U.S. DEPARTMENT OF COMMERCE
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AD-A024 030

REALTRAIN: A NEW METHOD FOR TACTICAL TRAINING OF SMALL UNITS

KINTON, INCORPORATED

PREPARED FOR
ARMY RESEARCH INSTITUTE FOR
THE BEHAVIORAL AND SOCIAL SCIENCES

DECEMBER 1975

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Report S-4
2. GOVT ACCESSION NO.:
3. RECIPIENT'S CATALOG NUMBER:

4. TITLE (and Subtitle): REALTRAIN: A NEW METHOD FOR TACTICAL TRAINING OF SMALL UNITS
5. TYPE OF REPORT & PERIOD COVERED:
6. PERFORMING ORG. REPORT NUMBER:

7. AUTHOR(s): E. L. Shriver, B. L. Mathers, G. R. Griffin, and D. R. Jones, Kinton, Inc., L. E. Word, R. T. Root, and J. F. Hayes, ARI
8. CONTRACT OR GRANT NUMBER(s): DAHC 19-73-C-0016; DAHC 19-74-C-0025

9. PERFORMING ORGANIZATION NAME AND ADDRESS: Army Research Institute, Arlington, VA 22209; Kinton, Inc.; URS/Matrix Co.
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 2Q162106A722

11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Training and Doctrine Command (TRADOC), Fort Monroe, VA 23351
12. REPORT DATE: December 1975
13. NUMBER OF PAGES: 38

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office): U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), 1300 Wilson Blvd, Arlington, VA 22209
15. SECURITY CLASS. (of this report): Unclassified
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

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

18. SUPPLEMENTARY NOTES

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

Small unit training	REALTRAIN
Tactical training	Performance-oriented training
Engagement simulation	Performance evaluation
Simulation techniques	SCOPES

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

REALTRAIN is an improved, low-cost tactical training and evaluation technique for use in Army combat unit training exercises. Realistic, two-sided, free-play tactical training employing recognized principles of learning is achieved through simulated combat engagement situations.

For Infantry, a soldier with a 6X telescope mounted on an M16 rifle attempts to identify 3-inch numbers on the helmet of his "enemy." When the number is identified he fires a blank round and reports the "hit" to a controller who

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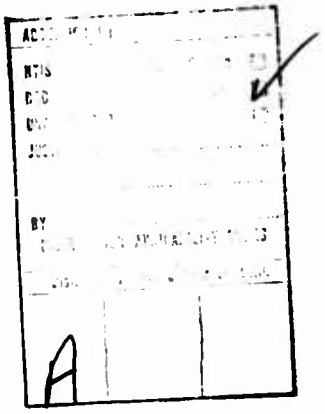
20. is in constant communication with controllers on the other side, and the "enemy" is withdrawn from action. An After Action Review, in which the participants describe and discuss their roles in the action, reinforces the lessons learned. The method is enthusiastically accepted and the learning of appropriate behavior is rapid. REALTRAIN principles have also been successfully adapted to Armor and Antiarmor units.

This report describes the development of the REALTRAIN training method, which incorporates the casualty assessment techniques into an appropriate learning environment; discusses in detail major aspects of the training method; presents data on the effectiveness of the method, its acceptance by men in units in the field, and its utilization in Army units throughout the world. This report also discusses future research in the refinement and extension of the REALTRAIN method.



Army Project Number
2Q162106A722

Combat Training Techniques

REALTRAIN: A NEW METHOD FOR TACTICAL TRAINING OF SMALL UNITS

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The art of war has no traffic with rules, for the infinitely varied circumstances and conditions of combat never produce exactly the same situation twice. Mission, terrain, weather, dispositions, armament, morale, supply, and comparative strength are variables whose mutations always combine to form a new tactical pattern. Thus, in battle, each situation is unique and must be solved on its own merits.

"Infantry In Battle"

The Infantry Journal 1939

FOREWORD

This publication reports on part of a broader program on unit training and unit performance assessment research conducted by the Unit Training and Evaluation Systems Technical Area of the Army Research Institute for the Behavioral and Social Sciences (ARI). The need for improvements in training in units was brought out by the report of the Board for Dynamic Training (Gorman Board) in 1971. In 1972 ARI established a formal mission and provided resources for research on Army training within the unit. The development of the REALTRAIN method of unit training, described in this report, was one of the first products of this effort; among other projects are a guidebook for revision of training literature, a course in how to deliver performance-oriented training, and research on the contribution of simulated firing to crew training.

REALTRAIN I--also called SCOPES, Squad Combat Operations Exercises (Simulation)--was first demonstrated to senior infantry training personnel at Fort Benning, Georgia in July 1973. Because of the method's ready acceptance by unit commanders and troops, the U.S. Army Training and Doctrine Command (TRADOC) began to implement it in January 1974. SCOPES is described in Training Circular 7-2. REALTRAIN II (Armor) and REALTRAIN III (Antiarmor) were developed, added to REALTRAIN I, and demonstrated in a combined arms exercise to senior personnel of U.S. Army, Europe (USAREUR) in June 1974. In November 1974 TRADOC began implementation of the combined arms application, with the Armor School as proponent, with the publication of Training Circular 71-5, REALTRAIN.

The engagement simulation research is a long-term continuing program, initiated and developed by ARI personnel in close coordination with Army proponents and users. Major Larry E. Word of ARI particularly shaped its evolution in many months of direct field development with Army units. Outside experts--URS/Matrix and Kinton, Incorporated--were called in to contribute timely assistance on special aspects of the overall program. Essential, however, have been the splendid cooperation and pertinent suggestions from all levels of command at all Army installations that supported this research.

The entire effort is responsive to the requirements of RDTE Project 2Q162106A722, FY 1974 Work Program, and of the Combat Arms Training Board (CATB) and TRADOC.

J. E. UHLANER
Technical Director

REALTRAIN: A NEW METHOD FOR TACTICAL TRAINING OF SMALL UNITS

BRIEF

Requirement:

To develop an improved method for the tactical training of small combat arms units.

Problem :

Historically, in Army tactical training exercises in the field the units met "aggressors" in a manner that almost totally lacked tactical realism. As a result, combat arms units could obtain effective training on only a limited number of tactical techniques; they gained little if any proficiency in making the adaptive decisions necessary in the face of an active opposing force. Tactical training and evaluation were particularly hampered by the lack of a realistic and credible method for simulating battlefield casualties.

To provide the appropriate environment for the realistic practice of tactical skills for training and evaluation, a few basic guidelines were established: 1) Simulation techniques should provide the psychological environment which would promote learning, 2) The simulation should be credible to those participating, requiring them to perform tasks directly related to their job on the tactical battlefield, 3) Support costs and equipment complexity should be minimized, 4) Weapons effects should be simulated in a manner which closely parallels their actual effects and signatures.

Solution:

The development of low-cost techniques for the simulation of weapons effects (i.e., casualties) and weapon signatures provided the breakthrough necessary to simulate the battlefield in a credible fashion. Casualty assessment techniques have been developed for the range of tactical weapons available to infantry and armor units; these techniques include simulation of the effects of the M16 rifle in the hands of the infantryman and the effects of tank armament, antitank weapons, and indirect fire.

