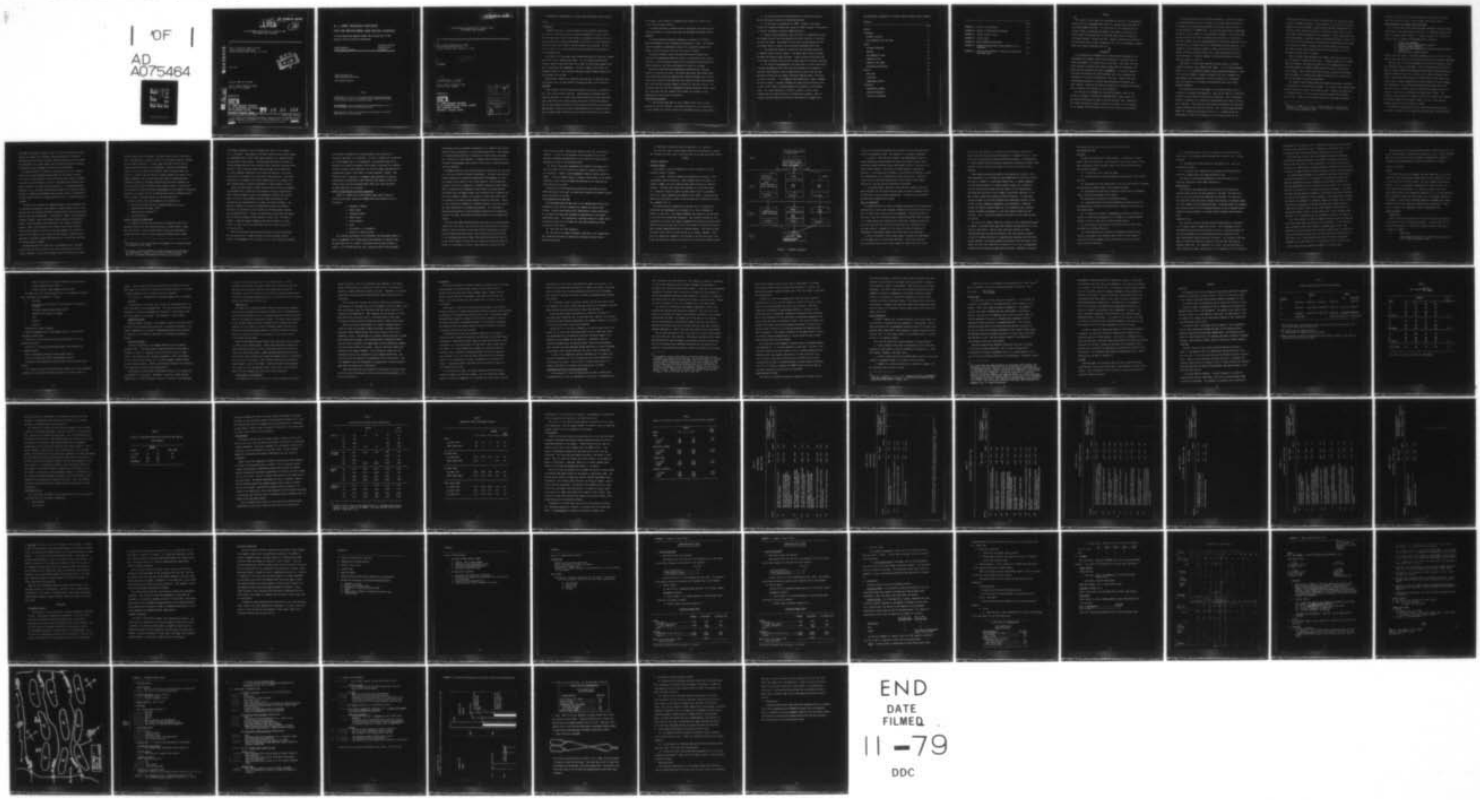
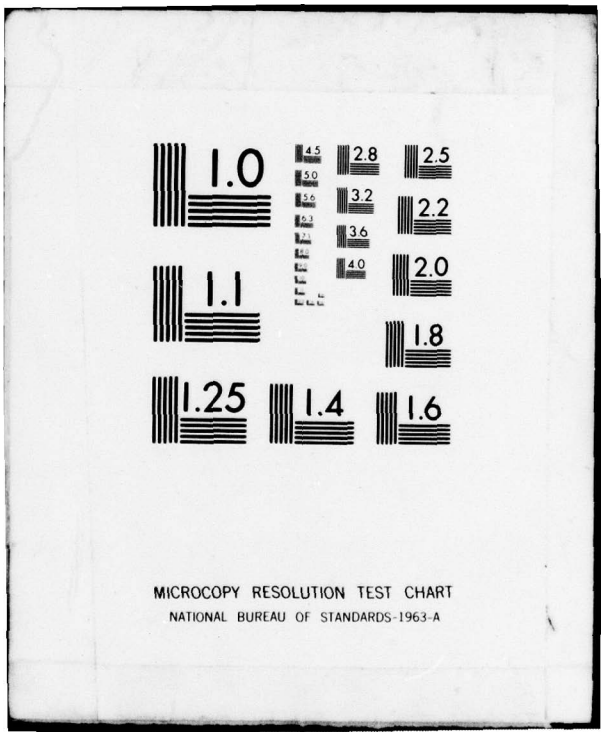
AD-A075 464 GENERAL RESEARCH CORP MCLEAN VA F/G 5/9
AN EXPERIMENTAL EVALUATION OF A TACTICAL GAME FOR COMPANY LEVEL--ETC(U)
JUL 78 E E MILLER, J M BACHTA DAHC19-75-C-0009
UNCLASSIFIED ARI-TR-78-B12 NL

| OF |
AD
A075464



END
DATE FILMED
11-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LEVEL II

ARI TECHNICAL REPORT
TR-78-B12

12

# AN EXPERIMENTAL EVALUATION OF A TACTICAL GAME FOR COMPANY LEVEL TRAINING

by

Elmo E. Miller and James M. Bachta
General Research Corporation
Westgate Research Park, McLean, VA 22101





July 1978

Contract DAHC 19-75-C-0009

John F. Hayes, Work Unit Leader
ARI Field Unit, USAREUR



Prepared for

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



Army Project Number 2Q763743A773 Combat Unit Training

This report on an advanced development research project is designed to meet military management requirements for research bearing on a specific management problem. Approved for public release; distribution unlimited.

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

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

JOSEPH ZEIDNER
Technical Director (Designate)

WILLIAM L. HAUSER
Colonel, US Army
Commander

Research accomplished under
contract to the Departmentof the Army

General Research Corporation

NOTICES

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

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

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

(9)

(18) ARI TECHNICAL REPORT

(19) TR-78-B12

# (6) AN EXPERIMENTAL EVALUATION OF A TACTICAL GAME FOR COMPANY LEVEL TRAINING

by

(10) Elmo E. Miller and James M. Bachta
General Research Corporation
Westgate Research Park, McLean, VA 22101

(11) July 1978

(12) 75

(15) Contract DAHC 19-75-C-0009

John F. Hayes, Work Unit Leader
ARI Field Unit, USAREUR

Prepared for

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

AN EXPERIMENTAL EVALUATION OF A TACTICAL GAME FOR COMPANY LEVEL TRAINING

BRIEF

REQUIREMENT

USAREUR units have a continuing need for multi-echelon, multi-level training on a concurrent basis to ensure sustainment of critical skills. Over the past year a host of new concepts, techniques and devices for such training have been received from TRADOC. Much effort is still required to relate and effectively utilize the new concepts and technology. As part of this effort, the research reported here investigated the potential of the Dunn-Kempf game.

Dunn-Kempf is a board game using miniaturized pieces to represent company and platoon level combined arms combat. It is a highly adaptable game (various weapon systems and rules can be used) for exercising command level skills (deployment and engagement). So far as command level skills are concerned almost all Army Training Evaluation Program (ARTEP) missions can be performed with the game.

Experimental training was conducted using the game to determine what the players learn, and what method of playing the game is most effective.

PROCEDURE

Seven company teams each played the game for four days, one battle per day, using active defense scenarios. Three methods of administering the game were employed: (a) three teams always played using formal operations orders and having their communications restricted to realistic channels, (b) two teams played "naturally" on the second and third days, and received supplementary lessons on anti-tank guided missiles and on using artillery, (c) two teams played "naturally" on the second and third days, but without

the lessons. (For purposes of comparison all groups were treated alike on the first and last battles.)

All groups received a critique on their performance after each battle, based upon items of a rating scale that was developed from ARTEP criteria.

FINDINGS

All groups improved markedly, especially in conduct of the battle. Their improvement was most striking on three kinds of items: (a) relative priority assigned to high-threat targets, (b) coordination among team members, and (c) shifting of forces as the battle develops.

The battle outcomes (losses inflicted and losses sustained) were affected by circumstances beyond the control of the players (e.g. terrain features). But the detailed ratings by the controller provided relatively stable indicators, and those were useful as a basis for critique.

There were advantages and disadvantages associated with different methods of conducting the game. The groups that always used formal operations orders and restricted communications improved somewhat more than the others, particularly on the items that are related to orders and communication, but they also required longer to prepare for and play a battle. The two groups that received the supplementary lessons performed a little better than the groups that had "natural" play without the lessons, but the significance of the effects is uncertain.

UTILIZATION OF FINDINGS

1. Use the Dunn-Kempf game to train company leader teams in their command and control functions. The unique potential in such a game relates to those things that involve reaction to battlefield events as they develop.

2. Use rating scales like those developed to critique the players and as performance criteria for determining mastery.

3. Use the game in preparation for ARTEP. (However, the skills learned in the game go beyond those needed for ARTEP, because of limitations in casualty assessment in current ARTEP exercises.)

4. Require formal operations orders and restrict communications until the ratings indicate they have mastered the skills involved, or for about the first two games. That seems to be the point of diminishing returns, and players seem to consider the restrictions burdensome after that.

5. The controller should be a person who has sufficient experience to command respect from the players. The enemy player should be someone who knows and applies threat doctrine. A data processor facilitates play of the game, relieving the controller of many routine but complex functions.

6. For effective implementation, the game needs a trained controlling team and supplementary aids (like the ones developed in the research.) A battalion team unfamiliar with the game could not merely take the game materials from the box and conduct effective training within a few hours (or even a few days). It is suggested that TRADOC send a team to USAREUR, 7th ATC to conduct a training workshop for teams from each division, who in turn, would conduct training workshops for personnel at the brigade level. (It seems unrealistic, at first, to expect a team at every battalion who can conduct effective training with the game.) Game resources (including game sets) should be consolidated at brigade level.

AN EXPERIMENTAL EVALUATION OF A TACTICAL GAME FOR COMPANY LEVEL TRAINING

CONTENTS


| | Page |
|---|---|
| PURPOSE | 1 |
| BACKGROUND | 1 |
| TRAINING POTENTIAL | 2 |
| PAST EXPERIENCE WITH THE GAME | 10 |
| METHOD | 11 |
| TRAINING STRATEGIES | 11 |
| SUBJECTS | 14 |
| THE CONTROLLING TEAM | 15 |
| LEARNING TO PLAY | 16 |
| CONDUCT OF THE GAMES | 18 |
| EVALUATION AND CRITIQUE | 26 |
| RESULTS | 30 |
| GAME TIME | 30 |
| CASUALTIES | 30 |
| PERFORMANCE RATINGS | 33 |
| DISCUSSION | 47 |
| PERFORMANCE CRITERIA | 47 |
| TRAINING STRATEGIES | 48 |
| EVALUATION STRATEGIES | 49 |

| | | Page |
|---|---|---|
| APPENDIX A: | Outline of Mini-Lessons | A-1 |
| APPNEDIX B: | Outline of Demonstration Briefing | B-1 |
| APPENDIX C: | Handout on How to Play | C-1 |
| APPENDIX D: | Control Sheet | D-1 |
| APPNEDIX E: | Sample OPORD From Battalion | E-1 |
| APPENDIX F: | Defensive Rating Scales (with subscales $E_1$, $E_2$ indicated) | F-1 |
| APPENDIX G: | Devices and Techniques to Facilitate Playing the Dunn-Kempf Game | G-1 |

## PURPOSE

The purpose of this report is to document the results of an experimental evaluation of the Dunn-Kempf game, which is a company level board game for exercising command functions. The objectives of the evaluation were to develop a means of measuring performance on the game, to determine what people learn from the game, and to determine which method of playing it ("learning strategy") is most effective. Methods, materials and procedures were developed during January through May, 1977, and the experimental company teams were trained during May-July 1977.

## BACKGROUND

A continuing need of USAREUR units is for improved techniques for accomplishing multi-echelon, multi-level training on a concurrent basis to insure sustainment of critical skills at all times. This means that sub-skill training is needed at all levels, broken down into meaningful segments that are configured for ease of management. In so doing, however, there must be assurance that the sub-skills are in fact integrated and contribute to the overall functioning of the unit. Further, there must be mechanisms available to indicate when satisfactory performance has been attained. Primarily this means the existence of standards and feasible ways of testing the achievement of such standards.

