPs were reviewed. Lesson Plan conditions were examined for their inclusion of modern battlefield conditions.

Review of Task Listings. Recently completed mission analyses and leadership task listings were examined and compared to assess their degree of task commonality, extent to which they reflect decision-making and $C^3$ tasks, and appropriateness as candidate tactical leadership tasks for subsequent training specification and scenario development. The different task listings and analyses are also reported in Appendix B.

Observation of Tactical Classes. In order to obtain a first-hand assessment of strengths and deficiencies in the training of inexperienced platoon leaders during tactical exercises, tactical classes were observed for a three day period during a ten day exercise conducted for Armor

Officer Branch (AOB) students at Ft. Knox in November, 1982. A 1/4 ton jeep with an AN/VRC-46 radio was used for transport and to monitor tactical communications. Tape recordings of the company radio net were made during the exercise and from these recordings exercise narratives were written.

Conference Proceedings and Industry Literature. Proceedings from professional conferences as well as product literature was collected to assess the state-of-the-art in low-cost training device configurations.

Research Literature. A survey of published research reports, operational test results and training evaluations from various Army agencies and institutes was conducted. The literature search also covered Department of Army periodicals for articles on new training policy, developments, and local unit training innovations.

Survey of Armor Officer Advanced Course (AOAC) Students. To obtain information on the tactical training experiences of AOAC students at the platoon and company team level, a questionnaire was administered to a class of 48 AOAC students at Ft. Knox during November, 1982. The questionnaire addressed the amount, adequacy, and conditions of tactical training received in both field and non-field settings, in AOB and in units. The questionnaire also assessed the difficulty in acquiring proficiency on specific tactical missions, whether further training was needed, and the extent to which particular missions, phases, and events occurred in engagement simulation settings. A copy of the questionnaire appears as Appendix C.

## RESULTS

There are several sets of results reported in this section. The first set lists the tasks that a previous ARI research effort has recommended for platoon leader training. The second set summarizes the findings of the survey of AOAC students on their tactical training experiences. Next, observations that were made during three Movement to Contact/Hasty Attack tactical exercises at Ft. Knox in November of 1982 comprise the third set of results. The fourth set of results reviews information obtained from representatives of U.S. Army agencies and schools on tactical training methodologies and the tactical training environment. Finally, the fifth set of results focuses on an assessment of the state-of-the-art with respect to current and projected training technology at the platoon and company level.

### Previous Research on Platoon Leader Tasks

As indicated earlier, the Army has sponsored research for insuring that the platoon leader tasks selected for training are those that would influence the outcome of combat operations. Table 1 shows the 40 platoon leader tasks organized by platoon operations that the Drucker (1982) analysis recommends for training. In recent years there have been increased efforts by the Army to provide the small unit leader with better and easy to use task information so that in his role as trainer he can achieve a consistently higher level of combat readiness in the unit. Therefore, the table also shows where in the Armor Platoon Test, ARTEP 71-2 (Mechanized Infantry/Tank Task Force), FM 71-1 (Tank and Mechanized Infantry Company Team) and TC 17-15-1 (Division 86 Tank Platoon Mission Training Plan) these same tasks can be found. The tasks are listed here because they provide the basis for development of tactical scenarios and specification of training device functional capability (covered in the second part of the research effort and reported under separate cover).

## Survey of AOAC Students

As a way of supplementing the information acquired from research on platoon leader tasks, the tactical training experiences of AOAC students at the platoon and company level were surveyed. A questionnaire was designed to address the amount, adequacy, and conditions of tactical training in both field and nonfield settings for AOB and unit environments. Students also were given the opportunity to rank order the difficulty in acquiring proficiency on specific tactical missions and in identifying whether further training is needed on these missions.

Forty eight students in the Armor Officer Advanced Course (AOAC) at Ft. Knox were administered the questionnaire on tactical training during November, 1982. Of the 48 students given the questionnaire, 38 listed their branch as armor, 7 listed their branch as infantry, and 3 listed their branch as armor/aviation. Because the questionnaire focused specifically on armor operations, questionnaire responses are summarized here only for those students listing their branch as armor. For these students, dates of commission ranged from 1974 to 1978. Table 2 provides an overview of their experience, reporting the mean number of months AOAC Armor Branch students were assigned to different units and duty positions.

Amount of Training. The first part of the questionnaire asked each respondent to rate (along a five point scale from "almost none" to "extensive") the amount of training received on six different missions while in AOB and also as a unit commander. Under each of these conditions, ratings were solicited for both field and nonfield training settings. Each mission was also rated for amount of training at the platoon and company level.

Figure 1 graphically portrays the data. Each panel is a plot of mean ratings for the amount of AOB and unit training received as a function of field and nonfield settings at platoon and company levels for one of the six tactical missions. Table 3 in Appendix D reports the actual mean ratings for the amount of AOB and unit training in field and nonfield settings on six tactical missions at the platoon and company level.

Table 1

Platoon Leader Tasks Recommended for Training
(Adapted from Drucker, 1982)

| | Platoon Test | ARTEP 71-2 | FM 71-1 | MTP TC 17-15-1 Task No. |
|---|---|---|---|---|
| CONDUCT FIRE AND MANEUVER (Fire and Maneuver Phase, Hasty Attack Mission) | | | | |
| 1. Issues FRAGO | 6-13 | 3-IV-2-8 | Ch 4 | 037, 038 |
| 2. Directs movement into attack position | 6-86 | 3-IV-2-2 | Ch 4 | 076, 173 |
| 3. Directs movement into attack formation | 6-87 | 3-IV-2-8 | Ch 4 | 076, 173 |
| 4. Directs movement out of attack position | 6-86 | 3-IV-2-2 | Ch 4 | 076, 173 |
| 5. Requests indirect fires | 6-83 | 3-IV-2-4 | Ch 4,7 | 076, 173 301 |
| 6. Requests indirect fires be adjusted | 6-83 | 3-IV-2-4 | Ch 4,7 | 076, 173 301 |
| 7. Directs target of opportunity be engaged | 6-86 | 3-IV-2-3 | Ch 4, App D | 137 |
| 8. Directs fire and maneuver be conducted | 6-88 | 3-IV-2-9 | Ch 4 | 076, 173 |
| IMMEDIATE ACTION (Action on Contact Phase, Movement to Contact Mission) | | | | |
| 1. Directs smoke be popped | 6-76 | 3-IV-2-4 | Ch 4,7 | 301 |
| 2. Directs movement into defilade position | 6-80 | 3-IV-2-6 | Ch 4 | 147 |
| 3. Submits SPOTREP | 6-81 | 3-IV-2-6 | Ch 4 | 147 |
| 4. Directs enemy be engaged | 6-76 | 3-V-2-3 | Ch 4, App D | 147 |
| 5. Requests indirect fires | 6-75 | 3-IV-2-4 | Ch 4,7 | 147 |
| 6. Requests indirect fires be shifted | 6-76 | 3-IV-2-4 | Ch 4,7 | 147, 301 |
| INITIATE DIRECT FIRES IN PLATOON SECTOR (Direct Fire Phase, Defend Battle Position Mission) | | | | |
| 1. Designates targets to TOW section | | 3-V-5 | App J | |
| 2. Monitors TOWS | | | App J | |
| 3. Submits SPOTREP | 6-81 | 3-IV-56 | Ch 5 | 147 |
| 4. Directs targets be engaged with TIS | | | | 137 |
| 5. Directs enemy be engaged | 6-109 | 3-IV-3-6 | Ch 5, App D | 137 |
| 6. Requests indirect fires | 6-107 | 3-IV-3-5 | Ch 4,7 | 301 |
| 7. Requests indirect fires be adjusted | 6-107 | 3-IV-3-5 | Ch 4,7 | 301 |
| 8. Requests TOW section reinforce platoon fire | | | App J | |
| 9. Submits SITREP | | | App B | |
| ORGANIZE PLATOON BATTLE POSITION (Occupy and Organize Battle Position, Phase, Occupy Battle Position Mission) | | | | |
| 1. Designates sectors of fire | 6-102 | 3-IV-3-2 | Ch 5 | 137, 165 |
| 2. Designates tank targets | 6-101 | 3-IV-3-3 | Ch 5 | 137, 165 |
| 3. Checks positions for suitability | 6-99 | 3-IV-5-3 | Ch 5 | 165 |
| 4. Directs tanks move to good fields of fire | 6-99 | 3-IV-3-2 | Ch 5 | 165 |
| 5. Assigns alternate positions | 6-101 | 3-IV-3-3 | Ch 5 | 165 |
| 6. Directs range cards be prepared | 6-101 | 3-IV-3-3 | Ch 5 | 165 |
| 7. Directs chemical alarms be emplaced | 6-31 | 3-IV-4-9 | FM 21-40, Ch 6 | 165 |
| 8. Directs obstacles, mines and flares be installed | 6-103 | 3-IV-3-3 | Ch 5 | 144, 165 |
| 9. Coordinates with FIST leader | 6-8 | 3-IV-5-5 | Ch 5,7 | 165 |
| 10. Coordinates with TOW section leaders | | | App J | |
| 11. Coordinates with adjacent platoon leaders | 6-9 | 3-V-3 | Ch 5 | 137 |
| 12. Prepares a fire plan | 6-101 | 3-IV-3-3 | Ch 5 | 137, 165 |
| 13. Reconnoiters assigned alternate position | 6-117 | 3-IV-5-9 | Ch 5 | 165 |
| 14. Selects and announces withdrawal routes | 6-101 | 3-IV-5-3 | Ch 5 | 165 |
| 15. Plans displacement | 6-101 | 3-V-3-11 | App K | 165 |
| 16. Requests team fire plan | 6-101 | 3-V-3 | Ch 5,7 | |
| 17. Requests wire communications be installed | 6-103 | 3-IV-5-4 3-IV-5-4 | Ch 5 | 165 |

Table 2

Mean Number of Months Assigned to Unit and
Each Duty Position for AOAC Armor Branch Students

| Unit | | Duty Positions: Platoon Leader Maneuver Plt. | Support Platoon Leader/Staff | Co. Exec. | Co. Cdr. Maneuver Co. | Co. Cdr. Support Co. | BN Staff | Other |
|---|---|---|---|---|---|---|---|---|
| Armor Company | $\bar{X}$ = | 13.43 | 9.0 | 15.88 | 10.33 | 16.0 | 9.0 | 4.0 |
| | SD = | 7.69 | 4.36 | 7.51 | 7.61 | 13.53 | N/A | N/A |
| | N = | 30 | 5 | 21 | 6 | 3 | 1 | 1 |
| Cavalry Troop | | 14.88 | | 11.29 | 19.50 | | | |
| | | 5.82 | | 2.81 | .71 | | | |
| | | 8 | | 7 | 2 | | | |
| Armor BN | | | 10.60 | | | | 10.0 | |
| | | | 4.56 | | | | 12.90 | |
| | | | 5 | | | | 11 | |
| Company Squadron | | | 6.50 | | | | 14.0 | |
| | | | 4.95 | | | | 2.83 | |
| | | | 2 | | | | 2 | |
| Other | | 10.0 | 21.0 | 7.0 | | 15.0 | 18.0 | 15.94 |
| | | 3.46 | 12.73 | 4.36 | | N/A | 15.87 | 11.06 |
| | | 3 | 2 | 3 | | 1 | 3 | 16 |

Most noteworthy is the similarity in the plots of the mean ratings across the six missions. As should be expected, Figure 1 shows that students report receiving the greatest amount of training in units. A Mission X Setting X AOB/Unit X Platoon/Company level analysis of variance revealed a significant AOB/Unit effect, $F(1,19) = 35.83$, $p < .001$. The difference between the amount of AOB and unit training is especially

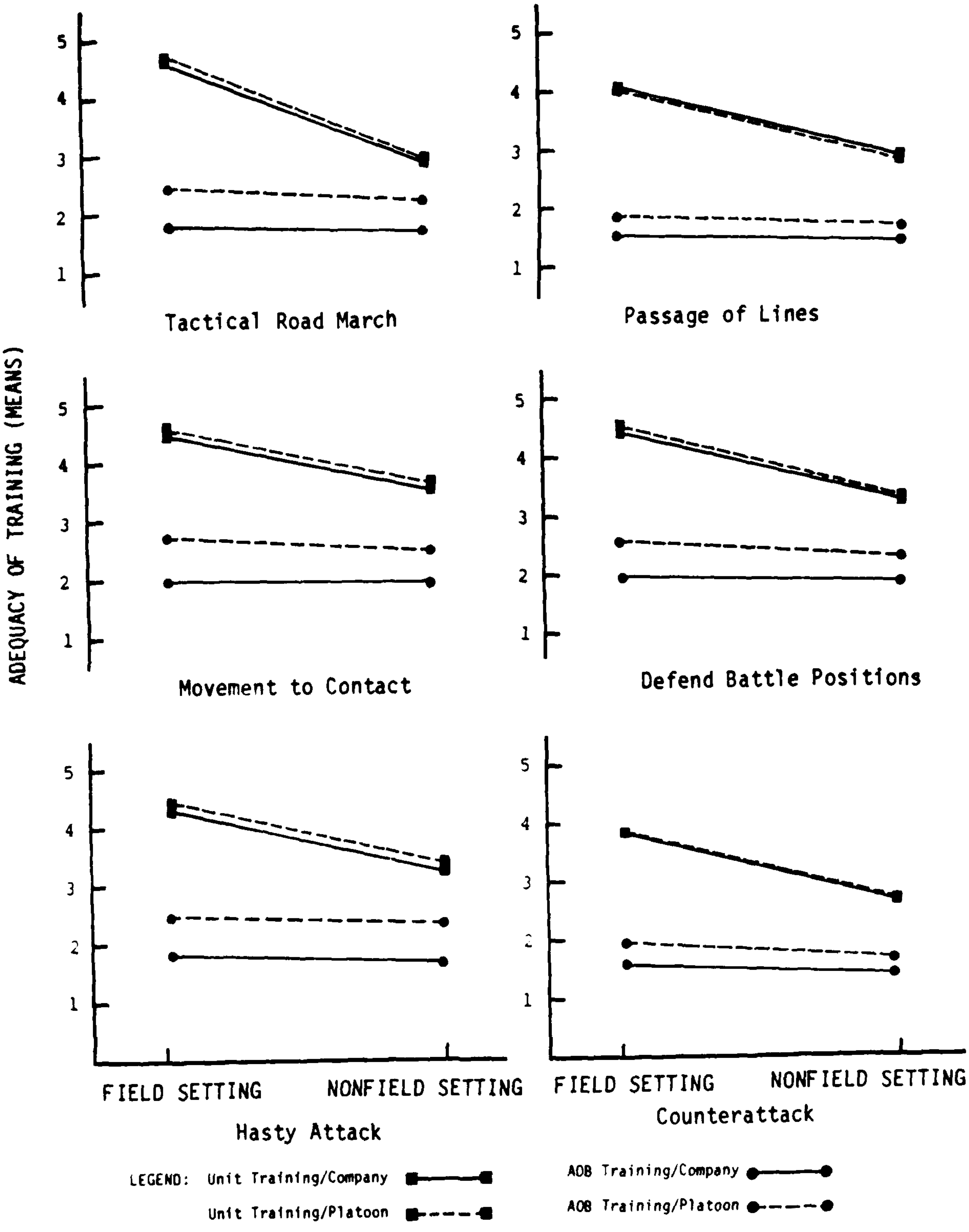


Figure 1. Amount of AOB and unit training as a function of field and nonfield settings at platoon and company levels for six missions.

pronounced for the field setting, $F(1,19) = 14.33$, $p < .01$. Across most of the missions, the difference between the amount of training conducted at the platoon and company level is confined to AOB training, $F(1,19) = 4.78$, $p < .05$. In AOB, students reported that platoon level training received more emphasis, as would be expected, than company level training. Although there was a significant main effect for missions ($F(5,95) = 6.53$, $p < .001$), it is doubtful whether the slight differences that exist among missions are of practical importance. As a result of the attenuated within-subject variability associated with repeated measures designs, it is not common for slight differences to be statistically significant.

Conditions of Training. Figure 2 presents in bar graph form mean ratings which assess the extent to which various battlefield conditions are incorporated into AOB and unit tactical training for each of the six tactical missions. Table 4 in Appendix D reports the actual means. The rating scale ranged from a rating of "1" which meant that the condition was almost never incorporated into training to a rating of "5" which meant the condition was quite often incorporated into training. Each panel in Figure 2 corresponds to one of the six tactical missions. The panels clearly show that unit training incorporates the various battlefield conditions to a greater extent than does AOB training. A Mission X AOB/Unit training X Battlefield Conditions analysis of variance (limited to those eight battlefield conditions in Figure 2 that are common to all six missions) found that the extent to which AOB and unit training differ in incorporating battlefield conditions to be significant, $F(1,28) = 61.35$, $p < .001$. Inspection of Figure 2 shows that AOB training has not received mean ratings much higher than two (representing "seldom" on the rating scale) for a number of battlefield conditions across the six tactical missions. For unit training, there were three conditions -- mines/booby traps, ES, and air defense -- that received mean ratings of less than 3 ("sometimes") across most of the missions. All three of these conditions are emphasized by Warsaw Pact doctrine. Less discernable although statistically significant were the effects for missions ($F(5,140) = 13.83$, $p < .001$) and battlefield conditions ($F(7,196) = 28.27$, $p < .001$). Also difficult to discern from a visual inspection of the data were the findings that differences between battlefield conditions depended somewhat upon the type of mission ($F(35,980) = 3.13$, $p < .001$) and that differences between AOB and unit training depended to some extent on the type of battlefield condition ($F(7, 196) = 5.90$, $p < .001$).

It is important to remember that Figure 2 portrays the extent to which battlefield conditions are incorporated into tactical training and does not address the fidelity of these conditions. For example, the play of mines may be nothing more than an evaluator announcing the presence of a minefield and instructing the platoon leader to describe what he would do. Because a battlefield condition is sometimes incorporated in the exercise does not mean it is incorporated well. It also should be pointed out that the student ratings reported here are based upon past training experiences. In the case of AOB training, these experiences may have occurred three to five years earlier. To what extent these data are influenced by difficulty in recall is not easy to determine.

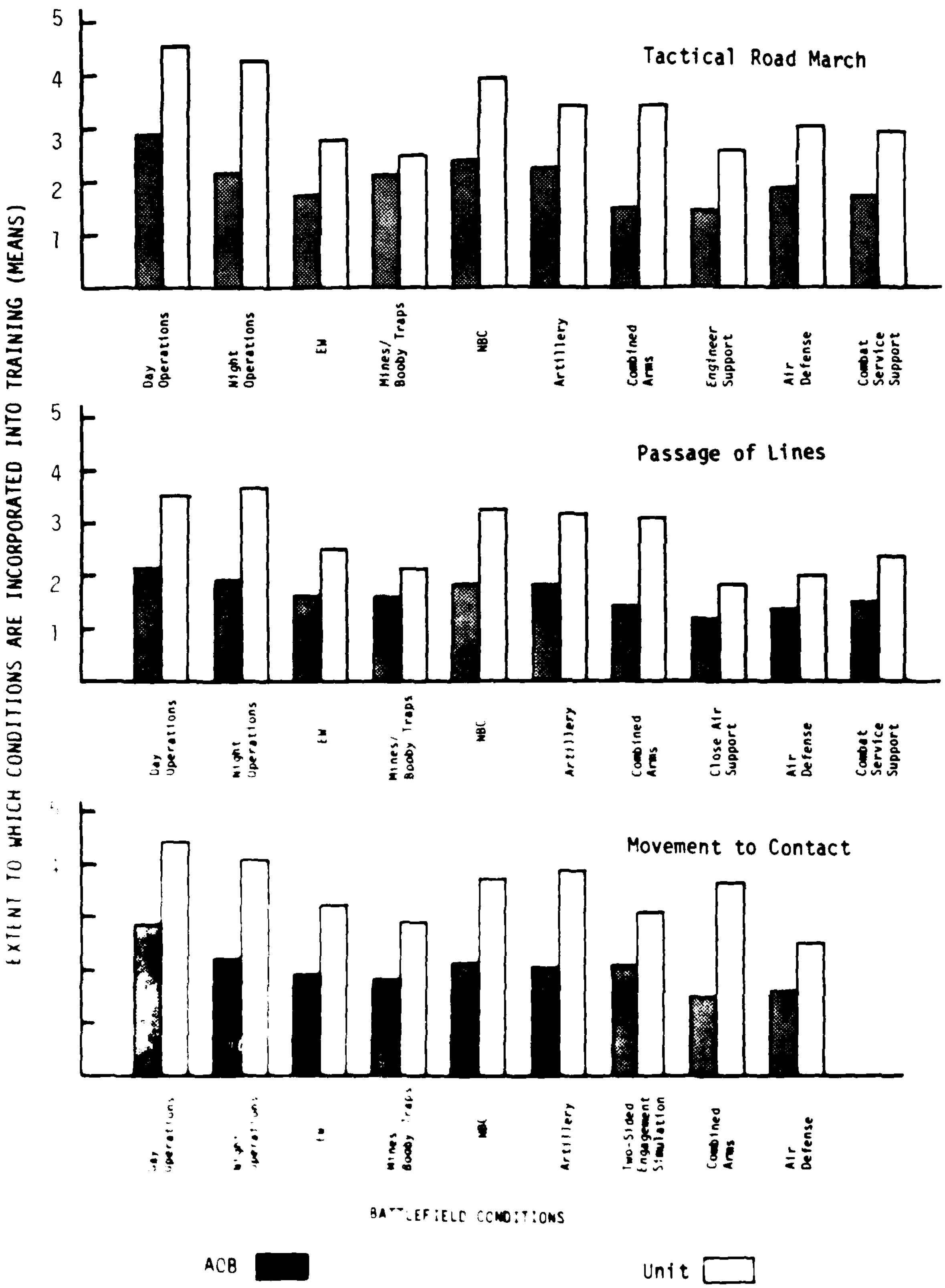


Figure 2. Extent to which battlefield conditions are incorporated into AOB and unit training for six missions.