To complement these simulation techniques the performance-oriented unit training model REALTRAIN was developed, based upon recognized principles of learning. This model involves use of realistic engagement simulation exercises of increasing tactical complexity for promo learning. A particularly important aspect of the model is the After Action Review, in wh soldiers themselves describe how they were able to engage an enemy soldier or destroy a target, or how they were "killed" themselves. They thus reinforce and extend what they learn during the engagement.

Results:

When engagement simulation techniques are used in conjuction with the REALTRAIN instructional model:

- Extremely effective and motivating tactical training can be achieved, to a degree not previously realized.
- Learning of individual and group tactical skills is enhanced.
- Troop motivation and interest increases significantly.
- The method is useful for diagnosing training needs and evaluating combat readiness.

Utilization:

The Army Training and Doctrine Command (TRADOC) has expedited implementation of the REALTRAIN method:

- REALTRAIN I--also known as SCOPES (Squad Combat Operations Exercises (Simulation)--was introduced into infantry units worldwide starting in January 1974.
- REALTRAIN II and III (a combined arms version including armor, infantry, and antiarmor units) is in the process of Army-wide implementation, with initial emphasis on its introduction in the U.S. Army Europe (USAREUR).

ACKNOWLEDGMENTS

Breakthroughs in any field are frequently the result of the interaction of many individuals. This has been particularly true in the development of REALTRAIN. The authors wish to express their appreciation to all those who have contributed to this effort over the past several years. Of particular importance has been the continued support of key people in a number of Army elements particularly COL Franklin Hart and LTC Jim Madden of the U.S. Army Combat Arms Training Board (CATB).

Throughout the developmental phase a number of Army units provided support to the project. In every instance the officers and men of these units contributed to improvements in the program through their ideas and suggestions. CPT Donald J. Brunner, U.S. Armor School, and CPT Edward Sherwood, U.S. Infantry School in particular were instrumental in the extension of REALTRAIN techniques to combined arms teams. Special thanks are due the officers and men of the following units which provided support:

6th Armored Cavalry Regiment, Fort Meade, MD
197th Infantry Brigade, Fort Benning, GA
194th Armored Brigade, Fort Knox, KY
4th Infantry Division, Fort Carson, CO
3rd Armored Division, USAREUR
11th Armored Cavalry Regiment, USAREUR
8th Infantry Division, USAREUR

Dr. Rudolph G. Berkhouse, ARI, conducted the survey of SCOPES utilization which is abstracted in the Field Tryout and Assessment section of this report.

REALTRAIN: A NEW METHOD FOR TACTICAL TRAINING OF SMALL UNITS

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REALTRAIN: A NEW METHOD FOR TACTICAL TRAINING OF SMALL UNITS

BACKGROUND

Learning tactical skills on the battlefield is costly; learning tactical skills short of a real combat environment is difficult. Yet this is precisely the Army's training mission--the training of troops in tactical skills and the constant improvement of the effectiveness and efficiency of that training. However, such training has typically not been realistic and, therefore, has been of questionable effectiveness in teaching skills essential to survival.

For tactical training there has been no way of effectively simulating an enemy with the capability and incentive to win on the battlefield. For obvious safety reasons, real ammunition could not be used against a live force. Therefore, there has been no reason for individuals to take advantage of cover and concealment and, all too frequently, one observes during training tactical behavior that may be self-defeating in battle.

This report describes the development of an engagement simulation training model (REALTRAIN) using casualty assessment techniques to provide the proper framework for the learning of tactical skills. The development of the training model and supporting casualty assessment techniques provides units in the field with the capability of conducting realistic, two-sided tactical training engagements. This effort is part of a larger research program concerned with techniques for effective combat training.

The objective of this report is to document the rationale, methodology, underlying principles, and development of the REALTRAIN method of training and to present an initial assessment of the effectiveness of the method. This report supplements other published documents written jointly by TRADOC and ARI,[1,2] which describe the "how to" aspects of REALTRAIN from the point of view of the military user.

THE TRAINING PROBLEM

The Army training mission requires that it take a raw recruit, introduce him to the basic requirements of being a soldier, provide him the skills required for his particular Military Occupational Specialty (MOS), and, when he is assigned to a unit, provide him further training to broaden his MOS skills and to make him an effective member of his unit.

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1 Training Circular 7-2, Squad Combat Operations Exercise (Simulated)–SCOPES. Fort Benning, GA.: U.S. Army Infantry School, 1973.

2 Training Circular 71-5, Tactical Training for Combined Arms Elements–REALTRAIN. Fort Knox, KY.: U.S. Army Armor School, January 1975.

A major part of the Army's training mission is related to collective (or group) training. At one level a man must be trained to become a proficient member of a crew (e.g., as the loader for a M60A1 tank or as the driver of a 155mm self-propelled howitzer). At a more complex level he and his fellow team/crew members must learn how to carry out their tactical mission on the battlefield.

In 1971 the report of the Board for Dynamic Training[3] convincingly demonstrated the need for improved collective training in units. Training emphasis had been on the individual in an institutional setting (Army School or Training Center), influenced by the "school" model which centered around a traditional classroom-lecture format. Even in the field, trainees could be found listening to lectures (while sitting in bleachers or on the ground). This orientation did not meet the most critical training problem facing unit commanders in the field.

As an illustration of the problems facing the company commander, assume, for a moment, that you are in command of an infantry company:

> You have the responsibility for training your men to insure they are combat ready. What do you have to work with? You have limited time that can be devoted to training. Terrain available for training is limited. Personnel turnover will be a factor.
>
> You must take a group of individuals and make them work as a team ("Eleven men, one mind"--General William DePuy).[4] For a group of men to work as one--leaders and troops together--they must learn common procedures for carrying out the tasks of combat, i.e., they must learn tactical skills. They must build upon previously learned individual and equipment-oriented skills; they must learn how to combine them for combat. Since leaders and soldiers do not have the same functions in combat, junior leaders (e.g., platoon and squad leaders) will possess one set of skills, enlisted men another. (Leaders must receive "big picture" or "hill and valley" training; troops require "rock and bush" training.)
>
> Your unit training responsibilities, then, include building upon the individual skills acquired before assignment to the unit. These responsibilities include significant time spent in training for team/crew skills.

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[3] U.S. Continental Army Command. Report of the Board for Dynamic Training, Volumes I-VI, December 1971.

[4] TRADOC Pamphlet 350-6, Training for Combat. Ft. Benning, GA: U.S. Army Combat Training Board, July 1974.

However, your training responsibility does not stop there. You must now give your men the opportunity to learn to apply their individual and group skills. You must insure that your men learn where individual and group skills should be used in combat and when they should be used. Your men must learn to act and react in relation to an intelligent enemy. They must learn the standard technique required for a given tactical situation and what to do when the combat situation dictates a variation from the standard technique. The individual foot soldiers must learn to be decision makers. In addition, they must learn the capabilities of tactical weapons, how to use them effectively and how to minimize their effects when in the hands of the enemy.

Your responsibilities also include diagnosing performance deficiencies of your men--as individuals and as teams. You must then be able to determine what additional training is required to bring your men up to desired levels of tactical proficiency.

