

AD-A134 962

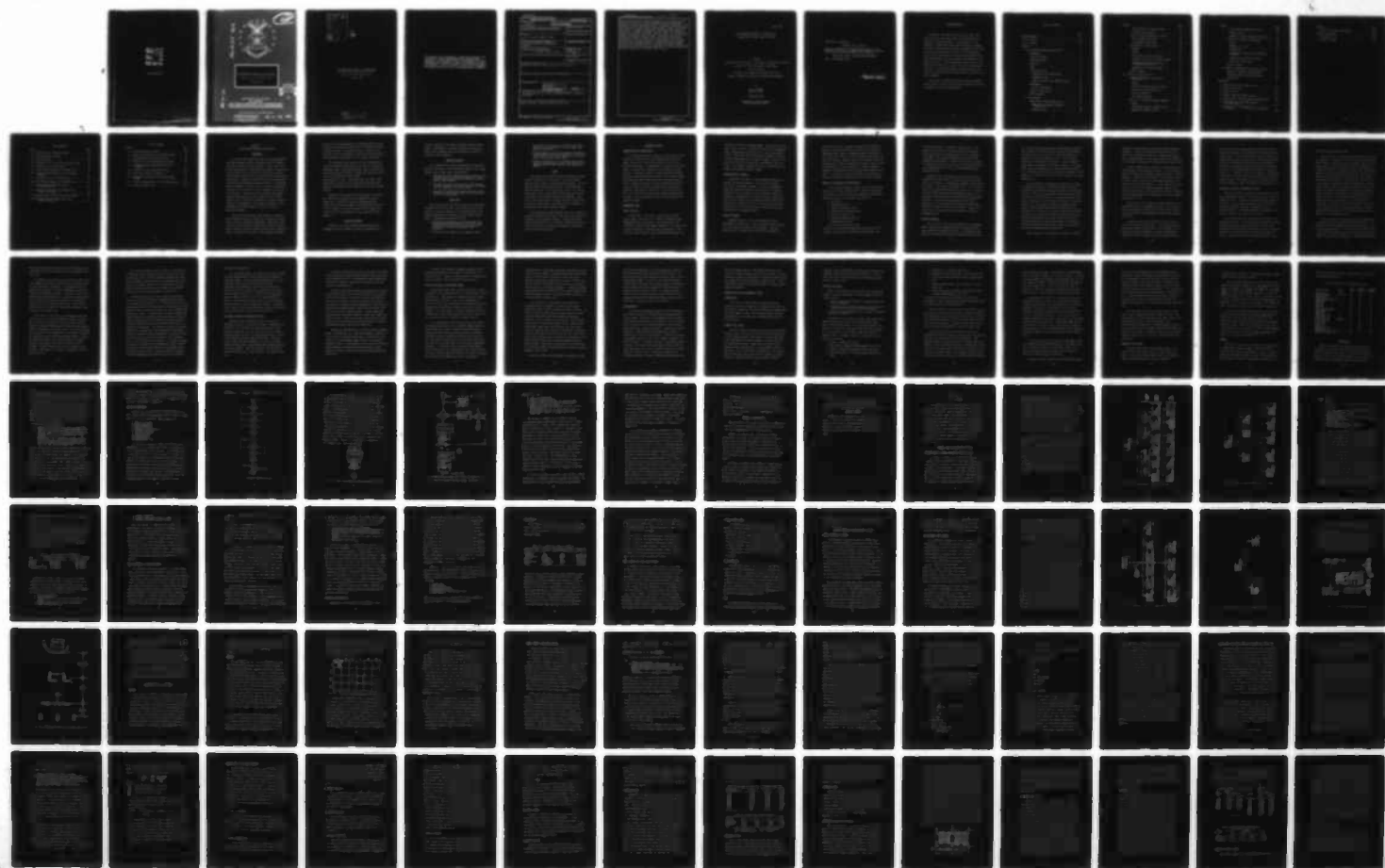
ANTI-MECHANIZED DEFENSE: A COMPUTERIZED SIMULATION FOR
SQUAD LEADER TRAINING(U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. J E WISSLER
SEP 83 AFIT-LSSR-77-83