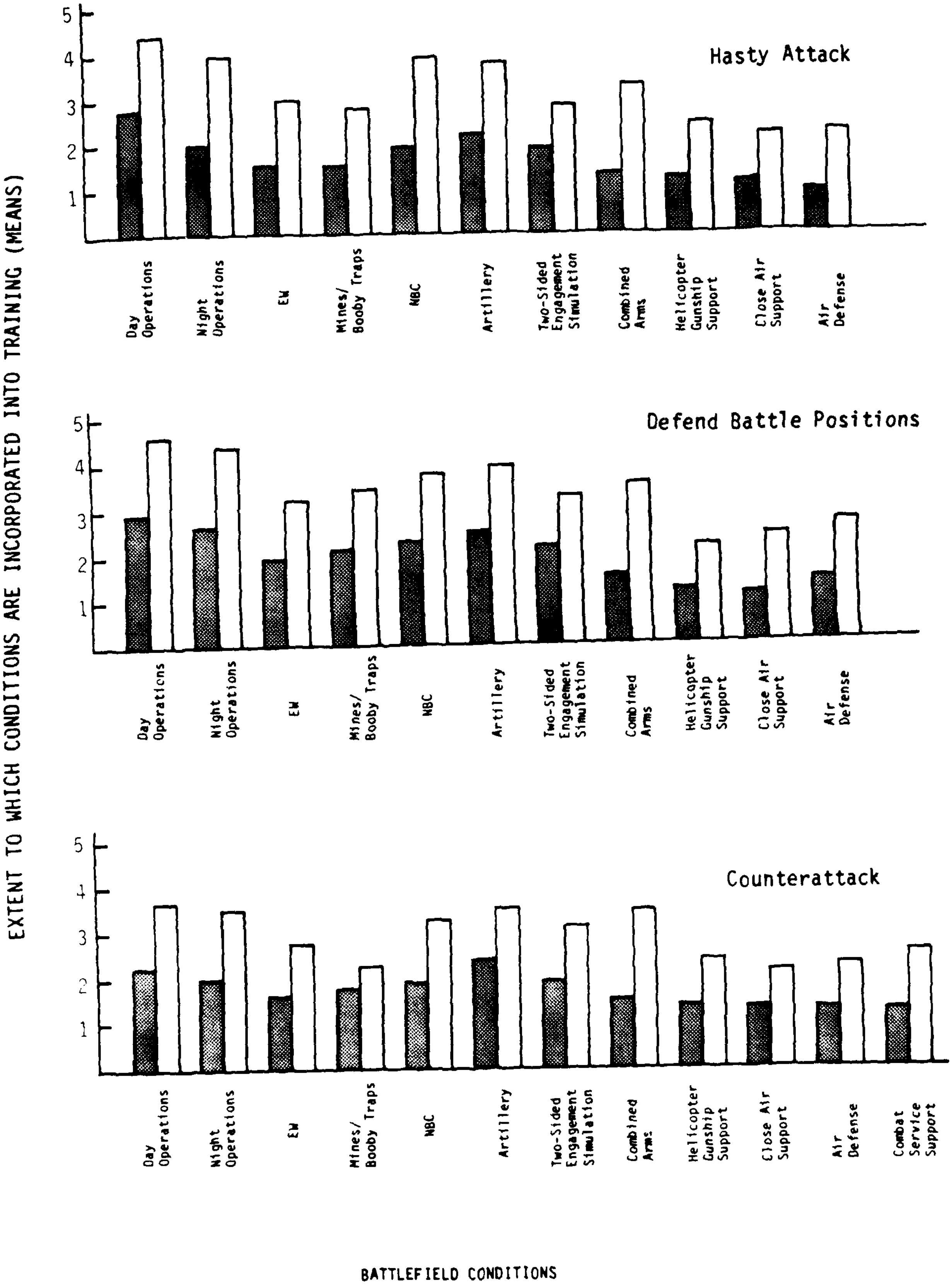


Figure 2. Continued.

Adequacy of Training. Students' mean responses to adequacy of AOB and unit training are portrayed in Figure 3. Actual means are provided in Table 5 in Appendix D. Students were surveyed on the six tactical missions at both platoon and company level. Again, a five point rating scale was used. A rating of "1" indicated that training was not adequate and "5" indicated that students felt training was more than adequate. Each panel in Figure 3 corresponds to one of the six tactical missions. The most noticeable feature for all the missions is the relatively high mean ratings (four represents adequate on the rating scale) concerning the adequacy of training received in units whether at the platoon or company level. Training was considered not quite adequate for most of the missions when AOB was assessed. A Mission X AOB/Unit training X Platoon/Company level analysis of variance found the difference in adequacy between AOB and unit training to be significant, $F(1,22) = 44.61$, $p < .001$. The slight overall difference between platoon and company adequacy of training as seen in Figure 3 was not found to be statistically significant; however, for some missions, there was a slight tendency for platoon level training in AOB to be considered more adequate than company level training. This three-way interaction was found to be significant $F(5,110) = 3.30$, $p < .01$. More important is the finding that even in AOB, platoon level training is rated as just barely adequate (2.0) to adequate (3.0), depending on the mission. The findings concerning adequacy of training parallel fairly closely those findings concerning amount of training. The amount of training received in units was considered fairly extensive and the adequacy of training in units was considered adequate. These findings are interesting in light of the ARI research efforts (e.g., SCOPES and REALTRAIN Validation, MILES and NTC operational tests) which show initial unit performance in tactical exercises to be poor.

Students also were asked to respond to several specific open-ended questions concerning the adequacy of training. Table 6 in Appendix D reports the most frequently occurring responses (in abbreviated form) to each question along with the frequency and percentage of students that made the response. In brief, students reported that Movement to Contact, Passage of Lines, and Counterattack were the tactical missions in AOB that should receive further training to ensure adequate preparation for units. The most frequently used map board games or training devices in both AOB and in units were Dunn-Kempf and sand tables. In terms of the tactical tasks that these devices allowed leaders to practice, terrain analysis and maneuver of elements were cited most often. The battlefield condition most often listed as needing to be incorporated was NBC. Forty-two of the respondents stated that the feedback provided to tank commanders, platoon leaders, and company commanders, when training on a unit tactical mission, was adequate whereas 39 percent indicated that training was not adequate. Of those respondents indicating feedback was not adequate, a couple of individuals indicated the feedback was degrading and not constructive while other respondents indicated that battle reenactments were missing from the feedback. It was interesting to note that only 55% of the respondents indicated that training continues on identified shortcomings once an ARTEP is taken on a particular mission and that the nature of continued training most often was field training. This percentage seems low since the primary objective of the ARTEP is to

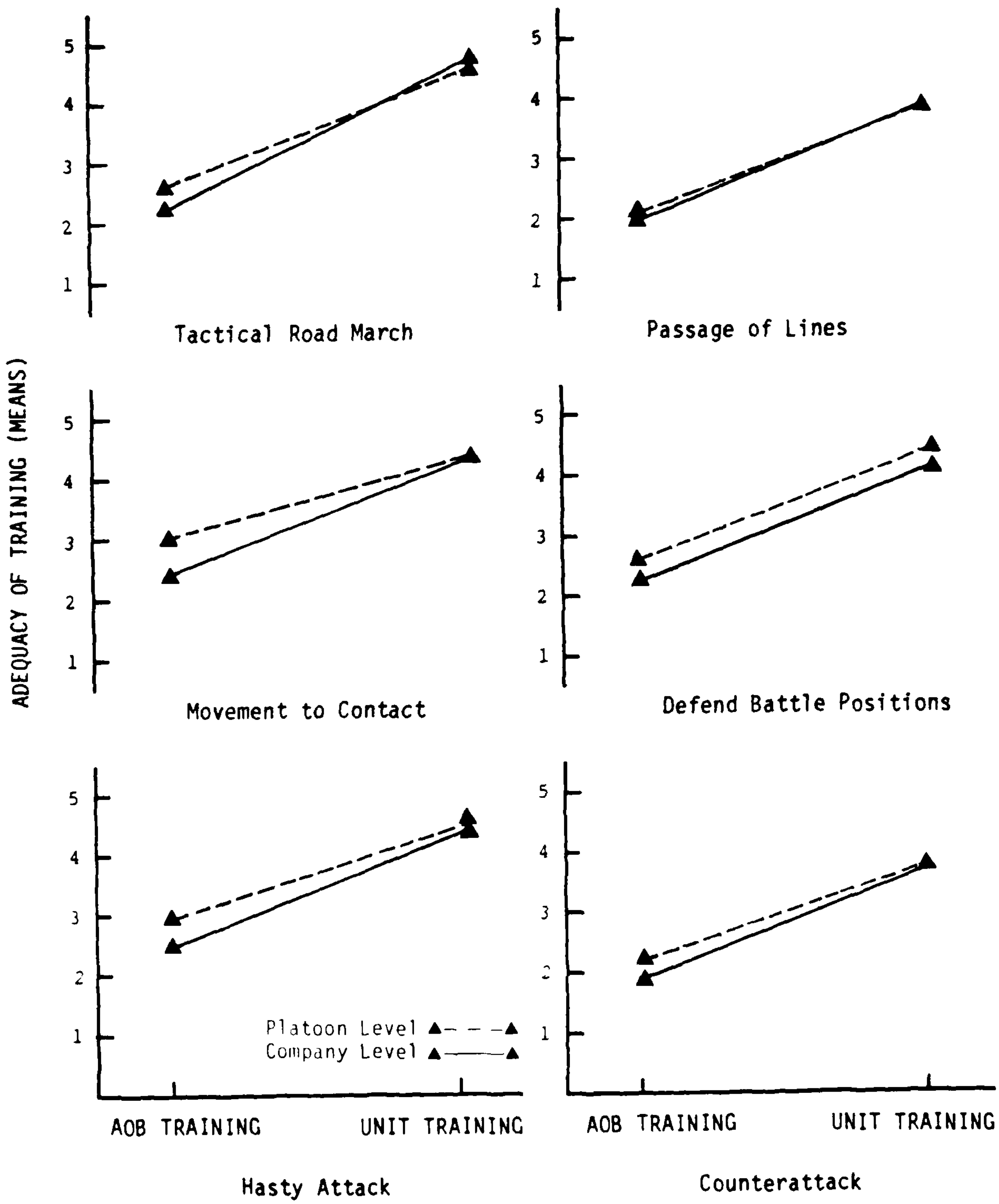


Figure 3. Adequacy of training as a function of type of training at platoon (PLT) and company (CO) levels for six missions.

provide specific feedback to a unit so identified deficiencies can be practiced in an appropriate training setting and then be reevaluated on a subsequent ARTEP. When asked whether some missions are more difficult to reach proficiency on than others, respondents overwhelmingly indicated yes. Movement to Contact, NBC, Passage of Lines, Hasty Attack, and Night Operations were the missions specified as difficult. Students mixed battlefield conditions with missions in their responses to this question. Sixty-one percent of the respondents indicated that their units conducted multiechelon training and 53% indicated that they devoted up to 25% of training time to their own specific leader training tasks compared to supervising unit training. These figures raise an interesting question as to what is the appropriate apportionment of the platoon leader's time to his own and to collective training.

Difficulty in Acquiring Proficiency. Table 7 shows the results of asking students to rank order the six missions in terms of difficulty in acquiring proficiency. A ranking of "1" indicated most difficult whereas a ranking of "6" indicated least difficult. Each mission was rated at the platoon and the company level. Each cell of the table reports the frequency and the percentage (in bold type) of students responding to each of the ranks for that particular mission. Number of observations (N), rank order means (M), and standard deviations (SD) for each mission are reported in the right margin columns. Movement to Contact and Hasty Attack, once again, were considered the most difficult for acquiring proficiency, followed by Counterattack, Passage of Lines, Defend Battle Positions, and Tactical Road March in descending order of difficulty. At the platoon level, an analysis of variance on the ranked data using a chi-square statistic (Friedman test) found the ranked difficulty differences among missions to be significant with an obtained $\chi^2$ (5) of 47.6, $p < .01$. A significant chi-square also was obtained with the company data, $\chi^2$ (5) = 41.2, $p < .01$. Overall, the level of agreement or interranker reliability among students in ranking the difficulty of the six missions at the platoon and company level can be described as fair. The coefficient of concordance ($W$), an index of agreement among judges, was .32 at the platoon level and .33 at the company level. Examination of Table 7 shows that the highest level of agreement occurred with Tactical Road March. Over 75% of the students gave it a ranking of 6 (least difficult) whether at the platoon or company level. Table 7 also shows only slight differences between the mean rankings at the platoon and company level for each of the six missions. Passage of Lines was the only mission for which the difference between platoon and company level was found to be significant.

When students were asked to list the leader tasks associated with the more difficult missions, a sizable number (as shown in Table 8 in Appendix D) indicated coordination was especially difficult during Passage of Lines; command and control was especially difficult during Movement to Contact, Hasty Attack, and Counterattack.

Identification of Training Needs. Students also were asked to identify the unit leader tasks requiring further training. Leader tasks were listed under the six tactical missions and students responded in "yes" or "no" columns under field and nonfield training settings. The results are

Table 7

Percentage Responding to Mission Difficulty
Rank Order Categories at Platoon and Company Level

| | Platoon | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Rank | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | N | M | SD |
| Tactical Road March | 2,7 | 1,3 | 0,0 | 0,0 | 3,10 | 24,80 | 30 | 5.43 | 1.43 |
| Passage of Lines | 8,27 | 2,7 | 3,10 | 5,17 | 9,29 | 3,10 | 30 | 3.47 | 1.81 |
| Movement to Contact | 8,27 | 5,17 | 7,23 | 7,23 | 3,10 | 0,0 | 30 | 2.73 | 1.36 |
| Hasty Attack | 3,10 | 15,47 | 6,20 | 5,16 | 2,7 | 0,0 | 30 | 2.63 | 1.10 |
| Defend Battle Positions | 1,3 | 4,13 | 7,23 | 6,20 | 12,38 | 1,3 | 30 | 3.83 | 1.26 |
| Counter-attack | 8,27 | 4,13 | 7,23 | 7,23 | 2,7 | 2,7 | 30 | 2.90 | 1.54 |

| | Company | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Rank | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | N | M | SD |
| Tactical Road March | 2,8 | 1,4 | 0,0 | 1,4 | 2,8 | 19,76 | 25 | 5.28 | 1.57 |
| Passage of Lines | 6,24 | 2,8 | 5,20 | 6,24 | 5,20 | 1,4 | 25 | 3.20 | 1.58 |
| Movement to Contact | 7,28 | 6,24 | 6,24 | 4,16 | 2,8 | 0,0 | 25 | 2.52 | 1.29 |
| Hasty Attack | 3,12 | 10,40 | 5,20 | 5,20 | 2,8 | 0,0 | 25 | 2.72 | 1.17 |
| Defend Battle Positions | 0,0 | 2,8 | 6,24 | 2,8 | 12,48 | 3,12 | 25 | 4.32 | 1.12 |
| Counter-attack | 7,28 | 4,16 | 3,12 | 7,28 | 2,8 | 2,8 | 25 | 2.96 | 1.64 |

displayed in Table 9 in Appendix D. A high percentage of students indicated further training is needed in both field and nonfield settings. Furthermore, the high percentage of affirmative responses was quite stable across the individual tasks. Table 10 shows that the range of percentage means across the six tactical missions for the field setting was 73.3% (Tactical Road March) to 86.8% (Counterattack) and for the nonfield setting the range was 66.1% (Defend Battle Positions) to the 79.9% (Counterattack). These differences are relatively small as are the mean percentage differences between field and nonfield settings. A Mission X Field/Nonfield Setting analysis of variance did yield a main effect for Setting, however ($F(1,35) = 4.81$, $p < .05$), with a higher percentage of students indicating a need for field training. These overall results which report a high percentage of students indicating a need for further training may appear inconsistent with the results in Figure 3 showing that training is adequate in units. It appears that students simultaneously are maintaining that training is adequate, yet also indicating further training is needed. Another interpretation is that students may have found it difficult to discriminate among the variables under study, falling into an acquiescent response mode and thereby giving generally affirmative responses to questions that appeared similar.

Engagement Simulation Experience. The last part of the questionnaire was an attempt to assess the amount of tactical engagement simulation experience AOAC students had received. Table 11 reports the mean previous engagement simulation exercises participated in by AOAC Armor Branch Students. The number of reported engagement simulation exercises is not very extensive. No significant statistical differences were found between occurrence of engagement simulation exercises at School and Unit locations or between Unit and National Training Center (NTC) locations. Students also were asked to report the number of Movement to Contact, Hasty Attack, and Defend Battle Positions engagement simulation missions experienced at School, Unit and NTC locations. As might be expected and in agreement with previous findings, Table 12 shows a considerably greater number of missions conducted within units. An analysis of variance confirmed this difference, $F\ (2, 70) = 27.60$, $p < .001$.

In the last part of the questionnaire, students were asked to estimate the number of times a particular mission or phase was performed, and of these, how many times did a specific tactical event occur. These results are reported in Table 13 in Appendix D. As evidenced by the high percentage of unscoreable responses and by considerable dispersion in the number of reported events, students appeared to have difficulty in responding to this section. Students had to rely on memory for estimating events that may have taken place several years earlier. Because of the presence of several extreme scores, the median is included in Table 13 and is probably the preferred measure of central tendency.

A cautious interpretation of these data is recommended. For example, of the 4.5 times (Mdn.) that students indicated they led a Movement to Contact mission, in four of these times, the overwatch elements were able to make detections prior to OPFOR firings. If these estimates are valid, they could be interpreted as representing a respectable level of tactical

Table 10

Percentage Means Indicating Further Field and Nonfield Training is Needed on Six Tactical Missions

| | Mean Percentage | | | | | |
|---|---|---|---|---|---|---|
| Setting | Tactical Road March | Passage of Lines | Movement to Contact | Hasty Attack | Defend Battle Positions | Counter-attack |
| Field | 73.3 | 79.2 | 78.3 | 86.1 | 78.6 | 86.8 |
| Nonfield | 68.8 | 71.0 | 70.0 | 73.6 | 66.1 | 79.9 |

Table 11

Mean Previous Engagement Simulation Exercises for AOAC Armor Branch Students

| Type of Engagement Simulation Exercise | Location | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | School | | | Unit | | | NTC | | |
| | $\overline{X}$ | SD | N | $\overline{X}$ | SD | N | $\overline{X}$ | SD | N |
| REALTRAIN | 1.88 | 4.25 | 35 | 2.14 | 3.49 | 35 | ////////////// | | |
| MILES | 0.15 | .50 | 34 | 1.70 | 3.79 | 34 | 1.0 | 4.48 | 31 |

Table 12

Mean Previous Mission Exercises for AOAC
Armor Branch Students

| Type of Mission | Location | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | School | | | | Unit | | | | NTC | | | |
| | Mdn | $\bar{X}$ | SD | N | Mdn | $\bar{X}$ | SD | N | Mdn | $\bar{X}$ | SD | N |
| Movement to Contact | 1.65 | 3.05 | 5.36 | 34 | 8.5 | 23.82 | 38.31 | 34 | 0 | .77 | 2.32 | 26 |
| Hasty Attack | 1.32 | 2.61 | 5.16 | 34 | 6.5 | 19.14 | 37.31 | 34 | 0 | .80 | 2.36 | 25 |
| Defend Battle Positions | 1.28 | 2.84 | 5.47 | 32 | 10.05 | 24.97 | 38.43 | 34 | 0 | 1.2 | 3.61 | 25 |

Note. Because of a few extreme numbers reported, medians (Mdn) as well as means have been included as measures of central tendency.

performance. These data, however, do not indicate the total number of opportunities to make detections prior to OPFOR firing so such an interpretation may be unwarranted. Given the difficulties in acquiring the present set of data, it is doubtful if student recall data for estimating the number of opportunities would be more reliable. Based upon the tactical exercise observations that were made and that are to be commented upon next, it was surprising to find the relatively high frequencies of leader tactical actions and events that are reported in Table 13.

Observation of Tactical Exercises

The following comments are based upon observations of three Movement to Contact/Hasty Attack tactical exercises. Observations made during the exercises were combined with tape recordings of the platoon/company command radio nets in order to obtain an accurate record of battle events. ' fuller description of each exercise is found in Appendix E, Exercise arratives.

Terrain Analysis. In preparing for the operation, platoon leaders issued Operation Orders (OPORDS) using the graphic control measures (e.g., phase lines, check points) provided to them by the company commander. None of the observed platoon leaders ever conducted a terrain analysis either by physically observing the terrain to be negotiated or by constructing a terrain model. A terrain analysis is an examination of the terrain in terms of how to use it to gain an advantage over the enemy or to deny him an advantage over you. Points to consider are: What areas would be difficult to cover by fire? What routes offer the best cover and concealment? What terrain features provide the OPFOR with the best fields of fire? In addition to not conducting a terrain analysis, platoon leaders did not plan how the platoons were to move. That is, there was no discussion as to how the platoons would cross danger areas or provide internal overwatch during travel.

Overwatch. In all three observed exercises, there was a failure to provide proper overwatch or no overwatch at all. The OPFOR were constantly able to engage platoon tanks and score first round hits. There was not one observed incident of a platoon tank, in overwatch, detecting and firing on an OPFOR weapon system first. Also OPFOR tanks were able to fire more than once without being detected.

Overwatch involves monitoring probable enemy locations while other platoon elements or platoons conduct movement. Overwatch positions must be close enough so that the overwatching elements can provide effective return fire. In addition, the overwatch position should be located so that all potential enemy controlled terrain features can be covered as the maneuver unit bounds.

Reporting Information. Platoon leaders for all three platoons generally failed to report contact accurately and provide the company commander complete and timely SPOTREPs. Frequently, platoon leaders inaccurately reported losses and misrepresented the platoon's actions. For example, when contact was made, the platoon leader almost always would report the platoon had OPFOR targets and was returning fire. In most cases, platoon leaders would completely forget to report that they were receiving indirect fire.

Additionally, there were many instances were contact was made and the SPOTREP was given several minutes later. Also, SPOTREPs virtually ceased when the platoon leader's tank became a casualty. Seldom did another tank commander report the situation and take command.

Action on Contact. Upon making contact, observed platoon leaders failed to direct immediate action. Visual signals or radio commands to initiate battledrills or to describe target locations were virtually non-existent; occasionally a hand or arm signal was seen. As mentioned above, SPOTREPs were incomplete. The tank platoon, upon receiving fire, often remained in the exposed area. Not one platoon leader was observed directing his platoon into a defilade position. When platoon leaders were faced with the need to discuss the platoon's next actions (e.g., excessive losses, OPFOR providing strong resistance, no fix on OPFOR locations) with the company commander, they always failed to do so.

Contingency Planning. Often during contact, the situation suggested a different course of action to be taken by the platoon leader. However, in all cases, the platoon leaders did not use the information gained during contact. For example, one platoon received fire from more than one location, indicating an OPFOR of approximately the same size as the advancing platoon. Instead of requesting assistance from the other platoon or calling indirect fire, the platoon continued to advance and suffered 100% casualties.

Platoon leaders did not change plans. The original plan continued to influence the operation although events and new information suggested rethinking the situation and issuing a FRAGO. There was no indication from these observations that platoon leaders adapted to new situations.

Platoon Integrity. Platoon leader control of the platoon, once in contact, was nonexistent. All platoon cohesion usually ceased and tanks usually operated on their own. Platoon leaders typically did not issue orders or direct the action of their tank commanders. Visual contact was often lost and commands over the radio net were rare. Once in contact, there was little interaction between the platoon leader and tank commanders as to how to advance against suspected OPFOR positions.