Over the past year USAREUR has received from TRADOC a host of new concepts, techniques, and devices; ARTEP,REALTRAIN, scaler ranges, and new training literature are some of the more important ones. Because of the volume and extent of changes involved, much effort is still required to tie together and effectively utilize the new concepts and technology.

The research reported here involved development of training strategies to accomplish ARTEP training for company and platoon command personnel of the combat arms, using training devices and materials that are about to be made available to USAREUR units. The specific device that is being made available for this purpose is the Dunn-Kempf board game. While board games and map exercises have been in existence and utilized for a long time in military training, they are seldom employed for defined and measurable training objectives, or under control of a well-defined training paradigm. Consequently, little objective evidence of their value and utility exists (except that they generally produce fair to high participant motivation and satisfaction). Similarly lacking is clear specification of how and when they should be utilized.

Dunn-Kempf is a board game using miniaturized pieces to represent company and platoon level combined arms combat. It is a highly adaptable game (i.e., it can accommodate various weapon systems and changes in rules) so it has the potential of almost any game of its class (company level board games); yet the operations involved are specific to the weapons and units simulated (in contrast with generalized games like chess.)

TRAINING POTENTIAL

The unique potential of Dunn-Kempf is for learning company level coordination of combined arms operations. This kind of game is a "functional context" in which command functions can be exercised. (Here "functional context" is defined as a situation for experiencing one's role in a battle as it develops.) There are only three logical alternatives for functional context involving this level of operation: (a) a tactical game like Dunn-Kempf, (b) a demonstration without troops (i.e., a simulation for experiencing the battle as it develops, but in a passive role) and (c) a

field exercise (either in an active or passive role, but involving troops as well as command functions.) Field exercises at this level are much more expensive and time-consuming. Demonstrations (whether miniaturized or by a movie or other medium) are staged to illustrate certain points, but do not involve active participation of the learners. Simpler operations (e.g. initial deployment of TOW) can readily be presented piecemeal, instead of in the context of total operation, but with certain disadvantages in applying the information learned. Probably each of these classes of techniques can serve a useful instructional function, and the research is to help determine the best uses of the game.

There are games like Dunn-Kempf (for company level play) that use an on-line computer to generate battle data. Prominent among these is BATTLE (Battalion Analyzer and Tactical Trainer for Local Engagements) which is being developed at the TRADOC Systems Analysis Activity at White Sands Missile Range. This system should provide useful comparative performance data and models for adjusting the rules and assessing the cost-effectiveness of Dunn-Kempf in various applications.

The EFFTRAIN study[1/] demonstrated that playing board games transferred to performance in tactical field exercises. To replicate such a demonstration would be beyond the scope of the present project. However, the game used in EFFTRAIN appears to be a prototype from which games like Dunn-Kempf were derived. Many of the operations required in Dunn-Kempf correspond

---

1/ Root, R. T., Hayes, J. F., et. al., Project Efftrain: Field Test of Techniques for Tactical Training of Junior Leaders in Infantry Units. ARI Draft Report, November, 1975.

in detail to some of the operations required in the field (e.g. making plans and operation orders) so some transfer seems highly likely.

Maneuver Elements and Command Levels Exercised

As a terrain board battle simulation game, Dunn-Kempf addresses itself specifically to the combat arms of maneuver, i.e. mechanized infantry and armor (including armored cavalry). It appears suitable for training the tactical staff of company sized maneuver units, including:

1. company/team commander
2. maneuver platoon leaders/platoon sergeant
3. artillery forward observer
4. company operations/communication sergeant/training sergeant
5. battalion S2
6. mortar/artillery forward observer

However, the first three of the above positions are most critical in playing the game, and these were the positions involved in the present experiment.

This key group of tactical personnel is very rarely trained as a group in a realistic tactical environment. Local training areas are often too small to conduct company sized operations and, hence, these operations are usually deferred until a unit is able to go to a major training area for ARTEP. Even during ARTEP training at an MTA, which usually occurs only once per year, company commanders and platoon leaders are heavily engaged with maintenance, troop training and administrative duties that often interfere with any realistic effort to develop the teamwork that is required to cope with the complexities of modern mobile combat. The artillery forward observer is another member of the combined arms team who, for various administrative reasons, rarely, if ever, trains with the maneuver unit that he will support in combat.

By isolating company level tactical functions and exercising them in a way that is cheaper (both in money and time) and more readily available

than ARTEP, Dunn-Kempf provides a means to train this important tactical echelon as a group, and to develop within the members of the group a familarity with each other's tactical roles and abilities, and to provide the opportunity for platoon leaders and the forward observers to operate in response to their commander's tactical style and methods.

The game could also be played at the platoon level, with a platoon leader and his tank commanders/squad leaders as the players; however, the limited training benefits at this level from such a game are probably not worth the time necessary to play it. Miniaturization degrades Dunn-Kempf's potential to train troop level skills (i.e. preparing defensive positions, etc.), and makes the game less suitable for training the lower echelons of combined arms elements whose missions involve a predominance of these types of skills or revolve around the use of a specific piece of equipment.

The game is not suitable for teaching specific target engagement and/or acquisition techniques to TOW, Redeye or Dragon elements, and it is not expected that the personnel who make up these sections would significantly benefit from playing Dunn-Kempf. The game does, however, require maneuver elements (Infantry, Armor, and Armored Cavalry platoons and companies/teams) to properly employ these sections in their scheme of maneuver/defense. Hence, the inclusion of the various "low echelon" sections (TOW, Redeye, Dragon) in the play of the game enhances the training afforded to the leaders of the "higher echelon" maneuver elements without necessarily providing training opportunities for the personnel making up the "lower echelon" elements.

The game may also be of some use at the battalion level, although neither the width nor the depth of the sector afforded by the terrain board is adequate to allow for sufficient room for an Infantry or Armor

battalion/task force to maneuver. The game could be used in conjunction with a map exercise to resolve a "slice" of a battalion operation, perhaps on the company objectives. In this respect, the game could be used to generate some spot reports, and intelligence, logistics and personnel reports in order to exercise the battalion staff, and would reduce the need for a "canned" scenario during a standard Command Post Exercise (CPX). Company commanders (two at most) would move their attacking/defending companies according to the game rules while the battalion commander and his staff would control the battle from a remote location. The game has the potential for making CPX's more interesting, but the maneuver restrictions imposed by the limited size of the playing board seem to otherwise severly limit the game's training potential at the battalion level.

Specific elements that can be expected to be trained are:

1. Mechanized Infantry and Armor companies/teams and platoons.
2. Armored Cavalry platoons. [2,3]
3. Battalion Scout platoons. [3]
4. Anti-Tank platoon.

Types of Skills To Be Exercised

The command functions to be exercised are limited not only by the personnel involved (as noted above) but also to certain kinds of tasks that they perform. These functions may be characterized generally as coordinated action within the upper echelons (between platoon leaders

---

2/ The game board is not large enough to accommodate the frontage occupied by an Armored Cavalry troop.

3/ At present, miniaturized models of scout vehicles are not included in the Dunn-Kempf Kit; however, if the pieces are made available, the game will accommodate Armd Cavalry and scout platoon missions.

and company commanders) and with elements not organic to the company (i.e., artillery). The elements from lower echelons (below platoon leader) are represented only in their most basic functions (i.e. weapons effects and positions on the terrain). Functions not represented are those involving interactions with lower echelons (those involving troops and troop leading.) Thus, a platoon leader playing the game has no opportunity to correct improper camouflage of his troops and vehicles, or to check range cards of his tanks, or to check their land navigation. Such skills would have to be trained at the local training areas or in classes, and such training need not involve coordination of large numbers of troops.

There are other kinds of combat functions that are better represented in Dunn-Kempf than in field exercises because of safety considerations. These include in ARTEP or other field exercises, artillery fire adjustments, the use of final protective fires, smoke and obstacles, and capabilities and vulnerabilities of organic and attached weapons. The game also provides for tactical air/helicopter attacks, air defense, techniques for suppression of air defense or anti-tank missile systems and counterbattery fire. Players can realistically experience and employ these "killing" techniques without danger of bodily harm. The game is capable of exposing company commanders and platoon leaders to a wider variety of combat skills than does ARTEP, and, of course, at less cost in time and money.

While the Dunn-Kempf game directly exercises the skills associated with the execution of a combat operation (tactical movement, direct/indirect fire engagement, use of smoke, etc.), it also indirectly exercises

the planning, coordinating and reporting skills that contribute to successful execution of an operation. In order to prepare for an operation on the Dunn-Kempf board, a reconnaissance, an operations order and an artillery fire plan are necessary, and in order to cope with the changing tactical situation during execution, the value of proper reporting and of a comprehensive system of unit SOP's is quickly realized. However, some teams may tend to abbreviate or eliminate these functions of planning, coordination and reporting, so the controller must insist on their performing these functions conscientiously rather than taking shortcuts, if these skills are to be learned.

ARTEP Training Missions Covered by Dunn-Kempf

ARTEP 71-2 (DRAFT) lists the following eight general types of tactical tasks which company and platoon sized units should be able to accomplish:

1. Movement to Contact.
2. Hasty Attack
3. Deliberate Attack
4. Night Attack.
5. Active Defense.
6. Delay.
7. Preparation of a Strongpoint.
8. Defense of a Built-up Area.

With certain reservations (to be discussed) the Dunn-Kempf trainer is able to accommodate all of these tasks except Defense of a Built-up area. The game board does not contain a sufficient built-up area in which to conduct a city defense operation, and, unless the scale of the buildings

and playing pieces is enlarged considerably, it is doubtful that such an operation can be conducted on a terrain board battlefield. The problems of miniaturization preclude the simulation of house-to-house fighting, and the bird's eye view inherent in a miniaturized battlefield is particularly disadvantageous when applied to the close-in combat associated with city fighting.

The Night Attack and other limited visibility operations (in fog, snow, etc.) are only partially trained by Dunn-Kempf. The game rules simulate limited visibility by disallowing observation and engagement by direct fire weapons until pieces are very close together. While technically accurate, this form of simulation is somewhat misleading, since players (who are playing on an illuminated terrain board) see enemy defenses long before they can engage targets, and can modify their formations and even their scheme of maneuver in response to visual inputs which would not ordinarily be present during limited visibility operations. Except for this unrealistic simulation of limited visibility, the rules governing night operations are thorough and realistic. The techniques of employing mortar/artillery and searchlight illumination are adequately tested by the game, and ground survelliance radar is also included with realism.

The only other ARTEP training mission that suffers from terrain board simulation is the Delay. The size of the terrain board and the limited number of terrain features on the board restrict preparation of second and third delay positions; however, this restriction can be overcome. If the attacking enemy pieces begin from attack positions that are off of the terrain board, and move onto the board about mid-way through the attack, it is possible to conduct a delay along the long axis of the

board using an initial company delay position (IDP) and one subsequent position. In this case the movement of the platoons off of the IDP and their subsequent bounding back to the second delay position may be adequately trained on the Dunn-Kempf Board.

The initial long range engagements and artillery fires which occur while the enemy is off the board will present the largest problem for the controller. However, these engagements should be fairly limited in number. It may be feasible simply to assess a fixed number of preliminary casualties to both sides and begin the operation at the time when the enemy comes onto the board.

Except for the three operations specifically mentioned, the other ARTEP operations listed above are adequately covered by Dunn-Kempf without severe sacrifices in realism.

PAST EXPERIENCE WITH THE GAME

The Dunn-Kempf game has been used at the Combined Arms Center, Fort Leavenworth, with officers attending the Command and General Staff College. Opinion questionnaires were administered to game participants by the school and these were reviewed in preparation for the present experimental study. The questionnaire responses indicated a highly favorable general reaction to the game, but some shortcomings were noted, primarily of three sorts:

(a) The rules are often ambiguous.

(b) The play of the game is somewhat inefficient, e.g. players must wait while the controller is delivering simulated artillery fire or measuring distances.

(c) Additional operations should be simulated, e.g. logistics.

The first two types of shortcomings resulted in developments to clarify and condense the rules, and to facilitate play of the game (described below).

## METHOD

### TRAINING STRATEGIES

#### Treatment Groups

The evaluation involved comparison of three strategies, used with different groups of players:

1. $E_1$ group: Realistic planning and communication required. This experimental group was required to make complete plans and reports, as needed in combat, and their communications were restricted to realistic channels. The plans and reports were evaluated on a functional basis (i.e. logically related to combat outcome) rather than on a procedural basis (e.g. proper sequencing of elements of the order). These plans and reports were discussed in detail in the critique that followed each battle. (See schedule, Fig. 1).