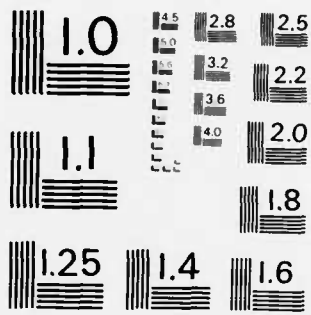
1/4

UNCLASSIFIED

F/G 5/9

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD-A134 962

2



ANTI-MECHANIZED DEFENSE: A COMPUTERIZED
SIMULATION FOR SQUAD LEADER TRAINING

John E. Wissler, Captain, USMC

LSSR 77-83

DTIC FILE COPY

DTIC
ELECTE
NOV 28 1983

D

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

83 11 28 029

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
Al	



ANTI-MECHANIZED DEFENSE: A COMPUTERIZED
SIMULATION FOR SQUAD LEADER TRAINING

John E. Wissler, Captain, USMC

LSSR 77-83

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information are contained therein. Furthermore, the views expressed in the document are those of the author(s) and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the Air Training Command, the United States Air Force, or the Department of Defense.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER LSSR 77-83	2. GOVT ACCESSION NO. AD-A134 962	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) ANTI-MECHANIZED DEFENSE: A COMPUTERIZED SIMULATION FOR SQUAD LEADER TRAINING		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis
7. AUTHOR(s) John E. Wissler, Captain, USMC		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS School of Systems and Logistics Air Force Institute of Technology, WPAFB OH		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Department of Communication AFIT/LSH, WPAFB OH 45433		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE September 1983
		13. NUMBER OF PAGES 369
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Approved for public release: LAW AFR 190-17. <i>John E. Wissler</i> LYNN E. WOLAVER Dech for Research and Professional Development Air Force Institute of Technology (ATC) Wright-Patterson AFB OH 45433 15 SEP '83		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) ANTITANK WARFARE, LAND COMBAT, LANDMINE WARFARE, SIMULATION, WAR GAMES		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Thesis Chairman: Thomas D. Clark, Lt Col, USAF		

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Battalion Landing Team

Marine Corps doctrine requires deployment of one combat engineer platoon with each BLT. Engineer squad leaders provide anti-mechanized defense expertise to BLT rifle company commanders. This expertise includes the effective use of barriers and obstacles in conjunction with organic direct fire antimech weapons and combined arms support. Current squad leader training in these areas is limited due to budget, equipment, and training area constraints during both shipboard and ashore periods. Gaming has proven a satisfactory approach in supplying this training. This research developed a two-player, Pascal-based, computerized simulation incorporating USMC and Soviet direct and indirect fire weapons, standard barriers and obstacles, and appropriate Soviet tactics. Development of the game included initial verification and validation testing through comparison of game responses to MCCRES standards and interpretation of actual Marine enlisted playtesting. The completed prototype war game was shown to provide realistic and enjoyable training on the squad leader level.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

LSSR 77-83

ANTI-MECHANIZED DEFENSE: A COMPUTERIZED
SIMULATION FOR SQUAD LEADER TRAINING

A Thesis

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirement for
Degree of Master of Science in Engineering Management

BY

John E. Wissler
Captain, USMC

September 1983

Approved for public release;
distribution unlimited

This thesis, written by

Captain John E. Wissler

has been accepted by the undersigned on behalf of the
Faculty of the School of Systems and Logistics in partial
fulfillment of the requirement for the degree of

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT

DATE: 28 September 1983

Thomas W. Clark, Jr.
COMMITTEE CHAIRMAN

ACKNOWLEDGEMENTS

Although an individual effort by title, this thesis would have been impossible without the cooperation and assistance of many individuals. In particular, I am indebted to Lieutenant Colonel James Bexfield and Captain Pat Lawlis, without whom the Pascal programming of the game would have been extremely difficult, if not impossible. Further, the author wishes to express appreciation to Professor Dan Reynolds for his guidance and tutelage in computer simulation. Finally, my utmost thanks goes to Lieutenant Colonel Tom Clark, thesis advisor and military professional. His gentle proddings, uplifting praise, and realistic outlook made this research effort a success and a joy to complete.