Although the above comments are based on events occurring in AOB tactical exercises at Fort Knox in November of 1982, the reader is urged to keep in mind the limitations of the observational data. Because the number of observations is small and the sample of exercises, terrain, and AOB students is likewise limited, it would be unwise to overgeneralize and conclude that the results are representative of all the tactical performance in the field.

## Interviews with Instructors/Agency Representatives

The purpose of interviews with representatives from various U.S Army agencies and schools was to obtain information on tactical training methodologies and training devices not likely to be found in the published literature. Because of the different missions and functions of each Army agency, the type of information sought and acquired depended upon the particular subject matter expertise of the agency. The paramount concern, however, was twofold: to gather information on deficiencies existing in both institutional and unit tactical leader training, and to collect information on current and projected training device configurations. Once again, because the number of individuals interviewed in the given agencies was limited, the following summarized comments, although descriptive of what was said, should not be overgeneralized.

ARTEP-Based Training. The ARTEP generally does not provide training effectiveness data at the platoon level. It was pointed out that company commanders either do not understand or have the inclination to pursue training deficiencies with platoon leaders. As a consequence, platoon leaders do not get a chance to work on deficiencies or plan for the next exercise. Also, the unit missions selected for training vary with the discretion of the battalion commander. The division commanding general sets the training priorities and the battalion commander meets these priorities but also can train other areas of his choosing.

Use of Battle Simulations. Except for some modified versions of Dunn-Kempf and possible use of sand tables, battle simulation as a training vehicle at the platoon/company level is not used very much. Nor could anyone identify anything resembling an integrated training approach or a systematic application of different media, devices, and methods to platoon training.

Observations from NTC. Interviewed individuals who had been at NTC were in agreement that participating units perform poorly at squad, platoon, and company levels. Among the comments were: troops are unable to transition from moving to fighting, troops get killed quickly, leaders do not control and coordinate fires, planning for indirect fires does not occur, effects of indirect fire are ignored, direct fire weapons dominate the situation, poor communications are prevalent and, command and control is a major pitfall.

MILES Utilization in Tactical Units. Post-implementation evaluation of MILES utilization in tactical units has found that MILES use in USAREUR is based on major training areas and not missions. Tank battalion use of MILES is limited, equipment maintainability has been a problem, and senior leaders do not perceive a training problem. Logistical support for MILES is perceived as a major administrative constraint.

Armor Platoon Test. The purpose of the Armor Platoon Test is to help standardize platoon testing within the battalion and to provide the battalion commander with information as to the combat readiness of his platoons. Although the platoon test provides some standardization within a battalion, there is no standardization across battalions since each battalion commander can choose the missions and tasks to be tested from a relatively large core.

Lack of an Armor Platoon Device for Tactical Training. The Armor School was able to provide information on tank gunnery devices, yet discussions of a platoon leader device for tactical training remained at a preliminary concept stage. Three concepts were advanced by Armor School personnel: a tank appended trainer, modification of the U-COFT and modification of the MK60 Tank Gunner Trainer. With regard to the platoon leader device, the view was expressed that the further one departed from the actual inside-the-tank environment, the fewer training benefits would be realized. It was also suggested that the best way to field a new device was to piggyback it to a device already scheduled for fielding.

Platoon Tactics. According to Command, Staff and Doctrine personnel at the Armor School, the platoon leader's role lies in directing the execution of appropriate battledrills while in contact and in gathering and transmitting accurate and complete information. Calling SPOTREPs and processing all the information preceding SPOTREPs were two critical areas that platoon tactics instructors agree could be taught on a low-cost device. Platoon leaders do not rely on SOPs enough and consequently experience information overload during field exercises. There is opportunity to do a better job defining a platoon leader's priorities in a given tactical situation.

Task Emphasis Underscored. Personnel at PM-TRADE were quite pleased with the emphasis that the current project is placing on task specification for determining training device requirements. PM-TRADE indicated that it is very important for the schools to have a good understanding of their own requirements.

Simulation Projects at Infantry School. Several simulation projects of interest, all in early conceptual stages, were discussed by Infantry School personnel. The Company Level Execution Simulation will teach tactics to company commanders. The terrain will be stored on a videodisc and shown on a large panoramic screen. The company commander will have access to the communication nets and the scene will change based upon his decisions and actions. Mounted Land Navigation and Military Operations in Urban Terrain are two other simulation projects, each incorporating videodisc technology. A brief concept also has been prepared by the Bradley Infantry Fighting Vehicle Task Force concerning a need for a leader trainer for M2/M3 vehicle commanders.

Military Qualification Standard for Company Grade Officers. Some 200 tasks collected as part of the Review of Education and Training for Officers (RETO), have been selected to help establish a Military Qualification Standard (i.e., analogous to a soldier's manual for officers) for company grade officers. Some of the tactics-related tasks from the Infantry Company Grade Task Selection Board's task listing were: plan/conduct deliberate attack, plan/conduct unit hasty attack, and consolidate/reorganize unit after enemy contact. It was indicated that 90% of these tasks are in the Infantry Officer Basic Course (IOBC) POI.

## Current and Projected Tactical Training Devices

A main objective since the project's outset has been to collect information on the current and projected state-of-the-art in tactical training methodologies and devices. The major focus of interest has been to determine methods and technical approaches that have tactical training potential for combat arms units below battalion level. Based on the information collected to date, there appears to be a serious void in the state-of-the-art in terms of training devices or methodologies that can expose platoon leaders to a wide variety of real-time tactical problems before they engage in costly full scale field exercises. Table 14, Matrix for Training Device Classification, provides an overview of the types of devices of interest to the present project that are either actually implemented or under development. Table 15 in Appendix F provides a fuller description of each device. No attempt has been made to list all the training devices in use throughout the Army or those under development by the Army. The Comprehensive Plan for Training Devices, a reference publication produced by the U.S. Army Training Support Center, provides the reader with a fairly exhaustive listing of system and non-system devices. Nor has any attempt been made to list the combat modeling techniques employed by the Army operations research community. Here, the interested reader is referred to the Catalog of War Games and Combat Simulations prepared by the U.S. Office of the Deputy Under Secretary of the Army.

Table 14

Matrix for Training Device Classification

| Training Device | Status | Procedures Oriented | Tactics Oriented | Generic Leadership | Application: Institution | Application: Unit | Application: Shipboard Officer | Unit level: Crew/Squad | Unit level: Platoon | Unit level: Company | Unit level: Battalion | Automation: Manual | Automation: Computer-Assisted | Automation: Computer-Driven |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observed Fire Trainer (OFT) | 1 | X | | | X | X | | | X | X | | | X | |
| VISTA | 1 | | | X | X | | | | X | | | | X | |
| NAVTAG | 2 | | X | | | | X | | | | | | | X |
| MBBE | 2 | X | | | | X | | X | X | | | | X | |
| Dunn-Kempf | 1 | | X | | | X | | | X | X | | X | | |
| BLOCKBUSTER | 2 | | X | | | X | | | X | X | | X | | |
| TACTRAIN | 1 | | X | | X | | X | | | | | | | X |
| MACE | 2 | | X | | | X | | | | | X | | | X |
| TACWAR | 2 | | X | | X | X | | X | X | X | | X | | |
| MK-60 Tank Gunnery Trainer | 2 | X | | | X | X | | X | | | | | | X |
| APKA | | | X | | X | | | | | | X | | | X |
| Janus | 2 | | X | | X | X | | | | | X | | | X |
| CATTS | 1 | | X | | X | | | | | | X | | | X |
| ARTBASS | 2 | | X | | | X | | | | | X | | | X |
| COFT | 2 | X | | | X | X | | X | X | | | | | X |

NOTE: (1) Indicates device actually implemented; (2) Indicates device under development/evaluation.

The devices listed in Table 14 are classified along several categories. The status category refers to the stage of development of the device. Those devices listed as implemented (1) have been used for training; those listed as under development (2) have an approved requirements status and are in the acquisition or procurement cycle. Procedures-oriented devices are used when the intent is to train the operator in a set of well defined procedures and when the associated skills are machine-dominant, such as tank gunnery. Where there are few well defined procedures for deciding among alternative courses of action, and where the role of the individual is more of a decision maker and less of an operator, the terms tactics-oriented is used to describe the device. Although combined arms operations involve elements of both procedures and tactics, devices that had potential to train platoon leaders and company team commanders in a decision making or problem solving role were of special interest. The generic leadership category refers to devices for the training of garrison-related leadership skills such as effective interaction with subordinates. The application category tells us whether the intended use of the device has potential application in the units or at the institution. The unit level for which the device was designed also required identification. The present work is most concerned with tactical training devices for combat arms units below battalion level. Unit level categories consist of crew/squad, platoon, company, and battalion. Because the search uncovered a couple of Naval training devices, a shipboard officer category is included. Another useful dimension for structuring training device information is level of automation. Computer assisted and computer driven devices avoid some of the shortcomings of manual-based devices in allowing tactical engagements to be practiced in close to real time and, therefore, are also of special interest.

When the training devices are classified in accordance with the format of Table 14, the scarcity of devices that will allow platoon leaders and company commanders to practice tactical decision making tasks in near real time becomes readily apparent. The three categories of major interest to the present project were:

- Tactics oriented devices
- Platoon and Company Team level appropriateness
- Automation to allow real time execution of tactics

The two devices that come closest to satisfying the above conditions were the APKA and Janus.

With respect to automated combat simulations which exercise tactical tank commander and platoon leader skills, the German developed Automatisierte Panzerkampf Simulationsanlage (APKA) has generated interest within the Army training community. Currently, under development as a research instrument, APKA consists of several wheeled vehicles (six vans for housing the simulation stations and one van each for housing the respective umpire, central computer, electric power, and service car functions). The overall system allows tank commanders and their drivers to engage in tactical preparations for real combat trials, formulate new tactics tailored to modified tank components, vary tactics for different types of terrain, and study the effective ranges of elevated weapons platforms for direct fire weapons. Each simulation station has a crew made up of the tank commander and driver; the loader and gunner are simulated. Umpires, located in a separate van, can elect to monitor any of the 40 simulation stations. The tank commander has his own display as well as a view of the driver's display. Peripheral devices that allow the tank commander to carry out tactical actions include an optical device selection button for choosing between general and detailed terrain maps, a joystick for designating targets, a firing button, and a radio telephone for communicating with the driver and within the platoon or company. Tactical actions initialized by the driver -- an often overlooked position in tactical training strategies -- are facilitated through the use of the driver's display, an accelerator for velocity control in forward or reverse gear, a knob for steering to the left or right, and a radio-telephone for receiving orders or for passing information to the commander. In addition to the commander's and driver's displays, a back-lighted map resembling an aerial photograph allows the terrain to be viewed in 3D when special glasses are worn. This reportedly allows the commander to determine his position on the battlefield more easily. Tactical actions carried out by the commander and driver are recorded by the system. Simulation models that have been developed and are driven by the computer include the line-of-sight determination, target acquisition, target engagement, movement, hit tables, vulnerability, mines, and infantry weapons. The computer facility is a linked data processing system made up of a master computer PDP 11/34, slave computer PDP 11/05, line-of-sight computer, terrain storage unit, magnetic disc station, double floppy disc and operator console.

The APKA system is still undergoing development for a more realistic terrain representation. Its tactical training potential remains to be demonstrated; however, the tactical use of terrain as well as small unit tasking and communication should be the most promising tactical training applications.

Regardless of its potential tactical training promise, any system that requires 10 wheeled vans for transportability is bound to have its critics on the grounds of availability alone. More and more, the demand is for powerful simulations which are less cumbersome, readily available, and easy to use. A good example of the move in this direction is an on-going project at Lawrence Livermore National Laboratory. The lab has developed a sophisticated war game graphics simulation incorporating interactive, high resolution color mapping and imagery called Janus (Warner, 1983). The purpose of Janus is to model air and land combat using a two-sided, real-time interactive war game simulation. During an actual session red and blue players are paired to a work station. A situational scenario is presented and each side develops tactical plans. With the use of a graphics tablet, the defending side, for example, can position its tanks, artillery, helicoptors, personnel, mines, barriers, craters and so forth. Digitized terrain data from the U.S. Defense Mapping Agency is utilized for the background map with enhancements (e.g., cities, vegetation) entered through the graphics tablet. The use of color allows for rapid discrimination of roads, railways, rivers, and towns. A function box lets players carry out their own maneuvers, and during game play, a "photographic record" of the battlefield is stored by the system every 5 to 10 minutes, providing players with an accurate visual aid for the after action review. Although Janus has its origins in a CDC-7600 mainframe simulation, it has undergone a series of upgrades. A VAX-11/780 with four Ramtek 9400s are used at present. As part of the facilities upgrade, Janus was transferred to a device independent graphics software package, the DI-3000 from Precision Visuals Inc., even though several escapes have been written calling in customized subroutines. According to the project leader, software development was the thorny issue. While an individually tailored graphics package was acknowledged to be more efficient than a general purpose package, an individually tailored package would have required a year to write only to become obsolete with the next equipment upgrade. Project staff decided upon the less efficient, long-term hardware independent option versus the short-term specific application.

The Janus project is now scheduled as a test site for the newer Ramtek 9460s which are reputed to have four times the speed of their predecessor. A further test of the DI-3000's device independence also is scheduled for test with some Megatek units.

Of the two Naval trainers, research staff were able to attend a demonstration of the Naval Tactical Game (NAVTAG). In its standard configuration, each player (a red and a blue) sits at the video display terminal requesting information and making decisions concerning the ship, aircraft or weapons platforms, depending upon a scenario. A game director, stationed at a third video display terminal, initially selects one of five prepared scenarios or may modify a scenario to stress a particular objective. The complexity of the scenarios range from ship-on-ship engagements to multiplatform over-the-horizon engagements in a multithreat environment. The game director initializes a scenario by accessing a series of menu selections whereby the environment is specified and weapons platforms are allocated to the opposing players. Players assess the general situation from the perspective of their own missions. Based upon their assessment, players decide the status of their platforms and associated systems at the start of the game. For example, a player could change the number of boilers on line from 2 to 4 during initialization. Commands concerning initial course, speed. altitude/depth/sensor status are entered from the keyboard. After this period of initialization, game play commences in a series of game turns each of which simulate one minute of real time. Since during each turn players must review displayed status reports (e.g., detection, damage. platforms), evaluate geographic plots and receive intelligence from the game director, a game turn usually exceeds one minute. Error messages may also appear for incorrect entries or for tactical command inputs that are incompatible with the capabilities of a particular subsystem. The game continues until the game director decides that the learning objectives have been met or one side has lost the capability to take further meaningful action. With the assistance of plot printouts, notes taken on error messages, prompts during play, and a scenario guide, the game director conducts a post-game critique on player performance. In addition, NAVTAG has a restart and replay capability which permits the game to be replayed from any game turn so that significant events can reanalyzed and alternative courses of action considered.

Although NAVTAG may serve, in part, the training needs of the surface Navy, it would be an oversight not to consider an essential difference between armor platoon leaders and surface warfare officers concerning the threat environment and the nature of the tasks performed. Tactical decisions at sea are made in a room with no windows; there is little need to have immediate environment represented or displayed on a video monitor since the threat is not visible. The information displayed on the monitor during a NAVTAG scenario is textual. Tactical decisions for the armor platoon leader are made from the ground perspective; processing information in the form of battlefield cues from the immediate environment and extending out to 4 kilometers is essential for platoon survival and mission attainment. An examination of the tasks recommended for platoon leader training by Drucker (1982) reveals a close dependence and interaction with the immediate environment. In what manner this environment is portrayed and what levels of fidelity are incorporated are issues that a tactical trainer for platoon leaders will have to resolve.

## DISCUSSION

The main findings of the present work can be summarized as follows. First, it is evident that considerable progress has been made in identifying and gaining a better understanding of platoon leader tasks in need of further training. Second, a greater knowledge of the Army training environment that can serve to facilitate or impede the extent to which platoon leaders reach proficiency on critical platoon leader tasks has been obtained. Third, there is a conspicuous absence of state-of-the-art tactical training devices at the platoon leader level capable of exposing leaders to a variety of realistic tactical problems. Finally, recent advances in microcomputer technology and the presence of automated battle simulations at higher command levels and in other services suggests that selected aspects of this same technology can be applied to the training needs of platoon leaders and company team commanders.

### Platoon Leader Tasks In Need of Further Training

Two relevant documents that can be used to select tactical leader tasks for training are Drucker's Platoon Leader Task Recommended for Training paper and the Armor School's Platoon Test. The Drucker task selection evolves from the application of a structured criticality assessment methodology. The Platoon Test is also a detailed document that presents platoon leader tasks across 17 tactical areas. As indicated in Table 1, Platoon Leader Tasks Recommended for Training, almost all of the candidate training tasks identified in the Drucker listing appear in the platoon test. As Drucker's list is the result of a criticality assessment, there are tasks in the Platoon Test that are not in Drucker's final selection.

Under the platoon operation, Conduct Fire and Maneuver, Drucker lists eight tasks recommended for training. The current research found that these tasks were performed poorly, and in some cases they were not performed at all. Tactical observations of AOB MILES exercises, although limited in number, found that platoon leaders, once in contact, fail to accomplish the following tasks: Evaluate the Information Obtained from Contact, Reassess the Situation, Decide on a Hasty Attack Option, Develop a Plan, and Issue a FRAGO. Rather, platoon leaders continued the mission based on the original plan, and new developments did not result in assessing the information or considering changes to the maneuver plan.

The inability of the observed platoon leaders to progress to a hasty attack stage negated the opportunity to exercise the other tasks associated with the Fire and Maneuver operation. In order to plan a hasty attack, OPFOR locations must be known and reasonable assurance obtained that the platoon has sufficient fire power to conduct a successful hasty attack. If OPFOR positions are not known, a fire maneuver plan cannot be developed, attack positions cannot be selected, and indirect fire cannot be adjusted. Although these observations were made on inexperienced second lieutenants, the interview data indicated the same outcomes were observed among lieutenants commanding platoons in NTC operational tests. These platoons reportedly are sustaining high casualties in the initial contact phases and are not able to progress to the stage where a hasty attack plan can be developed.

Student results from the AOAC questionnaire indicate that Hasty Attack is the second most difficult mission for obtaining proficiency and 84% of the students indicated further training on tasks associated with Hasty Attack was needed. Also, these same students indicated that the Movement to Contact operation, which proceeds and leads up to a hasty attack, is the most difficult mission on which to gain tactical proficiency. A high percentage of students (84%) commented that additional training was needed on Developing the Situation. This task involves a planned series of actions to gain essential elements of information (e.g., OPFOR locations and weapons systems) so a hasty attack decision can be made.

The Drucker tasks for the platoon operation, Immediate Action, also were performed poorly in the AOB exercises. Research staff observed platoon leaders not responding well to initial contact. Platoon tanks usually remained exposed to OPFOR weapon systems as opposed to moving, under a platoon leader's direction, into defilade positions. Often OPFOR targets were not known and platoon leaders did not know how to locate these targets. There was minimal use of indirect fire, either for suppressive or screening missions. Lack of identified targets was probably a contributing factor to the minimal use of indirect fire as well as its ineffectiveness against OPFOR units.

The SPOTREPs submitted by platoon leaders were consistently late, incomplete, and inaccurate. Very seldom did the company commander really know the status of his platoons. Platoon leaders infrequently directed the actions of their tank commanders (i.e., little use of visual signals or audio commands), and platoon integrity rapidly broke down. Observers at NTC also indicate that incomplete SPOTREPs and failure to use indirect fire (or use it properly) are common deficiencies.

Questionnaire participants cited the general task area of Command and Control as the most difficult in a Movement to Contact operation. Approximately 80% of the questionnaire participants stated more training is needed on Movement to Contact tasks.

Drucker, under the platoon operation, Organize Platoon Battle Position, lists 17 tasks for training. The research staff did not observe defensive operations during AOB tactical exercises. However, interview data indicated that a number of these tasks have not been performed well in NTC training exercises. It was stated that terrain reconnaissance is lacking, and that platoon leaders are not selecting good defensive positions.

Failure to select alternate positions was another stated problem. Platoon tanks were observed firing too many times from the same location. As a result, OPFOR were able to successfully engage U.S. defensive positions. Improper use of range cards and failure to establish Target Reference Points and Engagement Areas were other stated reasons for ineffective defenses.

Observations from NTC concerning tasks under Drucker's platoon operation, Initiate Direct Fires in Platoon Sector, also suggest a strong need for further training. Engaging targets out of range and engaging the same target with multiple weapon systems (tanks, TOWs and Dragons) were deficiencies commented on more than once. Fire control and fire discipline are serious problems. A failure to properly use indirect fires as part of the defense and to execute maneuvers that avoid OPFOR indirect fire was reported. Lack of accurate and timely reports, especially during contact, was another observed shortcoming.

Questionnaire participants, although not rating Defend Battle Positions as high as Hasty Attack or Movement to Contact, suggested substantial training is needed on specific tasks associated with defending a battle position. For example, 89% of the students felt they needed actual practice controlling a defensive operation and 82% of the students felt additional training was needed controlling direct and indirect fires.

Problems with the Army Training Environment

The Army, in recent years, has made significant strides toward improving tactical training. However, even with the advent of performance-oriented training and the engagement simulation (ES) training systems, there exist serious problems in the training of squad, platoon, and company size units.

As indicated earlier, SCOPES and REALTRAIN, although implemented throughout the Army, have not been extensively utilized. With MILES, a better but more costly system, similar problems are occuring. Unit commanders often do not perceive that their units are inadequately trained. Units generally perceive themselves to be well trained; however, objective evidence from REALTRAIN validation tests suggests otherwise. In a discussion of small unit tactical training, Scott (1980) underscores this point.

> The units themselves (prior to the pretraining test) did not generally perceive that their state of tactical training left a good deal to be desired. Seventy percent of the armor/anti-armor units' members rated their units as at least adequately trained and 30.5% rated their units as well or extremely well trained. Other data suggest that infantry squad members also over-estimated their unit's tactical proficiency.

These "adequately trained" test units accomplished only three of forty-eight tactical missions. These units suffered high losses and inflicted few casualties. Leader casualties, by mid-point of the test exercises, were as high as 70%. The quality of initial tactical performance of these units raised serious questions as to the combat readiness of U.S. Army operational units.

The use of engagement simulation training techniques to conduct ARTEP training is an option available to the unit commander; it is not a requirement. As the utilization of REALTRAIN and MILES requires significant administrative and logistical support, unit commanders who do not perceive a training problem have little motivation to incorporate these systems in their tactical training. Even though the failure to completely integrate engagement simulation with ARTEP has lessened its objectivity as a training evaluation and feedback system, the ARTEP still remains the foundation for unit tactical training.