RATIONALE AND GUIDELINES OF THE RESEARCH

Directing their efforts toward a unit environment such as that described above, ARI scientists initiated a program of research to produce improved, performance-based methods of training and evaluation. They wanted to break away from the institutional model and to develop techniques for use within the unit.

Orginally, this research sought to develop a method for evaluating individual tactical performance under simulated battlefield conditions. To develop a simulation of the tactical environment in which a man's performance could be assessed, it was felt necessary to construct job situations that would demand that he act as he would be expected to on a battlefield. Because of the close and direct relationship between training and evaluation in performance-oriented training, it is not surprising that the environment developed for testing became a powerful vehicle for training. The rationale which provided the basis for the initial development of the assessment situations led directly to the REALTRAIN method for tactical training.

Two conceptual frameworks influenced much of the early development. In the more general one, man is one component of the system in which he operates; performance standards are established for him in terms of the outputs required of him for effective system functioning. Uhlaner[5] has outlined a general rationale for specifying human performance in

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[5] Uhlaner, J. E. Human performance, jobs, and systems psychology-The systems measurement bed. ARI Technical Report S-2, October 1970.

system terms which would permit the study of such performance in relationship to other system elements on an interactional basis. In the development of performance situations an early decision was made that a man's performance was to be evaluated on the basis of his role as related to the operational mission of his unit and his interaction with interfacing system components.

The second general framework reflects the distinction between norm-referenced and criterion-referenced tests. A basic premise of the design of the performance situations for this research was that "success in battle" was the standard against which all performances were to be evaluated and that all intermediate criteria should be established accordingly. Relative measures were considered less significant for this purpose. The concern was to be: Can the soldier successfully perform the tasks required of him--not how well did he perform them relative to other men in his unit?

At the outset only a general concept existed of how performance testing in combat arms skills could be accomplished to permit evaluation of individual performance in an overall systems context. A number of models of performance tests in combat skills existed.[6,7,8] However, these evaluated separately the individual skill components of combat jobs and were developed primarily to determine the relative effectiveness of training treatments. Thus their rationale was quite different from that involved with developing proficiency measures that could be employed in Army units on a continuing basis.

The aim of this project was to combine the two concepts, of integrated performance testing and criterion-referenced testing, using performance criteria derived from the overall system in which the individual was operating. These concepts are particularly important for combat proficiency, since no job requires a more totally integrated involvement of the component parts or inflicts so high a penalty for component failure. In the combat situation no individual action is without danger or possible influence on the overall situation.

Initial work on the project resulted in a set of general guidelines for all of the subsequent developmental efforts. These guidelines, of course, continued to evolve and be refined.

---

[6] Baker, Robert A., Mathers, Boyd L., and Roach, Eugene G. The effects of increasing and decreasing training time on proficiency in the critical armor skills (Technical Report 55). Alexandria, Va.: Human Resources Research Organization, June 1959.

[7] Nichols, T. F., Ward, J. S., Fooks, N. I., Brown, F. G., and Rosenquist, H. S. Performance evaluation of light weapons infantrymen (MOS 111.0), graduates of the Advanced Individual Training course (ATP 7-17) (Technical Report 81). Alexandria, Va.: Human Resources Research Organization, December 1962.

[8] Schwartz, Shepard, and Floyd, Arthur, Jr. Improving tactical training for tank commanders: Test development and performance assessment (Technical Report 82). Alexandria, Va.: Human Resources Research Organization, March 1963.

Content Validity: Content validity for the combat performance situations was to be achieved by careful design of the performance situations so that job duties, work conditions, and outputs of the combat soldier were accurately reflected. Performance situations were based on tasks and conditions recognized and agreed upon by experts (combat-experienced military personnel) as accurate reflections of the combat environment and upon official doctrine as stated in appropriate Army publications.

Situational Framework: The most meaningful segments of the combat soldier's activities were described in such terms as "squad in the assault," "movement to contact" and "reconnaissance patrolling." Individual soldier skills, such as first aid, navigation, and marksmanship, seemed to require a situational context before it was possible to define what was critical. The decision was made to use general combat situations as the context for the performance tests, rather than defining job requirements by developing exhaustive, detailed lists of job tasks and duties. While such lists serve many useful purposes, tasks are abstracted from the work environment and may lose their situation or job context; the integrity of the situation, once lost, is difficult to recapture. In order to overcome this problem, the situational or unit framework was utilized to provide a meaningful context to maintain the integrity of combat performance.

Product Measurement: The critical concern in proficiency evaluation is whether the individual can get the job done. Therefore, the measurement objective was to record data that indicated whether the defined job had been successfully performed (product measurement) rather than whether correct processes or techniques had been employed (process measurement).

Integrated Skill Testing: Since the situational approach was to be followed in test development, the individual would have to be able to employ all the skills he felt the situation required. This meant that it was necessary to devise methods whereby he could meaningfully employ all of his normal resources. If the soldier were told to assault a position with his squad, he would expect to have (simulated) artillery support, grenades, smoke cover, etc., available to him. He would then have to select and employ those resources demanded by the situation in order to be successful.

Responsive Test Situations: In performance testing it is important that the environment provide feedback to the test subject in the same manner and degree as the real situation would. Combat presents a rapidly changing series of events to which the individual has to respond. This responsiveness is in itself a major performance requirement for the combat soldier; it is as critical to know when to employ various weapons and tactics as it is to know how to use them. The simulated tactical environment must, in turn, change as a consequence of the soldier's actions.

Simulation: Fundamental to the feasibility of implementing these performance testing concepts was the requirement to simulate those situational elements that could not be permitted to operate normally. The obvious case in this application was the use of real ammunition. It was decided that whenever simulation was required, it would be accomplished as simply as possible, without reliance on sophisticated equipment, consistent with the need to create the psychological environment as realistically as possible for the individual. In simulating the battle environment several ground rules were established:

- The perceived cues to which the soldier would respond should be as similar as possible to those of the combat situation.
- The soldier should have the opportunity to respond to the situation as he would in combat.
- The situation should change realistically as a result of the soldier's actions.
- The individual must be in and part of the simulation itself, rather than a passive observer.

These generalized principles were initially applied to develop tests for the combat infantryman and the armor crewman. For each Military Occupational Specialty (MOS) a series of combat situations was designed in which the individual had to operate as a member of a squad or crew.

METHODOLOGY

DEVELOPMENT OF CASUALTY ASSESSMENT TECHNIQUES

To provide the realism required for two-sided, free-play exercises, a credible means of assessing casualties was developed. Engagement simulation became a reality with the development of a casualty assessment technique for the basic infantry weapon, the M16 rifle. The development of the casualty assessment technique for the M16 and the development of techniques for other infantry and armor weapons represented the breakthrough necessary to simulate the tactical environment.

Infantry exercises are centered around the M16. Each soldier's weapon is equipped with a 6X telescope (Figure 1), and all participants must wear 3" high black two-digit numbers on their helmets. These numbers can be read with the telescope at distances up to 250 meters. Opponents try to read each other's numbers using the telescope (Figure 2), an action analogous to aligning the rifle sights on a target. When a man on one side identifies a number, he fires a blank round and reports the number to a controller;[9] the controller then radios the number to

[9] Controllers are administrative personnel accompanying each tactical element who assess casualties, communicate casualties, and activate simulative devices.

a controller with the opposing force, and the man whose number was identified is assessed as a casualty. This can be accomplished in 5-10 seconds. In this way both sides can inflict casualties with effective M16 fire in a manner very similar to combat.