This thesis is dedicated to my wife Sue, my daughter Becky, and my son Thomas John, who have helped in ways only a husband and father can appreciate.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER	
I. THE RESEARCH PROBLEM AND STRUCTURE	1
BACKGROUND	1
PROBLEM STATEMENT	2
RESEARCH QUESTION	3
OBJECTIVES	3
SCOPE	4
LITERATURE REVIEW	5
INTRODUCTION AND ORGANIZATION	5
MANAGEMENT GAMES	5
CURRENT MILITARY AND COMMERCIAL GAMES	20
METHODOLOGY	26
APPLIED METHODOLOGY	28
ORDER OF PRESENTATION	34
CHAPTER SUMMARY	35
II. THE WAR GAME	36
MARINE CORPS DOCTRINE AND TACTICS	36
ORGANIZATION OF COMBAT ENGINEERS WITHIN THE BLT	36
GROUND DEFENSE	40

Chapter	Page
THE PHILOSOPHY OF FIGHTING ARMOR	42
OBSTACLES AND BARRIERS	44
SOVIET OFFENSIVE DOCTRINE AND TACTICS	49
SOVIET OFFENSIVE ACTIONS	49
THE COMBINED ARMS ASSAULT	50
DEVELOPMENT OF THE WAR GAME	56
GENERAL	56
TERRAIN	57
SQUAD LEADER'S DECISION PROCESS	60
SEQUENCE OF ACTION IN THE MAIN PROGRAM	61
DETERMINING THE EFFECTIVENESS OF WEAPONS AND OBSTACLES	67
SUBROUTINES TO THE MAIN PROGRAM	71
CHAPTER SUMMARY	89
III. ANALYSIS OF GAME VALIDITY	91
STANDARD APPROACHES TO SIMULATION VALIDATION	91
GENERAL	91
SUBJECTIVE VERSUS OBJECTIVE METHODS	92
RATIONALIST VERSUS EMPIRICIST	93
ABSOLUTE PRAGMATIST	94
UTILITARIAN APPROACH	95
ANALYSIS OF APPLICABLE MCCRES STANDARDS	97
GENERAL	97
CONTINUING ACTIONS BY MARINES (S2A.1)	97
COMMAND AND CONTROL (S2A.2)	102

Chapter	Page
FIRE SUPPORT COORDINATION (S2A.3)	104
DEFENSE (S2B.6)	105
SUMMARY OF MCCRES STANDARDS COMPARISON . . .	106
ANALYSIS OF PROTOTYPE PLAYTESTING	107
GENERAL	107
CONDUCT OF THE TEST	107
DEMOGRAPHICS	109
INTERPRETIVE RESULTS OF QUESTIONNAIRE ANALYSIS	110
OBSERVATIONS DURING PLAYTESTING	112
SUMMARY OF PLAYTESTING	115
CHAPTER SUMMARY	115
IV. SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS . . .	117
SUMMARY OF RESEARCH ACCOMPLISHMENTS	117
RECOMMENDATIONS FOR FURTHER RESEARCH	123
CONCLUSIONS	125
APPENDICES	
A. PROTOTYPE WAR GAME PROGRAM LISTING	127
B. SAMPLE GAME OUTPUT	200
C. RULES FOR PLAY	301
D. TERRAIN CREATION PROGRAM LISTING	312
E. SQUAD LEADER'S DECISION PROCESS FLOWCHARTING . .	332
F. IDEF MODELING OF THE SQUAD LEADER'S DECISION PROCESS	336
G. RESULTS FROM "S" DETERMINATION OF CHI-SQUARE STATISTIC	346

Appendix	Page
H. SAMPLE POST-GAME QUESTIONNAIRE	348
SELECTED BIBLIOGRAPHY	352
A. REFERENCES CITED	353
B. RELATED SOURCES	358

LIST OF TABLES

Table	Page
1.1 Results of War Game Model Review	26
2.1 Unit Defensive Frontages	41
2.2 Minefield Types	46
2.3 Probability of a Hit with Soviet Small Arms . .	76
2.4 Probability of Wound Severity	76
2.5 Soviet Armored Weapons Hit Probabilities	81
2.6 Soviet Effects Probabilities for Armored Weapons	81
2.7 USMC Small Arms Hit Probabilities	83
2.8 USMC Antimech Weapons Hit Probabilities	84
2.9 USMC Antimech Weapons Hit Effects Probabilities.	84
2.10 Indirect Fire Weapons Hit Probabilities (USMC and Soviet).	84
2.11 Maximum Travel Distances per Turn (meters) . . .	88
2.12 Casualty Effects Probabilities from Landmine Encounters	89