The restrictions on communication required use of a realistic communications net employing actual equipment (i.e. field telephones to simulate a radio net). The company commander was allowed to see the board at the start and periodically thereafter. The original intention in this strategy was to prevent the company commander from viewing the terrain board during the actual battle, and to force him to gain all battlefield intelligence through communications with his platoon leaders. This plan was modified when it was found to be very boring to the company commander. After the first company the commanders were allowed to see the board every fifth bound, and then their vision was restricted by curtains and cardboard sheets

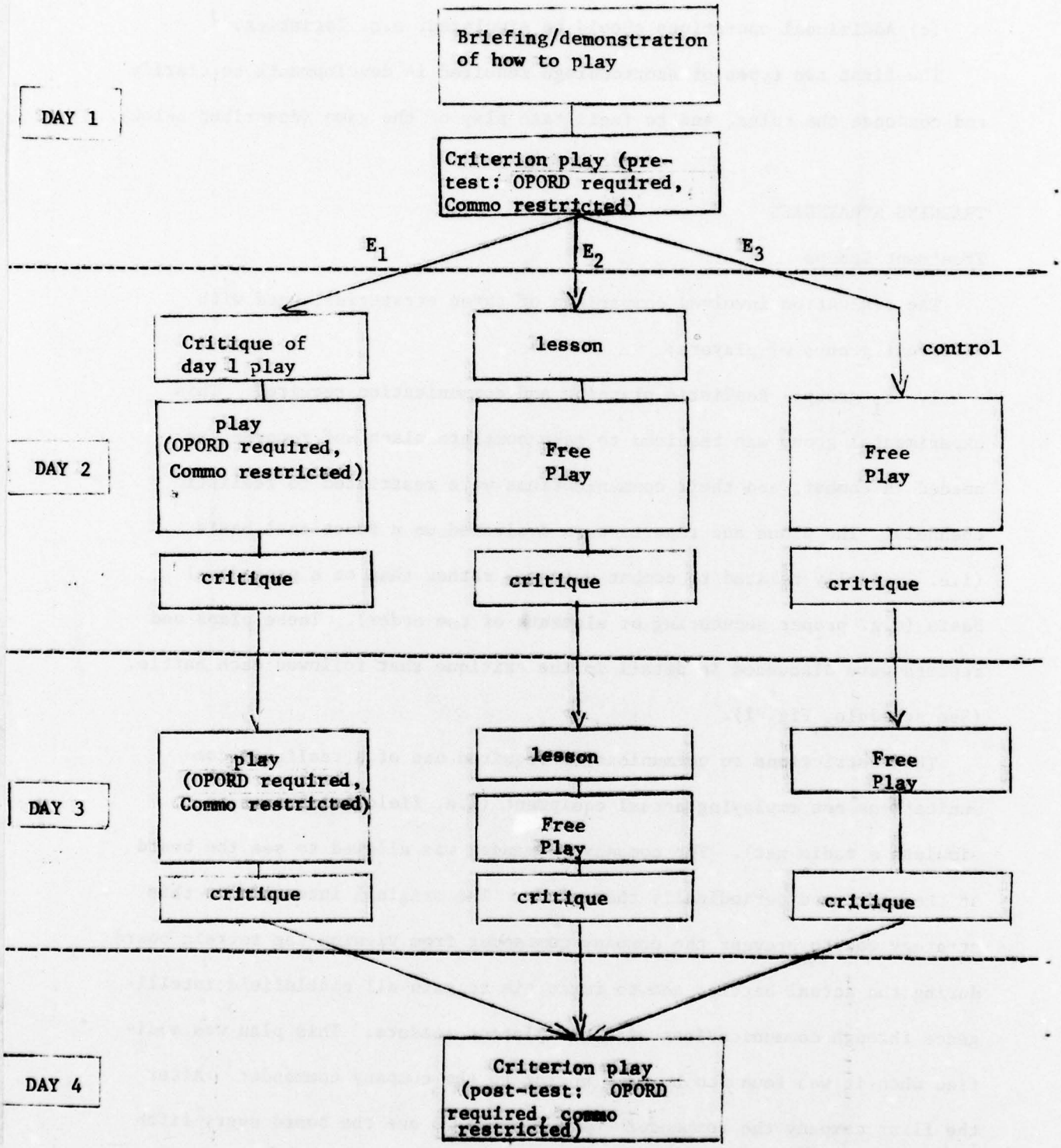



Figure 1. Treatment Schedules

to what the controller determined could be seen from the battlefield position of the commander's tank. This seemed to be a workable compromise.

2. $E_2$ group: Free play plus lessons. This experimental group received various mini-lessons before the play of the game on days 2 and 3, presenting various doctrinal points that seemed critical to the play (i.e., reverse slope defense). The content of these lessons is outlined in Appendix A. $E_2$ Groups were not subject to the special stipulations on plans and communications of $E_1$, except on the first and last day. Plans and reports were not discussed specifically in the critique, since unlike strategy $E_1$, they were neither required nor prohibited.

3. $E_3$ control group: Fee play. This group was allowed to play the game "naturally" on the second and third days, as typical companies would be expected it with no special stipulations. Critiques by the controller covered tactics employed in the game.

Basis of Comparison

All groups received four days of training, beginning with an explanation/demonstration of how to play the game, followed by a "pre-test" play of the game, in which their initial ability was assessed. The pre-test and the post-test on day four took place under conditions described under $E_1$ above, i.e., OPORD required and communications restricted. Between pre-test and post-test play there were two days of play under the conditions of the strategy selected. Assessment of the effects of each strategy was by measurement of performance gains from the pre-test to the post-test.

It was not feasible to train enough groups to satisfy the requirements for the common tests of statistical inference. These tests would not have sufficient power with the small number of company teams that could

be run (i.e. one would not be likely to get statistically significant results even with large practical differences in treatment effects.) Therefore, tests of statistical inference would be misleading. The reliability of results depends upon the extensive ratings that constitute a group's total score on each day, and upon the trend of scores over the four battles.

SUBJECTS

Seven company teams participated in the experimental training. Each team consistend of five officers and non-commissioned officers representing the chain of command of a tank-heavy company team: a company commander, two tank platoon leaders, an infantry platoon leader, and a forward observer from the mortar platoon that was organic to the tank battalion. The teams were selected by their brigade to participate when most of the men in their company were occupied as the duty section. In some cases the men assigned to these TOE positions were unavailable because of leave or TDY, so their immediate subordinates were substituted. Sometimes neither the infantry platoon leader nor his subordinate were available because of mission requirements, so the scout platoon leader was substituted. In no case did any subject participate for more than one four-day period.

The first three company teams were assigned to three learning strategies at random. The second three teams were assigned the same way so as to constitute a replication. Another three teams were desired, but after cancellations only one team was available; that team received strategy 1 in order to increase the data for comparing that treatment with the others, because strategy 1 procedures seemed most different from the others. Hereafter, the first three teams will be referred to as $A_1$, $A_2$, $A_3$ designating replication and learning strategy that was followd. Similarly, the second

three groups are $B_1$, $B_2$, and $B_3$, and the last group is $C_1$.)

## THE CONTROLLING TEAM

### Functions

The game was administered by three people: a controller, an enemy player, and a data processor. The controller directed all aspects of the game, operating in direct personal contact with the participant teams. His functions included:

(1) Instructing on how to play the game.

(2) Interpreting the rules and judging any inconsistency with tactical doctrine.

(3) Determining tactical application of the rules (as referee), including intervisibility, weapons effects, and allowable movement.

(4) Evaluating and conducting critiques of participants' performance, using a rating form developed in the project.

The enemy player performed the following functions:

(1) Controlling enemy action--using consistent threat doctrine--in deploying forces, calling for artillery fires, engaging with direct fire, and moving pieces.

(2) As assistant controller, supplementing controller's efforts as needed, by supervising preparation of U.S. OPORD, by providing engineer support to the U.S. team, and by conducting mini-lessons.

The data processor (stationed a few feet away from the game board) performed the following functions:

(1) Processing artillery requests by determining scheduled availability, by acting as fire direction center (FDC) for both teams, by recording artillery requests, and by telling the controller when and where to deliver artillery.

(2) Determining weapons effects, by using dice and rotary computer ("whiz wheel") and applying factors announced by controller (e.g., moving, defilade).

(3) Recording battle data needed for the project (i.e., hits, hit probabilities, kills).

(4) Performing other administrative functions, including checking controller's administering the game according to plan.

The specific actions and interactions of the controlling team are described sequentially below under "The Battles."

Qualifications

The controller and enemy player in this project were former army captains (Armor Branch) and 1969 graduates of the USMA. Both had served tours as tactical advisors with ARVN units in Viet Nam. The controller had significant armor and armored cavalry line experience, including command of a tank company in the 3d Armored Division. The enemy player had commanded armor cavalry troops in the 3d Infantry Division and the 2d Armored Cavalry Regiments and had authored a 7d Armored Cavalry Reigment Central Defense Plan.

LEARNING TO PLAY

The research objectives required measuring improvement in performance of the company teams in command and control. Such improvement could be confounded with learning the procedures and rules of playing the game, unless such procedures and rules were mastered before playing the first game (during which baseline data were collected). But learning to play the game by conventional means was expected to take far more time than was feasible, based upon: (a) complexity of the game, (b) past experience of others learning the game, particularly at Ft. Leavenworth, and (c) difficulty

encountered by the research team in learning the game from only the printed directions that came with the game. Therefore, a substantial part of the preliminary effort involved developing instruction on how to play.

The instruction on how to play was developed through task analysis and repeated tryouts and revisions with players (including three Reserve Officers) who were like the target population. The resulting instruction consisted of a demonstration briefing followed by applications of the rules in playing the game, which also served as quality controls to ensure mastery.

The demonstration briefing by the controller took about fifty minutes (outlined in Appendix B). It consisted of an introduction (about five minutes) describing the scale, the pieces, and the board, followed by a detailed demonstration of the four parts of a U.S. bound: (a) call fire missions, (b) deliver fire, (c) direct fire, and (d) movement. A handout following the same sequence (Appendix C) was issued to all participants for use with the briefing and for later reference. The demonstration briefing and handout were designed to completely replace the diverse rules, printed instructions, commentary, and British War Game rules booklet that were issued with the game, except for the rotary computer ("whiz wheel") for determining weapons effects (a video tape on how to play the game, being prepared at Ft. Leavenworth, was not available in time for the project.)

After the briefing, the platoon leaders practiced playing the game for about five bounds under supervision of the controller. In this practice they conducted a hasty attack against a defending enemy force. This mission, which differed from later missions, allowed them to practice the rules and procedures without practicing the particular military tactics they were to use. During this period (about 90 minutes) the company commander and forward observer, in consultation with the assistant controller (enemy player) prepared the OPORD for the first game.

The demonstration briefing and guided practice eliminated virtually all of the problems usually encountered in learning the game. During subsequent game play there was very little confusion or mistakes that could be attributed to misunderstanding the rules and procedures of the game.

## CONDUCT OF THE GAMES

### Mission

One ARTEP mission, active defense, was used repeatedly as a training vehicle for each participating company staff so that comparability could be established over the four battles. The active defense was selected because: (1) it is reasonably representative of other missions (i.e., if the game enables particpants to learn this mission, they could learn other missions using comparable scenarios), (2) it is characteristic of the USAREUR situation and force ratios, and (3) although training for the defense is receiving an increasing emphasis in USAREUR, many company commanders still seem relatively unfamiliar with this mission. Thus, there is likely to be considerable room for improvement here.

### Forces Available

#### Combat Units

The US and threat forces were set at levels that were representative of the expected Western European battlefield. In each battle, the U.S. forces were organized as a tank heavy company team with a TOW section attached, as follows:

| | |
|---|---|
| 12 | M60A1 Tanks |
| 3 | Rifle Squads (each armed with a DRAGON and mounted on an M113A1 armored personnel carrier). |

2 TOWS (each mounted on an M113A1 armored personnel carrier).

1 Company command vehicle, M113A1

1 Infantry Platoon Leader Command vehicle, M113A1

The enemy force was a tank battalion from a tank regiment, reinforced with a motorized rifle company, as follows:

33 T62 Tanks

9 Rifle Squads (each mounted on a BMP mounting a 73mm gun and a SAGGER.)

1 MTZ Rifle Company Command Vehicle (BMP).

4 SWATTERS (each mounted on a BRDM).

3 PT76

2 ZSU-57-2

2 ZSU-23-4

Definitions of threat equipment:

SAGGAR and SWATTAR are anti-tank guided missiles, range 3000 and 2500 meters respectively.

ZSU-57-2 is a 57-mm (antiaircraft) gun system mounted on a T-54 medium tank chassis.

ZSU-23-4 is a 23-mm (antiaircraft) gun system, self-propelled (on a tracked vehicle).

BMP is an amphibious armored infantry combat vehicle.

PT-76 is an amphibious armored reconnaissance vehicle.

To simplify and standardize playing the game, certain resources were denied:

(1) Tactical aircraft on both sides were assumed to be wholly committed elsewhere and the friendly commander was told not to expect close air

support. This obviated the need for tactical air or attack helicopters, which might have significantly affected the outcome of battle by "rescuing" a company commander from the effects of his poor planning.

(2) Electronic countermeasures, including jamming, were not employed.

Artillery

The availability of indirect fire followed the recommendations of the Rules Supplement of the Dunn-Kempf game. The dice were rolled before the experiment to establish availability of artillery for each battle, which was then standard for all groups. (See Appendix D, control sheet).

Engineering Support

Engineer support available to the company consisted of ten engineer-dug defilade firing positions and two barriers, including one minefield. The company commander had the option of exchanging defilade firing positions for barriers, or vice versa at the rate of two defilade positions per barrier.