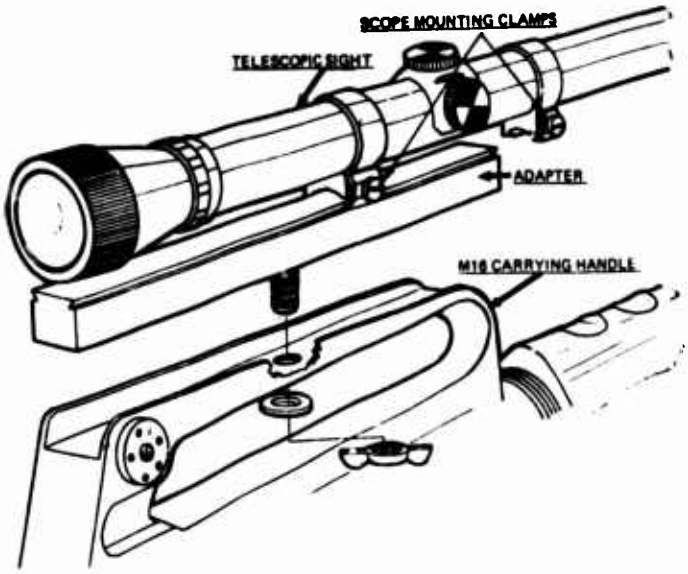

Figure 1. REALTRAIN I, M16 scope mount

Figure 2. REALTRAIN scoping procedure

For each of the weapons found in an infantry squad or platoon, there is a similar casualty assessment technique. The M60 machine gun is employed with the gunner firing blanks while the assistant gunner uses binoculars to identify opponents' numbers. The light antitank weapon (LAW) and 90mm recoiless rifle are equipped with range-calibrated sighting plates (Figure 3) which a controller looks through during a simulated engagement to determine hits. Casualties with the TOW[10] antitank weapon are determined by a controller sighting through an accessory telescope mounted on the outside of the weapon (Figure 4). Simulated Claymore antipersonnel mines are set up in the normal fashion and the detonation simulated with a grenade simulator buried behind it and wired to the firing mechanism. The controller assesses casualties on the basis of the position of the Claymore and the number of personnel within effective range of the weapon when fired. If the firer is in an exposed position too close behind the Claymore, he may also be assessed as a casualty from the backblast of the mine.

For the M60 tank, the controller's telescope is mounted in the breech of the main gun. When the controller in the tank determines that the main gun is centered on a target at the time of simulated impact, he assesses a casualty. The controller then radios the number of the tank or other vehicle that was hit to the controller on the other side who removes the vehicle from action.

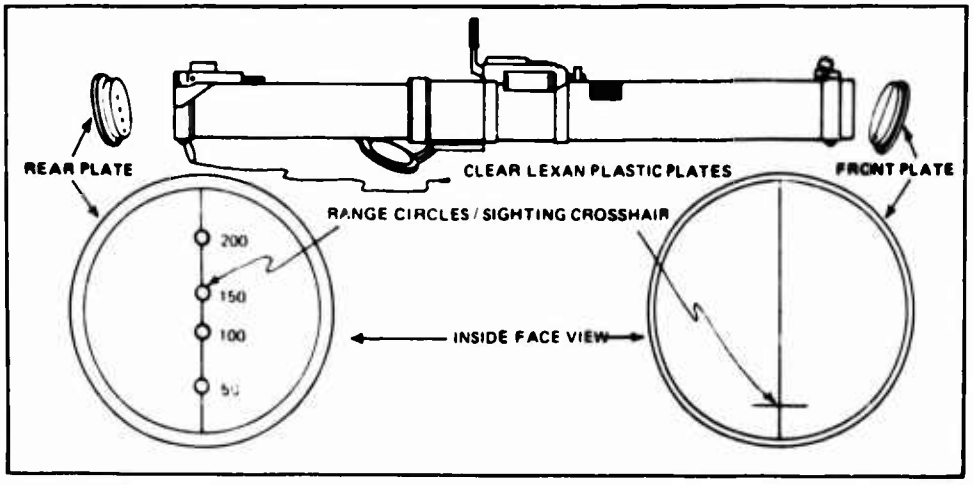

Figure 3. M72A2 light antitank weapon (LAW) sighting plates

[10] TOW = Tube-launched, optically tracked, wire command linked guided missile system.

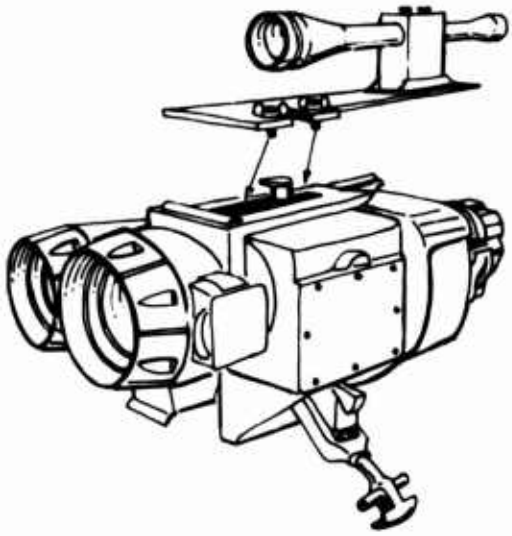

Figure 4. REALTRAIN TOW controller optics mount

Artillery fire is realistically simulated by detonating artillery simulators at the actual point requested (by infantry personnel) based on map coordinates, indirect fire "call" procedures and "times" to impact. The rounds are placed by administrative personnel who are directed by a Fire Direction controller who in turn receives fire requests from the forward observer or unit leader in the simulated engagement. When simulated rounds are detonated by artillery throwers, controllers assess casualties within the "kill radius" of the simulated artillery round and take them out of action.

In order to coordinate these diverse elements and integrate them into an effective combat simulation, control personnel on both sides are in direct communication with each other and with a Net Control Station (NCS). This control communication net is, in a very real sense, the lifeline of the exercises. It carries the communications by which controllers maintain the real-time responsiveness of the simulations and simultaneously informs the NCS of events as they occur. Personnel at the NCS record casualties and significant events for use in the After Action Reviews (Figure 5).

Given these casualty assessment techniques and a group of trained controllers, a wide range of infantry and armor missions can be practiced under very realistic conditions. By combining infantry, armor, and anti-armor techniques, full combined arms exercises can be staged.

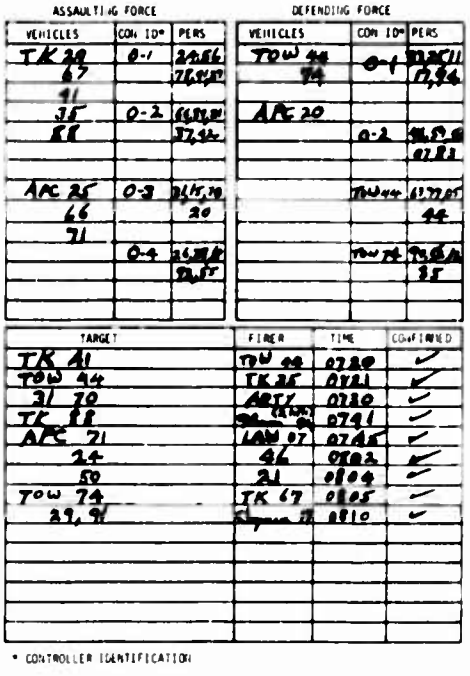

Figure 5. Net Control Station data recording sheet.