LIST OF FIGURES

Figure	Page
1.1 Systems Simulation Process	29
1.2 Logic Flow Diagram of Squad Combat System	30
2.1 Organizational Structure of the BLT	38
2.2 Structure of the Reinforced Rifle Company	39
2.3 Structure of the Soviet Motorized Rifle Battalion	52
2.4 Structure of the Combat Recon Patrol	53
2.5 Soviet APC Dismount Procedures	54
2.6 Combined Arms Assault by the Combat Recon Patrol	55
2.7 Pictorial Representation of the Terrain Array	58
2.8 Artillery Search Areas	78

CHAPTER I
THE RESEARCH PROBLEM AND STRUCTURE

BACKGROUND

U.S. Marine Corps doctrine calls for the deployment of one combat engineer platoon with every Battalion Landing Team (BLT) aboard U.S. Navy shipping. The BLT tasks this platoon with providing combat engineer support in areas such as land mine warfare, preparation of obstacles and field fortifications, demolitions, and light road and landing zone construction. Inherent in this mission is the requirement to provide anti-mechanized defense expertise. The engineer platoon commander (normally a First or Second Lieutenant) is a special staff officer to the BLT commander and provides this expertise. Depending on the situation, each combat engineer squad leader acts as a special advisor to the infantry unit to which he is attached. As such, he must be equally as knowledgeable as the platoon commander in the employment of engineer support and its use in anti-mechanized defense.

Training for the engineer squad leader in the area of anti-mechanized defense is almost non-existent and is generally limited to practical experience. Expansion of this training is very difficult because time, space, and equipment constraints create a limited availability of assets for actual "in-the-field" training. While deployed, training

areas are not readily available to embarked Marines (those on ships), and little room exists for training during actual shipboard periods. Classroom training is limited in its ability to test the employment of specific tactics and their effectiveness and therefore, is not a viable alternative.

The literature review portion of this research establishes the teaching effectiveness and external validity of management games. War games have been shown to effectively teach anti-mechanized tactics, however they currently exist only on the platoon and larger levels (10,25,26,35,46,47,50). Development of a war game on the squad level, incorporating the decisions and actions pertinent to the engineer squad leader will solve the training problem.

Included in this chapter are discussions of the problem, the research question and the supporting research objectives, a literature review of management gaming, analysis of existing war games, and the methodology applied in this research. The final portion of this chapter outlines the order of presentation of the remainder of this research.

PROBLEM STATEMENT

Currently, no single training method exists which encompasses the size, weapon, vehicle, and obstacle con-

straints necessary in training the combat engineer squad leader. Development of a single simulation war game will provide this training, given all pertinent decisions are included in the simulation.

RESEARCH QUESTION

Can a simulation war game be developed to incorporate decisions pertinent to anti-mechanized support on the combat engineer squad leader level? Specifically :

- a. How can the use of landmine warfare, obstacles, and indirect and direct fire weapons against a Soviet equipped enemy be modeled for effective use by engineer squad leaders?
- b. How does the simulation accurately reflect those decisions germane to the squad leader's environment (are the simulation results verified)?
- c. How does the simulation war game provide realistic training as determined through actual play testing by Marine squad leaders?

OBJECTIVES

The primary objective of this research was to develop a validated simulation war game incorporating decisions pertinent to direct and indirect fire, landmine warfare, and obstacles applicable to the Marine combat engineer squad leader. Intermediate objectives were to:

1. Evaluate current tactical military war games and simulations to determine their fulfillment of the research objectives and effects on, and possible inclusion in, the prototype computerized simulation.
2. Evaluate current commercial war games for their

fulfillment of the research objectives and their effect on and possible use in the prototype computerized simulation.

3. Evaluate Marine Corps Combat Readiness Evaluation System (MCCRES) criteria to determine if the prototype simulation accurately reflects decisions germane to the engineer squad leader.
4. Evaluate impressions of the prototype simulation's realism as determined by actual play testing and compare these with the results of the MCCRES evaluation.