Tactical Situation

In each of the battles, the company defensive position covered a kilometer front. The enemy player's habitual massing of forces made it necessary to shift U.S. platoons during the battle to meet the enemy thrust. Each operation also included a passage of lines, with elements of the battalion scout platoon or of a forward company passing through the unit being evaluated. Weather conditions were assumed to be excellent, with unrestricted visibility and trafficability.

The particular terrain used for deployment varied so as to change the circumstances of each battle. Otherwise, it might be claimed that any improvement in outcomes was merely a matter of learning to take advantage

of specific terrain features, such as a particular hill. The two scenarios that appeared to be most similar were scheduled for the first and last battles, because these were the battles most critical for evaluation. Also, the scenarios used for the first and last battles were reversed for the second replication ($B_1$, $B_2$, $B_3$ companies) so as to counterbalance any differences in difficulty.

Enemy Tactics

The enemy player employed standard threat tactics with all companies. Initial enemy deployments and scheduled artillery fires corresponded with the situation described in the U.S. battalion operations order, and was the same for all groups on any particular battle. The threat forces presented an obvious mass along one avenue of approach and a secondary mass along another, so as to induce U.S. forces to maneuver against the mass. The threat force neither deployed columns nor initiated scheduled artillery until U.S. direct fire revealed his presence, or until threat forces closed within visible range.

Threat forces employed massed direct fires, generally firing a platoon of tanks at each friendly target. Threat tanks fired while moving until within 1500 meters from U.S. forces, after which they had the option of firing two rounds while halted. BRDMs (mounting SAGGAR missiles and ZSU anti-aircraft guns) followed each column and engaged targets of opportunity across the entire battlefield. ZSUs provided suppressive fires against ground targets to protect the BRDMs. Other enemy weapon systems engaged only targets in their designated sectors unless fired on from elsewhere. BMPs fired their SAGGARS only after their troops dismounted.

Plans, Orders, and Deployment

In preparing for the first battle, each company commander and forward

observer received a battalion operations order (Appendix E) and made a ground reconnaissance (by viewing the terrain board.) From these they prepared a company OPORD and artillery fire plan. (Meanwhile, the platoon leaders were practicing basic board maneuvers under supervision of the controller).

After preparation of plans, the platoon leaders were assembled in a room separate from the game room, and the commander issued the OPORD, using maps and diagrams, while the controller rated its content based on his evaluation form (Appendix F). (The commander was not allowed to use the game board while giving his order.) Following receipt of the order, the platoon leaders returned to theterrain board to deploy their forces.

While forces were being deployed, the company commander drew his concept of where he intended to deploy the forces, including platoon positions, general HAW positions, and platoon sectors of fire (with deadspace, if any.) He drew this on an acetate overlay using the 1:12,500 map provided with the game. The controller made a comparable drawing from the actual positions on the game board, and then checked his drawing with each platoon leader for accuracy. Then the controller showed both drawings to the company commander, and discussed the reasons for any discrepancy between the intended and actual company dispositions. The controller rated the degree of correspondence on his rating forms. Then the commander viewed the deployment on the game board, and was allowed to make minor corrections (up to 500 meters).

These conditions were also required of all groups on the last battle (so as to measure improvement) and for the first strategy (groups $A_1$, $B_1$, $C_1$) on every battle.

The Battles

Each battle proceeded by alternate enemy and friendly bounds, with each bound supposed to represent thirty seconds of real time in battle. Actually, the time represented seems somewhat longer, judging from the amount of action and rates of movement. Each bound consisted of four phases: (a) call fire missions, (b) deliver fire, (c) direct fire, and (d) movement.

During the U.S. bound, the call-for-fire phase began with the data processor telling the forward observer what artillery batteries were available for missions, as determined by a previous roll of dice. The platoon leaders determined what targets to engage, and called their missions to the data processor for delivery on subsequent bounds. The controller disallowed any mission in which the target could not have been visible or could not be logically deduced from the situation.

In delivering fire, the data processor called out the location of rounds that were scheduled for delivery on that bound, using either target coordinates or registration points; then the rounds were delivered by the controller, or by the enemy player (if they were to land on that side of the table.) If a round landed near a target, the controller used the artillery effects template to determine whether it was close enough to have an effect; if so, the data processor rolled the dice to determine whether it was neutralized or killed, and announced and recorded the result. The platoon leaders could then call corrections on repeats of the rounds that just fell.

In the direct fire phase, the platoon leaders first decided which targets to engage, and with what weapons. Then the controller decided whether to allow the engagement (i.e., whether the target really could be

seen according to the rules) and measured the range to the target. The controller then announced the status (e.g., SABOT, 2000 meters, stationary tank in defilade); and the data processor rolled the dice to determine hits and kills, applying the factors involved, and announced and recorded the results.

In the movement phase, the platoon leaders advanced each piece, using the "movement rate cards"; these cards had scales of the allowable distances, along with directions on which rate to apply (see Appendix G.)

During the enemy bound, the action was essentially the same, with the enemy player taking the part of the whole team. However, the available artillery and other weapons capabilities were somewhat different as specified in the rules, and threat tactics were employed.

During the first replication (groups $A_1$, $A_2$, and $A_3$) each battle continued for as long as the particpants wanted to play, which went beyond the normal work day, and beyond the time when the battle seemed to be resolved, in the judgment of the controller. Thereafter, play was stopped two bounds after the opposing forces' tanks were one kilometer apart, because the rules generally became unrealistic at closer distances. Occasionally, that required continuing the play on the following day.

In order to get comparable casualty assessment for all groups, such data were considered only for the bounds that all groups completed for that battle, as follows: first battle, 15 bounds; second battle, 17 bounds; third battle, 15 bounds; and fourth battle, 16 bounds.

Techniques and Devices for Facilitating Play

It was essential to have the experimental sessions conducted with extreme efficiency, both for experimental control and to accomplish what

had to be done in the time available. This appeared to present a challenge, in view of past experience with the game (although the Dunn-Kempf is probably better than most games in this respect.) This was to be accomplished primarily by technique rather than devices, because only the simplest of devices was feasible beyond what would normally be available in a battalion. The need for each of these techniques and devices is discussed here. Details are given in Appendix G, for use in playing this or any similar game.

The rules were consolidated into handouts (Appendixes C and G) that replaced the materials that came with the game.[4/] The crux of his technique is to structure the rules so that they are available in the situation in which they are used. For example, all of the direct fire criterion factors were printed on a card that was taped to the dice cup, and the movement rate factors were printed on the cards that were used to measure movement (Appendix G). Maps of the area were issued to every participant.

The dice were enclosed in a dice cup, made of two clear plastic glasses with their open ends taped together. This sped up rolling the dice (which happened about 250 times per game) by preventing loose dice getting away. Two pair of aluminum tongs, developed especially for the project, were essential to move pieces and artillery rounds in the middle of the terrain

---

4/ Two apparently critical rules were in the British Rule Book, but were overlooked, and hence were not followed: (a) a vehicle may be fired upon anywhere along the path of its last bound, and not only where it comes to rest; and (b) tanks should be easier to kill with a flank shot than with a frontal shot (but the rules did not say how to take this into account.) Neglecting the first rule allowed a vehicle to duck from one secure spot to another, without suffering the consequences of being exposed in transit. Neglect of the second rule sharply reduced the advantages of letting the enemy get into a kill zone.

board, which otherwise would require partial disassembly of the board. Other general purpose devices included the telephones to simulate communication equipment (mentioned above) and a table (42" high) for mounting the terrain board.

A curtain on a pole was suspended just above the table (about 6") between opposing forces, and was adjusted to prevent the players seeing more of the enemy deployment then they could in battle. (The table height also contributed to controlling visibility.) This use of the curtain was only an approximate simulation of intervisibility thresholds, but it was supplemented by the controller's disallowing engagements with targets that they were not supposed to detect. The curtain, however, did prevent the players' detecting the general deployment of threat forces, which was only revealed as the situation developed and opposing forces were in proximity. This gradual revelation of the enemy's mass of forces is critical, because otherwise the U.S. forces would not have to shift their defense after the battle begins.

The control sheet was expanded to provide room for recording research data (Appendix D). It was also improved in other ways: (a) each of the artillery batteries was given separate space, to permit keeping track of which batteries were engaged, what kind of fire was called for (e.g., fire for effect, FFE), when to deliver fire, and where; (b) dice were rolled before the game to determine whether to grant missions (indicated by a "+" or "-"); and (c) putting the "ENEMY" record on the top part of the sheet, because they acted first on each bound.

EVALUATION AND CRITIQUE

The effects of playing the game were measured by two kinds of data:

(a) battle indicators, consisting of hits, kills and similar objective evidence of the outcomes of each game, and (b) controller's ratings of various specific aspects of performance. Each kind of data has unique advantages. The battle indicators are relatively unaffected by rater judgments, and bear an unambiguous relationship to desired outcomes. However, it is difficult to establish comparability across various scenarios and other situational factors. The ratings, while involving some element of judgment, were made more objective by designating rather specific aspects of performance, and by using rating scales rather than simple check lists.

Battle Indicators

In order to measure the outcome of battles, the various losses that are inflicted or sustained must be combined in a single index. Such an index was derived for the REALTRAIN validation project,[5/] designated the Weighted Combat Index (WCI), which weights the combat elements killed as follows: WCI - 35 (# of tanks killed) + 25 (# TOWS killed) + 15 (# APC killed) + 1 (# infantry killed).

Their WCI was adapted for present purposes in certain respects:

1. Threat elements, which were not addressed by their index, were assigned the same weight as the most comparable US elements (i.e., T62 = M60, SAGGAR or SWATTER = TOW, BMP = APC).

2. Infantry squads (which the Dunn-Kempf game treats as a unit) were assigned an aggregate weight of 10 (number of men in squad).

3. DRAGONS (not covered previously) were assigned a weight of 10.

The resulting index we shall call WCI'.

---

5/ Root, R. T., Epstein, I. I., et. al., Initial Validation of REALTRAIN with Army Combat Units in Europe, U.S. Army Research Institute, Army Project No. 20763731A773. October 1976.

A comparative index of performance is the exchange ratio (WCI' ratio),[6/] which is defined at the ratio of losses sustained to losses inflicted:

$$\text{WCI' ratio} = \frac{\text{WCI' (U.S.)}}{\text{WCI' (threat)}}$$

Rating Scales

The controller rated four aspects of performance: (a) the OPORD, (b) execution of the OPORD, (c) the defensive plan, and (d) conduct of the defense. (The actual items are listed in Appendix F). The OPORD was rated as the company commander gave his formal OPORD to the platoon leaders. The execution of OPORD was rated as the controller viewed the initial deployment of forces, by comparing that deployment with the commander's orders and sketch of intended deployment. Both of these sections were not rated on the second and third battles for groups $A_2$, $A_3$, $B_2$, $B_3$, since their training strategies did not require formal orders. The defensive plan was evaluated just prior to battle, after corrections had been made, if any. The last section, conduct of the defense, was rated during or after the actual battle.

Previous rating scales, generally checklists, have been criticized on the basis of being superficial. Much of this criticism may be attributable to having a dichotomous scale (i.e., present-absent, or OK - not OK) with the resulting limitation of discrimination. Therefore, during

---

6/ This ratio might have been defined as the reciprocal (with numerator and denominator exchanged) which would have the advantage of increasing when US performance is good. However, the reciprocal figure has the disadvantage of being peculiarly sensitive to variations in US casualties. This results from two statistical anomalies: (a) the US casualties in a defensive mission are generally smaller, and therefore subject to a larger percentage variation and (b) when the smaller number of US casualties is the denominator, that compounds the effect. But when the US casualty figure is the numerator of the ratio, these two factors counteract each other, thus minimizing the apparent effect of random fluctuations.

development, a means was devised to expand check items to a five point scale whenever the rater felt it was desirable. All scales were anchored at two points: "OK" and "Not OK". If the rater could not decide between the two, he checked a point in between, "marginal", which defined the mid-point of the scale. Then the end points, "exceptionally good" and "exceptionally bad" were added to cover cases of special competence or glaring shortcomings, respectively. The rater was not encouraged to force the ratings into any preconceived percentage distribution, but rather to consider it an absolute scale, independent of content. The rater (controller) apparently found this easy to do, without needing additional points on the scale. As a result of this process, the items for rating the operations order remained dichotomous, while most of the other items (41 out of 44) were expanded to a five point scale.

In order to assess the particular effects of the different training strategies, the items were sorted into subscales that should be particularly sensitive to those effects. An $E_1$ scale ( consisting of the first two parts and a few other items) were identified as being particularly indicative of the kind of thing that strategy 1 was designed to teach. Another set of items ($E_2$) was identified as reflecting the content of the mini-lessons. The remaining items formed the general ($E_3$) scale. (These subscales are indicated in Appendix F.)

Critique

After each game, the controller gave the team a detailed critique, based upon the items in the rating scale. This generally took about forty minutes. Their performance was also related to casualties inflicted or sustained, whenever possible.

## RESULTS

### GAME TIME

The learning that occurs in playing the Dunn-Kempf game must be balanced against the investment in time to play it. This is of particular concern if the training strategies should require different investments in time.