DEVELOPMENT OF THE REALTRAIN MODEL

In the course of early developmental tryouts in the field to refine the performance situations, members of the research team found that with each repetition of a performance exercise their own tactical behavior improved. For example, they quickly learned appropriate concealment tactics when attacking a defended position or proper search behavior when looking for an enemy from a defensive bunker. When soldiers subsequently participated during developmental tryouts, a second phenomenon was noted: troops were highly motivated by the competitive nature of the two-sided exercises and the credible simulation of combat.

At this point it became clear that the main thrust of the research should be toward developing the training potential of the engagement simulation exercises.

This led ARI scientists to develop a tactical training model which incorporated the emerging engagement simulation/casualty assessment techniques with established principles of effective instruction. The resulting model (Figure 6) is discussed in the following section. Table 1 presents the learning principles on which the model is based, coupled with their corresponding REALTRAIN characteristics.

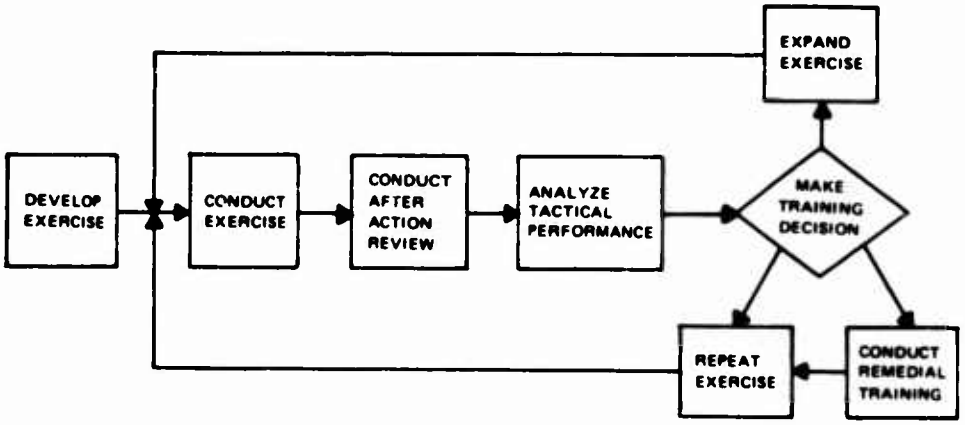

Figure 6. REALTRAIN training model

Table 1

LEARNING PRINCIPLES AND CORRESPONDING REALTRAIN CHARACTERISTICS

Learning Principle	REALTRAIN Practice
Motivation to learn	Two-sided competition
Realism	Free-play scenario Simulated weapons effects
Discovery learning	Free-play scenario Immediate feedback
Transfer of training	Performance orientation Functional context
Reinforcement	Immediate feedback on consequences of actions After Action Review
Discrimination learning Generalization learning	Realistic situations for learning when and where to apply previously learned skills
Overlearning	Repetition
Hierarchical learning	Simple to complex exercises
Association	Combat stimuli
Retention	Repeated practice
Vicarious learning	After Action Review

The model is basically very simple; properly implemented, it can be very powerful. With the REALTRAIN method, training, in the conventional sense of having an instructor tell an individual what to do, is minimized or postponed until that individual has learned as much as possible for himself. Part of this learning involves his finding out for himself what he actually can and cannot do, or what he knows and does not know.

The following paragraphs are keyed directly to the model (Figure 6).

Develop Exercise. A unit commander or other training manager must first decide what needs to be learned. The first REALTRAIN exercise should be relatively simple and designed to teach some basic element of tactical performance--such as the conduct of an attack on a defended position using only the M16 rifle. Later exercises can employ additional resources. The training manager selects terrain and insures that necessary equipment and personnel are available. He must prepare a brief description of the tactical situation that will provide the desired learning situation. There is no need to prepare a detailed scenario; the two competing forces will develop the scenario as the simulated engagement progresses.

Conduct Exercise. During an exercise, both sides are free to execute their missions as required by the situation. Leaders of the units being trained make plans, issue orders, and attempt to insure that the orders are properly executed. Individual squad members interpret and execute the orders using relevant skills and knowledge. Once the problem starts, no halts are made for instruction and critique. When an individual chooses a course of action, he and his unit have to live with its consequences. In this way, an individual receives the full impact of the total experience. Over the course of a series of exercises, successful and unsuccessful behavior becomes clearly defined.

Conduct After Action Review. Upon completion of an exercise, the second phase of learning occurs. An After Action Review is held with all participants. As part of the REALTRAIN procedures a sequential record of events is kept during each engagement at the Net Control Station. (See Figure 5.) This record--which includes each casualty, the time at which it occurred, and the weapon used--provides a guide for the discussion of events during the review. The review begins with a brief description of the leader's plan on each side. Using the record sheet, the review leader then takes each event in chronological order, getting participants to describe exactly what happened. He only talks to drive home teaching points related to appropriate tactical behavior.

During an exercise an individual may have realized that he did something wrong but not know exactly why it was wrong. During the After Action Review, the "enemy" can tell him. This is the particularly unique learning feature in REALTRAIN. The individual is told, not what an instructor or trainer thought he did wrong, but what the opposition actually heard or saw that led to his failure.

The After Action Review is not a critique; these sessions are designed to be informative. Everyone should have an opportunity to speak. The role of the person conducting the review, however, is extremely important. He must be familiar with the requirements of the exercise and must have observed the exercise. He must also be properly trained to conduct an After Action Review. His role is to:

- initiate and sustain the review;
- get the participants to describe what happened in their own terms;
- direct the review in such a manner that important lessons will surface;
- show how participants' experiences were related to possible courses of action that might have affected the outcome.

Analyze Tactical Performance and Make Training Decision. After an exercise and the After Action Review are completed, senior unit personnel analyze the exercise and make one of three decisions: 1) is remedial training required to improve individual or crew skills, 2) should the same basic exercise be repeated, or 3) should the scope of the exercise be expanded to include the employment of new tactics, weapons, or other items of equipment?

Conduct Remedial Training. After REALTRAIN exercises make specific skill deficiencies clear to everyone, remedial training in individual and team skills can be accomplished. Remedial training should occur quickly and informally, providing the specific information needed to correct performance deficiencies. It should not explain more than is needed. Informal, on-the-spot instruction has been shown to be effective in promoting the required learning.

Repeat Exercise. A given two-sided, free-play exercise may be repeated a number of times until the unit commander's training objectives are attained. No two REALTRAIN exercises will be exactly the same; participants will learn something new each time.

Expand Exercise. Once the basic elements of tactical performance are satisfactorily learned, more advanced learning objectives can be introduced until a squad or platoon can effectively carry out all of its assigned missions. This feature of the REALTRAIN model can also be used at a more sophisticated level in training infantry and armor units to work together in a combined arms operation. Training Circular 71-5, REALTRAIN,[11] describes in detail the application of the model to such combined arms exercises.