There are other problems which further affect the ability to provide effective training for small unit leaders. Past and current research continues to show that training feedback from ARTEPs is not sufficient and that the opportunity to conduct further training on unit deficiencies is marginal. In the present research, personnel interviewed in Army agencies associated with training management and collective training cited inadequate feedback and lack of retraining time as current ARTEP problems. As mentioned previously, Armor Officer Advanced Course students participating in the tactical questionnaire were asked specific questions about the ARTEP. Concerning training feedback, only 42% of the students considered feedback adequate and 39% indicated training feedback was inadequate. As for the opportunity to retrain, only 55% of the students indicated there was time to practice on identified training deficiencies. When asked how much time is devoted to individual leader tasks, only 25% of their total training time was devoted to practice on their own tasks.

The current research also attempted to identify specific training strategies or training models that have been implemented to guide platoon leader training. None were found. Except for the battle simulation Dunn-Kempf, which is marginally used, there are no current simulations or training devices used to assist platoon leader tactical training. There is recent concern within the Armor and Infantry Schools and the TRADOC community about the combat proficiency of operational platoons. The schools, in conjunction with TRADOC, have developed platoon tests which are designed to measure the tactical proficiency of the platoons using MILES. Platoon tasks are derived from the ARTEP, and the test is used on selected missions. The platoon tests seem to be an attempt to have an ES-based ARTEP. While the platoon test seems to be a move in the right direction, in order for platoons to do well on the test, they must train in an ES environment. Currently, the amount of ES training time platoons have is limited.

The schools and the TRADOC community see the need for the development of a training device to support platoon leader tactical training. However, if a device is to be effective, major changes in the training environment, such as detailed training feedback and more training time, especially multiechelon training, will have to be made.

## Identification of Tactical Training Device Deficiencies

Given it is platoon leaders and company commanders--those with the least amount of time in the service and least amount of accumulated tactical experience--that must do the fighting and function in an extremely complex and demanding battlefield environment, it was surprising to discover a dearth of training devices that would help prepare leaders for such an environment. Of all the command levels, one would expect to find a number of training devices in use and under development addressing critical aspects of the platoon leader's and company commander's job. The present research was not able to confirm this expectation.

A variety of battle simulations for maneuver echelons have been designed and developed by the Combined Arms Training Developments Activity (CATRADA). While these battle simulations help mitigate the problems associated with field training (e.g., high resource cost) and allow commanders and their staffs to practice certain tactical principles, most of the simulations (e.g., CATTS, CAMMS, ARTBASS) are directed at battalion level and up. The two battle games--Dunn-Kempf and BLOCKBUSTER--that are appropriate for platoon and company operations are manual simulations and, as previously noted, do not adequately approximate the rapid-pressure decision making required of combat leaders. Upon observing U.S. Marine Corps company and platoon commanders play TACWAR, the manual company-level war game developed by the Naval Training Equipment Center, research staff concluded that the same inability of this game to allow players to execute tactics in near real time detracted from its effectiveness.

Four of the training devices in Table 14, Matrix for Training Device Classification, were classified as procedures-oriented. Procedures-oriented devices are most useful for training technical skills where there is specific step-by-step guidance for accomplishing the tasks associated with those skills. Almost all of the devices listed in the Comprehensive Plan for Training Devices fall in this category. In the

Conduct-of-Fire-Trainer (COFT), for example, the amount of attention given to faithfully reproducing the appearance and functions of the vehicle's operating controls, indicators, and weapons sights indicates that crew members will be performing their duties in the simulator in the same way as in the actual vehicle. Tactics-oriented devices, on the other hand, are useful for those circumstances where there are several alternative courses of action open to the individual. Whether or not a task is performed satisfactorily is, to a large extent, situationally determined and therefore, a tactics oriented device must be capable of presenting a variety of situational conditions.

In combat arms, the tasks assigned to the platoon leader vary in the degree to which they are procedures or tactics oriented. Procedures-oriented devices, such as the Observed Fire Trainer (OFT), the MK-60 Tank Gunnery Trainer, and the COFT, will be useful in providing training on a select subset of platoon leader tasks. The task of calling for and adjusting indirect fire, for example, could be practiced on the OFT. In his dual role in directing the activities of the platoon and in serving as a vehicle commander, the platoon leader should find the COFT useful in gaining proficiency on his tank commander tasks such as acquiring and shifting targets. The procedures-oriented devices, in their present configuration, would not do a good job in allowing the platoon leader to direct the activities of the platoon. How should one practice those platoon leader tasks recommended for training in Table 1 (e.g., Directs Movement into Attack Position, Directs Enemy be Engaged, Coordinates with Adjacent Platoon Leaders, Selects and Announces Withdrawal Routes) in a nonfield setting? These tasks are more situation dependent and require an interactive capability with other platoon members that the present devices do not have.

Three of the training devices listed in Table 14, Matrix for Training Device Classification, incorporate videodisc technology. These three devices were the Videodisc Interpersonal Skills Training and Assessment (VISTA), Minefield Breaching Battledrill Evaluation (MBBE), and the MK-60 Tank Gunnery Trainer. It was noted that the Infantry School also is considering use of the videodisc in some of its tactical simulation projects. The videodisc technology along with other technological options will be carefully evaluated and matched to critical leader tasks in the next phase of the research project.

## Availability of New Technology

Recent advances and innovations in microcomputer technology, voice recognition and synthesis, videodisc storage and retrieval, high resolution computer graphics, artificial intelligence, and electronic gaming have generated considerable interest in the training application of this technology. With falling costs and increasing portability, the technology underlying automated battle simulations (e.g., CATTS, ARTBASS) to which heretofore only higher levels of command had access, is now available for wider use and distribution. In addition to lower cost, the trend toward miniaturization has meant training devices that are more portable, highly reliable, and are easy to operate--all of which increase the likelihood that the device will be used. As indicated earlier, the Janus project at the Lawrence Livermore National Laboratory is a good example of the move in this direction. Although the creation of a two-sided, real-time interactive war game simulation like Janus requires considerable development effort and cannot be considered truly portable, device configurations with this capability should offer excellent potential for training the rapid-pressured decision-making required of platoon leaders. Tasks that required a minicomputer or main frame only a few years ago can be accommodated now on the new wave of 16 bit and 32 bit microcomputers which provide for faster operation, greater accuracy, and welcomed increases in memory address space. New micros with multiple CPUs and expanded RAM now allow for multitasking. Users of this technology can do several tasks simultaneously -- platoon leaders, for example, should be able to work up an OPORD or FRAGO, decide on which targets of opportunity to engage, and submit a SPOTREP electronically, all without experiencing the delays that use of separate disk drives would involve.

The above developments provide new potential for supporting training on platoon leader problem-solving tasks not well represented in current nonfield settings. The ultimate goal is a training system that will expose platoon leaders to a wide variety of tactical and operational principles. Skill areas which need to be emphasized include real time assessment of threat situations, sufficient execution of $C^3$ procedures, rapid-pressure decision making, anticipation of OPFOR intention, initiation of friendly actions, and control of direct and indirect fire. Progress has been made in identifying critical platoon leader tasks which underlie these skills and in identifying current deficiencies in tactical training methodologies at the platoon level. Combined with new initiatives in tactical training at the Armor School, an integrated and balanced approach to tactical training may soon be possible. Brown (1983b) has advocated a logical progression to field training -- a "crawl, walk, run" approach whereby platoon leaders first learn to crawl with tactical exercises without troops, secondly, learn to walk with command field exercises, and given mastery of the preceding stages, finally, are allowed to run exercises with the full resources of combined arms units. A similar approach to nonfield training whereby it is integrated with field training needs to be considered. One strategy would be to identify those tactical skills likely to experience decay as a result of the long time intervals between field exercises. Computer-based training materials and automated tactical simulations could be used to fill the gaps in the "crawl, walk and run" stages that Brown describes. The learning experience in the field could be enhanced, if it were possible to train leaders to a specified level of mastery on those fundamental tactical skills that are infrequently practiced and hence highly susceptible to skill decay. The more costly field exercises could then truly focus on the integration of these fundamental skills into the complex performance demands required of the small unit leader. The availability and judicious use of low-cost microcomputer technology will not only have potential to fill field training gaps in a nonfield setting, but in turn, should provide useful information and hypotheses for maximizing the field training experience.

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# APPENDIX A

## Sources of Interview Data

## APPENDIX A

### Sources of Interview Data

| Army School/Agency | Content Area |
|---|---|
| Directorate of Training Developments - U.S. Army Armor School | Current training devices, devices projected for development |
| | Armor Platoon Test |
| | Project briefing |
| | Armor task listing |
| U.S. Army Engineer School | Videodisc demonstration, engineer leader training for minefield breaching |
| Command, Staff and Doctrine Department - U.S. Army Armor School | Platoon leader tasks, standards of performance in combat situations |
| | Doctrine for company level operations, platoon leader's role |
| Office of Armor Force Development and Standardization - U.S. Army Armor School | Briefing |
| U.S. Army Armor and Engineering Board Major Activities | Briefing |
| Training Systems Analysis Agency | Devices under evaluation for training effectiveness |
| | Information on devices under evaluation |

| Army School/Agency | Content Area |
|---|---|
| Army Training Support Center | Leader training devices-fielded or projected |
| TRADOC System Manager for M1 | Briefing |
| U.S. Army Armor School | Briefing |
| | Combat leadership behavior |
| | Instructional approaches, map board simulation |
| Army Training Board | Impact of BTMS on platoon training |
| | Unit missions and associated leader tasks |
| Combat Development Experimentation Command | Device effectiveness associated with weapons systems, U.S. doctrine experiments, engagement simulation systems |
| U.S. Army Armor Center | U.S. vs. OPFOR war gaming simulation |
| Army Training Support Center | Lessons learned from MILES implementation concerning tactical deficiency |
| Army Communicative Technology Office | Applications of advanced training technology to platoon leader training |
| Training Developments Institute | Advanced training technology |

| Army School/Agency | Content Area |
|---|---|
| Naval Training Equipment Center | Simulation to train platoon leaders on tactical skills |
| PM-TRADE | Training devices falling under engineering management |
| | Overview of PM-TRADE organizations and functions |
| | Information on training devices under development that may have potential application to tactical training |
| | Information of NAVTAG |
| | Contact person to set up interviews at PM-TRADE |
| Army Infantry School | Briefing |
| | Information on projected automated simulations related to company and platoon operations |
| | Extent to which automated devices are used to teach leadership skills, VISTA project |
| | Extent to which combat development affects leader training |
| | Information on platoon leader tasks collected for MIL Qualification Standard |
| | Information on ARTEP, battle drills, and MIL Qualification System as it relates to platoon leader training |

| Army School/Agency | Content Area |
|---|---|
| | Information on the current thinking of the Bradley Infantry Fighting Vehicle Task Force on leadership training |
| | Information on new equipment that could potentially affect leader training |
| | Leadership tasks taught in IOBC and IOAC |
| | Information on how the IFV changes organization |
| Army Resea h Institute Presidio ot Monterey | Briefing, research dealing with tactical team training, team testing and tactical leader training, DeANZA monitoring system for effective monitoring of tactical units |
| National Training Center | Information on platoon leader and company commander behaviors during engagement simulation exercises at NTC, DeANZA system |
| Army Research Institute-Fort Leavenworth Field Unit | Briefing, overview CATRADA's battle simulations CAMMS, CATTS, MACE and ARTBASS, specific tasks the battle simulations train |
| Combined Arms Training Developments Activity | Types of technology that might be considered when defining alternative device concepts, CAMMS II, CATTS, associated software and hardware |

# APPENDIX B

## List of Documentation

## APPENDIX B

## List of Documentation

### ARTEP


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# APPENDIX C

## AOAC Questionnaire

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APPENDIX C

AOAC Questionnaire

Rank ____________________ Student Number ______________

Source of Commission (Check One)

Military Commission: Military Academy ___ ROTC ___ OCS ___
Date of Commission: ______________
Current Branch: ______________
AOB Branch: ______________
AOB Completion Date: ______________

Army Commands Assigned To:

| Command | Months Assigned |
|---|---|
| FORSCOM | ___ |
| USAREUR | ___ |
| 8th Army | ___ |
| Other (Identify) | |
| ______________ | ___ |
| ______________ | ___ |

Military Experience

Please fill in number of months assigned to each duty position for the units listed.

| Unit | Plt. Ldr. Maneuver Plt. | Support Plt. Leader/Staff | Co. Exec. | Co. Cdr. Maneuver Co. | Co. Cdr. Support Co. | BN Staff | Other- | Other- |
|---|---|---|---|---|---|---|---|---|
| Armor Company | ___ | ___ | ___ | ___ | ___ | | ___ | ___ |
| Cavalry Troop | ___ | ___ | ___ | ___ | ___ | | ___ | ___ |
| Armor Battalion | | ___ | | | | ___ | ___ | ___ |
| Cavalry Squadron | | ___ | | | | ___ | ___ | ___ |
| Other | | | | | | | | |
| ______________ | ___ | ___ | ___ | ___ | ___ | ___ | ___ | ___ |
| ______________ | ___ | ___ | ___ | ___ | ___ | ___ | ___ | ___ |

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## DIRECTIONS

This questionnaire is designed to help the Army Research Institute (ARI) to obtain information on the tactical training experiences of AOAC students at the platoon and company team level. The questionnaire consists of six parts:

- Part I - Amount of Training
- Part II - Conditions of Training
- Part III - Adequacy of Training
- Part IV - Mission Difficulty
- Part V - Identification of Training Needs
- Part VI - Engagement Simulation Experience

You can help us most by completing the form in a careful and honest manner. Please be as specific as possible where written comments are solicited.

We appreciate your participation in this study. Your responses are confidential; no effort will be made to identify you or your unit.

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## PART I - AMOUNT OF TRAINING

DIRECTIONS: For each mission below, please rate the amount of training received while in AOB and also as a unit commander. Ratings should be given for both field and nonfield tactical training. Nonfield refers to use of map board games, map exercises with sand tables, and any other training devices. Also, rate each mission in terms of whether it was conducted at the platoon level, company level, or both.

---

AMOUNT OF TRAINING:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Almost None | Little | Some | Moderate | Extensive |

---

| MISSIONS: | AOB Training | | Unit Training | |
|---|---|---|---|---|
| | Field | Nonfield | Field | Nonfield |
| Tactical Road March | | | | |
| Platoon | ____ | ____ | ____ | ____ |
| Company | ____ | ____ | ____ | ____ |
| Passage of Lines (FWD) | | | | |
| Platoon | ____ | ____ | ____ | ____ |
| Company | ____ | ____ | ____ | ____ |
| Movement to Contact | | | | |
| Platoon | ____ | ____ | ____ | ____ |
| Company | ____ | ____ | ____ | ____ |
| Defend Battle Positions | | | | |
| Platoon | ____ | ____ | ____ | ____ |
| Company | ____ | ____ | ____ | ____ |
| Hasty Attack | | | | |
| Platoon | ____ | ____ | ____ | ____ |
| Company | ____ | ____ | ____ | ____ |
| Counterattack | | | | |
| Platoon | ____ | ____ | ____ | ____ |
| Company | ____ | ____ | ____ | ____ |

## PART II - CONDITIONS OF TRAINING

DIRECTIONS: For each mission below, please rate the extent to which the following conditions are incorporated into AOB and unit tactical training. Shaded areas indicate conditions not normally applied to the particular mission.

EXTENT TO WHICH CONDITIONS ARE INCORPORATED:

| 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|
| Almost never | Seldom | Sometimes | Moderate | Quite Often | Not applicable |

| | Day Operations | Night Operations | EW | Mines/Booby Traps | NBC | Artillery | Two-Sided Engagement Simulation | Combined Arms | Engine Support | Helicopter Gunship Support | Close Air Support | Air Defense | Combat Service Support |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tactical Road March** | | | | | | | | | | | | | |
| AOB | | | | | | | ////// | | | ////// | ////// | | |
| Unit | | | | | | | ////// | | | ////// | ////// | | |
| **Passage of Lines (FWD)** | | | | | | | | | | | | | |
| AOB | | | | | | | ////// | | ////// | ////// | | | |
| Unit | | | | | | | ////// | | ////// | ////// | | | |
| **Movement to Contact** | | | | | | | | | | | | | |
| AOB | | | | | | | | | ////// | ////// | ////// | | ////// |
| Unit | | | | | | | | | ////// | ////// | ////// | | ////// |
| **Hasty Attack** | | | | | | | | | | | | | |
| AOB | | | | | | | | | ////// | | | | ////// |
| Unit | | | | | | | | | ////// | | | | ////// |
| **Defend Battle Positions** | | | | | | | | | | | | | |
| AOB | | | | | | | | | ////// | | | | ////// |
| Unit | | | | | | | | | ////// | | | | ////// |
| **Counterattack** | | | | | | | | | | | | | |
| AOB | | | | | | | | | ////// | | | | |
| Unit | | | | | | | | | ////// | | | | |

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PART III - ADEQUACY OF TRAINING

DIRECTIONS: For each mission below, please rate the adequacy of training received while in AOB and also as a unit commander. Training adequacy for AOB means adequate preparation for entry into your first unit; for unit commanders it means the ability to perform proficiently various tactical missions. Rate each mission in terms of whether it was conducted at platoon level, company level, or both.

---

ADEQUACY OF TRAINING:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not Adequate | Not Quite Adequate | Barely Adequate | Adequate | More Than Adequate |

---

MISSIONS:

| | AOB Training | Unit Training |
|---|---|---|
| **Tactical Road March** | | |
| Platoon | ____ | ____ |
| Company | ____ | ____ |
| **Passage of Lines (FWD)** | | |
| Platoon | ____ | ____ |
| Company | ____ | ____ |
| **Movement to Contact** | | |
| Platoon | ____ | ____ |
| Company | ____ | ____ |
| **Hasty Attack** | | |
| Platoon | ____ | ____ |
| Company | ____ | ____ |
| **Defend Battle Positions** | | |
| Platoon | ____ | ____ |
| Company | ____ | ____ |
| **Counterattack** | | |
| Platoon | ____ | ____ |
| Company | ____ | ____ |

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PART III - ADEQUACY OF TRAINING (CONTINUED)

Please respond to the following questions in a candid and succinct fashion. The first two questions pertain to AOB training.

1. What tactical missions in AOB should receive more training to ensure adequate preparation into units?

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

2. What map board games or training devices did you use as part of your tactical training experience in AOB?

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

3. Were you using any map board games or training devices at your unit? Yes_____ No_____

a. If so, what devices did you use?

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

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b. What tactical leader tasks did these devices allow you to practice?

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

4. What battlefield conditions do you feel should be incorporated more often into tactical training?

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

5. When training on a unit tactical mission, is adequate feedback provided to the tank commanders, platoon leaders, and company commanders on training progress and shortcomings? What is the nature of this feedback?

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

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6. Once an ARTEP is taken on a particular mission, does training continue on identified shortcomings? What form does training take?

7. Are some missions more difficult to reach proficiency on than others? Please specify.

8. What type of field training techniques do you use to do collective training (e.g., REALTRAIN, MILES, TEWTS, and/or Dry Runs)?

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9. Does your unit conduct multiechelon training (company cdr. and platoon leaders involved in leader training and tank cdrs. involved in crew/battle drill)?

10. What percentage of your training time is devoted to training on your own specific leader tasks as opposed to supervising unit training?

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# PART IV - MISSION DIFFICULTY

Please rank order the following missions in terms of difficulty in acquiring proficiency. A ranking of 1 indicates most difficult; a ranking of 2 is the next most difficult and so forth. A ranking of 6 indicates the least difficult mission. Rate each mission for both platoon and company levels.

| | Platoon | Company |
|---|---|---|
| Tactical Road March | ______ | ______ |
| Passage of Lines (FWD) | ______ | ______ |
| Movement to Contact | ______ | ______ |
| Hasty Attack | ______ | ______ |
| Defend Battle Positions | ______ | ______ |
| Counterattack | ______ | ______ |

For the two most difficult missions listed under platoon operations, specify the associated leader tasks that are especially difficult.

Most difficult mission - associated leader tasks:

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

*Second most difficult mission - associated leader tasks:*

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

For the two most difficult missions listed under company operations, specify the associated company commander tasks that are especially difficult.