The average times for preparation and for battle are reported in Table 1. (These are times to resolution of battle, defined as two bounds after opposing forces close to one kilometer). The general trend, between first and last battle, is for the battles to take about the same amount of time or perhaps a bit longer, but for the formal planning to take considerably less time (about an hour less.)

On battles 2 and 3, Strategies $E_2$ and $E_3$ appear to save considerable time for both planning and playing the game, by not requiring formal planning, reporting and restricted communication. The resulting saving seems to be about half an hour in planning, and about 45 minutes in playing the game. (The planning, however, need not involve the platoon leaders).

### CASUALTIES

The WCI' ratios for the various groups and battles are given in Table 2. The general trend is to improve with each battle (from .44 on the first day to .29 on the last) but there are marked variations from this trend. Battle 3 seems especially difficult and this is consistent with observed tactical factors (primarily, lack of terrain suitable for defensive positions) and with the general discouragement that groups seemed to feel after the third battle.

All groups improved somewhat. Although Strategy 2 ($E_2$ means) is associated with greater improvement, there are not enough company teams to draw any conclusions. For instance, the groups $A_3$ and $B_3$ show quite

Table 1

Average Times (Hr:Min) For Preparation/Battle

| | Battle | | | | Means | |
|---|---|---|---|---|---|---|
| Strategy | 1 | 2 | 3 | 4 | Free | Controlled |
| $E_1$ | 2:51/4:11* | 2:00/4:30 | 1:47/4:33 | 1:50/5:10 | | 2:07/4:36 |
| $E_2$ | 2:45/4:50 | 1:45/3:38** | 1:45/3:40** | 1:30/4:30 | 1:45/3:39* | 2:08/4:40 |
| $E_3$ | 2:45/4:40 | 1:15/3:45** | 1:38/3:53** | 1:55/4:23 | 1:26/3:49** | 2:20/4:32 |
| | 2:48/4:30*** | | | 1:46/4:45*** | 1:36/3:44 | 2:10/4:36*** |

*This format means in this instance, that 2:51 was the time for preparation, and 4:11 was the time taken for the battle.

**No formal plans and reports required.
No restrictions on communications during battle.

***These means were computed by weighting the above means according to the number of groups and battles involved in each.

Table 2

$$\text{WCI' Ratios}^{*} = \frac{\text{WCI' US}}{\text{WCI' threat}}$$

| Group | Battle 1 | 2 | 3 | 4 | Gain (1 minus 4) |
|---|---|---|---|---|---|
| $A_1$ | .36 | .25 | .88 | .36 | |
| $B_1$ | .42 | .45 | .30 | .33 | |
| $C_1$ | .62 | .47 | .56 | .34 | |
| ($E_1$ means) | .47 | .39 | .58 | .34 | .13 |
| $A_2$ | .49 | .36 | .71 | .27 | |
| $B_2$ | .52 | .44 | .27 | .18 | |
| ($E_2$ means) | .50 | .40 | .49 | .22 | .28 |
| $A_3$ | .16 | .26 | .41 | .30 | |
| $B_3$ | .51 | .27 | .33 | .24 | |
| ($E_3$ means) | .34 | .26 | .37 | .27 | .07 |
| Battle means | .44 | .36 | .49 | .29 | .15 |

* The lower the ratio, the better the performance.

different patterns of improvement, even though they received the same treatment: $B_3$ shows about the same gain as $E_2$ groups, but $A_3$ shows a loss from its extremely good score on battle 1.

The scenarios for battles one and four were designed so as to provide a basis for estimating improvement. Then the scenarios for these battles were reversed for the second (B) replication, so as to counterbalance any differences that did occur. That research design also allows one to assess the difference in scenarios, other things being equal, by comparing performances of the B replication with the other groups (Table 3). The B groups' average of first and last battles was the same as for the other groups (.36) indicating that the groups were comparable in overall performance. But, the pattern of results indicates that groups tend to score better on the WCI' ratio when they have the scenario that was used originally on the first battle (A, C replications, Battle 1, and B replication, Battle 4;) the difference in scenarios appears to make about .07 difference in the WCI' index. A large part of this difference, however, is attributable to the exceptionally good performance of group $A_3$ on the first battle, which consisted of exceptionally few losses of US forces. Thus, the observed difference associated with these scenarios may be attributable to chance fluctuations.

PERFORMANCE RATINGS

The rating scales developed in the project were used by the controller to generate data for two kinds of comparisons:

1. Group averages.
2. Item analyses.

Table 3

Effects of Reversing Scenarios for First and Last Battles

(WCI' Ratios)

| | Battle | | |
|---|---|---|---|
| Groups | 1 | 4 | Repl. Mean |
| A, C repl | .41 | .32 | .36 |
| B repl | .48 | .25 | .36 |
| Difference | -.07 | .07 | |

The group averages were used to calculate overall improvement in playing the game, and the particular effects of each training strategy ($E_1$, $E_2$, $E_3$). The item analyses involve a somewhat less conventional kind of comparison: on what kinds of items is there the greatest improvement, and on what kinds of items is there little or no improvement.

Group Averages

The average ratings (over all teams) tended to improve over the four days of play on all four sections of the rating form (Table 4), indicating steady improvement. There is no tendency for the ratings to drop on the third day, as was characteristic of the WCI' ratio. The $E_1$ treatment generally is associated with greater improvement than the $E_2$ and $E_3$ treatments.

Table 5 gives the comparative ratings by subscales that were designed to reflect the particular treatment effects. The $E_1$ training strategy (formal plans required, communication restricted) resulted in somewhat greater learning than the others, especially on the items that were singled out, on an a priori basis, to reflect those practices (the OPORD and the $E_1$ scale items). The greater improvement for the $E_1$ treatment, however, must be balanced against the somewhat greater time it takes to prepare and to play the game. Examination of battle-to-battle progress of $E_1$ groups on the OPORD and $E_1$ scale items indicates that the special advantages of strategy $E_1$ may reach the point of diminshing returns somewhere near the middle of the four game sequence.

The $E_2$ treatment (mini lessons) is associated with slightly greater improvement on the $E_2$ scale items, but the practical and statistical

Table 4

Average Ratings on Each Section, Each Battle

| | | Battle | | | | Gain |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | (4 - 1) |
| OPORD 1/ | $E_1$ | .81 | .92 | .97 | .94 | .13 |
| | $E_2$ | .80 | | | .94 | .06 |
| | $E_3$ | .90 | | | .92 | .02 |
| | Av. | .85 | .92 | .97 | .93 | .08 |
| Execution of OPORD | $E_1$ | 3.33 | 4.25 | 4.50 | 4.08 | .75 |
| | $E_2$ | 3.50 | | | 3.38 | - .12 |
| | $E_3$ | 3.00 | | | 3.75 | .75 |
| | Av. | 3.29 | 4.25 | 4.50 | 3.79 | .50 |
| Defense Plan | $E_1$ | 3.29 | 3.85 | 3.97 | 4.39 | 1.10 |
| | $E_2$ | 3.31 | 4.22 | 4.26 | 4.25 | .94 |
| | $E_3$ | 3.60 | 4.22 | 4.24 | 4.02 | .42 |
| | Av. | 3.39 | 4.07 | 4.13 | 4.24 | .85 |
| Conduct of Defense | $E_1$ | 2.62 | 3.77 | 3.58 | 4.15 | 1.53 |
| | $E_2$ | 2.88 | 3.58 | 4.08 | 4.02 | 1.14 |
| | $E_3$ | 3.03 | 3.62 | 4.04 | 4.09 | 1.06 |
| | Av. | 2.81 | 3.68 | 3.85 | 4.10 | 1.29 |

1/ Possible scores on this section range from 0 to 1, depending upon the percentage of items present in the OPORDs. The other sections involve scores that may range from 1 to 5.

Table 5

Comparisons Among Group Means, Ratings

| | Battle | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Gain (4-1) |
| OPORD | | | | | |
| $E_1$ teams (n=3) | .81 | .92 | .97 | .94 | .13 |
| Other teams (n=4) | .89 | -- | -- | .93 | .04 |
| $E_1$ Scale Items | | | | | |
| $E_1$ teams (n=3) | 3.15 | 4.22 | 4.30 | 4.37 | 1.22 |
| Other teams (n=4) | 3.00 | -- | -- | 3.67 | .67 |
| $E_2$ Scale Items | | | | | |
| $E_2$ teams (n=2) | 2.65 | 3.85 | 3.90 | 3.85 | 1.20 |
| Other teams (n=5) | 2.76 | 3.57 | 3.66 | 3.57 | .81 |
| Other scale items | | | | | |
| $E_1$ teams (n=3) | 3.24 | 3.90 | 3.99 | 4.36 | 1.12 |
| $E_2$ teams (n=2) | 3.44 | 4.10 | 4.38 | 4.22 | .78 |
| $E_3$ teams (n=2) | 3.50 | 4.14 | 4.06 | 4.02 | .52 |

implications of that difference are dubious. Any advantage associated with the $E_2$ strategy is not apparent on the other scale items.

The effects of reversing the first and last scenarios (Table 6) appear to be negligible. Even the slight tendency of the WCI' ratios to favor one scenario (Table 3) is not confirmed by the ratings.

Item Analysis

Forty-one items were rated on a scale from one to five, and these were analyzed to determine what kind of item was associated with the greatest improvement (average for all teams.) These five-point-scale items included all but three of the ratings, after the OPORD section. The amount of improvement between first and last battle on each item was calculated. The items were then ranked according to the amount of gain shown. Then the items were divided into three clusters, on the basis of amount of improvement: high gain (Table 7a, 11 items), moderate gain (Table 7b, 19 items) and minimal gain (Table 7c, 11 items).

The crux of the item analysis is to examine the content of each cluster to determine what might account for the amount of improvement shown. The initial scores (battle 1) might also indicate whether improvement could be expected. The "minimal gain" items have one thing in common: there is little room for improvement. The initial scores generally were so high that little improvement could be expected. In terms of content, these items seem to be common sense and/or well taught in Army courses. Also, only one of these items involved the conduct of the battle; rather, they involved plans and preparation for battle.

Examination of the high gain items revealed three kinds of content: (a) assigning priorities to targets in accordance with the threat they pose, (b) coordinating the actions of the maneuver elements, and

Table 6

Effects of Reversing Scenarios for First and Last Battles (Ratings)

| Group | Battle 1 | Battle 4 | repl means |
|---|---|---|---|
| OPORD | | | |
| A, C repl | .84 | .93 | .885 |
| B repl | .86 | .94 | .90 |
| Diff. | -.02 | +.01 | |
| Execution of OPORD | | | |
| A, C repl | 3.19 | 3.88 | 3.535 |
| B repl | 3.42 | 3.67 | 3.545 |
| Diff. | .25 | .21 | |
| Defense Plan | | | |
| A, C repl | 3.23 | 4.35 | 3.79 |
| B repl | 3.58 | 4.09 | 3.835 |
| Diff. | -.35 | .26 | |
| Conduct of Defense | | | |
| A, C repl | 2.89 | 4.24 | 3.565 |
| B repl | 2.71 | 3.94 | 3.325 |
| Diff. | .18 | .30 | |

Table 7a

Item Analysis:

High Gain Items

| Section | | Mean Rating 1 | Mean Rating 4 | (gain) | Content Classification (consensus judgment) Priority | Co-ordination | Shifting of Forces |
|---|---|---|---|---|---|---|---|
| IV | Did HAWS give priority of fires to most dangerous enemy weapons? | 2.29 | 4.43 | 2.14 | ✓ | | |
| IV | Once enemy vehicles had moved within effective range of friendly positions, did friendly vehicles shoot and move to alternate positions to reduce their vulnerability? | 2.57 | 4.71 | 2.14 | | | ✓ |
| IV | Did HAWS coordinate fire with tank direct fire suppression so as to minimize vulnerability of HAW to enemy counter-fire? | 2.29 | 4.00 | 1.71 | ✓ | ✓ | |
| III | Did individual HAW positions afford/provide alternate defilade firing positions? | 2.86 | 4.43 | 1.57 | | | ✓ |
| III | Did individual vehicle positions afford/ provide primary and alternate firing positions (either natural or man-made) within 50m. | 3.00 | 4.57 | 1.57 | | | ✓ |
| IV | Was the CO kept informed of enemy situation? | 2.43 | 4.00 | 1.57 | | ✓ | |
| IV | Was direct fire used to suppress the most lethal enemy weapons? | 2.86 | 4.43 | 1.57 | ✓ | | |
| IV | Were ARTY adjustments quick and accurate? | 2.43 | 4.00 | 1.57 | | | |

Table 7a (cont)

Item Analysis:

High Gain Items

| Section | | Mean Rating 1 | Mean Rating 4 | (gain) | Content Classification (consensus judgment) Priority | Co-ordination | Shifting of Forces |
|---|---|---|---|---|---|---|---|
| III | Did platoon positions selected by the CO afford/provide cover? | 3.14 | 4.57 | 1.43 | | | |
| IV | Was the CO kept informed of friendly situation? | 2.86 | 4.29 | 1.43 | | ✓ | |
| IV | Did CO shift plts to meet the major enemy threat? | 2.71 | 4.14 | 1.43 | ✓ | | |
| | Means for High-Gain Items | 2.67 | 4.32 | 1.65 | | | |

Section II was an evaluation of how well the platoon leaders had executed the OPORD. Section III was an evaluation of the defensive plan. Section IV was an evaluation of theconduct of the battle.