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[11] Training Circular 71-5, 1975, op.cit.

Used according to this model, REALTRAIN engagement simulation exercises provide an unparalleled opportunity for simultaneous training, diagnosis, and feedback for all members of a unit. For long-term maintenance of skills, it is necessary to continue to run exercises for trained personnel on a regular basis. Such exercises should cover current unit missions under varying terrain, weather, and light conditions so that a unit can encounter as many potential variations as possible.

Table 2 provides some concrete examples of how the training provided by the REALTRAIN method differs from standard tactical training exercises.

Table 2

COMPARISON OF REALTRAIN AND STANDARD TACTICAL TRAINING EXERCISES

REALTRAIN Exercises	Standard Exercises
Exercises are free play with outcomes dictated by action and counteractions taken by opponents	Action and outcomes proceed according to preplanned scenario
Indirect fire delivered at locations specified by participants upon their proper request	Indirect fire placed at discretion of control personnel
Casualty assessment based on objective determination by controller	Casualty assessment based on subjective judgment of control personnel
Control personnel remain tactical and do not compromise participant locations	Control and administrative personnel are visible, and participants must ignore them
Individuals can see direct results of their actions	Individual actions may have little impact on outcomes
Most tactical weapons employed as in combat	Weapons effects generally estimated; many weapons not employed
Tactical behavior is produced naturally by the situation	Tactical behavior occurs only if scenario or controllers require it
Detailed objective review of performance immediately after exercise, involving all participants	Subjective critique of performance, by senior personnel

FIELD TRYOUT AND ASSESSMENT

FIELD TRIALS OF THE REALTRAIN METHOD

During the developmental phase of the REALTRAIN method numerous field trials were conducted in order to refine procedures for applying the training method and to demonstrate the feasibility, practicality, and credibility of the component casualty assessment techniques. These field trials ranged from the research team's participation in small-scale REALTRAIN exercises to establish the initial casualty assessment and training procedures, to large-scale exercises involving a sizable number of troops, extensive equipment resources, and large areas of terrain.

Following the initial trials with research team personnel, infantry exercises were tried out with a limited number of enlisted personnel at Fort Meade, Maryland in March 1973. More extensive field work, at Fort Benning, Georgia in July and August 1973 used troops from the 197th Infantry Brigade. During October 1973, preliminary mechanized infantry and armor REALTRAIN exercises were field tested at Fort Carson, Colorado, using personnel from the 4th Infantry Division (Mechanized). REALTRAIN I (Infantry) exercises were further field tested in November 1973, this time in the Federal Republic of Germany with infantry troops from the 3rd Armored Division (USAREUR). During May and June 1974 a series of combined arms REALTRAIN exercises--including REALTRAIN I (Infantry), II (Armor), and III (Antiarmor)--were field tested, again in USAREUR.

Before a research organization recommends implementation of a new training method it is accepted practice to determine empirically whether the new method works and how well it works--the degree to which training objectives are achieved, and the nature of the skill acquisition curve--and to compare the new method with the method it was designed to replace. This was not done with REALTRAIN. The decision was made by the Training and Doctrine Command (TRADOC) to implement the method before the standard validation procedures had been conducted.[12]

There are a number of reasons for this unusual decision: (1) the heavy cost of conducting an evaluation of a new unit training technique in the field;[13] (2) the rapid and enthusiastic acceptance of the method by troops and commanders; (3) the overwhelming face validity; and (4) the fact that no technique for realistic tactical training had previously existed.

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[12] The standard validation procedures, however, may not be applicable because of the current lack of suitable tactical criterion measures and unit performance measurement techniques.

[13] As an illustration of cost, the support required to conduct even the limited field tryout of the combined arms REALTRAIN exercise at Wildflecken training area in Germany in June 1974 included one armor company consisting of three tank platoons of five tanks each, one infantry company, and three antiarmor TOW sections. These units were provided to ARI for a period of about one month. In addition, about a third of the Wildflecken Training Area (approximately 12 square kilometers) was committed to the REALTRAIN tryout, along with an augmented supply of training ammunition. Although the support represents a significant and much appreciated commitment of USAREUR resources, the limited number of platoons and squads precluded the collection of sufficient data to warrant rigorous statistical treatment.

INITIAL ASSESSMENT OF REALTRAIN EFFECTIVENESS

During field testing of combined arms REALTRAIN exercises in USAREUR in May and June 1974, a limited effort was made to collect data on changes in performance as a result of the REALTRAIN experience and on participants' perceptions of the training provided by the REALTRAIN method. The refinement of the REALTRAIN method for combined arms tactical training was the major purpose of this field tryout. Because of this priority, and because of methodological problems of quantitatively measuring unit performance, the data collected during these 1974 exercises were necessarily limited; they may at best be described as suggestive of possible trends in performance improvement.

Data on Performance Improvement. An example will show the nature of the performance improvements found. During a series of exercises, three tank platoons participated in three different two-sided exercises: an ambush, a combat outpost operation, and a village clearing operation. Each of the three exercises was repeated three times. (The actual number of tanks participating in an exercise varied from exercise to exercise.) The opposition in each exercise consisted of an infantry squad and a TOW section. Table 3 shows the losses incurred by the three tank platoons for each repetition of each exercise. The platoons showed consistent progress in reducing their losses in each of the exercise situations; with practice they were learning the tactical skills necessary for battlefield survival.

Table 3

PERCENT OF TANKS LOST DURING EACH REPETITION OF THREE TACTICAL EXERCISES

Exercise	Repetition	Percent Tanks Lost
Ambush	1	73
	2	50
	3	36
Combat Outpost Operation	1	86
	2	79
	3	62
Village Clearing Operation	1	73
	2	73
	3	64

Several factors influence the interpretation of the results:

- The sample size was extremely small: three tank platoons. (Even this limited number of platoons represented a sizable support commitment--a total of 15 tanks and 60 men participated at various times during the REALTRAIN exercises.)

- Simulated tactical operations were carried much further than would be the case in combat. To establish a clear "victory," engagements were continued beyond the point at which contact would normally be broken and withdrawal occur. Therefore, the loss figures in the table are higher than they would normally be in combat.

- During repetitions of a given REALTRAIN exercise, both attacking and defending forces gain experience, with increasing tactical proficiency on one side likely to be counterbalanced by the increasing proficiency of the other side.

Results of Participant Questionnaire. At the conclusion of the USAREUR exercises, participants were administered a questionnaire to assess their attitudes toward the training they had just received.[14] The results showed that:

- Fifty-four percent of the respondents felt that they were not combat ready before participating in the REALTRAIN exercises; 24% felt they were only minimally qualified; only 22% felt they were combat ready before the REALTRAIN exercises.

- Eighty percent felt that the REALTRAIN exercises increased their tactical proficiency; 16% felt the exercises made little difference; 4% felt less prepared.

- Seventy-four percent liked the REALTRAIN exercises; 15% felt they were "OK," while 11% said they did not enjoy the exercises. More important, however, 58% said they would like to "switch over to this type of training as much as possible"; 31% said they would like a mixture of REALTRAIN training and more conventional training; only 11% said they would rather "go back to the old type of training."