SCOPE

This research was directed towards developing a computerized simulation war game useful in training combat engineer squad leaders in anti-mechanized defense. The war game developed covers those aspects of anti-mechanized defense applicable to the squad leader level. All actions and results provide reinforcement of Marine Corps tactics and doctrine in accordance with MCCRES standards. Similarly, the prototype game increases the user's familiarity with Marine Corps weapons and combined arms procedures in conjunction with combat engineer support.

The prototype war game emphasizes the use of landmine warfare and obstacles and their interaction with organic BLT anti-tank and fire-support weapons. Inputs to the game include representative U.S. and Soviet weaponry and tactics including direct and indirect fire weapons, and obstacle construction and destruction.

LITERATURE REVIEW

INTRODUCTION AND ORGANIZATION

In reviewing pertinent literature, this research investigated two separate areas; the teaching effectiveness of games, and current simulations available to fulfill the research objectives. In developing a war game to train personnel, the teaching effectiveness of war games was established. Although no specific research has been performed relevant to the teaching effectiveness of war games, management games have been studied and empirical results determined. Numerous war games have been developed by both military and commercial sources and these were reviewed with respect to the research objectives. The first portion of this literature review develops the teaching effectiveness of games. The final portion reviews current military and commercial games.

MANAGEMENT GAMES

Topic Statement

By definition, a war game, a game which simulates actual combat conditions, is a subset of management games. Management games are defined as role playing exercises involving a simulated environment engaged in to increase and reinforce managerial techniques and concepts (35). This section reviews research on the teaching effectiveness and

external validity of management games. "Teaching effectiveness" in this review is defined as the ability of management games, through game participation, to increase management skills. Conversely, Wolfe (55) defines "external validity" as the transferrability of academic insights into useful and effective real world orientations, perceptions, and practices. The academic insights referred to by Wolfe (53) are gained through participation in games.

Justification of Review

Since their inception in 1957, management games have enjoyed increased acceptance in providing experiential learning for management students. Critics of management games have questioned gaming's effectiveness in teaching managerial skills and pointed to the absence of empirical evidence as substantiation of their criticism. Recent findings in well controlled and analyzed experiments have outdated earlier reviews (9,27,55). This review displays the existing empirical base from which to decide the teaching effectiveness of management games.

Scope of Review

Management games exist in two categories; general management and functional. General management games attempt to reinforce skills common to all managers. Functional games, however, reinforce and stress skills relevant to

specific areas such as finance, production, or marketing. Because of the transferrability of the results of general management games, general management games are analyzed in this review with respect to their teaching effectiveness and external validity. Research concerning functional games and the effects of differing demographic characteristics of gaming individuals are not included due to their extremely tangential relationship to the teaching effectiveness of war games. A review of research from 1962 to the present provides an evolutionary perspective to the current research.

Method of Treatment and Organization

Prior to 1973, managerial skills were relatively undefined and difficult to analyze (29). However, Mintzberg's (24) research at McGill University focused upon eight basic managerial skills. His eight skills consist of :

1. peer skills
2. leadership skills
3. conflict resolution skills
4. information-processing skills
5. decision making skills
6. resource-allocation skills
7. entrepreneurial skills
8. skills of introspection (24)

These skills are directly applicable to the skills of an effective squad leader as defined by MCI0 P1550.54, The

United States Marine ...Essential Subjects (22). Even though the resources and decisions vary, both managers (businessman and squad leader) must react to a changing environment. This review separates pre- and post 1973 management game research. Further, the post 1973 research is analyzed according to two criteria, (1) measurable learning of managerial skills and (2), perceived learning of managerial skills.

Measurable learning describes the ability to express through quantifiable means the extent to which skills are attained or improved. As defined by Mintzberg, eight skills are evident in the effective manager (24). It is, at best, difficult to objectively measure any single skill. The difficulty in defining objective measurement criteria can be overcome by determining the perceived learning of game participants. With participant awareness of the eight managerial skills, perceptions of learning provide added evidence of gaming's teaching effectiveness. The final portion of this review deals with the external validity of management games.