Most difficult mission - associated leader tasks:

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

Second most difficult mission - associated leader tasks:

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

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## PART V - IDENTIFICATION OF TRAINING NEEDS

DIRECTIONS: For the missions below, indicate what leader tasks need further training. Observations should be made for field and nonfield settings by placing a check in the appropriate space. Also indicate any other tasks not addressed here.

| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| **MISSION: TACTICAL ROAD MARCH** | | | | |
| Tasks: | | | | |
| • Develop fire support plan on potential OPFOR positions | ___ | ___ | ___ | ___ |
| • Assign tank sectors of fire | ___ | ___ | ___ | ___ |
| • Develop and execute movement control measures | ___ | ___ | ___ | ___ |
| • Develop movement route to maximize terrain protection: | ___ | ___ | ___ | ___ |
| - terrain/vegetation barriers | | | | |
| - accessible hull down firing positions | | | | |
| - concealment from the air | | | | |
| • Develop and execute contingency plans/drills (formations, actions, and alert signals) for: | ___ | ___ | ___ | ___ |
| - antitank attack | | | | |
| - air attack (fixed wing, rotary) | | | | |
| - NBC attack | | | | |
| • Please specify other tasks not mentioned here | ___ | ___ | ___ | ___ |

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| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| **MISSION: PASSAGE OF LINES (FWD)** | | | | |
| Tasks: | | | | |
| • Establishment of passage lanes, traffic control procedures, and identification of times and location to rendezvous with guides | ___ | ___ | ___ | ___ |
| • Develop and execute communication plan: | ___ | ___ | ___ | ___ |
| - identification of unit frequencies and call signs of passing and stationary units | | | | |
| - develop and exchange vehicle recognition signals | | | | |
| • Develop and execute supporting fire plan: | ___ | ___ | ___ | ___ |
| - which unit provides overwatch as passage occurs | | | | |
| - control of fires | | | | |
| • Control a passage of lines: | ___ | ___ | ___ | ___ |
| - move on time, arrive at designated passage points on time | | | | |
| - maintain noise and light discipline | | | | |
| - control supporting fires in the event of contact | | | | |
| • Please specify other tasks not mentioned here | ___ | ___ | ___ | ___ |

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| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| **MISSION: MOVEMENT TO CONTACT** | | | | |
| Tasks: | | | | |
| • Develop fire support, overwatch and maneuver plans to minimize surprise and first firing capability by OPFOR: | ___ | ___ | ___ | ___ |
| - overwatch elements capable of sighting enemy or weapon signature and returning fire | | | | |
| - contact made with the smallest element possible | | | | |
| • Direct fires against OPFOR position(s) | ___ | ___ | ___ | ___ |
| • Execute protective measures to negate subsequent OPFOR firings: | ___ | ___ | ___ | ___ |
| - continue to coordinate direct fire | | | | |
| - direct movement into a defilade position | | | | |
| - call indirect fire (smoke, HE) | | | | |
| - direct movement into a support position | | | | |
| • Obtain SPOTREP on OPFOR: | ___ | ___ | ___ | ___ |
| - determine size of OPFOR and probable deployment from known and suspected locations | | | | |
| - anticipate OPFOR's next actions | | | | |
| - submit SITREP | | | | |

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| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| MISSION: MOVEMENT TO CONTACT (CONTINUED) | | | | |
| • Develop situation: | ___ | ___ | ___ | ___ |
| - issue FRAGO | | | | |
| - continue movement toward OPFOR to gain more information on size and deployment (reconnaissance) | | | | |
| - reassess tactical situation (bypass, hasty attack, and/ or withdraw) | | | | |
| • Please specify other tasks not mentioned here | ___ | ___ | ___ | ___ |

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| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| MISSION: HASTY ATTACK | | | | |
| Tasks: | | | | |
| • Develop attack plan, issue FRAGO: | ___ | ___ | ___ | ___ |
| - identify indirect fire targets | | | | |
| - identify support position(s) and targets for suppressive fire element | | | | |
| - identify attack positions, maneuver route, and actions of maneuver team | | | | |
| - develop coordination procedures to integrate indirect, direct fire, and maneuver elements | | | | |
| • Direct and control attack: | ___ | ___ | ___ | ___ |
| - coordinate and shift direct and indirect fires | | | | |
| - obtain SPOTREPs from maneuver and supporting elements | | | | |
| - continually reassess tactical situation | | | | |
| - issue new orders as situation develops (continue, reinforce, hold, and/or withdraw) | | | | |
| • Please specify other tasks not mentioned here | ___ | ___ | ___ | ___ |

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| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| **MISSION: DEFEND BATTLE POSITIONS** | | | | |
| Tasks: | | | | |
| • Anticipate likely avenues of approach and OPFOR attack options (likely areas for OPFOR artillery, suppressive fire) | ___ | ___ | ___ | ___ |
| • Develop defensive plans: | ___ | ___ | ___ | ___ |
| - provide local early warning | | | | |
| - assign sector of fire and TRPs | | | | |
| - plot indirect fire targets | | | | |
| - integrate hasty minefields into fire plan | | | | |
| - provide depth to defense, incorporate TOWs | | | | |
| - identify alternate firing positions and withdrawal routes | | | | |
| • Develop contingency plans and appropriate signals if weapon system losses threaten defense | ___ | ___ | ___ | ___ |
| • Develop integrated fire plans based on possible enemy attack options for day and night conditions | ___ | ___ | ___ | ___ |
| • Develop detailed communications plan to implement defensive plan (quick and accurate SITREPs, signals to coordinate direct fires, targets, movement to alternate positions, and withdrawal) | ___ | ___ | ___ | ___ |

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| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| MISSION: DEFEND BATTLE POSITIONS (CONTINUED) | | | | |
| Tasks: | | | | |
| • Direct and control a defense | ___ | ___ | ___ | ___ |
| • Assess intelligence from OPFOR sightings or contact and anticipate OPFOR actions | ___ | ___ | ___ | ___ |
| • Coordinate direct and indirect fires | ___ | ___ | ___ | ___ |
| • Mix primary and alternate firing positions to minimize effects of OPFOR direct fire weapon systems and artillery | ___ | ___ | ___ | ___ |
| • Reassess tactical situation: | ___ | ___ | ___ | ___ |
| - continue to defend as positioned | | | | |
| - reinforce threatened sector | | | | |
| - withdraw to alternate positions | | | | |
| - withdraw defensive position | | | | |
| - submit SITREP | | | | |
| • Please specify other tasks not mentioned here | ___ | ___ | ___ | ___ |

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| | FURTHER UNIT TRAINING NEEDED | | | |
|---|---|---|---|---|
| | Field (LTA, MTA) | | Nonfield | |
| | Yes | No | Yes | No |
| **MISSION: COUNTERATTACK** | | | | |
| Tasks: | | | | |
| • Analyze intelligence, determine OPFOR size and weapons systems | ___ | ___ | ___ | ___ |
| • Analyze terrain, estimate OPFOR deployment, potential TRPs/FPFs, and sector of fire | ___ | ___ | ___ | ___ |
| • Develop attack plan, issue FRAGO: | ___ | ___ | ___ | ___ |
| - identify indirect fire targets | | | | |
| - identify support position and potential targets for suppressive fire element | | | | |
| - identify attack positions, maneuver route, and action of maneuver team | | | | |
| - develop coordination procedures to integrate indirect, direct fire and maneuver elements | | | | |
| • Direct and control counterattack: | ___ | ___ | ___ | ___ |
| - coordinate and shift direct and indirect fires | | | | |
| - obtain SPOTREPs from maneuver and supporting elements | | | | |
| - continually reassess tactical situation | | | | |
| - issue new orders as appropriate (continue, reinforce, hold, and/or withdraw) | | | | |
| • Please specify other tasks not mentioned here | ___ | ___ | ___ | ___ |

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# PART VI - ENGAGEMENT SIMULATION EXPERIENCE

Indicated your level of engagement simulation experience by filling in the appropriate blocks below.

Tactical Engagement Simulation Training Experience

Fill in Blocks

| Total Number of Engagement Simulation Exercises | School | Unit |
|---|---|---|
| REALTRAIN | ☐ | ☐ |
| MILES | ☐ | ☐ |
| MILES (NTC) | ☐ | |

| Total Number of Mission Exercises | School | Unit | NTC |
|---|---|---|---|
| Movement to Contact | ☐ | ☐ | ☐ |
| Hasty Attack | ☐ | ☐ | ☐ |
| Defend Battle Positions | ☐ | ☐ | ☐ |

DIRECTIONS: If you have participated in one or more exercises, respond to the questions below. Based upon engagement simulation exercises, the questions first ask you to estimate the number of times you performed a particular mission or phase; secondly, a series of questions relative to the mission or phase asks you how many times a specific tactical event occurred. It is understood that it is difficult to remember precisely how many times a particular event occurred; however, the numbers that you provide should be based upon your experience and realistically represent your best recall. You will also have the opportunity to provide written comments to any of the questions where you feel elaboration is needed.

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Movement to Contact

1. Based upon your engagement simulation experience, how many times did you lead a movement to contact mission? ________ Of these times, how often:

   a. did you employ indirect fire to support your unit's movement? __________

   b. did your overwatch elements make detections prior to OPFOR firings? __________

   c. were OPFOR positions prevented from firing (smoke obscuration or suppression)? __________

Please elaborate on any of the above items. ________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

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Initial Contact

2. Based upon past engagement simulation exercises, estimate the number of initial contact situations you led. __________ Of the number of initial contact situations you led, in how many:

   a. did you identify targets to other unit elements and coordinate unit fires? __________

   b. did elements in contact provide prompt information on OPFOR units? __________

   c. were contact reports on OPFOR activity accurate as to location? __________

   d. did you know the location of your tanks and their status? __________

   e. did you give immediate guidance to your unit elements for protective measures? __________

   f. did the unit act in a fragmented fashion with tanks fighting on their own? __________

   g. was your tank assessed an early casualty? __________

   h. did your tank engage OPFOR targets? __________

Please elaborate on any of the above items. ________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

PT # 5509

3. Estimate the number of times your tanks were engaged during movement to contact by antitank missile weapon systems. __________ Of these times, in how many:

   a. did your engaged tanks receive early warning that would have made evasive action possible? __________

   b. were targeted tanks hit by the OPFOR? __________

   c. was your unit able to suppress or neutralize OPFOR launch platforms? __________

Please elaborate on any of the above items. ________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

PT # 5509

Develop the Situation

4. Based upon your engagement simulation experience, how may times did you have the opportunity to develop the situation after initial contact? __________ Of the number of times you had an opportunity to develop the situation, how many of these times:

   a. was your unit strength sufficient to continue to develop the situation or conduct a hasty attack? __________

   b. did you pursue additional information on OPFOR activity? __________

   c. did you reconsider likely secondary or alternate OPFOR firing positions? __________

   d. were you able to locate a weak point in enemy disposition? __________

*Please elaborate on any of the above items.* ______________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

PT # 5509

Hasty Attack

5. Based upon your engagement simulation experience, how many times did you lead a hasty attack? __________ Of these times, in how many:

   a. did you communicate a plan for the hasty attack to your units prior to becoming fully engaged? __________

   b. were subordinate elements positioned to take advantage of OPFOR disposition? __________

   c. did you place indirect fire (smoke or HE) on OPFOR positions prior to your assault? __________

   d. did your fire support element destroy OPFOR positions? __________

   e. did you receive reports on casualties, progress, OPFOR targets, and OPFOR actions during the assault? __________

Please elaborate on any of the above items. ________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

PT # 5509

Defend Battle Positions

6. Based on your engagement simulation experience, how many times did you perform a defensive mission? ________ Of these times, in how many?

   a. did you correctly anticipate the OPFOR's avenues of approach? ________

   b. did your unit successfully engage OPFOR targets at:

      more than 3,000 meters? ________
      2,000 - 3,000 meters? ________
      1,000 - 2,000 meters? ________

   c. did your weapon systems engage first? ________

   d. did OPFOR weapon systems engage first? ________

   e. were your weapon systems destroyed after initiating the engagement? ________

   f. were you aware of OPFOR locations after initial contact? ________

Please elaborate on any of the above items. ________________________

________________________________________

________________________________________

________________________________________

________________________________________

## APPENDIX D

Tables 3, 4, 5, 6, 8, 9, 13

APPENDIX D

Table 3

Amount of AOB and Unit Training in Field and Nonfield Settings on Six Tactical Missions at Platoon and Company Level

| N = 20 | AOB Training | | | | Unit Training | | | |
|---|---|---|---|---|---|---|---|---|
| | Field | | Nonfield | | Field | | Nonfield | |
| Missions | $\bar{X}$ | SD | $\bar{X}$ | SD | $\bar{X}$ | SD | $\bar{X}$ | SD |
| Tactical Road March | | | | | | | | |
| Platoon | 2.45 | 1.15 | 2.10 | 1.02 | 4.65 | .81 | 2.80 | 1.28 |
| Company | 1.80 | 1.05 | 1.75 | .85 | 4.55 | .89 | 2.80 | 1.20 |
| Passage of Lines (FWD) | | | | | | | | |
| Platoon | 2.00 | .92 | 1.70 | .86 | 3.95 | 1.28 | 2.80 | 1.32 |
| Company | 1.75 | .97 | 1.65 | .93 | 4.00 | 1.26 | 2.85 | 1.23 |
| Movement to Contact | | | | | | | | |
| Platoon | 2.70 | 1.22 | 2.45 | 1.28 | 4.55 | 1.00 | 3.55 | 1.36 |
| Company | 2.05 | 1.10 | 1.95 | 1.00 | 4.50 | 1.05 | 3.50 | 1.36 |
| Defend Battle Positions | | | | | | | | |
| Platoon | 2.65 | 1.39 | 2.50 | 1.24 | 4.40 | 1.19 | 3.40 | 1.43 |
| Company | 2.05 | 1.23 | 2.05 | 1.00 | 4.35 | 1.27 | 3.40 | 1.47 |
| Hasty Attack | | | | | | | | |
| Platoon | 2.45 | 1.32 | 2.30 | 1.26 | 4.35 | 1.09 | 3.25 | 1.45 |
| Company | 1.90 | 1.12 | 1.85 | .99 | 4.25 | 1.21 | 3.15 | 1.46 |
| Counterattack | | | | | | | | |
| Platoon | 2.00 | 1.08 | 1.90 | .91 | 3.85 | 1.31 | 2.85 | 1.46 |
| Company | 1.75 | 1.06 | 1.70 | .86 | 3.85 | 1.35 | 2.80 | 1.47 |

Note. Rating Scale: 1 = Almost none; 2 = Little; 3 = Some; 4 = Moderate; 5 = Extensive

Table 4

Extent to Which Battlefield Conditions are Incorporated into AOB and Unit Tactical Training for Six Missions

BATTLEFIELD CONDITIONS

| Missions | | Day Operations | | | Night Operations | | | EW | | | Mines/Booby Traps | | | NBC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N |
| Tactical Road March | AOB | 2.83 | 1.22 | 29 | 2.24 | 1.09 | 29 | 1.79 | .86 | 29 | 2.10 | 1.18 | 29 | 2.45 | 1.09 | 29 |
| | Unit | 4.62 | .86 | 29 | 4.28 | 1.00 | 29 | 2.83 | 1.34 | 29 | 2.62 | 1.15 | 29 | 3.97 | 1.12 | 29 |
| Passage of Lines (FWD) | AOB | 2.07 | 1.13 | 29 | 1.86 | 1.16 | 29 | 1.66 | .90 | 29 | 1.69 | .81 | 29 | 1.83 | .97 | 29 |
| | Unit | 3.45 | 1.30 | 29 | 3.66 | 1.40 | 29 | 2.48 | 1.40 | 29 | 2.34 | 1.26 | 29 | 3.34 | 1.37 | 29 |
| Movement to Contact | AOB | 2.90 | 1.37 | 29 | 2.24 | 1.30 | 29 | 1.97 | 1.02 | 29 | 1.79 | .98 | 29 | ‹ 21 | 1.18 | 29 |
| | Unit | 4.55 | .87 | 29 | 4.07 | 1.19 | 29 | 3.24 | 1.35 | 29 | 2.83 | 1.34 | 29 | 3.69 | 1.20 | 29 |
| Hasty Attack | AOB | 2.72 | 1.39 | 29 | 2.10 | 1.18 | 29 | 1.62 | .73 | 29 | 1.62 | .78 | 29 | 2.14 | 1.19 | 29 |
| | Unit | 4.34 | 1.14 | 29 | 3.83 | 1.39 | 29 | 2.90 | 1.35 | 29 | 2.66 | 1.17 | 29 | 3.76 | 1.30 | 29 |
| Defend Battle Position | AOB | 2.97 | 1.32 | 29 | 2.66 | 1.29 | 29 | 1.90 | .90 | 29 | 2.10 | 1.21 | 29 | 2.24 | 1.24 | 29 |
| | Unit | 4.62 | .86 | 29 | 4.41 | .98 | 29 | 3.17 | 1.28 | 29 | 3.28 | 1.33 | 29 | 3.86 | 1.06 | 29 |
| Counterattack | AOB | 2.17 | 1.14 | 29 | 2.03 | 1.12 | 29 | 1.52 | .83 | 29 | 1.52 | .78 | 29 | 1.79 | .94 | 29 |
| | Unit | 3.62 | 1.35 | 29 | 3.55 | 1.45 | 29 | 2.62 | 1.42 | 29 | 2.24 | 1.35 | 29 | 3.38 | 1.45 | 29 |

| Missions | | Artillery | | | Two-sided Engagement Simulation | | | Combined Arms | | | Engineer Support | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N |
| Tactical Road March | AOB | 2.34 | 1.11 | 29 | ////////// | | | 1.52 | .87 | 29 | 1.43 | .62 | 32 |
| | Unit | 3.41 | 1.24 | 29 | ////////// | | | 3.41 | 1.45 | 29 | 2.61 | 1.30 | 33 |
| Passage of Lines (FWD) | AOB | 1.76 | .99 | 29 | ////////// | | | 1.41 | .78 | 29 | ////////// | | |
| | Unit | 3.31 | 1.39 | 29 | ////////// | | | 3.07 | 1.53 | 29 | ////////// | | |
| Movement to Contact | AOB | 2.10 | 1.08 | 29 | 2.16 | 1.29 | 31 | 1.34 | .72 | 29 | ////////// | | |
| | Unit | 3.79 | 1.21 | 29 | 3.19 | 1.67 | 32 | 3.55 | 1.35 | 29 | ////////// | | |
| Hasty Attack | AOB | 2.28 | 1.07 | 29 | 1.81 | 1.03 | 32 | 1.45 | .91 | 29 | ////////// | | |
| | Unit | 3.62 | 1.35 | 29 | 2.79 | 1.77 | 34 | 3.38 | 1.45 | 29 | ////////// | | |
| Defend Battle Position | AOB | 2.45 | 1.09 | 29 | 2.19 | 1.25 | 32 | 1.52 | .99 | 29 | ////////// | | |
| | Unit | 3.93 | 1.16 | 29 | 3.29 | 1.62 | 34 | 3.55 | 1.45 | 29 | ////////// | | |
| Counterattack | AOB | 2.28 | 1.22 | 29 | 1.93 | 1.09 | 31 | 1.55 | .99 | 29 | ////////// | | |
| | Unit | 3.47 | 1.45 | 29 | 3.09 | 1.61 | 32 | 3.45 | 1.38 | 29 | ////////// | | |

| Missions | | Helicopter Gunship Support | | | Close Air Support | | | Air Defense | | | Combined Service Support | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | N |
| Tactical Road March | AOB | ////////// | | | ////////// | | | 1.83 | 1.04 | 29 | 1.73 | 1.00 | 33 |
| | Unit | ////////// | | | ////////// | | | 2.79 | 1.35 | 29 | 3.06 | 1.59 | 34 |
| Passage of Lines (FWD) | AOB | ////////// | | | 1.19 | .48 | 31 | 1.38 | .62 | 29 | 1.53 | .80 | 32 |
| | Unit | ////////// | | | 1.82 | 1.21 | 33 | 2.00 | 1.13 | 29 | 2.32 | 1.30 | 34 |
| Movement to Contact | AOB | ////////// | | | ////////// | | | 1.31 | .60 | 29 | ////////// | | |
| | Unit | ////////// | | | ////////// | | | 2.48 | 1.35 | 29 | ////////// | | |
| Hasty Attack | AOB | 1.23 | .50 | 30 | 1.14 | .35 | 29 | 1.28 | .59 | 29 | ////////// | | |
| | Unit | 2.36 | 1.45 | 33 | 2.22 | 1.28 | 31 | 2.34 | 1.23 | 29 | ////////// | | |
| Defend Battle Position | AOB | 1.22 | .55 | 32 | 1.16 | .45 | 32 | 1.34 | .67 | 32 | ////////// | | |
| | Unit | 2.21 | 1.47 | 33 | 2.51 | 1.39 | 33 | 2.48 | 1.27 | 29 | ////////// | | |
| Counterattack | AOB | 1.45 | 1.05 | 29 | 1.34 | .77 | 29 | 1.34 | .77 | 29 | 1.31 | .76 | 29 |
| | Unit | 2.35 | 1.49 | 31 | 2.19 | 1.38 | 31 | 2.20 | 1.26 | 29 | 2.47 | 1.59 | 30 |

*Note.* Rating Scale: Extent to which conditions are incorporated. 1 = Almost never; 2 = Seldom; 3 = Sometimes; 4 = Moderate; 5 = Quite Often

Table 5

Adequacy of AOB and Unit Training on Six Tactical Missions at Platoon and Company Level

| N = 23 | AOB Training | | Unit Training | |
|---|---|---|---|---|
| Missions | $\bar{X}$ | SD | $\bar{X}$ | SD |
| Tactical Road March | | | | |
| Platoon | 2.65 | 1.07 | 4.56 | .66 |
| Company | 2.21 | 1.24 | 4.60 | .58 |
| Passage of Lines | | | | |
| Platoon | 2.00 | 1.09 | 3.83 | 1.03 |
| Company | 1.95 | 1.22 | 3.91 | 1.04 |
| Movement to Contact | | | | |
| Platoon | 3.00 | 1.27 | 4.34 | .83 |
| Company | 2.52 | 1.30 | 4.39 | .78 |
| Hasty Attack | | | | |
| Platoon | 2.70 | 1.25 | 4.17 | 1.03 |
| Company | 2.22 | 1.13 | 4.09 | 1.12 |
| Defend Battle Positions | | | | |
| Platoon | 3.00 | 1.24 | 4.57 | .66 |
| Company | 2.65 | 1.27 | 4.48 | .85 |
| Counterattack | | | | |
| Platoon | 2.22 | 1.00 | 3.87 | 1.14 |
| Company | 2.00 | 1.00 | 3.83 | 1.23 |

Note. Rating Scale:
1 = Not adequate
2 = Not quite adequate
3 = Barely adequate
4 = Adequate
5 = More than adequate

Table 6

Most Frequently Occurring Responses to Adequacy of Training Questions

Question 1. What tactical missions in AOB should receive more training to ensure adequate preparation into units?

| Percentage | Frequency | Response |
| --- | --- | --- |
| 32 | 12 | Movement to contact |
| 24 | 9 | Passage of lines |
| 24 | 9 | Counterattack |
| 18 | 7 | Hasty attack |
| 16 | 6 | All the missions |

Question 2. What map board games or training devices did you use as part of your tactical training experience in AOB?

| Percentage | Frequency | Response |
| --- | --- | --- |
| 21 | 8 | Dunn-Kempf |
| 21 | 8 | None |
| 18 | 7 | Sand table |
| 13 | 5 | Terrain board |

Question 3. Were you using any map board games or training devices at your unit?

| Percentage | Frequency | Response |
| --- | --- | --- |
| 84 | 32 | Yes |
| 16 | 6 | No |

Table 6 continued

a. If so, what devices did you use?

| Percentage | Frequency | Response |
|---|---|---|
| 50 | 16 | Dunn-Kempf |
| 28 | 9 | Sand tables |
| 22 | 7 | Pegasus |
| 13 | 4 | CAMMS |

b. What tactical leader tasks did these devices allow you to practice?

| Percentage | Frequency | Response |
|---|---|---|
| 29 | 11 | Terrain analysis and maneuver of elements |
| 21 | 8 | Command and control |
| 18 | 7 | Defense |
| 16 | 6 | Call for and adjust fire |
| 13 | 5 | Hasty attack |
| 11 | 4 | Movement to contact |
| 11 | 4 | Communication procedures |
| 11 | 4 | Reporting |

Question 4. What battlefield conditions do you feel should be more often incorporated into tactical training?

| Percentage | Frequency | Response |
|---|---|---|
| 47 | 18 | NBC |
| 24 | 9 | EW |
| 16 | 6 | Engagement simulation |
| 16 | 6 | Enemy air attack |
| 13 | 5 | Close air support |
| 13 | 5 | Artillery support |
| 11 | 4 | Enemy artillery |

Table 6 continued

Question 5. When training on a unit tactical mission, is adequate feedback provided to the tank commanders, platoon leaders, and company commanders on training progress and shortcomings? What is the nature of this feedback?