- Eighty-five percent expressed the opinion that the exercises were valuable in gaining experience in their MOS; 15% said the exercises made little difference or made things more confusing.

- Sixty-six percent felt REALTRAIN exercises were more valuable for training than an equivalent amount of time in Basic Combat Training; 89% said they were more valuable than the same amount of time in Advanced Individual Training.

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[14] The questionnaire was administered to 45 tank crewmen and light weapon infantrymen. No antiarmor personnel were included. The 90% confidence limits for each percentage are approximately ± 12%.

- Similarly, 80% and 86%, respectively, felt REALTRAIN exercises were more valuable than a similar amount of time spent in conventional Basic Unit Training and Operational Readiness Training.

- Eighty-six percent felt they were more effective team members as a result of participating in the exercises.

- Eighty-seven percent felt that they did a better job each time they went through the series of engagements.

- Eighty-four percent considered the After Action Review to be a valuable part of the learning experience.

DEVELOPMENT OF TACTICAL SKILLS

Field trials also provided valuable information on the general patterns of skill progression in a unit tactical environment. At the small unit level a tactical skill development pattern emerges. When a unit first participates in REALTRAIN exercises, defensive forces win the initial engagements. It is more difficult to conduct an offense than a defense. The attacking force must expose itself, coordinate separate moving elements, maintain momentum, find the enemy; the defense is stationary and fights from prepared positions. Even though the offense has numerical superiority (3 to 1 in a typical infantry assault/defense engagement) it usually does not win initial engagements.

After the first several engagements, the offense starts correcting its mistakes, which usually include failure to use cover and concealment properly, too rapid movement, and uncoordinated individual efforts. The defense, having been successful in the past, may not appreciably alter its tactical behavior. Thus, the offense begins to win. This, in turn, promotes changes in the defense, so that both sides improve. Specific defensive skills begin to emerge: effective use of Claymore antipersonnel mines, improved use of camouflage, more effective use of outposts, and improved artillery utilization. Learning continues until, after a number of REALTRAIN tactical engagement exercises, unit personnel are performing at a level approaching that of experienced combat soldiers (as judged by experienced Army personnel).

The following lists exemplify types of tactical skills observed during infantry REALTRAIN exercises which have not usually been observed during past unit training exercises.

Individual Tactical Skills

- Men moved undetected across 250 meters to within hand grenade range of defensive positions.
- Men employed hand grenades accurately without leaving prone position.
- Men ingeniously placed hasty minefields to cover unobserved and unprotected areas.
- Fire team leaders navigated 1,000 meters to within 50 meters of objective.
- Fire team leaders brought indirect fire on enemy positions with two adjustments.
- Squad leaders and fire team leaders issued operation orders (para III) without prior instruction to do so.

Group Tactical Skills

- Squads and fire teams spontaneously perfected communication control procedures such as voice, whistles, smoke.
- Squads employed elements to provide fire support upon known or suspected enemy positions.
- Squads regrouped after suffering casualties and attacked from a different direction.
- Fire teams withdrew from breached positions and counterattacked.
- Squads employed direct fire to suppress defensive positions, allowing the unit to cross open areas.

Significant training also occurs for officer and enlisted leaders, who experience the demands of combat leadership. This leadership training is unique and extremely important; it develops appropriate leader tactical behaviors which underlie the effectiveness of all combat leadership.

Leaders learn, for example, specific lessons, personal vulnerability, difficulties in maintaining command and control, and effective and ineffective tactics. The realization of personal vulnerability comes as very much of a surprise to many leaders. In exercises prior to REALTRAIN they were able to do whatever was necessary to control their units, to stand up, shout, or wave their arms. Such actions quickly result in the leader becoming a casualty in REALTRAIN exercises. The first several times that this happens the unit usually becomes ineffective for lack of an effective chain of command. In subsequent engagements, the leader begins to avoid becoming a casualty, at the cost of seriously degrading his ability to control his unit. He must then place greater emphasis

on SOP's, alternate communication systems, and delegation of authority. He quickly learns also that he must have mastered the basic requirements of his job--such as command and control, planning, and artillery adjustment--so that he will have time to concentrate on the tactics to use and the probable decisions to make under pressure. If this is not the case, the simultaneous demands of combat leadership will quickly render him ineffective.

In addition to observing the development of these tactical behaviors, the research team and military observers found frequent indications of the motivating nature of REALTRAIN training. Soldiers often would not want to leave the training area, requesting to participate in more exercises even under very unpleasant weather conditions. Off-duty discussions were frequently observed among soldiers about their most recent engagements. Soldiers also volunteered to train on weekends in order to compete against other units, and disciplinary problems during the tryout periods were minimal or totally absent.

SURVEY ON UTILIZATION OF REALTRAIN I

REALTRAIN I (Infantry) was implemented for infantry small unit tactical training late in January 1974 as SCOPES (Squad Combat Operations Exercises (Simulation)). ARI conducted a survey on the extent of utilization of SCOPES in the U.S. Army at the end of approximately one year. The specific objectives of the survey were: 1) to determine who was using SCOPES (as of 24 February 1975) and to what extent; 2) to obtain users' comments about utilization problems; and 3) to determine how much SCOPES equipment was located in what areas, and at what level it was controlled. The results and conclusions of the survey are summarized here.

Of of 47 commands queried, 39 responded to the survey. Only one organization which had received the necessary SCOPES equipment had not conducted at least one SCOPES training exercise. In the responding commands, a total of 494 company-size units had conducted at least one exercise as of 24 February 1975. At that time 14,799 sets of SCOPES equipment (6X telescopes and number sets) were in the field worldwide (out of a total procurement of approximately 30,000 sets). Positive comments from commanders, trainers, and trainees far outnumbered critical comments.

Positive Comments. A representative sample of specific positive comments reported in the survey gives users' perceptions of the general benefits of this type of training, the major lessons learned by participating soldiers, and different areas of SCOPES application.

General Benefits from SCOPES

- "Extremely useful for small unit level tactical training."
- "Very beneficial--adding greatly to training realism."
- "Made soldiers aware of importance of cover and concealment during tactical training....Made both leaders and soldiers aware that an attack does not progress nearly as fast as imagined....Use resulted in higher morale and motivation of individual soldiers."
- "SCOPES has proven itself to be a valuable training tool. Used correctly it provides immediate feedback on individual as well as unit success or failure."
- "In almost all cases the user reactions reflected that SCOPES was realistic, competitive, and highly motivational in nature. Almost all of the participants had a sense of personal accomplishment, growth, and individual recognition at the termination of the exercises."
- "Individual soldiers and units are very enthusiastic when training with SCOPES. The training is challenging to individual soldiers as well as weapons crews, facilitating competition and job satisfaction. ."
- "It instills unit competition, the desire to succeed. Individual soldiers are motivated to do their part to insure their unit accomplishes its mission. SCOPES results in considerable peer pressure which further reinforces the 'will to win' attitude."
- "Soldier response and acceptance was enthusiastic. Small unit leaders and staff officers were impressed with the motivation and realism which SCOPES provided for the infantry squad."