Pre-1973 Research

Prior to 1973, it was felt participation in management games provided reinforcement and better understanding of course objectives (managerial skills). The teaching effectiveness of management gaming was accepted on face validity

(9). Most of the research of this period failed to support the acceptance on face validity of teaching effectiveness. The major cause of failure evolved from the inability to operationally define managerial skills. This research resulted in two separate conclusions. First, management games taught intangibles, and second, learning in a management game was not necessarily related to game performance (9). Research expressing these conclusions include Dill and Doppelt (7), Strother, et al (44), Lewin and Weber (18), and McKenney (23).

Dill and Doppelt (7) attempted to measure an increase in perceived learning and interest by administering and correlating pre- and post-test questionnaires to gaming participants. Positive correlations indicated perceived learning increased in three areas; (1) problem recognition, (2) general solutions, and (3) specific solutions. The primary conclusion of this research indicated management games taught problem recognition and not problem solving (7). Strother, et al (44) chose to measure conceptual knowledge, attitudes, and motivation through the administration of an attitude questionnaire and a fact and concept test (44). Using post-test only control group design, no significant differences between test and control groups were evident in any of the three measured variables (44).

Lewin and Weber (18) included risk taking in decision

making and organizational structuring as their dependent variables. Pre-test and post-test administration of the Social Risk Preference Questionnaire demonstrated higher risk taking tendencies in game participants and no effect on an individual's conception of organizational structure (18).

As well, McKenney (23) conducted a study choosing planning concepts as his dependent variable. A pre-test/post-test case examination evaluated student learning of planning concepts. High positive correlations, statistically significant at the 0.05 level, existed between successful case analysis and game participation. At the time of this study, case analysis was the standard management teaching tool (control group) against which games were compared. McKenny (23) concluded gaming was a substitute for cases in management education (23).

Participants in all studies, (7,18,23,44) were undergraduates enrolled in management programs. The wide variation of dependent variables and the inconclusive results provided no evidence that management games taught managerial skills (9).

The most controlled and effective research of this period was conducted by Raia (30). Raia's findings were in direct opposition to the majority of the findings for the period and provided evidence of teaching effectiveness. Conducting pre-test and post-test written examinations of

139 business school undergraduates, Raia (30) concluded measurable learning of course objectives resulted from game participation. A pre-test, post-test, control group with randomization design, a post test only motivation questionnaire, and absentee and drop-out data provided empirical evidence that management games had teaching effectiveness and as well increased motivation and interest in participants (30). Although a majority of findings in this period established a lack of teaching effectiveness, the empirical nature of Raia's (30) study adds positive support to the initial hypothesis, games are effective teaching tools. (9).

Measurable Learning of Managerial Skills

Previous research was inconclusive regarding the ability of management games to increase measurable learning of managerial skills. Subsequent research provides support to this claim. Five studies supported gaming's ability to increase measurable learning of managerial skills (49,51,52,53,56). In addition, Butler (4) expanded on the research of Wolfe (56) with similar results.

Vora (49) established learning and motivation as his dependent variables. A one shot design incorporated written examinations and participant interviews to obtain data. Analysis of the data revealed increased learning in problem recognition and solution using structure and leadership skills. Exact structure and leadership techniques varied

according to environmental needs.

Wolfe and Guth (53) compared the gaming approach to the case approach in the measure of overall knowledge of management concepts. Seventy-one senior management students were administered pre-test and post-test essay examinations to determine the relative learning effects of case study versus gaming. Using a pre-test/post-test control group with randomization research design, Wolfe and Guth (53) achieved high positive correlations, significant at the 0.01 level, between gaming students and mastery of management concepts and principles, and low positive correlations between fact mastery and gaming participation. Principle and concept mastery occurred in five aspects of decision making: (1) goals, (2) time, (3) information processing, (4) environment, and (5) long run versus short run time frames. According to Wolfe and Guth (53), fact mastery is the ability to describe a given principle with examples or facts while principle mastery is the ability to redefine and elaborate on a given managerial skill.

A third study of measurable learning through game participation was conducted individually by Wolfe (51). Two-hundred and eleven management students participated in one of two management games. Using the critical incident technique, Wolfe identified 1,453 critical incidents outlining effective and ineffective behaviors. Results showed manage-

ment games required participants to exhibit effective decision making skills and to display positive management policies (51).