Adequacy of Feedback

| Percentage | Frequency | Response |
|---|---|---|
| 42 | 16 | Yes |
| 5 | 2 | Occasionally |
| 39 | 15 | No |
| 13 | 5 | No answer |

Yes Responses - Nature of Feedback

| Percentage | Frequency | Response |
|---|---|---|
| 44 | 7 | Debriefing |
| 19 | 3 | Critiques by evaluator |
| 13 | 2 | After action reports |
| 13 | 2 | Verbal discipline |
| 6 | 1 | Scene/mission recreation |

No Responses - Nature of Feedback

| Percentage | Frequency | Response |
|---|---|---|
| 13 | 2 | Feedback degrading not constructive |
| 13 | 2 | Received no battle developments |
| 7 | 1 | Feedback stops at BN |
| 7 | 1 | No casualty assessments |
| 7 | 1 | Written reports 60 days later |
| 7 | 1 | Inadequate debriefing |
| 7 | 1 | Evaluators undermanned - presented an unclear picture |
| 7 | 1 | Unit commanders did not receive after action reports from T.C. level |
| 7 | 1 | Too much emphasis on graded exercises-more guidance is needed and chance to try different ideas |

Table 6 continued

Question 6. Once an ARTEP is taken on a particular mission, does training continue on identified shortcomings? What form does training take?

Continuation of Training

| Percentage | Frequency | Response |
|---|---|---|
| 55 | 21 | Yes |
| 24 | 9 | No |
| 8 | 3 | Occasionally |
| 13 | 5 | No answer |

Yes Responses - Nature of Training

| Percentage | Frequency | Response |
|---|---|---|
| 62 | 13 | Field training |
| 24 | 5 | Class |
| 14 | 3 | Remedial training on shortcomings |
| 10 | 2 | Repetition of problem |
| 10 | 2 | SQT tasks |
| 5 | 1 | Post ARTEP evaluation |
| 5 | 1 | Map and terrain board exercises |
| 5 | 1 | TEWTS |

No Responses - Nature of Training

| Percentage | Frequency | Response |
|---|---|---|
| 22 | 2 | Too little time |
| 11 | 1 | Most training geared to gunnery |

Question 7. Are some missions more difficult to reach proficiency on than others? Please specify.

| Percentage | Frequency | Response |
|---|---|---|
| 84 | 32 | Yes |
| 5 | 2 | No |
| 11 | 4 | N/A |

Table 6 continued

Question 7. Most Frequently Occurring Responses Continued

| Percentage | Frequency | Response |
|---|---|---|
| 16 | 6 | Movement to contact |
| 16 | 6 | NBC |
| 16 | 6 | Passage of lines |
| 13 | 5 | Hasty attack |
| 13 | 5 | Night operations |

Question 8. What type of field training techniques do you use to do collective training (e.g., REALTRAIN, MILES, TEWTS, and/or Dry Runs)?

| Percentage | Frequency | Response |
|---|---|---|
| 50 | 19 | Dry runs |
| 39 | 15 | MILES |
| 37 | 14 | REALTRAIN |
| 29 | 11 | TEWTS |

Question 9. Does your unit conduct multiechelon training (company cdr. and platoon leaders involved in leader training and tank cdrs. involved in crew/battle drill)?

| Percentage | Frequency | Response |
|---|---|---|
| 61 | 23 | Yes |
| 16 | 6 | Occasionally |
| 16 | 6 | No |
| 3 | 8 | N/A |

Question 10. What percentage of your training time is devoted to training on your own specific leader tasks as opposed to supervising unit training?

| Percentage | Frequency | Response |
|---|---|---|
| 53 | 20 | 0-25% of training time |
| 18 | 7 | 26-50% |
| 3 | 1 | 51-75% |
| 11 | 4 | 76-100% |
| 16 | 6 | N/A |

Table 8

Listing of Leader Tasks Associated with Most Difficult Missions at Platoon and Company Level

| Mission | Platoon | | Company | |
|---|---|---|---|---|
| | Response | Frequency | Response | Frequency |
| Tactical Road March | Maintaining speed | 1 | Command and control | 1 |
| | Control of elements | 1 | Identification of terrain | 1 |
| | Map reading | 1 | Map reading | 1 |
| | Identification of terrain | 1 | | |
| | Maintaining interval/distance | 1 | | |
| | Breakdowns | 1 | | |
| | Use of time | 1 | | |
| Passage of Lines | Coordination | 6 | Coordination | 4 |
| | Control of passage | 5 | Training | 2 |
| | Communication | 2 | Command and control | 1 |
| | Fire support | 2 | Planning for fire control | 1 |
| | Security | 1 | Maintaining composure | 1 |
| | Immediate action during passage | 1 | Communication | 1 |
| | Retaining composure | 1 | | |
| Movement To Contact | Command and control | 8 | Maneuver upon contact | 3 |
| | Communication | 3 | Command and control | 3 |
| | Coordination | 3 | Communication | 2 |
| | Navigation | 2 | Coordination of units | 2 |
| | Reporting | 2 | Use of terrain | 1 |
| | React to enemy contact | 1 | Accurate reporting | 1 |
| | Enemy detection | 1 | Map reading | 1 |
| | Distribution of fires | 1 | Attacking correct locations | 1 |
| | Analyzing rapidly incoming information | 1 | | |
| | Training of personnel | 1 | | |
| | Fire support | 1 | | |
| Hasty Attack | Command and control | 8 | Call for fire | 2 |
| | Artillery/air support | 1 | Command | 1 |
| | Change of mission | 1 | Orient and organize elements | 1 |
| | Analyzing information | 1 | Moving concealed | 1 |
| | | | Reporting | 1 |
| | | | Map reading | 1 |
| Defend Battle Positions | Selection of defense positions | 1 | Providing maintenance support | 1 |
| | | | Intelligence | 1 |
| | | | Reporting | 1 |
| Counter-attack | Command and control | 8 | Command and control | 6 |
| | Reconsolidation | 2 | Intelligence | 2 |
| | React to enemy contact/ actions at objective | 2 | Reconsolidation | 2 |
| | | | Coordination with other units | 1 |
| | Timely reporting of contact | 1 | FRAGO | 1 |
| | Intelligence | 1 | Actions at objective | 1 |
| | Receiving support | 1 | Effective use of time | 1 |
| | Integration of friendly fire support | 1 | | |
| | FRAGO | 1 | | |
| | Forward recon and development of plan | 1 | | |

Table 9

Identification of Further Unit Training Needed in Field and Nonfield Settings for Six Tactical Missions

| Mission | Field | | | | Nonfield | | | |
|---|---|---|---|---|---|---|---|---|
| | Yes | | No | | Yes | | No | |
| | Freq-uency | Per-cent | Freq-uency | Per-cent | Freq-uency | Per-cent | Freq-uency | Per-cent |
| Tactical Road March | | | | | | | | |
| Tasks: | | | | | | | | |
| • Develop fire support plan on potential OPFOR positions | 30 | 79 | 5 | 13 | 30 | 79 | 6 | 16 |
| • Assign tank sectors of fire | 24 | 63 | 13 | 34 | 24 | 63 | 10 | 26 |
| • Develop and execute movement control measures | 30 | 79 | 7 | 18 | 26 | 68 | 9 | 24 |
| • Develop movement route to maximize terrain protection | 30 | 79 | 7 | 18 | 24 | 63 | 11 | 31 |
| • Develop and execute contingency plans/drills (formations, actions, and alert signals) | 32 | 84 | 4 | 11 | 30 | 79 | 6 | 16 |
| • Please specify other tasks not mentioned here | | | | | | | | |
| All ARTEP Tasks | 1 | | | | 1 | | | |
| Interval of vehicles | 1 | | | | 1 | | | |
| Close air support | 1 | | | | 1 | | | |
| Smoke use | 1 | | | | 1 | | | |
| Mines | 1 | | | | 1 | | | |
| Passage of Lines | | | | | | | | |
| Tasks: | | | | | | | | |
| • Establishment of passage lanes, traffic control procedures, and identification of times and locations to rendezvous with guides | 33 | 87 | 5 | 13 | 31 | 82 | 6 | 16 |
| • Develop and execute communication plan | 22 | 58 | 15 | 39 | 18 | 47 | 16 | 42 |
| • Develop and execute supporting fire plan | 29 | 76 | 9 | 24 | 31 | 82 | 5 | 13 |
| • Control a passage of lines | 37 | 97 | 1 | 3 | 26 | 68 | 10 | 26 |
| Movement to Contact | | | | | | | | |
| Tasks: | | | | | | | | |
| • Develop fire support, overwatch and maneuver plans to minimize surprise and first firing capability by OPFOR | 34 | 89 | 3 | 8 | 31 | 82 | 4 | 11 |
| • Direct fires against OPFOR position | 27 | 71 | 10 | 26 | 21 | 55 | 13 | 34 |

Table 9 continued

| Mission | Field | | | | Nonfield | | | |
|---|---|---|---|---|---|---|---|---|
| | Yes | | No | | Yes | | No | |
| | Freq-uency | Per-cent | Freq-uency | Per-cent | Freq-uency | Per-cent | Freq-uency | Per-cent |
| • Execute protective measures to negate subsequent OPFOR firings | 30 | 79 | 5 | 13 | 29 | 76 | 6 | 16 |
| • Obtain SPOTREP on OPFOR | 28 | 74 | 9 | 24 | 26 | 68 | 10 | 26 |
| • Develop situation | 32 | 84 | 5 | 13 | 25 | 66 | 10 | 26 |
| • Please specify other tasks not mentioned here | | | | | | | | |
| All areas | 1 | | | | 1 | | | |
| Hasty Attack | | | | | | | | |
| Tasks: | | | | | | | | |
| • Develop attack plan, issue FRAGO | 30 | 79 | 6 | 16 | 27 | 71 | 9 | 24 |
| • Direct and control attack | 34 | 89 | 3 | 8 | 30 | 79 | 5 | 13 |
| Defend Battle Positions | | | | | | | | |
| Tasks: | | | | | | | | |
| • Anticipate likely avenues of approach and OPFOR attack options (likely areas for OPFOR artillery, suppressive fires) | 27 | 71 | 8 | 21 | 24 | 63 | 11 | 29 |
| • Develop defensive plans | 30 | 79 | 4 | 11 | 27 | 71 | 7 | 18 |
| • Develop contingency plans and appropriate signals if weapon system losses threaten defense | 29 | 76 | 7 | 18 | 27 | 71 | 8 | 21 |
| • Develop integrated fire plans based on possible enemy attack options for day and night conditions | 29 | 76 | 6 | 16 | 25 | 66 | 10 | 26 |
| • Develop detailed communications plan to implement defensive plan (quick and accurate SITREPs, signals to coordinate direct fires, targets, movement to alternate positions, and withdrawal) | 26 | 68 | 10 | 26 | 25 | 66 | 10 | 26 |
| • Direct and control a defense | 34 | 89 | 2 | 5 | 27 | 71 | 7 | 18 |
| • Assess intelligence from OPFOR sightings or contact and anticipate OPFOR actions | 30 | 79 | 6 | 16 | 26 | 68 | 8 | 21 |
| • Coordinate direct and indirect fires | 31 | 82 | 5 | 13 | 26 | 68 | 8 | 21 |

Table 9 continued

| Mission | Field | | | | Nonfield | | | |
|---|---|---|---|---|---|---|---|---|
| | Yes | | No | | Yes | | No | |
| | Freq-uency | Per-cent | Freq-uency | Per-cent | Freq-uency | Per-cent | Freq-uency | Per-cent |
| • Mix primary and alternate firing positions to minimize effects of OPFOR direct fire weapon system and artillery | 31 | 82 | 5 | 13 | 22 | 58 | 11 | 29 |
| • Reassess tactical situation | 32 | 84 | 4 | 11 | 26 | 68 | 7 | 18 |
| Counterattack | | | | | | | | |
| _Tasks:_ | | | | | | | | |
| • Analyze intelligence, determine OPFOR size and weapon systems | 32 | 84 | 4 | 11 | 30 | 79 | 5 | 13 |
| • Analyze terrain, estimate OPFOR deployment, potential TRPs/FPFs and sectors of fire | 32 | 84 | 4 | 11 | 29 | 76 | 5 | 13 |
| • Develop attack plan, issue FRAGO | 32 | 84 | 4 | 11 | 29 | 76 | 5 | 13 |
| • Direct and control counter-attack | 35 | 92 | 1 | 3 | 31 | 82 | 3 | 8 |

Table 13

Estimated Mean Number of Previous Tactical Missions, Phases, and Events

| | Mdn | $\bar{X}$ | SD | N | Percent Unscorable Responses |
|---|---|---|---|---|---|
| <u>Movement to Contact</u> | | | | | |
| Question 1. Based upon your engagement simulation experience, how many times did you lead a movement to contact mission? | 4.5 | 16.09 | 36.72 | 34 | 8 |
| a. Of these times, how often did you employ direct fire to support your units movement? | 5.0 | 16.37 | 31.19 | 15 | 59 |
| b. Of these times, how often did your overwatch elements make detections prior to OPFOR firings? | 4.0 | 16.13 | 42.26 | 12 | 68 |
| c. Of these times, how often were OPFOR positions prevented from firing (smoke obscuration or suppression)? | 3.0 | 15.57 | 44.52 | 14 | 62 |
| <u>Initial Contact</u> | | | | | |
| Question 2. Based upon past engagement simulation exercises, estimate the number of initial contact situations you led. | 3.5 | 7.71 | 13.18 | 29 | 22 |
| Of the number of initial contact situations you led, in how many: | | | | | |
| a. Did you identify targets to other unit elements and coordinate unit fires? | 3.5 | 6.75 | 8.63 | 10 | 73 |
| b. Did elements in contact provide prompt information on OPFOR units? | 3.5 | 4.21 | 3.68 | 12 | 68 |
| c. Were contact reports on OPFOR activity accurate as to location? | 3.5 | 9.40 | 18.05 | 10 | 73 |

Table 13 continued

| | Mdn | $\bar{X}$ | SD | N | Percent Unscorable Responses |
|---|---|---|---|---|---|
| d. Did you know the location of your tanks and their status? | 3.5 | 11.00 | 11.86 | 10 | 73 |
| e. Did you give immediate guidance to your unit elements for protection measures? | 4.5 | 7.25 | 8.65 | 12 | 68 |
| f. Did the unit act in a fragmented fashion with tanks fighting on their own? | 1.5 | 3.41 | 5.75 | 11 | 70 |
| g. Was your tank assessed an early casualty? | 1.8 | 2.14 | 2.78 | 11 | 70 |
| h. Did your tank engage OPFOR targets? | 4.5 | 10.30 | 16.31 | 10 | 73 |
| *Question 3. Estimate the number* of times your tanks were engaged during movement to contact by antitank missile weapon systems. | 2.29 | 6.89 | 15.53 | 33 | 11 |
| Of these times, in how many: | | | | | |
| a. Did your engaged tanks receive early warning that would have made evasive action possible? | 1.5 | 3.68 | 6.18 | 11 | 70 |
| b. Were targeted tanks hit by the OPFOR? | 2.25 | 4.09 | 5.51 | 11 | 70 |
| c. Was your unit able to suppress or neutralize OPFOR launch platforms? | 2.1 | 3.00 | 4.05 | 12 | 68 |
| Develop the Situation | | | | | |
| Question 4. Based upon your engagement simulation experience, how many times did you have the opportunity to develop the situation after initial contact? | 4.0 | 7.43 | 10.99 | 29 | 22 |

Table 13 continued

| | Mdn | $\bar{X}$ | SD | N | Percent Unscorable Responses |
|---|---|---|---|---|---|
| Of the number of times you had n opportunity to develop the situation, how many of these times: | | | | | |
| a. Was your unit strength sufficient to continue to develop the situation or conduct a hasty attack? | 3.75 | 5.92 | 6.99 | 13 | 65 |
| b. Did you pursue additional information on OPFOR activity? | 2.75 | 3.64 | 4.27 | 11 | 70 |
| c. Did you reconsider likely secondary or alternate OPFOR firing positions? | 3.0 | 2.95 | 3.34 | 11 | 70 |
| d. Were you able to locate a weak point in enemy disposition? | 3.0 | 3.73 | 3.17 | 11 | 70 |
| <u>Hasty Attack</u> | | | | | |
| Question 5. Based upon your engagement simulation experience, how many times did you lead a hasty attack? | 4.0 | 5.38 | 5.69 | 33 | 11 |
| Of these times, in how many: | | | | | |
| a. Did you communicate a plan for the hasty attack to your units prior to becoming fully engaged? | 5.5 | 4.96 | 3.12 | 12 | 68 |
| b. Were subordinate elements positioned to take advantage of OPFOR disposition? | 2.5 | 3.33 | 2.99 | 12 | 68 |
| c. Did you place indirect fire (smoke or HE) on OPFOR positions prior to your assault? | 3.5 | 4.14 | 3.10 | 12 | 68 |
| d. Did your fire support element destroy OPFOR positions? | 1.5 | 2.88 | 2.91 | 12 | 68 |

Table 13 continued

| | Mdn | $\bar{X}$ | SD | N | Percent Unscorable Responses |
|---|---|---|---|---|---|
| e. Did you receive reports on casualties, progress, OPFOR targets, and OPFOR actions during the assault? | 5.0 | 4.13 | 3.10 | 11 | 70 |
| <u>Defend Battle Positions</u> | | | | | |
| Question 6. Based on your engagement simulation experience, how many times did you perform a defensive mission? | 6.0 | 16.52 | 36.43 | 31 | 16 |
| Of these times, in how many: | | | | | |
| a. Did you correctly anticipate the OPFOR's avenues of approach? | 4.5 | 7.75 | 8.64 | 16 | 57 |
| b. Did your unit successfully engage OPFOR targets at: | | | | | |
| more than 3,000 meters? | 1.25 | 2.14 | 2.67 | 11 | 70 |
| 2,000 - 3,000 meters? | 2.0 | 4.0 | 4.42 | 10 | 73 |
| 1,000 - 2,000 meters? | 6.0 | 7.45 | 6.11 | 11 | 70 |
| c. Did your weapon systems engage first? | 3.25 | 12.60 | 25.31 | 15 | 54 |
| Did OPFOR weapon systems engage first? | 0 | 7.44 | 24.78 | 16 | 57 |
| e. Were your weapon systems destroyed after initiating the engagement? | 1.1 | 1.54 | 1.56 | 12 | 68 |
| f. Were you aware of OPFOR locations after initial contact? | 5.0 | 7.08 | 7.93 | 12 | 68 |

# APPENDIX E

## Exercise Narrative Movement to Contact/Hasty Attack

APPENDIX E

Exercise Narrative
Movement to Contact/Hasty Attack

AOB Tactical Exercise Number 1, 14 Nov 82

## Situation

The 1st and 2nd platoons were to secure objective SNAKE (850947, section of US 60 on high ground). Contact was expected and any OPFOR elements in the area were to be neutralized. Platoons were to travel using bounding overwatch. The 1st platoon was initially to occupy a support position with the 2nd platoon maneuvering. The Company Team Commander's (CTC) role was performed by an instructor. The CTC coordinated the platoons' movement using graphic control measures (phase lines and check points).

The 2nd and 3rd platoons were to execute a delaying action in the sector with instructions not to get decisively engaged.

## Outcome

The 1st platoon initially lost two tanks in the first support position. The 2nd platoon lost one tank in the initial maneuver phase. The 1st platoon's support position was compromised from the beginning and effective overwatch was not provided. The platoon did not identify any OPFOR targets and the 2nd platoon moved without any covering fire. The attacking platoons lost 30% of their force at the first of 4 OPFOR delay positions. Only 2 of 10 friendly tanks were operating when the exercise was terminated.

## Actions

The CTC called for smoke on CP#2 and directed 1st platoon to overwatch and 2nd platoon to move to CP#2. The OPFOR tanks, located just east of CP#2, observed 2 friendly tanks moving into the support position as a result of the sun reflecting off the tanks' cupolas. Those tanks were engaged and destroyed. The other two platoon tanks did not observe the OPFOR tanks firing. The 1st platoon leader did not provide an immediate report of contact, casualties, or suspected OPFOR positions. Meanwhile the 2nd platoon continued to maneuver and lost a tank to OPFOR fire. The 2nd platoon leader radioed "Contact North" but did not follow up with any details, tank losses, OPFOR positions, and the platoon's inability to locate and dislodge the OPFOR. The CTC requested a preplot on CP#4 be fired. However, the platoon leader did not shift fires on the suspected target area. The CTC radioed several times to the 2nd platoon leader to keep moving to CP#2. The platoon leader did not get back on the radio to CTC and had moved the platoon into defilade to prevent any further direct fire casualties. The platoon remained in that position for several minutes and came under indirect fire. While under indirect fire, the platoon began to move to CP#2. Prior to the platoon reaching CP#2, the CTC ordered the 1st platoon to move to CP#3. Consequently, both platoons were moving independently of each other; bounding overwatch between platoons ceased to be used for the remainder of the exercise.

Once on CP#2, the 2nd platoon leader submitted the following SPOTREP: "One OPFOR tank and one platoon tank destroyed, OPFOR withdrawing." The OPFOR was actually pulling back only one section of tanks, while the other section remained in a defensive posture between CP#2 and CP#5. From the SPOTREP it appears the platoon leader, observing one section of OPFOR tanks withdrawing, assumed all OPFOR tanks had pulled back.

The CTC ordered 2nd platoon to move to CP#5. Enroute the platoon was engaged by the OPFOR light section, which had remained in the vicinity of CP#2 and 5. This OPFOR section had been bypassed by 1st platoon as it moved from CP#3 to CP#4 (the OPFOR tanks had been unable to track and engage the fast moving M1 tanks of the 1st platoon).

In this contact, the 2nd platoon leader's tank and a 3rd tank were destroyed. No SPOTREP was submitted from the remaining elements of 2nd platoon. The 1st platoon, now moving far ahead of the 2nd platoon, came under effective OPFOR direct fire and the remaining two tanks were lost. At this point, the exercise was terminated.

Comments

Note. The following comments were derived by comparing observations made while moving with the 2nd platoon with a tape recording of the tactical command net.

- Bounding overwatch (one platoon moving with another platoon in position to support fire) did not take place except for the initial movement from the attack position. The support platoon, however, was not effective as it was observed by the OPFOR and successfully engaged.

- Spot Reports (SPOTREPs) were generally not on time, incomplete, and inaccurate. For example, the observed platoon met stiff OPFOR resistance on two occasions. In the first contact situation, the platoon leader's SPOTREP failed to communicate the platoon's actual situation to the CTC. The SPOTREP only mentioned OPFOR and platoon losses; it did not include the fact that OPFOR tanks were still in the area, that the platoon was in a defilade position, and that it was receiving indirect fire. The second contact situation saw the platoon leader's tank hit, and although two platoon tanks were operational, a SPOTREP was never transmitted.

- Visual signals or voice commands to initiate battledrills (fire and maneuver against OPFOR) were seldom seen or heard. Tanks tended to operate individually as opposed to sections or as a platoon.