Table 7b

Item Analysis: Moderate Gain Items

| Section | | Mean Rating 1 | Mean Rating 4 | (gain) | Content Classification (consensus judgment) Priority | Co-ordination | Shifting of Forces |
|---|---|---|---|---|---|---|---|
| III | Did platoon positions selected by the CO afford/provide use of reverse slope advantage? | 3.29 | 4.57 | 1.28 | | | |
| III | Were registered fires located so as to be easily adjusted from? | 2.86 | 4.14 | 1.28 | | | |
| III | Did platoon positions selected by the CO afford/provide long range fields of fire? | 3.00 | 4.14 | 1.14 | | | |
| III | Did platoon positions selected by the CO afford/provide mutual supportability with interlocking fire between platoons? | 2.57 | 3.71 | 1.14 | | | |
| III | Did individual HAW positions afford/ provide cover: | 3.43 | 4.57 | 1.14 | | | |
| IV | Did HAWS open fire at maximum range (2000-2000m)? | 3.57 | 4.71 | 1.14 | | | |
| IV | Did DRAGON contribute to the defensive effort? | 3.43 | 4.57 | 1.14 | | | |
| IV | Was ARTY used to suppress the most dangerous enemy wpns? | 2.29 | 3.43 | 1.14 | ✓ | | |
| III | Did individual HAW positions afford/provide concealment from air observation; i.e. woods or hide position behind firing position? | 4.00 | 5.00 | 1.00 | | | |

(Table 7b (Cont)

Item Analysis: Moderate Gain Items

| Section | | Mean Rating 1 | Mean Rating 2 | (gain) | Content Classification (consensus judgment) Priority | Co-ordination | Shifting of Forces |
|---|---|---|---|---|---|---|---|
| III | Did platoon positions selected by the CO afford/provide concentration of massed direct fire on most likely routes of enemy advance? | 3.00 | 4.00 | 1.00 | | | |
| III | Did individual vehicle positions afford/ provide cover? | 3.00 | 4.00 | 1.00 | | | |
| III | Were preplanned fires located along all likely avenues of approach? | 3.43 | 4.43 | 1.00 | | | |
| III | Were registered fires located along most likely enemy avenues of approach? | 3.29 | 4.29 | 1.00 | | | |
| IV | Did HAWS shoot and move to avoid being suppressed? | 3.29 | 4.29 | 1.00 | | | |
| IV | Was maximum use made of registration points? | 2.71 | 3.71 | 1.00 | | | |
| II | Did platoon leaders know the location of registered and preplanned fires in their sectors? | 3.43 | 4.29 | .86 | | | |
| III | Did platoon positions selected by the CO afford/provide concealment? | 3.71 | 4.57 | .86 | | | |
| III | Did individual vehicle positions afford/ provide concealment from air observation, i.e., in woods or hide position behind firing position? | 3.57 | 4.43 | .86 | | | |

Table 7b (Cont)

Item Analysis: Moderate Gain Items

| Section | | Mean Rating 1 | Mean Rating 4 | (gain) | Content Classification (consensus judgment) Priority | Co-ordination | Shifting of Forces |
|---|---|---|---|---|---|---|---|
| III | Did platoon positions selected by the CO afford/provide long range vision? | 3.43 | 4.14 | .71 | | | |
| | Means for Moderate Gain Items | 3.23 | 4.26 | 1.03 | | | |

Table 7c

Item Analysis: Low Gain Items

| Section | | Mean Rating 1 | Mean Rating 4 | (gain) | Content Classification (consensus judgment) Priority | Co-ordination | Shifting of Forces |
|---|---|---|---|---|---|---|---|
| III | Did individual vehicle positions afford/provide long range field of fire (at least up to 1500 m)? | 3.71 | 4.29 | .58 | | | |
| II | Were intended platoon sectors of responsibility covered? | 3.29 | 3.86 | .57 | | ✓ | |
| III | Did individual HAW positions afford/provide enough distance from other firing vehicles to prevent simultaneous suppression by a single artillery mission? | 3.43 | 4.00 | .57 | | | |
| III | Was the passage point covered by fire? | 4.00 | 4.57 | .57 | | | |
| III | Did platoon positions selected by the CO afford/provide primary and supplementary platoon positions? | 3.14 | 3.43 | .29 | | | ✓ |
| IV | Were initial engagements conducted so as to minimize divulgence of friendly strength and positions? | 3.43 | 3.71 | .28 | | | |
| III | Were barriers placed so as to channelize the enemy or to deny him avenues of approach? | 3.17 | 3.17 | 0 | | | |
| III | Did platoon positions selected by the CO afford/provide covered and trafficable routes of withdrawal? | 4.43 | 4.14 | -.29 | | | ✓ |
| III | Were barriers placed in areas not easily bypassed? | 3.67 | 3.17 | -.50 | | | |

Table 7c (Cont)

Item Analysis: Low Gain Items

| Section | | Mean Rating 1 | Mean Rating 4 | (gain) | Content Classification (consensus judgment) Priority | Co-ordination | Shifting of Forces |
|---|---|---|---|---|---|---|---|
| II | Were platoons located in positions designated by CO? | 3.86 | 3.29 | -.57 | | | |
| | Means for Low Gain Items | 3.66 | 3.85 | .19 | | | |

(c) shifting of forces as a result of changes in the situation. In order to check the objectivity of the above descriptions, the controller, senior author, and enemy player classified each of the items with respect to these factors. To do this, each item was discussed until a concensus was reached concerning which, if any, of the three factors were involved. The results are reported in the right hand columns of Tables 7a, 7b, and 7c. The consensus was that almost all of the high gain items involved one or more of these factors, while almost none of the moderate gain items did. Similarly, few of the low gain items involved these factors. The "high gain" items also tended to involve conduct of the battle (section IV) rather than plans and preparation.

When the low and moderate items did involve these factors, it was generally a matter of "coordination." But here it was a special kind of coordination, in the sense of following orders, rather than coordination among maneuver elements during the battle, which was present in the high gain items.

## DISCUSSION

### PERFORMANCE CRITERIA

One objective of the research was to develop measurable performance criteria. Two kinds of measures were developed: (a) the WCI' ratio, based upon casualties, and (b) the rating scales. Both kinds of measures show a steady trend of improvement over the four battles. But the WCI' ratios are especially affected by circumstances, such as the unfavorable terrain on the third battle, or an unfavorable roll of the dice at a particularly critical point in the battle. The poor outcomes on the third battle also seemed to demoralize the participants,

as indicated by such behavior as inattention (i.e. looking away from the game board for substantial periods.) If a controller emphasizes the WCI' as a critical measure of the participants' skill (which our controller did not), there would seem to be a risk of aggravating the demoralizing effects of taking casualties.

There are other quirks of the data on WCI' ratios, such as the exceptionally good performance of the $A_3$ group on the first day. This may be related to the fact that two of the platoon leaders in that group were regular players of war games, as members of a war-games club, and no other participants had that kind of previous experience. The commander of that group also was highly experienced in command.

The rating scales indicated a much steadier progress with increasing experience. The ratings also have the advantage of structuring the critiques, thus serving as guidance on what is to be learned. The rating scales seem to have overcome the superficiality of the traditional check lists (which have dichotomous scoring), as indicated especially by the coherent patterns that emerged from the item analysis.

TRAINING STRATEGIES

Two kinds of modification seemed most promising and feasible: (a) restriction of communication to realistic channels through use of field telephones, and requiring formal orders as needed in combat; and (b) adding mini-lessons on such apparently critical points as reverse slope defense. A third alternative is "free" play of the game, as it would be played normally if there were no instructions to the contrary.

EVALUATION STRATEGIES

The first strategy (limited communication and formal orders required) took somewhat longer, both in preparation and playing, but seemed to result in somewhat greater learning, especially on generating an OPORD and other items that should be sensitive to this treatment. (The differences between this and other groups might have been larger if all groups had not played under the $E_1$ conditions on the firsd day.) However, these advantages seemed to reach the point of diminishing returns (i.e., approach an asymptote) around the end of the second game, so it seems reasonable to discontinue the special restrictions after the second game, or when the average ratings on $E_1$ items reaches a criterion level of about 4.10 (presuming the same items and ratings standards are applied.) Such a mixed strategy is also consistent with the general observation that the participants often seemed to complain about the special restrictions after the second game.

Although the mini-lessons may have some effect on the items measuring their content, the effect appears to be negligible. In view of the small amount of time involved for the lessons, it would seem to make little difference whether they are given or not.

APPENDICES

---

A. Content of Mini-Lessons (Outline)

B. Demonstration Briefing Outline

C. Handout: How to Play

D. Control Sheet

E. Sample Bn OPORD

F. Defensive Rating Scales (with subscales $E_1$, $E_2$ indicated)

G. Devices and Techniques to Facilitate Playing the Game

1. Movement rate card
2. Direct fire criterion card
3. Technique for placing artillery rounds
4. Tongs
5. Visual coding schemes for artillery and direct fire
6. Communications

APPENDIX A

---

Outline of Mini-Lessons

I. Anti-tank Guided Missiles (ATGM)

1. General: TOE for TOW, DRAGON
2. Capabilities and limitations of ATGM
3. Selecting and preparing positions
4. Execution of ATGM fire plan

II. Artillery Fire Planning

1. Functions and criticality of artillery
2. Definitions of planned and registered fires, and criteria for using them
3. Calling for and adjusting fire
4. Types of ammo and fuses, and when to use each

APPENDIX B

---

Outline of Demonstration Briefing

Introduction

Territory represented by game board.
Scale: The board, its relief, and pieces
The tank-heavy company team
Definitions of bounds and phases, and a discussion of time represented by each bound.

How to play

Distribution of handout "Directions for U.S. Bound." Participants read these section by section, as the controller demonstrates:

1. Call missions
2. Deliver fire
3. Direct fire
4. Movement

APPENDIX C. Handout on How to Play

DIRECTIONS FOR US BOUND
(All the rules you need)

I. CALL FIRE MISSIONS

A. Controller grants fire missions.

The recorder will roll one die to see whether each of the following artillery elements is available for fire missions:

| | roll rqd. |
|---|---|
| 4.2 inch mortar plt | 4* |
| 155mm howitzer battery | 4 |
| 8 inch howitzer battery | 6 |

He will notify F.O. at the beginning of each round. Once granted, your mission occupies the battery until finished (two or more bounds).

B. Select targets.

You may fire at a suspected enemy position, or at visible targets.

Visibility requires:

1. Line of sight -- no terrain masking or firing through smoke (controller's decision is final).

2. Visible range (controller measures it).

Visibility Range Table

| | Moving | Stationary | In trees, etc. |
|---|---|---|---|
| Troops | | | |
| Individual | 500m | 250m | 50m |
| With ATGM (TOW, Dragon, SAGGAR, SWATTER) | 500m | 500m | 100m |
| Squad | ——— | 500m | ——— |
| Vehicles | | | |
| In defilade or prep def posn | 2,000m | 1,000m | 100m |
| Exposed | 5,000m | 3,000m | 250m |
| Blast-from firing guns or ATGM (lasts one bound) | ——— | 5,000m | ——— |

*Controller explained that this meant 4 or greater

DIRECTIONS FOR US BOUND
(All the rules you need)

## I. CALL FIRE MISSIONS

A. Controller grants fire missions.

The recorder will roll one die to see whether each of the following artillery elements is available for fire missions:

| | roll rqd. |
|---|---|
| 4.2 inch mortar plt | 4* |
| 155mm howitzer battery | 4 |
| 8 inch howitzer battery | 6 |

He will notify F.O. at the beginning of each round. Once granted, your mission occupies the battery until finished (two or more bounds).

B. Select targets.

You may fire at a suspected enemy position, or at visible targets.

Visibility requires:

1. Line of sight -- no terrain masking or firing through smoke (controller's decision is final).

2. Visible range (controller measures it).

### Visibility Range Table

| | Moving | Stationary | In trees, etc. |
|---|---|---|---|
| **Troops** | | | |
| Individual | 500m | 250m | 50m |
| With ATGM (TOW, Dragon, SAGGAR, SWATTER) | 500m | 500m | 100m |
| Squad | ——— | 500m | ——— |
| **Vehicles** | | | |
| In defilade or prep def posn | 2,000m | 1,000m | 100m |
| Exposed | 5,000m | 3,000m | 250m |
| **Blast-from firing guns or ATGM (lasts one bound)** | ——— | 5,000m | ——— |

*Controller explained that this meant 4 or greater

C. Call for round.

Using target coordinates, you may call for an adjusting round, fire for effect, or smoke. It will land two bounds later, with a chance error introduced.

If a registration point is available, you can call adjustments from that point (no more than 1000m corrections, please). The round will land in two bounds, accurately. The registration point may be from pre-planning, or from a previous fire mission if you told the FO to register it.