Lessons Learned

- "This type of training forced everyone to use available cover and concealment, movement techniques and fire discipline. Furthermore, it emphasized the need for hand and arm signals, noise discipline and marksmanship techniques..."
- "The SCOPES training technique clearly points out the small unit leader's control problems. In the initial SCOPES exercises control clearly broke down into individual 'cowboy and Indian' fights. Definite improvement in the squad leader's capability to control his squad was demonstrated by the fourth SCOPES squad attack exercise where, in most cases, the squad leaders were

moving fire teams instead of individuals. During the SCOPES training exercises, the competitive spirit contributed greatly to improved individual camouflage techniques and aggressive movement utilizing all available cover and concealment."

SCOPES Applications:

- "SCOPES training techniques are useful in an ATC" (Army Training Center).

- "Throughout all the ROTC Basic and Advanced Camps, SCOPES training was received with great enthusiasm by cadets, cadre, and visitors alike."

- "SCOPES training techniques have a high degree of potential value to combat arms units. In particular, here in Berlin SCOPES training has been shown to be extremely effective in all phases of Combat-in-the Cities training. Not only in sniper training but also in house-to-house clearing operations, SCOPES techniques provide for realistic play between attacking and defending forces."

Negative Comments. Relevant negative comments on SCOPES serve to pinpoint problem areas requiring further unit training research, hardware modifications, or changed implementation. For each problem area sample comments are quoted and discussed.

Problem: Exercise Control

- "Units felt that training above platoon level was difficult because of the large number of controllers needed."

- "There are nuisance problems in command and control in that umpire and communications requirements are extensive if accurate and timely casualty assessment is to be achieved."

Discussion: While controller requirements may seem excessive even at squad and platoon level, controllers are learning as much, if not more, than the troops they are accompanying. Research to be initiated during FY 76 will investigate techniques for reducing controller requirements.

Problem: Increased Requirements for Training Ammunition

- "SCOPES training requires increased amounts of ammunition, radios, and control personnel, depending on the size exercise (company, platoon, squad) conducted. Serious attention should be given to revising the CTA (Common Table of Allowances) for training ammunition if SCOPES techniques are to be fully utilized."

- "The ammunition and pyrotechnic requirements necessary to conduct SCOPES is not provided for by current CTA's."

Discussion: TRADOC is modifying the CTA for training ammunition to reflect the need for increased expenditures during REALTRAIN exercises. When the Army fields its new squad radio (current projection is FY 78) the number of AN/PRC-77 radios required would be considerably reduced.

Problem: Limited Applicability of SCOPES at Night

- "SCOPES cannot be used during hours of darkness."
- "Has limited applicability at night...."

Discussion: Research being initiated in FY 76 will specifically address this problem.

Problem: Sighting Through 6X Telescopes

- "Too much time needed to adjust eye focus in mobile exercise...."
- "The scope has extremely poor eye relief and adjustment is difficult even to well trained cadre personnel."

Discussion: Learning to use the telescope is a hand-to-eye coordination skill. Procedures for readily acquiring this skill are detailed in TC 7-2. This is mandatory prerequisite training that is often deleted, by practicing units. With proper training soldiers will become proficient in use of the telescope. The large majority of persons using SCOPES have not raised this objection. However, cost-effectiveness analysis should be conducted on the addition of a rubber "stand-off" eyepiece.

THE FUTURE OF REALTRAIN

REALTRAIN has had a short history. Less than a year elapsed from the initiation of REALTRAIN research to TRADOC's initial implementation of the first REALTRAIN product. This rush to implementation came about because the REALTRAIN method was seen to fill a major void in unit training. For the first time, the Army had a means for training combat arms units in the accomplishment of their tactical missions through what has come to be known as "engagement simulation". Experience with REALTRAIN has helped to establish firmly the value of engagement simulation.

Embodied in the REALTRAIN model are a number of classic learning principles which have again been demonstrated to be important for effective training. Probably most important is that the competitive nature

of REALTRAIN exercises provides the motivation to learn, an element often lacking in Army training. Because men in infantry and armor units see that these exercises are training them to do the job they will be called upon to do in a combat situation and because the exercises are an interesting departure from conventional training, they have consistently shown a desire to learn.

The free-play nature of REALTRAIN exercises, with immediate feedback on the consequences of soldiers' individual actions, provides the proper environment for the learning of tactical skills. Men find out for themselves just what is important to insure their survival; individual and team skills are called for in a functional context, where realism is provided by simulated weapons effects.

Appropriate actions are reinforced and inappropriate actions inhibited through the immediate feedback provided on the simulated battlefield. At the conclusion of an exercise, an After Action Review provides further feedback to an individual on the consequences of his actions from the perspective of others.

The potential of engagement simulation training has been demonstrated. For this potential to be realized fully, further research is required to refine current engagement simulation training techniques to make them more effective and to extend these techniques to other areas of application.

A research effort directly related to the REALTRAIN method is directed at the development of an engagement simulation training method for combat leaders. Research to date has investigated the effectiveness of board-game and mini-exercise abstractions of two-sided, free-play engagement simulation exercises to train combat leaders (company commanders, platoon leaders, squad leaders) prior to full troop participation. When subsequently combined with REALTRAIN exercises (including all unit members), these abstractions appear to offer an effective technique for efficient leader training in the maneuver arms.

Recent field tryouts have demonstrated that as unit size increases, certain aspects of the REALTRAIN model require refinement and expansion. For example, the emphasis in the After Action Review shifts from a concern with appropriate and inappropriate individual actions of troops to a concern with leader behavior and the tactical execution of his unit. Therefore, changes in the procedures for conducting the After Action Review must be made to reflect this new complexity.

Field experience has also shown the need for: (1) further research on credible and timely simulation of indirect fire through battalion (involving firing sections, the forward observer, and the maneuver units supported by indirect fire); (2) integration of antitank and antipersonnel mines into engagement simulation exercises; (3) research on the utility of a tactical overlay for training feedback (used in conjunction with the After Action Review) and as a technique for evaluating unit performance; (4) development of procedures for the assessment of nonfatal casualties; and (5) research on low cost engagement simulation alternatives for night operations.

Engagement simulation training, as represented by REALTRAIN, potentially represents a significant future refinement to combat arms Army Training and Evaluation Programs (ARTEP), which have recently been developed to replace Army Training Programs (ATP) and Army Training Tests (ATT). An ARTEP stresses a unit's tactical missions, the conditions under which the missions are carried out, and, where possible, the standards of performance expected. The ARTEP stresses performance-oriented training and criterion-referenced testing. Engagement simulation training would provide units using the ARTEP the avenue by which they could attain the performance levels specified by the ARTEP. REALTRAIN exercises would provide the appropriate mission context for the required training; the REALTRAIN method would provide the training structure necessary to bring men up to the required performance levels.

When a method for the objective measurement of unit performance is available it will additionally provide a means for validly measuring the effectiveness of engagement simulation training techniques and, with cost information, its cost effectiveness.

Current research being conducted by ARI is directed at future improvement of the ARTEP. Engagement simulation training methods will provide units with the necessary tools for achieving mission performance objectives; measurement research in an engagement simulation context will provide improved methods for accurately assessing personnel proficiency and diagnosing performance deficiencies.