- Overwatch within platoons was sporadic. Not once did we observe an overwatching tank engage an OPFOR target before that target fired. Most often tanks did not provide support to maneuvering tanks. Frequently, OPFOR tanks fired without being observed or receiving return fire.

- The instructors who acted as CTCs did not seem to encourage lieutenants to effectively develop the situation and provide situation assessments to them. Rapid movement to CPs was constantly emphasized, even though the tactical situation (stiff OPFOR resistance) indicated other options be considered.

- Attack and defend ratio was 1:1. Although time constraint is the primary reason for this, the ratio is a major contributing factor to the early neutralization of the attacking unit.

- The absence of a dual radio capability (no separate platoon net) probably contributed to the lack of communication between the platoon leader and his tank commanders.

Exercise Narrative
Movement to Contact/Hasty Attack

AOB Tactical Exercise Number 2, Nov 16, 1982

## Situation

The 1st and 2nd platoons were to search out the OPFOR and conduct a hasty attack once the OPFOR was located. The 2nd platoon was to occupy CP#1 (850947), locate the OPFOR, and establish a base of fire. Once the OPFOR disposition was known, the Company Team Commander (CTC) would call for indirect fire (high explosive and smoke) and move the 1st platoon to the right of CP#1 and onto CP#2 (852933). The tactical situation was to be reassessed at CP#2; however, the CTC wanted to keep the 1st platoon (M1 tanks) moving as fast as possible to bypass the OPFOR. The 3rd and 4th platoons were to execute a delaying action in sector with instructions not to get decisively engaged.

## Outcome

The 2nd platoon made contact as it moved into CP#1. One tank was immediately lost, and within a couple of minutes a second tank was hit. The 1st platoon moved to CP#2 without being supported by 2nd platoon which was in contact. The 1st platoon bypassed the OPFOR left flank. Two of the platoon's four tanks were lost to bypassed OPFOR elements engaging from the rear. The remainder of the 2nd platoon (3 tanks) moved out of CP#1 on orders from the CTC. The platoon had OPFOR tanks both at its front and rear. All three tanks were lost in a series of independent actions.

## Actions

The 2nd platoon drew fire moving into CP#1. The platoon leader's tank was immediately hit. No one reported the contact and losses for several minutes. After the CTC requested a SPOTREP, contact was reported, and OPFOR was identified to be south of CP#1. There was no mention in the SPOTREP that the platoon was still in contact and a 2nd tank had been lost. The platoon did not report that it was unable to locate OPFOR targets. The CTC ordered the platoon to lay down a base of fire and maneuver.

While 2nd platoon was in contact, the CTC had the 1st platoon moving toward the CP#2. The platoon moved unsupported as 2nd platoon was being engaged. The 2nd platoon moved out of CP#2 and almost immediately the tanks ceased to operate as a platoon. There was no indication of anyone directing the tanks; subsequent movement was completely uncoordinated.

The OPFOR tanks were now in front and behind the 2nd platoon. A third 2nd platoon tank was successfully engaged by an OPFOR tank located only 75 meters away. The OPFOR tank was engaged on its blind side by another 2nd platoon tank. This tank, in turn, was destroyed by an OPFOR tank approaching from the rear. The last 2nd platoon tank was also destroyed by a "Grill Door" shot.

During this series of engagements only one SPOTREP was communicated. The report cited an OPFOR tank destroyed; it made no mention of platoon casualties or the fact the OPFOR had the platoon cut off and virtually surrounded. The OPFOR, although it did eliminate the second platoon, did not successfully complete its mission either, as it had been instructed to not become decisively engaged. The first platoon continued to move at a rapid rate and bypassed some OPFOR units. The first platoon then found itself engaging OPFOR units to its front and rear. Two first platoon tanks were lost by "Grill Door" shots, and one was hit from the front.

Only one SPOTREP was monitored from first platoon. This report, like the others, provided incomplete information. Reported losses were inaccurate, and the fact that platoon had OPFOR tanks to its front and rear was not mentioned.

Comments

Many of the same ineffective behaviors seen in the first tactical exercise also were observed in this exercise.

- Overwatch between platoons did not exist. Frequently, OPFOR tanks were firing first, obtaining first round hits and not being detected. Probable enemy locations were not being covered, and platoon tanks were moving into OPFOR fields of fire without covering support.

- Upon contact, platoon leaders generally failed to get tanks into defilade positions and locate targets. Often a second tank was lost before the platoon reacted. Platoon leaders were not observed nor monitored attempting to develop and execute a scheme of maneuver against suspected OPFOR positions.

- There appeared to be a complete inability to read terrain, especially when in contact. Even though OPFOR positions were known to be nearby, there was no evidence that platoon leaders analyzed the terrain to help determine their location. Also, when moving out, tanks did not use the folds of the terrain. Instead, tank commanders would maneuver their tanks over open terrain, even with the knowledge that the area was covered by OPFOR weapons. Many tanks were hit moving through an area already containing destroyed tanks.

- Submitted SPOTREPs continued to be inaccurate and incomplete. Platoon losses were not reported accurately; nor was the platoon situation communicated properly. For example, the 2nd platoon never reported its initial heavy losses (2 tanks) accurately and the fact that the platoon had OPFOR tanks to its front and rear. The 2nd platoon needed help; however, the CTC was not aware of the fact due to poor transfer of information.

- Platoon leaders seemed unable to change plans. All platoon leaders continued to execute the initial plan even though their immediate situation called for an alternate plan.

APPENDIX F

Table 15 Device Descriptions

## APPENDIX F

Table 15

Device Description

| | |
|---|---|
| Device Name: | Observed Fire Trainer (OFT). |
| Vendor/Proponent: | Invertron Simulated Systems Ltd. (U.K.)<br>U.S. Army Field Artillary School. |
| Purpose: | To provide initial and refresher training in the observation and adjustment of fire and for fire planning. |
| Target Audience: | Forward Observers and Battery Commanders. |
| User Location: | Institution. |
| Type of Device: | The OFT utilizes image projectors and a minicomputer with keyboard and monitor to conduct forward observer training. |
| Associated Hardware/ Software: | The Invertron system employs a simulated laser range finder, moving target controller, and optical servo system for positioning burst symbols and targets. Projection screen is 6 meters by 1.5 meters. Sound simulation is provided for shell aerodynamics and burst noise, single shot and automatic weapons fire, tracked and wheeled vehicles, and helicopters. A communication system provides three tactical networks plus a private interphone line. |
| Principal Training Missions/Tasks: | Observations and adjustment of fire for all types of indirect fire control, map reading, position siting, terrain recognition, and exercises preplanning. |
| Status: | Implemented. |
| Information Source(s) | Comprehensive Plan for Training Devices, (1981, July). Invertron Brochure. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Videodisc Interpersonal Skills Training and Assessment (VISTA) project. |
| Vendor/Proponent: | Litton Mellonics Systems Development Group/Army Research Institute Field Unit, Ft. Benning, GA. |
| Purpose: | To determine the feasibility of training leadership and counseling skills using current computer assisted videodisc technology. |
| Targeted Audience: | Second lieutenants in the Infantry Officer Basic Course. |
| User Location: | Institution. |
| Type of Device: | Computer assisted videodisc technology. |
| Associated Hardware/ Software: | The system consists of an MCA PR-7820 videodisc player interfaced to an Apple-II computer (48k plus PASCAL language card) via a Colony Products VAI controller card. PASCAL is the programming language. Students interact with display scenarios by means of a hand-held cursing device or by means of a Symtec light pen. A Mountain Hardware real-time clock is used to measure response latencies and for cueing video segments. |
| Principal Training Missions/Tasks: | Principle of leadership, interpersonal skills. |
| Status: | Currently used as a counseling aid in IOBC classes. |
| Information Source(s): | Schroder, J. E. (1982, August). U.S. army VISTA evaluation results. Proceedings of the Society for Applied Learning Technology Conference on Video Learning Systems, (pp. 1-3). Arlington, VA. |
| | Personal demonstration at ARI Field Unit - Ft. Benning, GA. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Naval Tactical Game (NAVTAG) Training System. |
| Vendor/Proponent: | Syscon Corporation/Naval Training Equipment Center. |
| Purpose: | To reinforce tactical skills at the shipboard level; specifically, decision making skills calling for the conceptual integration of weapons systems, sensors, and platform employment within tactical scenarios. |
| Target Audience: | Surface Warfare Officer. |
| User Location: | Aboard ship. |
| Type of Device: | An automated tactical training system. |
| Associated Hardware/ Software: | The hardware consists of three interconnected video display terminals serving a game director station and two independent player stations. Each station includes an alphanumeric keyboard, a magnetic disk for mass storage, and a microcomputer (WICAT 150-3). All stations share a single printer. Software allows students to enter commands (maneuver, sensor employment, and weapon employment), compute the consequences of resulting actions, generate displays of the results of friendly or opposing force action. A maintenance handbook along with user and scenario guides are provided. |
| Principal Training Missions/Tasks: | Increase knowledge of the capabilities of U.S. and threat Naval Forces, accounting for ship classes, submarine classes, naval aircraft types, sensor systems, countermeasure systems and weapons systems.<br><br>Increase knowledge of tactical doctrine for surface warfare, antisubmarine warfare, and antiair warfare.<br><br>Increase skill in tactical decision making for employing available sensors in preengagement search and surveillance, assessing threat information implementing appropriate responses, and redirecting surviving counters to remaining threat as engagement progresses. |
| Status: | Fifteen preproduction copies delivered to fleet. |
| Information Source(s) | <u>Fleet tactical game (NAVTAG) training system: Executive summary</u> (1983). Demonstrated at Naval Microcomputer Conference, Monterey, CA. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Minefield Breaching Battledrill Evaluation (MBBE). |
| Vendor/Proponent: | U.S. Army Engineer School. |
| Purpose: | Engineer Leader trainer for minefield breaching; to to train and test mission related decision making skills. |
| Targeted Audience: | Combat engineers at squad leader level. |
| User Location: | Active engineer units. |
| Type of Device: | Interactive videodisc. |
| Associated Hardware/ Software: | Videodisc player, display screen, keyboard, training scenarios. |
| Principal Training Missions/Tasks: | Minefield breaching using the M173 Line Charge, and related decision making skills. |
| Status: | Test and evaluation. |
| Information Source: | MME brochure prepared for Commander's conference, (1982). Crystal City, VA. |

Table 15 continued

Device Description

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| | |
|---|---|
| Device Name: | Dunn-Kempf. |
| Vendor/Proponent: | U.S. Army Training Support Center/Combined Arms Center. |
| Purpose: | To provide training in small unit tactics, weapon systems capabilities and lethality, and proper use of terrain and maneuver tactics. |
| Targeted Audience: | Company level and below. |
| User Location: | Unit. |
| Type of Device: | Manual battle simulation. |
| Associated Hardware/ Software: | Miniature models of U.S. and OPFOR tanks, armored personnel carriers, BMPs and other weapons systems. |
| Principal Training Missions/Tasks: | Plan the conduct of tactical operations, employ U.S. weapons and understand the range and lethality of these weapons, understand OPFOR tactics and weapons, maneuver a squad, platoon, or company using the terrain. |
| Status: | Implemented. |
| Information Source(s): | U.S. Army Training Support Center (1982, April). Battle Simulation (Bulletin No. 82-1). |

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Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | BLOCKBUSTER. |
| Vendor/Proponent: | Combined Arms Training Developments Activity (CATRADA). |
| Purpose: | To train Company Commanders and Platoon Leaders to plan and conduct combat operations in and around urbanized terrain. |
| Target Audience: | Company Commanders and Platoon Leaders. |
| User Location: | Unit. |
| Type of Device: | Manual battle simulation. |
| Associated Hardware/ Software: | Three-dimensional terrain board, vehicle miniatures, simulated weapons systems, buildings, rubble, rules of play, random number tables, and combat result tables. |
| Principal Training Missions/Tasks: | To plan and execute Military Operations on Urbanized Terrain (MOUT) while using supporting artillery, attacking helicopters, close air support, air defense artillery and engineers. |
| Status: | In production. |
| Information Source(s) | U.S. Army Training Support Center (1982, April) Battle Simulations (Bulletin No. 82-1). |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Tactical Training (TACTRAIN) facility. |
| Vendor/Proponent: | Electric Boat Division of General Dynamics. |
| Purpose: | To train decision making skills and for use as an experimental tool for evaluation of alternative tactical display/interrogation formats. |
| Targeted Audience: | Research participants investigating submarine commander decision making. |
| User Location: | Research facility. |
| Type of Device: | Computer driven, interactive CRT display. |
| Associated Hardware/ Software: | CRT with capability to provide a graphic portrayal of the interactions between tactical and environmental variables; the player interrogates a display with a light pen to retrieve stored information. |
| Principal Training Missions/Tasks: | Submarine commander decision making skills. |
| Status: | Experimental. |
| Information Source(s) | Nickerson, R. & Feehrer, C. (1975, August). Decision making and training (Tech. Rep. NAVTRAEQUIPCEN 73-C-1028-1). Orlando, FL: Naval Training Equipment Center. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | MACE. |
| Vendor/Proponent: | BDM, Inc.<br>Combined Arms Training Developments Activity (CATRADA). |
| Purpose: | To train active and reserve component maneuver battalion/squadron battle staffs in command, control and communications of combined arms operations in simulated combat environment. |
| Targeted Audience: | Battalion commanders. |
| User Location: | Unit. |
| Type of Device: | Microcomputer driven, interactive, free play, real time, part task trainer. |
| Associated Hardware/ Software: | Videodisc player, graphics generator, hard disk memory, video display, video cassette recorder, battle sound system, closed circuit TV, communication system, printer. |
| Principal Training Missions/Tasks: | Command, control and communications of combined arms operation. |
| Status: | Operational testing, prototypes available in Europe, 1983. |
| Information Source(s): | Briefing at Battle Simulations Directorate, Combined Arms Training Developments Activity. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | TACWAR. |
| Vendor/Proponent: | University of Central Florida/Naval Training Equipment Center. |
| Purpose: | Designed as a U.S. Marine Corps company-level, wargame-based training system to provide small-unit leaders an opportunity to make combat decisions and to receive feedback from those decisions. |
| Targeted Audience: | Company Commander, Platoon Commander, Platoon Sergeant, Squad Leader, Section Leader, Forward Observer. |
| User Location: | Instituion and unit. |
| Type of Device: | A manual war game allowing for two-sided engagements. |
| Associated Hardware/ Software: | TACWAR consists of a terrain board, playing pieces, game rules, lesson packages and guides, and handbooks for instructors, controllers, and training management. |
| Principal Training Missions/Tasks: | Helicopter Assault, Reaction Force, Platoon Ambush, Movement to Contact, Hasty Defense. |
| Status: | Delivery of production copies, October, 1983. |
| Information Source(s): | Naval Training Equipment Center (1982, October). <u>TACWAR - Executive summary: Plan of action and milestones for USMC manual wargame based training systems</u>. Orlando, FL. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | MK-60 Tank Gunnery Trainer. |
| Vendor/Proponent: | Perceptronics/U.S. Army Tank Training Support Center and Defense Advanced Research Projects Agency. |
| Purpose: | To provide gunner with realistic and effective engagement skills training in both initial entry and sustainment training modes. |
| Targeted Audience: | Tank gunners. |
| User Location: | Institution and unit. |
| Type of Device: | The MK-60 is a real-time, interactive, part-task training system based on video-disc and microcomputer technology. |
| Associated Hardware/ Software: | The simulation system consists of an MCA PR-7820 videodisc player for allowing video scenes of target vehicles to be displayed in the gunner's vehicle. The microcomputer accesses the target scenes, keys synthetic sound effects, processes gunner's actions, generates visual effects in the target scene, keeps time data, scores, and displays performance data. The trainer is fitted with gunner controls and a scoreboard affixed to the trainer station automatically keeps track of the gunner's performance. |
| Principal Training Missions/Tasks: | Initial gunnery training of stationary or moving targets. Advanced training with evasive targets, multiple targets, battlefield clutter, and smoke. Practice in acquiring neon infra-red and thermal imagery is possible. |
| Status: | Under evaluation by the Armor School and ARI Field Unit, Ft. Knox. |
| Information Source(s): | Perceptronics. |
| Note: | Similar simulation configurations produced by Perceptronics include the MK-729 Combat Engineer Vehicle Gunnery Trainer and the MK-2/3 Bradley Fighting Vehicle Gunnery Trainer. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Automatisierte Panzerkampf Simulationsanlage (APKA) (Automated Tank Combat Simulation System: English Name) |
| Vendor/Proponent: | IAGB |
| Purpose: | Used for tactical preparation for real combat trials to formulate new tactics tailored to modified tank components, variable tactics for different types of terrain, operational study of weapons which can be elevated. |
| Targeted Audience: | Tank commander and driver. |
| User Location: | Research facility. |
| Type of Device: | Mobile, computer-aided interactive tank combat simulator. |
| Associated Hardware/ Software: | System mounted on 6 vans, each with 5 simulation stations, plus 1 van for umpires who can observe the tactical behavior of participants, 1 van with central computer, 1 van with electrical power unit, 1 service van. Each simulation station consists of seats and displays for the tank commander and driver, and various controls that allow interaction. |
| Principal Training Missions/Tasks: | Tank commander and driver decision making skills including best tank movement techniques, line of sight, tank positions, formations, engagement. |
| Status: | Prototype. |
| Information Source(s): | Reimer J. (1983, November). Description of the automated tank combat simulation system. (Unpublished paper). |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Janus. |
| Vendor/Proponent: | Lawrence Livermore National Laboratory. |
| Purpose: | To model air and land combat using a two-sided, real-time interactive war game simulation. |
| Targeted Audience: | Battalion commanders. |
| User Location: | Research facility. |
| Type of Device: | Interactive graphics simulation system. |
| Associated Hardware/ Software: | A VAX-11/780 with four Ramtek 9400s with a device independent graphics software package, the DI-3000 from Precision Visuals, Inc. Full range of interactive graphics capabilities including color, three dimensionality, high resolution color mapping and imagery, and a graphics data structure. |
| Principal Training Missions/Tasks: | Battle commander decision making skills. |
| Status: | Under development. |
| Information Source(s): | Warner, J. (1983, July). CPU in the trenches. Hardcopy, 63-65. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Combined Arms Tactical Training Simulator (CATTS). |
| Vendor/Proponent: | Combined Arms Training Developments Activity (CATRADA). |
| Purpose: | To train maneuver battalion and cavalry squadron command groups to attain and sustain the ARTEP standards in the control and coordination of combined arms operations. |
| Targeted Audience: | A computer-driven battle simulation that provides a realistic approximation of a battlefield environment. CATTS simulates the actions of units in combat and calculates intervisibility, weapon to target ranges and weapons effect. Maintains status of personnel, equipment, ammunition and fuel. |
| Associated Hardware/ Software: | Main frame computer, software includes line of sight module, digitized terrain, target acquisition, ground fire engagement, ground movement, air movement and fire, air defense fires, logistics. |
| Principal Training Missions/Tasks: | To enhance the knowledge of a battalion commander and staff on the necessary actions, decisions, and coordination that must occur in an efficiency operated battalion command post during combat operation. |
| Status: | Implemented at Fort Leavenworth only. |
| Information Source(s): | U.S. Army Training Support Center (1982, April). Battle Simulations. (Bulletin No. 82-1).<br>U.S. Army Training Support Center (1981, July). Comprehensive Plan for Training Devices. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | A ıy Training Battle Simulations Systems (ARTBASS). |
| Vendor/Proponent: | Combined Arms Training Developments Activity (CATRADA). |
| Purpose: | To train maneuver battalion commanders and staffs in the control and coordination of combined arms warfare, enabling them to attain and sustain ARTEP standards. |
| Targeted Audience: | Mechanized infantry, armor, and cavalry squadron commanders and staffs. |
| User Location: | Unit. |
| Type of Device: | Van-portable, computer driven, two-sided, freeplay, real time battle simulation with high fidelity. |
| Associated Hardware/ Software: | Digitized terrain data base, van-portable computer driven system. |
| Principal Training Missions/Tasks: | Development of command, control, and communication skills. |
| Status: | Under development. |
| Information Source(s): | U.S. Army Training Support Center (1981, July). Comprehensive Plan for Training Devices.<br><br>U.S. Army Training Support Center (1982, April). Battle Simulations (Bulletin No. 82-1).<br><br>Campbell, D. M. COL (1981, September). Resources optimization via training devices Army R, D & A Magazine. |

Table 15 continued

Device Description

| | |
|---|---|
| Device Name: | Conduct of Fire Trainer (COFT). |
| Vendor/Proponent: | General Electric. |
| | U.S. Army Material Development and Readiness Command (DARCOM). |
| Purpose: | For precision gunnery training of tank gunner and tank commander in a simulated environment, to evaluate gunner/tank commander performance. |
| Targeted Audience: | Tank gunner and tank commander. |
| User Location: | Institution, unit. |
| Type of Device: | A transportable gunnery simulator which uses computer-based visual simulation technology to create the combat environment. The trainer produces full-color computer-generated action scenes in which vehicle crew members can see and interact with multiple threat target situations. |
| Associated Hardware/ Software: | Keyboard terminal, two full-color video screens, intercom system, library of preprogrammed exercises, computer-generated weapon effects, instructor console to console training exercises. |
| Principal Training Missions/Tasks: | To develop gunnery skills. |
| Status: | Under development. |
| Information Source(s): | Lawler, F. C. MAJ. (1981, December). A new era for gunnery training. Army R, D & A Magazine. |
| | Lawler, F. C. MAJ. (1982, October). Army develops computerized simulator for training. The Turret. |
| | Lawler, F. C. MAJ. (1981, July). Comprehensive Plan for Training Devices. |
| Note: | The simulator will come in three basic configurations that correspond to the M60A3 and M1 tanks and the M2/M3 fighting vehicles. |

# APPENDIX G

## Decision Making and Training:
## A Brief Literature Review

APPENDIX G

# DECISION MAKING AND TRAINING: A BRIEF LITERATURE REVIEW

> Despite numerous references to the importance of the training of decision makers . . . the number of studies that have explicitly addressed the question of exactly what should be taught and how the teaching can best be accomplished is remarkably small (Nickerson and Feehrer, 1975, p. 3).

This frequently quoted remark was the conclusion made by Nickerson and Feehrer after an exhaustive search of the decision making and training literature. Although their search provided few convincing studies on the effectiveness of different training methodologies for decision making training, it is apparent that interest in this area is growing rapidly, especially in the defense research and development community. This interest has evolved from a need to improve the quality of decisions by insuring that the actions chosen are optimal for a particular situation. In a combat environment, a decision that is appropriate under one set of circumstances can be fatal under another. Consequently, there is a need to provide tactical decision makers with the skills of processing, organizing and analyzing information in ways that will enhance decision making in a rapidly changing combat environment.