II. DELIVER FIRE

Controller delivers fire and determines effects:

Adjusting rounds. As you observe an adjusting round fall, you call corrections right away (approved automatically) and the next round (adjusting or FEE) will fall on the next bound, accurately.

Fire-for-effect. If a FFE lands near a target, controller will use "artillery effects" template to see whether the target is in the zone. If so, then he will roll one die to see whehter it is neutralized. (Neutralized vehicles may not fire on the next bound.) If a vehicle is neutralized, he will roll die again to see whether it is killed.

| | roll rqd. for neutralization* | rqd. on 2nd roll for kill |
|---|---|---|
| BMD/BRDM/APC | 4 | 5 |
| Tank | 5 | 6 |
| Troops | 4 | (if troops are neutralized they're also killed) |

You may call "REPEAT" or request a shift of a FFE (subject to approval by roll of die); if approved, it will fall on the next bound.

Smoke. A smoke mission is represented by three cotton puffs, which

extend downwind to five then contract at the rate of one puff per bound.

III. DIRECT FIRE

A. Necessary conditions.

1. Target must be visible (same as above).

2. Firing vehicle may not have been hit by direct or indirect fire on the previous bound.

B. Firing decision. Issue a platoon fire command indicating which of your weapon systems fire at which targets.

When firing tanks, you must also decide whether to fire two rounds, or only one, and how much you want to move.

Firing two rounds, you can't move, and that makes you more vulnerable.

Firing one round:

- you may move 50m without affecting accuracy.

- or you may move 1/2 normal distance, but degrade accuracy.

C. Effect. Determine:

1. Range (controller will measure it after you have decided to engage).

2. Effect

a. Tank main gun or ATGM. Required roll of dice is established by the whiz wheel and the following table:

DIRECT FIRE HIT DETERMINATION

roll normally rqd.
(from whiz wheel)

| Special Factors | roll rqd. |
|---|---|
| You're moving (1/2 speed)..... | +20 |
| Target moving..... | +10 |
| Target in dfld..... | +10 |
| Suppression (for one bound) | |
| from ARTY beat zone..... | +10 |
| from tank or ATGM..... | +10 |
| Tank's second round..... | -10 |

b. Machine guns. Required roll (one die) is as follows:

| | 50m | 100m | 250m | 500m | 1000m |
|---|---|---|---|---|---|
| Cal. 50, coax | 4 | 4 | 4 | 4 | 5 |
| M60 | 3 | 3 | 4 | 5 | |

IV. MOVEMENT

Move each piece, using the "movement rate" card to measure maximum distance. Also apply the following special factors when appropriate:

Firing weapons

Tanks, main gun

- one round...50m or 1/2 movement, as you decided during "Direct Fire"

- two rounds...stop for that bound

ATGM (TOW, Dragon, etc.) - stop for that bound

Obstacles (streams, etc.)

Stop at obstruction, use one bound just to cross, then proceed.

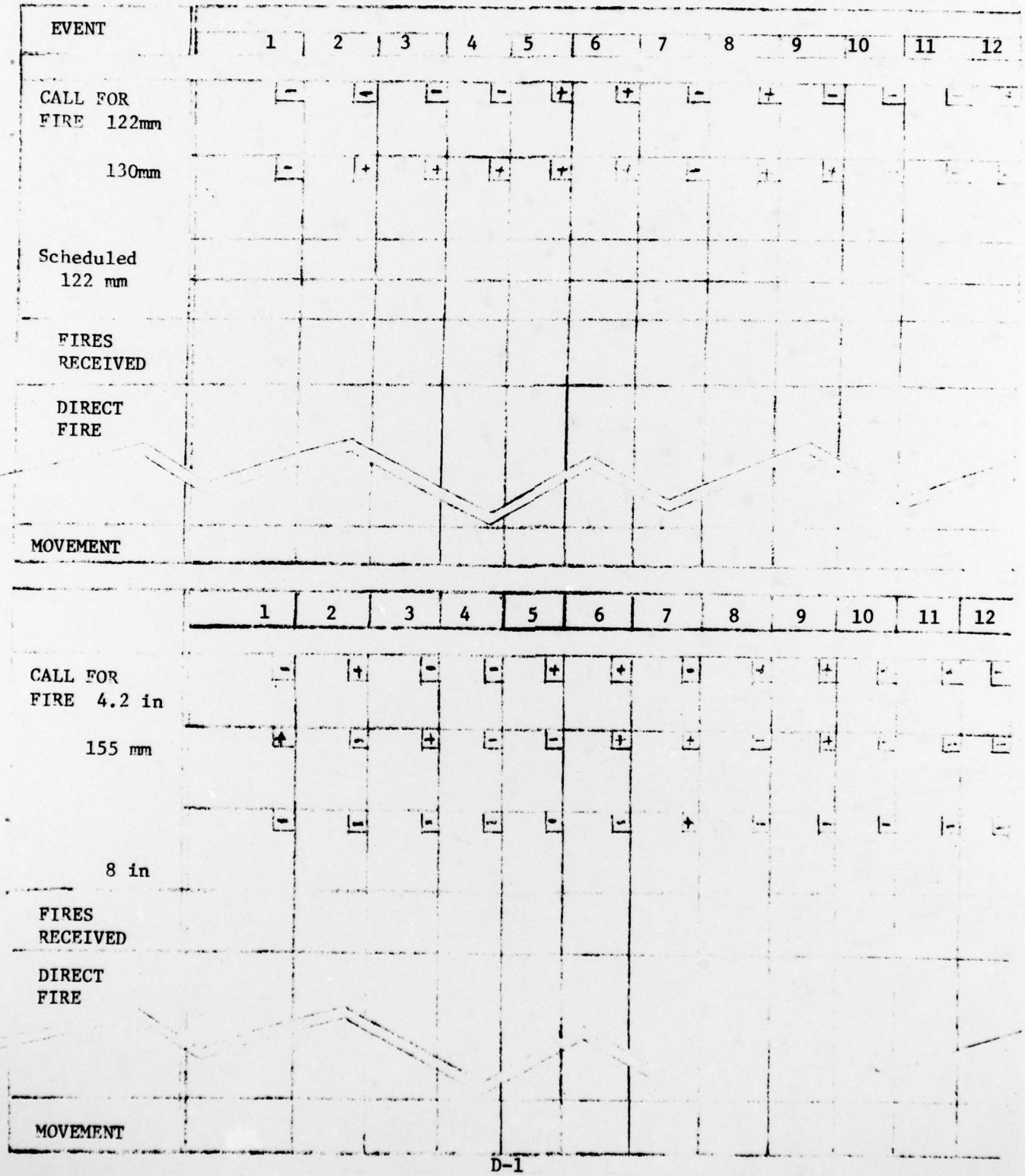
Mine fields

First vehicle to cross a field explodes a mine, which may kill it (roll one die).

| | roll rqd. |
|---|---|
| Kill of BMP/BRDM/APC ..... | 4 |
| Kill of tank..... | 5 |

Then other vehicles may safely follow his path at 50m per bound.

Appendix D. Control Sheet



Copy No. _____
TF 1-31 Armor
Bad Hersfeld, Germany
NB619210
061800Jun

OPORD 1
Ref: Map GERMANY, 1:50,000, HUNFELD and BAD HERSFELD sheets.

Task Organization:

Tm A:
A/2-40 MECH (-1 Plt)
1 Plt/B/1-31 Arm

Tm B:
B/1-31 ARMOR (-1 Plt)
1 Plt/A/2-40 MECH
1 HAW Sect (TOW)

Co C
C/1-31 Armor

TF Con:
1 LOH OPCON
Scout Plt
3 AN/PPS-5A
1 Plt/A/25 ENGR (DS)

1. SITUATION

a. Enemy forces: Elements of the 51st Tank Division and the 242d Motorized Rifle Divisions are suspected to be preparing for an attack to the SE along Autobahn E70, W of HUNFELD (NB5415). Elements of the 22d Motorized Rifle Regiment and 33d Tank Regiment have been sighted approximately 25 Km N of HUNFELD and are believed to be preparing to participate in a secondary attack against friendly defenses NE of HUNFELD.

b. Friendly forces:

(1) 1st Bde will conduct active defense along FEBA from Autobahn E70 (N34815) to HEIMBOLDSHAUSEN (NB 6734).
(2) TF 2-31 ARMOR defends in sector on TF left flank.
(3) 1-9th Cav screens on TF right flank.
(4) 1-39 Arty (155 HOW): DS 1st Bde

c. Attachments and Detachments: Task Org. A/1-31 ARMOR remains detached.

2. MISSION
TF 1-31 ARMOR conducts active defense by 07 1300 JUN from NB 486155 to NB 675346.

3. EXECUTION
a. Concept of Operation:
(1) Maneuver: TF 1-31 occupies battle positions along FEBA with 3 company/teams abreast, Tm A, Tm B, and Co C from left to right; defends along FEBA; on order, moves to battle positions along PL Bravo.

(2) Fires: Arty; Priority of fires initially to Tm B; annex A, Fire Support. No nuclear fires are available.

b. Tm A: Occupy POSN 3 NLT 071300 Jun; defend POSN 3; assist passage of scout plat at PP 1; be prepared to occupy POSN 6 and 9 on order.

c. Tm B: Occupy POSN 2 NLT 071300 Jun; defend POSN 2; assist passage of scout plat at PP2; be prepared to occupy POSN 5 and 8 on order.

d. Co C: Occupy POSN 1 NLT 071300 Jun; defend POSN 2, be prepared to occupy POSN 4 and 7 on order.

e. Scout Plt: Initially screen TF Front; on order conduct passage of lines thru Tm A and Tm B; after passage screen TF right flank.

f. Hv. Mort Plt: GS: priority of fires initially to Co C. Locate initially vic NB 6426.

g. Gnd Surv Sec: Initially attach 3 AN/PPS-5A to Scout Plt. After passage of FEBA by Scout Plt, attach 1 AN/PPS-5A to Tm A and 2 to Tm B.

h. Engr Plat: priority of work to building obstacles and improving battle positions along FEBA. Priority initially to Tm B, then Tm A then Co C.

i. Coordinating instructions: Tm A and Tm B report clearance of FEBA by Scout Plt.

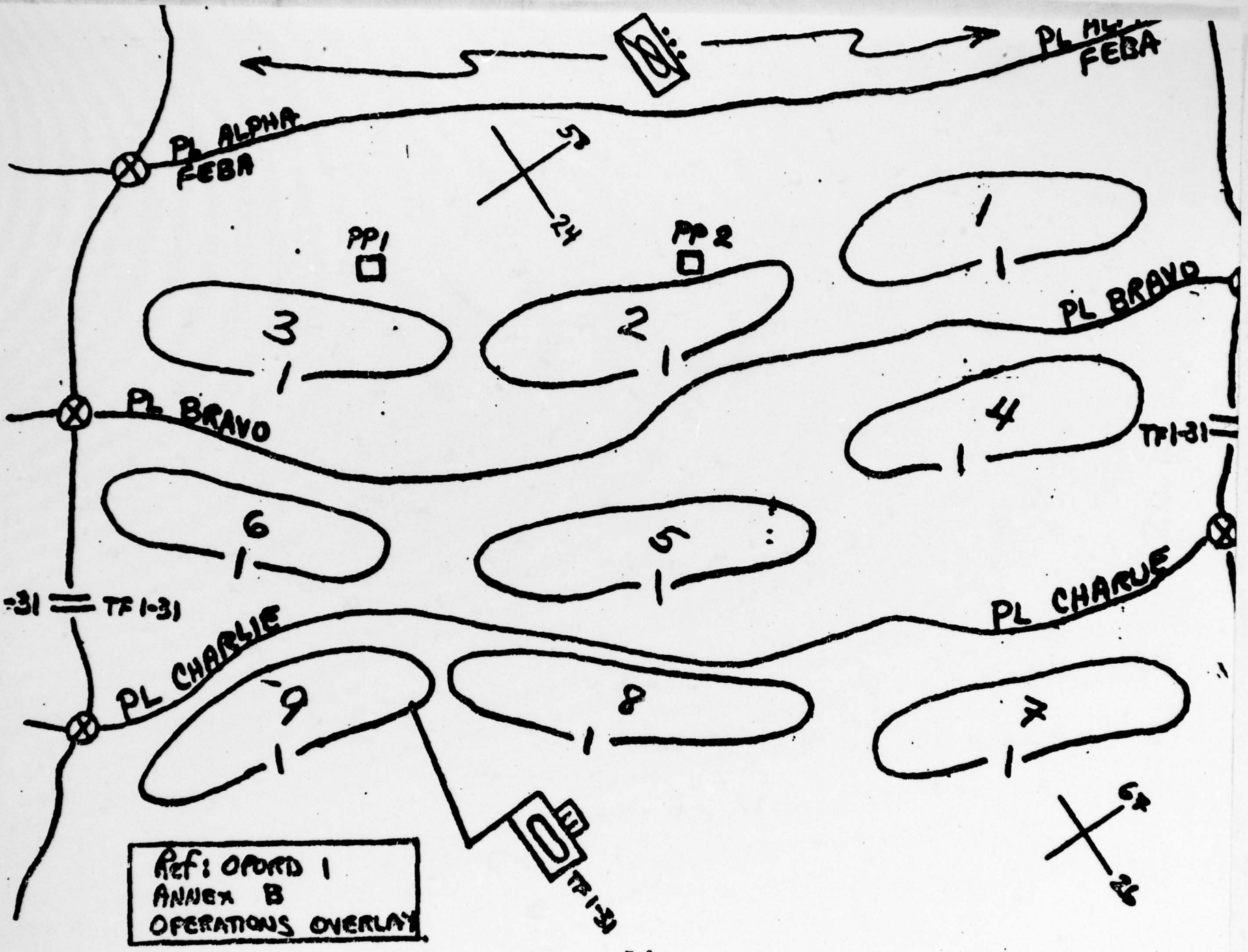
4. SERVICE SUPPORT
   a. Cbt tns loc init vic NB 650215; move on order.
   b. CSR: (1) 4.2-in (HE): 60
      (2) Other, no restriction.