## Definition of Decision Making

Definitions of decision making are nearly as numerous as the number of individuals who have studied the process. In a somewhat circular definition, decision making can be viewed, according to Lucaccini (1978), as the "efficient translation of high quality information into appropriate action by a rational decision maker using effective decision strategies" (p.3). More useful is a definition by Nickerson and Feehrer (1975) who conceptual ᷊ed decision making as a collection of decision or problem solving tasks which include: information gathering, data evaluation, hypothesis generation, problem structuring, hypothesis evaluation, preference specification, action selection and decision evaluation. With this definition, decision making appears to be treated interchangeably with problem solving, a practice not uncommon in the literature (MacCrimmon & Taylor, 1976). Quite often, decision making is regarded as a subset of problem solving concerned primarily with evaluation and choice from a set of alternatives. Problem solving, on the other hand, is concerned with information gathering, problem structuring, hypothesis generation and preference, all of which leads to a choice.

## The Tactical Decision Making Environment

The information processing and decision making demands confronting the small unit commander on the modern battlefield are infinitely varied and often overwhelming. Given the introduction of Airland Battle 2000 doctrine and the progressively increasing technological sophistication of the battlefield, there will be an even greater requirement for efficiently managing and quickly responding to a plethora of information to which the small unit commander will have access.

Given a tactical situation, the small unit commander as decision maker must be receptive and actively pursue all available information. Nickerson and Feehrer (1975) describe information gathering as one of the most important tasks performed by decision makers given that most decision situations are characterized by some degree of uncertainty. The decision maker must determine whether the value of the information that might be gathered through a particular effort is likely to be greater than the cost of obtaining it. Unfortunately, much of the information available is often incomplete, ambiguous and of uncertain reliability. Once information has been gathered, the decision maker usually develops a set of plausible alternative courses of action, objectively and critically assesses the costs and gains associated with each, and finally comes to a decision on the course of action that will result in a successful mission. Whether the decision making process is as orderly and as rational as this is open to question.

In the military context, one must often make a decision when the consequences of that decision cannot be predicted with certainty. According to Nickerson and Feehrer (1975), in such circumstances, the individual is said to be making a decision under risk. The evaluation of alternatives becomes an extremely difficult task in situations where the risk is high, information is incomplete and the objectives are complex. The added factor of time pressure makes selecting an alternative much more difficult. It is often the case that no decision outcome is desirable and the individual may find himself faced with the necessity of selecting the least undesirable alternative. In brief, Nickerson and Feehrer assert that tactical decision making is characterized by fairly well defined objectives, significant action alternatives, high stakes, inconclusive information, and a limited time for decision.

In a discussion on pilot training, Edwards (1978) noted several important dimensions in routine and emergency situations which can be applied to the combat situation. These dimensions were (a) well defined vs. ambiguous, (b) single attribute vs. multi-attribute, (c) time relaxed vs. time pressured, and (d) static vs. dynamic. Tactical decision making situations would seem to encompass the second alternative of each dimension. The combat environment is often ambiguous with numerous attributes to consider; the situation is very dynamic and time is frequently of the essence. According to Saleh, Leal, Lucaccini, Gardiner and Hopf-Weichel (1978) a multi-attribute decision situation is one in which the action taken and the "state of the world" together determine the consequences, and where the outcome involves multiple value dimensions. Further, Saleh et al. (1978) define an ambiguous decision making situation as one in which the action alternatives, state of nature and outcome are not well defined or completely understood prior to or during the actual decision-making task. A time pressured decision was described as a situation where the decision maker has limited time in which to structure his decision in terms of attributes, action alternatives, states of nature and outcome. Finally, a dynamic decision making situation may be defined as one in which the action taken produces outcomes that may vary as a function of time. For Edwards (1962), a dynamic decision situation is one in which a chain of decisions are made, each having implications for the other.

Human Decision Making Limitations And Deficiencies

Despite the exalted image of ourselves as rational creatures, human beings are frequently less than optimal decision makers. Investigators of decision making have identified many instances of human decision making limitations and deficiencies. In the literature, the term deficiency usually refers to stereotyped ways of behaving less than optimally, such as the tendency of humans to be overly conservative in the application of probabilities to the evaluation of a hypothesis. Difficulties that can be related to basic cognitive processes, such as short term memory, attention span and information processing loads are generally referred to as limitations (Nickerson & Feehrer, 1975).

In a discussion of human information processing difficulties, Crecine (1980) states humans make choices which are generally adaptive but usually not optimal. Information searches are neither very comprehensive nor thorough. Many of the difficulties arise from the individual's cognitive ability to deal with complex problems. Castore (1978) points out further difficulties human beings encounter when making decisions. Individuals find it difficult to coordinate many separate pieces of information into a structured configuration. Problems occur in trying to process a lot of new information in an integrated fashion. Problems also occur in trying to process a lot of new information in a relatively short period of time. With a high information load, respondent decision making often replaces integrated decision making. Castore defines respondent decision making as a situation in which one simply responds to each new issue as it arises without the coordination of other information or responses. Respondent decision making is not atypical of the combat environment where the threat situation frequently changes and the information load is high.

In other circumstances characterized by high levels of information, it becomes difficult for individuals to sort out the irrelevant material and act only on relevant information. Human information processors may tend to gather more information than is actually needed and thus delay in making a decision. It may be difficult to determine the appropriate time to end the information gathering process. The implications for the tactical environment again are quite apparent. When battlefield information is confusing and often incomplete, the optimal point at which the combat leader avoids the pitfalls of respondent decision making while at the same time collects only the necessary and sufficient information for making a decision without undue delay, is not easy to determine.

In a study (Sidorsky, 1972) designed to examine decision making performance, individuals were placed in simulated naval tactical units where they had to decide when to fire a missile. The probabilities of hitting the opponent and of being hit were varied. When the probability of being hit was greater than that of hitting the opponent, the individual was said to be operating under disadvantageous circumstances. It was found that subjects experienced difficulties and performed less appropriately when faced with a disadvantageous situation. In such circumstances, subjects were unable to analyze information and use it effectively. Sidorsky considers this inability to effectively integrate information to be a major cause of poor performance in the tactical environment.

From a training perspective, tactical decision makers require extensive decision making experience in disadvantageous circumstances. According to Nickerson and Feehrer (1975), human deficiencies may be trained out, but basic limitations, such as short term memory, must be trained around. Whether or not the distinction between deficiencies and limitations is a valid one, the question of how to overcome these shortcomings with training remains. One possibility is to expose individuals to decision situations where a given deficiency is likely to present itself and to provide trainees with immediate feedback concerning the effectiveness of their behavior. When dealing with basic human limitations, Nickerson and Feehrer state that the training objectives should be to educate individuals to recognize their limitations and to train individuals to perform around them. The problem with this well intended advice is that it is based on the questionable assumption that certain cognitive processes (e.g., attention span, short-term memory and processing load) are immutable and hence beyond the realm of training while other cognitive processes are not immutable and thus are amenable to training. While not denying the presence of biological constraints on learning, the history of psychology is replete with instances of creating pseudo-dichotomies long before our understanding of the basic variables justify the dichotomy.

## Approaches To Improving Decision Making

Schrenk (1969) listed three ways to improve decision making: the selection of competent individuals, training on situation prototypes to improve decision making skills, and the use of decision aids. While the first alternative may not be possible in many cases and is beyond the scope of this review, the remaining approaches have received a certain amount of attention in recent years.

Training On Situation Prototypes. Much of the research on decision making has been to make unique situations less unique by providing training on situation prototypes. The basic idea is to construct training techniques that will decrease the probability of surprise by the intentional incorporation of unexpected situational developments in the training program. The primary focus is to train decision makers to successfully respond to novel situations.

For example, Hopf-Weichel, Lucaccini, Saleh, and Freedy (1979) developed a procedure designed to train pilots to respond effectively to emergency situations. This procedure, called BOLDFACE, identifies specific critical situations that may arise and the exact procedures pilots should use to deal with them. Pilots are thoroughly trained and tested on these procedures. The advantages of this method are that BOLDFACE procedures are clear and concise as well as easy to communicate and evaluate. The pilots are taught to respond to an emergency situation in a highly rehearsed and preplanned manner.

In another paper on emergency aircrew decision training, Edwards (1978) states that the pilot's sole decision is to determine what situation is being encountered. In order to train by this method, every possible emergency situation that could arise must be identified and thoroughly trained. Edwards believes a majority of pilot emergencies can be preplanned; however, pilots should be made aware of the possibility of unique problems and be given strategies to cope with them. Eventually, most pilots will counter a novel situation and will have to make an effective decision on the spur of the moment. Even so, Edwards prefers to structure the training environment so that pilots never encounter a situation for which they are not prepared.

Emergency situations have several characteristics in common with the combat environment. Both are stressful, involve high risk, and allow limited time for making decisions. The consequences of inappropriate decisions have a profound effect in both settings. Both underscore the importance of preplanning so that novel situations can be eliminated as much as possible. The methodology for both also would seem to involve an analysis of the situation in terms of its decision making requirements and the development of training scenarios which incorporate the complexity of the immediate environment.

<u>Decision Aiding</u>. The realization that humans frequently are not optimal decision makers has prompted the development of decision aiding devices and methodologies. Decision aiding and decision training may be viewed as complimentary to one another. While decision training attempts to improve decision making behavior by training out deficiencies and working around limitations, decision aids provide decision makers with ways for going beyond their limitations. Almost any procedure or technique that is used to improve decision making can be considered a decision aid. The technique or procedure typically restructures the way problems are analyzed, alternatives developed, and decisions are made (Saleh et al., 1978; Levit, Alden, Erickson and Heaton, 1974). Saleh et al. (1978) state that the implementation of decision aids in the decision environment will provide a framework for familiarizing the decision maker with theoretical concepts and decision training approaches. Other investigators claim that decision aids can be effective instructional tools for behavior change and the improvement of performance (May, Crooks & Freedy, 1976).

Computer-based decision aids have been introduced recently to aid the decision maker in the performance of a wide variety of tasks. In addition to performing computational chores, they can provide graphical presentations of the decision data. They can be used to generate hypotheses and to structure the decision space. Computer-based aids can provide a fairly extensive data base for the individual to draw upon as well as provide prompts and cues for problem diagnosis such as symptom specification in the medical field (Griest, Klein, & VanCura, 1973). Since both humans and computers have unique capabilities to offer to the decision making process, a major challenge lies in the development of decision systems that ensure a symbiotic union of the capabilities of each (Briggs & Schum, 1965; Edwards, 1965).

Several investigators have explored the use of computer-based aids for tactical decision making (Alden, Levit, & Henke, 1973; Baker, 1970; Bennett, Degan, & Spiegel, 1964; Levit, Alden, Erickson, & Heaton, 1974; Sidorsky & Mara, 1968). The amount and transfer rate of military information will increase rapidly in the years ahead as a result of technological advances. Increases in information load which must be processed quickly and efficiently places continuous demands on the decision maker. Computer-based aids are intended to help ease the burden and aid in the collection, processing and utilization of military data (Bowen, Feehrer, Nickerson & Triggs, 1975). In tactical situations, a computer-based aid should relieve the decision maker of mundane tasks and leave more time for those tasks that combat leaders do well. Computer aiding should also increase the quality and accuracy of information through repeated upgrading. Decision aids should be designed to help decision makers with their limitations, not replace tasks that require human judgment and expertise.

The automation of some aspects of decision making has been described as a two-edged sword. While it can lead to greater precision and higher reliability, it may also introduce some potential man-machine problems. One potential problem is that the decision makers' skill may atrophy if they rely solely on the device. Human factors guidelines must be generated and used for any computer-based system. Another man-machine issue is that of task allocation. It is important tc note that decision aids can be more easily applied to some tasks than others. Certain decision processes may be wholly automated while others may need only minimal aiding or none at all. Levit et al. (1974) believe that it is not possible to develop one generic decision aid for all decision situations. This view is supported by Christen and Samet (1980) who state that no generic aiding concept would be adequate for tactical decision making.

Whether individuals will accept the guidance of a decision aid is yet another human factors issue. Christen and Samet (1980) designed a study to compare the quality of decision making performance under two different situations. Under the first, subjects were allowed to make a decision on hypothetical enemy disposition using a computer supported decision aiding package. Under the second condition, subjects were required to make decisions without the benefit of a decision aid. Subjects were to decide whether they were faced with a situation where the enemy was about to attack or a situation with little danger of an attack. Christen and Samet found aided subjects did better in predicting situations where there was no impending attack. However, the authors found aided decision makers chose to countermand the decision aid in a significant number of cases, thereby selecting inappropriate decision actions. Furthermore, subjects with aids were no more confident in their decisions than the unaided subjects.

Several reasons were offered why the aided decision makers chose to overlook the alternative selected by the decision aid. Decision makers may feel threatened by the aid, especially if they are unable to understand it. They may overrule the aid in order to exercise authority or compensate for a feeling of inferiority. The decision aid may be considered inaccurate or training in its use may be inadequate. The ideal aid should possess some built-in flexibility to adapt to individual decision making styles in order to be effective across users. Christen and Samet conclude that whatever the cause of rejection, the issue of user acceptance is an important one and must be taken into account when developing and implementing a decision aid.

Nickerson and Feehrer (1975) discuss two contrasting implications for training. First, the decision aid may lessen or eliminate entirely the need for training a particular decision task. Secondly, in order to use the decision aid, the individual may have to be trained in its use. However, these authors conclude that if the use of a decision aid results in better decision making, training the individual to use the aid is worthwhile. This is especially important in the tactical environment where the consequences of failing to analyze and interpret information accurately are indeed serious.

The extent to which computer-based aids have actually facilitated tactical decision making is difficult to determine. According to Nickerson and Feehrer (1975), progress has not really lived up to expectations. Investigators have found tactical decision making to be a complicated topic. While many of the earlier efforts may have been poorly conceived, our knowledge has benefited from these pioneering efforts, if in no other way than in the clarification of the important dimensions of decision making and aiding.

## A Tactical Training System (TACTRAIN)

A tactical training system, known as TACTRAIN, was developed by General Dynamics to demonstrate the feasibility of using a computer with a CRT display for training a submarine officer in decision making skills and also to evaluate alternative tactical display/interrogation formats. During a search and destroy mission, the officer's task was to maneuver his vessel in such a way as to maximize the probability of destroying a simulated enemy ship while simultaneously minimizing the probability of his own destruction by the enemy ship. Five alternative levels of speed, depth, firing range, and torpedo stores insured a wide range of maneuvering. The maneuver and weapon alternatives chosen were evaluated with respect to reported probabilities for (a) detection of the enemy ship, (b) detection by the enemy ship, (c) destruction of the enemy ship, and (d) destruction by the enemy ship. Prior to a command decision, the officer could interrogate the display with a light pen to retrieve a graphic portrayal of the projected tactical effectiveness associated with the choice of a particular alternative on each tactical dimension (e.g., speed, firing range) with respect to each of the four evaluation criteria. Following a command decision, an alphanumeric display showed the outcome of the maneuver in terms of number of quality points assigned to the outcome. The alphanumeric display also kept track of the cumulative number of points earned during an experimental trial.

Although TACTRAIN users were limited in the range of their tactical operations, the system contains a number of features beneficial to the learning process of the decision maker. It provides immediate knowledge of the decision's consequences. The student officer rapidly learns under what conditions his own ship can be destroyed. It also provides a qualitative measure of his own performance over a number or tactical encounters. Furthermore, it sensitizes the officer to the intricate interaction among the tactical variables under study and their relationship to tactical effectiveness as represented by detection/counter-detection and hit/miss outcomes. The officer also is exposed to changing complexities of these interactions over time (Nickerson & Feehrer, 1975).

## Issues Faced By Training Program Developers

According to Taylor (1982), developers of training programs for tactical decision making are faced with two difficult problems: providing feedback about the consequences of the decision and evaluating the decision maker's performance.

Taylor states tactical training programs need to reflect the implications of real-life consequences. Additionally, these consequences should be perceived as important to decision makers. They should be fully aware of the adverse and often profound effects of an incorrect decision and how it may affect them directly. It also is recommended that the consequences of the decision should be immediate in order for decision makers to feel responsibility for their actions. In many settings, however, the consequences of decisions are not always immediate. A considerable delay can intervene between the decision and its consequences. One could argue that individuals need to be trained to mediate or endure the delay interval if they are to perceive the relationship between last week's decision and today's disaster. Specifying the key indicators or dependent measures in advance and monitoring their performance periodically during the delay interval is one possible way of maintaining the immediacy of the consequences of the decision.

It also is essential to have some means of evaluating the effectiveness of a decision. Without a valid evaluation scheme, it is difficult to tell whether or not the training program has improved decision making performance. But how does one evaluate the quality of a decision? A number of investigators have struggled with this issue (Einhorn & Hogarth, 1981; Jensen, 1982; Nickerson & Feehrer, 1975; Taylor, 1982). Taylor notes three basic problems. First, given the incomplete and rapidly changing nature of battlefield information, the quality of the decision is likely to depend upon the quality of the information available. Realizing that this is often the case, the present authors would be inclined to give a higher evaluation to a decision if we knew that the decision maker took certain steps to improve the quality or amount of information available rather than accept a fait accompli. Secondly, since the decision maker is never in complete control of the tactical environment, seemingly good decisions can be suddenly rendered bad, and conversely, a bad decision rendered good. The tactical decision is situation dependent. Here the approach adopted by O'Brien and Drucker (1983) (i.e., specifying the conditions or situational cues to which the decision maker must respond, specifying the information that must be considered, and providing some principles how the information should be used) is worth considering. Third, a given situation may have two or more equally good courses of action. For deciding among what appear to be equally good courses of action, multiple dependent measures (e.g., time to objective, fuel consumption, likelihood of being assessed a casualty, ammunition expended, probability of mission accomplishment) may be required to discriminate among them.

Other investigators have made a distinction between decision effectiveness and logical soundness of a decision (Nickerson and Feehrer, 1975). Effectiveness is determined after the fact once the consequences of the decision are well known. Logical soundness is the extent to which the decision is congruent with all the available information at the time of the decision. Evaluation on the basis of logical soundness tends to avoid the situational dependency problem and is the path recent training development work has taken (O'Brien & Drucker, 1983).

## Simulation As An Approach To Decision Making Training

Simulation has been used in a variety of settings for the training of different types of decision makers (Cohen & Rehnman, 1961; Raser, 1969). Areas of application have included business (Graham & Gray, 1969), education (Carlson, 1969), political science (Coplin, 1967), government (Abt, 1970) and, of course, military strategy and tactics (Carr, Pyrwes, Bursky, Linzen & Hull, 1970; Paxson, 1963). The basic idea is to place the decision maker in contrived situations which are similar in certain critical aspects to the decision situations he or she is likely to encounter in the real world. The success of the tactical engagement simulations discussed earlier in the report is due, in large part, to their excellent ability to expose combat leaders to the same decisions and actions as they would in combat.

The keen interest in simulation during the past twenty years can be traced to a number of trends (Coppard, 1976). Application of systems analysis, computer science, and operations research have unraveled the complexities of many areas heretofore considered unfathomable. Simulations of more complex systems have served as a valuable research and development tool. Trends in education also have shifted over the years. A wider range of teaching approaches and learning experiences are being tried; instructors are more willing to explore appropriate uses of group processes, problem-solving approaches, case studies, and participative peer learning. Although there is a present demand for a return to the basics, the classroom has become more open, and progressive educators are considering ways of teaching basic scientific and mathematical principles through the use of microcomputers. Through the clever use of graphics and software development techniques, natural phenomena can be simulated and students can be self-tested on their understanding of the underlying principles. The same technology can be directed at the decision making process and simulations can serve as a convenient laboratory for studying decision-related issues.

The advantages of simulation have not gone unnoticed (Coppard, 1976; Kibbee, 1959, Shriver, Henriksen, Jones & Onoszko, 1980). Among those frequently cited, which also have been cited for engagement simulation, are the following:

(1) An elevated level of motivation and involvement among the participants is the most frequent observation. The high level of motivation generated by the experience is thought to result from both the immediate feedback and the competitive nature of many simulations. Most simulations give the participant identifiable goals to achieve.

(2) Depending upon their level of fidelity, simulations provide an ideal opportunity for positive transfer of training. Decisions are made in a context highly similar to that in which they will be ultimately made. (Engagement simulations, and to a lesser extent, battle simulations create ample opportunities for command, control and communications procedures).

(3) A risk-free environment for making critical decisions and carrying out courses of action is provided by simulations. (It can be argued that allowing one's mistakes to be immune from normally occurring adverse consequences may encourage carelessness or bolder decisions. Most practitioners, however, believe that the advantages or degree of positive transfer from a risk-free environment outweighs the disadvantages or negative transfer).

(4) Simulations represent a low cost method for systematically exploring the intricate relationships among the elements in a system in a way not possible with other methods. Situation parameters can be manipulated purposefully. Furthermore, specific scenarios can be selected which place participants in situations where they have experienced previous difficulties.

(5) As a result of the dynamic and free-play character of many simulations, participants are likely to be exposed to a wide variety of changing situational demands in a short period of time. Pre-planned strategies have to be overhauled in the face of new information, unforeseen events and dwindling resources. Participants are forced to do contingency planning -- a skill often overlooked in traditional training programs.

While these advantages offer strong support for the use of simulation in the training of decision making, several caveats have been raised (Coppard, 1976; Martin, 1959; Nickerson & Feehrer, 1975). First of all, simulation is still more an art than a science. No one knows why it is as effective as it appears to be. Very little evaluative research has been conducted. Secondly, no one really knows what students are actually learning in the simulation setting. Testimonials are loaded with phrases like "appreciation of overall operations" or "insight into problem." Given their multifaceted and free flowing nature, simulations are multiple skill trainers, and unless one isolates and experimentally manipulates specific situational events, we will remain ignorant of what is being learned. Third, it is not an easy task to decide what should be simulated. Training developers need to conduct fairly rigorous job and task analyses if they wish to insure that the simulation captures the essential aspects of the real-life situation. Criticality assessment procedures, such as those under development by ARI (Drucker, Hoffman, & Bessemer, 1982) deserve consideration. Fourth, unless the simulation and student can interact repeatedly across a wide variety of exercises, it is doubtful if the student will carry away decision making skills or well developed concepts that will generalize to new real-life encounters. Fifth, in order to ensure user acceptance and respectable transfer of training, the psychological veridicality of the simulation has to be maintained. That is, the simulation should expose participants to the same information and require participants to engage in the same decisions and perform the same actions as they would find in the real-life setting. Finally, if the simulation is one that commands the use and coordination of vast resources (e.g., personnel, equipment, facilities), adequate organizational and training environment preparation is essential if the sort of implementation problems that have prevented a truly effective utilization of REALTRAIN (Scott, 1980) are to be avoided.

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