5. COMMAND AND SIGNAL
   a. Signal
      (1) Current CEOI is in effect
      (2) Recognition Signal: One aircraft marker panel on front slope of each vehicle making passage of lines.
   b. Command: CP loc NB 619210.

BROWN
S-3

12

Annex A - Fire Support (to be issued)
Annex B - Operations Overlay
Distribution: A


PL ALPHA
FEBA
PL BRAVO
PL CHARLIE
PP1
PP2
TF 1-31
24
64
1
2
3
4
5
6
7
8
9
Ref: OPORD 1
ANNEX B
OPERATIONS OVERLAY

## APPENDIX F. DEFENSIVE RATING SCALE

I. OPERATIONS ORDER

$E_1$ subscale items

Enemy Situation

_____ Did it include size, direction and type of enemy units?
_____ Was the tac air situation mentioned?

Friendly Situation: Did it include:

_____ Battalion mission
_____ Adjacent companies mission

Company Mission: Was it given?

Execution:

Were specific tasks assigned to:

_____ 1st Plat
_____ 2nd Plat
_____ 3d Plat
_____ HAW Sect
_____ Engrs
_____ Was a completion time designated?
_____ Was someone assigned the passage point?
_____ Were sectors of responsibility designated?

Fire Support Plan

Did it include:

_____ Preplanned Fires
_____ Registered Fires
_____ Were fires called to battalion FDC?
_____ Final Protective Fires

Barrier Plan: If a barrier plan existed was it mentioned?

Coordinating Instructions:

_____ Was Passage Point recognition signal mentioned?

Service Support:

_____ Was location of Company trains given?

Command and Signal

Did it include location of

_____ CO
_____ FO
_____ Commo track
_____ Was CEOI addressed?

II. EXECUTION OF OPERATIONS ORDER

(Compare CO's sketch of his intended defense plan with actual set up.)

_____ Were platoons located in positions designated by CO?
_____ Were intended platoon sectors of responsibility covered?

$E_1$ Did someone man the passage point?

Did Platoon Leaders know the location of registered and preplanned fires in their sectors?

## III. EVALUATION OF DEFENSIVE PLAN

Did Platoon positions selected by the CO afford/provide:

- Cover
- Concealment
- Use of reverse slope advantage
- Long range vision
- Long range fields of fire
- Mutual supportability with interlocking fire between platoons
- Concentration of massed direct fire on most likely routes of enemy advance
- Covered and trafficable routes of withdrawal
- Primary and Supplementary platoon positions

Did individual HAW positions afford/provide:

- Cover
- Concealment from air observation; i.e., woods or hide position behind firing position
- Alternate defilade firing positions
- Long range fields of fire (out to 3000m)
- Enough distance from other firing vehicles to prevent simultaneous suppression by a single artillery mission

Did individual vehicle positions *afford/provide:*

- Cover
- Concealment from air observation, i.e., in woods or hide position behind firing position
- Long range field of fire (at least up to 1500m)
- Primary and alternate firing positions (either natural or man-made) within 50m.

Was the passage point covered by fire.

Indirect fires

- Were preplanned fires located along all likely avenues of enemy approach?
- Were registered fires located along most likely enemy avenues of approach?
- Were registered fires located so as to be easily adjusted from?

Barrier Plan:

- Were barriers placed in areas not easily bypassed?
- So as to channelize the enemy or to deny him avenues of approach?

IV. CONDUCT OF THE DEFENSE

$E_1$ ____ Did CO shift platoons to meet major enemy threat?

Passage of Lines

____ Did friendly vehicles man the passage point until all passing vehicles had passed?

Did HAWS:

$E_2$

____ Open fire at maximum range (2000-3000m)?

____ Shoot and move to avoid being suppressed?

____ Coordinate fire with tank direct fire suppression so as to minimize vulnerability of HAW to enemy counter-fire?

____ Give priority of fires to most dangerous enemy weapons?

____ *Did DRAGON contribute to the defensive effort?

____ Were initial engagements conducted so as to minimize divulgence of friendly strength and positions?

Tank fire techniques

____ Was direct fire used to suppress the most lethal enemy weapons?

____ Once enemy vehicles had moved within effective range of friendly positions, did friendly vehicles shoot and move to alternate positions to reduce their vulnerability?

Reports

$E_1$

____ Was the CO kept informed of friendly situation?

____ Was the CO kept informed of enemy situation?

____ *Was clearance of the passage point reported?

$E_2$

____ Was maximum use made of registration points?

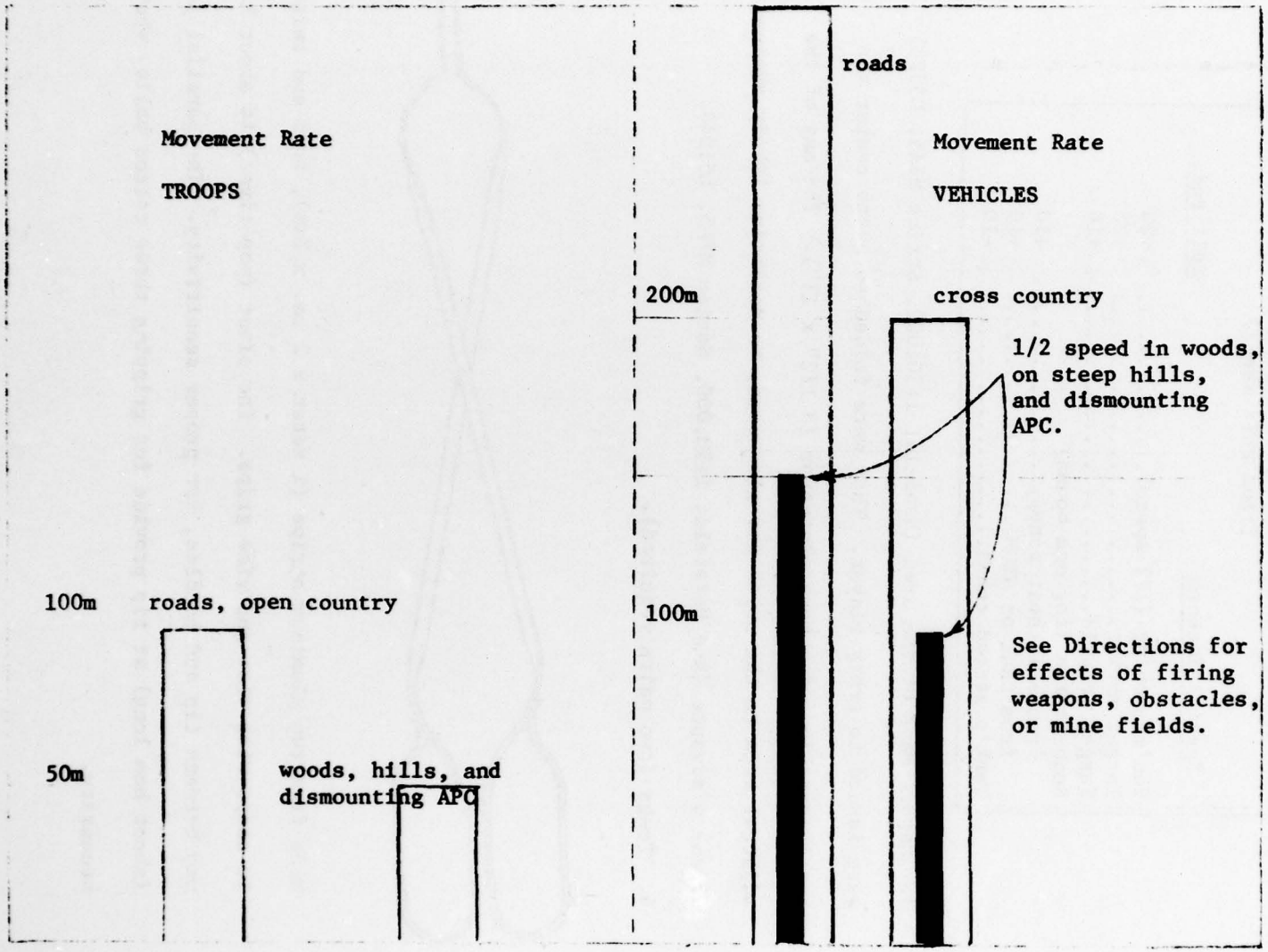
____ Were adjustments quick and accurate?

____ Was ARTY fire used to suppress most dangerous enemy weapons?

*These items were graded as dichotomous, with values: OK=4, not OK=2.

1. Movement Rate Card

DIRECTIONS: Duplicate as needed, cut out, fold on dotted line, and tape over a 4"x6" card.



2. Direct fire criterion card. Cut out and tape to dice cup.

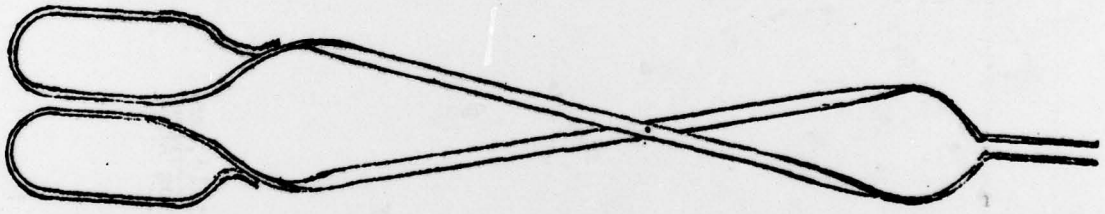
DIRECT FIRE HIT DETERMINATION

= roll normally rqd.
(from whiz wheel)

| Special Factors | roll rqd. |
|---|---|
| You're moving (1/2 speed)..... | +20 |
| Target moving..... | +10 |
| Target in dfld..... | +10 |
| Suppression (for one bound) | |
| from ARTY beat zone..... | +10 |
| from tank or ATGM..... | +10 |
| Tank's second round..... | -10 |

3. Maps. Maps of the area (Hunfeld; 1:50,000, Series M745; L5324) were issued to every player. They were folded so as to center the battle area in a document protector (8 1/2" x 11"). The map of the adjacent area to the north was also used, to determine likely avenues of enemy advance (Bad Hersfeld; 1:50,000, Series M745, L5124).

4. Tongs (two pairs required).



Made from two aluminum strips (1 meter x 2 cm. x 2mm), bent and twisted to shape with vise and vise grips. The pivot (pop-rivet) is about half way between tip and handles, for proper sensitivity. The parallel jaws (about 8cm long) at tip provide for gripping three cotton balls, when necessary.

5. Technique for laying artillery rounds:

(1) Find the first coordinate along the short side of the game board. (The coordinates are printed along the edges of the board.) Extend the tape measure to lay off this distance from the corner of the board, and pinch the tape to hold it.

(2) Find the other coordinate along the long side of the board. From this point, lay off the first coordinate distance with the tape at right angles to the edge of the game board, and place the artillery round. Your visual estimate of right angles will be good enough. (Controller skipped the laborious step of rolling dice to determine artillery error; instead he applied a small amount of random error by rough estimate.)

Note: Although this method may seem straightforward, even obvious, it was arrived at only after considering more complex methods and devices. Also, much more cumbersome methods for doing this have been observed.

6. Visual coding techniques for artillery and direct fire:

(1) To designate artillery rounds of different caliber, different color cotton balls were used. (Dyed red, yellow and blue with felt-tipped markers.)

(2) To distinguish an expanding smoke pattern from contracting smoke, the fifth (last) cotton ball was colored black.

(3) Firing units under suppression were designated with a very small cardboard tag alongside, folded into a "T" shape so that it could be picked up with the tongs.

7. Measuring range

For measuring range between U.S. and threat elements the controller used an aluminum beam about 60 inches long (a bracket support for adjustable

shelving.) it was calibrated at scale distances of 50, 100, 250, 500, 1000, 1500, 2000, 2500, and 3000 meters. (These are the only distances needed for any range tables on the "whiz wheel", so measurement was simplified.) The measuring beam overcame the shortcomings of tape by being rigid, extremely light, and by eliminating conversion and interpolation.

8. Communications.

To simulate radio contact when restricted communications were required, TA-312 field telephones and an AN/GRC-39 renovate unit were employed. One net consisted of the team commander connected with the platoon leaders, and another net connected the forward observer with the data processor, who took the role of the fire direction center.