In another study similar to Wolfe and Guth (53), Wolfe (52) compared the teaching effectiveness of simulation gaming and experiential techniques. He measured principle mastery, fact mastery, and overall management knowledge in eighty-four management students. The control group in this experiment was the gaming group. Significant differences in pre- and post-test examinations appeared for the gaming group but not for the experiential group. These results translated into an increase in measurable learning of principles and fact mastery (52).

More recently, Wolfe (56) varied management game complexity levels in assessing dependent variables of measurable learning and attitudinal reactions in participants. Seventy-six business administration students played games of simple, intermediate, or complex levels. Pre- and post-game essay examinations were administered and greater reliability was checked using the Spearman test-retest method. Results of examinations showed the complex game had the highest increase in measurable learning of concepts and facts although all games produced some level of teaching effectiveness. Additionally, all games increased peer skills in participants (56).

In a follow on study to Wolfe, Butler, et al (4) used an identical research design to assess measurable learning of both upper level (senior) management students and lower level (freshmen) students playing an intermediate level complexity (ILC) game. Butler, et al concluded the ILC game developed decision making skills in lower level students while honing skills already present in seniors (4).

Contradictory results to the aforementioned studies exist in two research efforts, Catalanello and Berenstuhl (5) and Rowland and Gardner (31). A medium difficulty simulation game served as the independent variable and cases and lectures served as the control groups in the Catalanello and Berenstuhl research. Pre-test/post-test essay examinations administered to 157 college juniors and seniors enrolled in a basic management course collected data on the dependent variables measurable learning, problem solving skills, and examination performance. An analysis of variance conducted between pre- and post-test scores denoted no significant measurable learning, however development of problem solving and decision making skills was highest of all managerial skills in both control and test groups. The study conducted by Rowland and Gardner was a correlational study in which low positive correlations between game performance scores and course grades existed. From this result the authors determined management game participation had no effect on

measurable knowledge (31).

As is evidenced above, the majority of current research provides substantiation to the teaching effectiveness of simulation games. The two dissenting studies have certain weaknesses which explain their contrary results.

Catalanello and Berenstuhl, while showing no measurable learning, did show a statistically significant increase in decision making skills (5). As defined by Mintzberg (24), decision making ability is one of the eight managerial skills. The Rowland and Gardner study used correlational data to exhibit a lack of measurable learning. The authors cite a lack of similarity between game success criteria and course objectives as a cause of this result (31).

Perceived Learning of Managerial Skills

Numerous studies measured perceived learning as a dependent variable. Five research efforts, Catalanello and Berenstuhl (5), Dittrich (8), Partridge and Sculli (29), Rowland and Gardner (31), and Sims and Hand (37), showed management games superior to traditional methods in providing perceived learning by game participants. Only one study, Boseman and Schellenberger (3), failed to support teaching effectiveness in management games through perceived learning increases. This study however, identified poor game administration as a major factor in its negative findings.

Catalanello and Berenstuh1 used a post-game Likert-type scale questionnaire measuring participant's perceived learning of managerial skills. Questionnaire scores ranked game participants highest in perceived learning over case and discussion techniques (5).

Dittrich varied game complexity and measured its effect on perceived realism and perceived learning in 203 students from two universities. Using pre- and post-test questionnaires, the researcher collected perceived learning data. An analysis of variance performed between pre- and post-test questionnaires demonstrated no significant perceived learning in high and low complexity games. Middle complexity games displayed decidedly different results with higher perceived learning. Additionally, perceived learning and perceived realism scores were correlated denoting a reciprocal relationship between these two variables (8).

Through the administration of three separate management games, Partridge and Sculli (29) used manager's responses to a five point Likert-type questionnaire in determining the degree to which management games assisted in developing managerial skills. The managerial skills of decision making under ambiguity and information processing were ranked highest in terms of perceived learning through game participation (29).

In their 1973 experiment, Rowland and Gardner used a post-test questionnaire to establish an increase in perceived learning. Likewise, Sims and Hand (37) showed a perceived increase in decision making and peer skills.

External Validity of Management Games

As defined by Wolfe (55), external validity of simulation games is the transferrability of lessons learned to the outside world. Two methods of research are used in determining external validity. The first is inferential in nature and offers the performance of businessmen against the performance of students as evidence of external validity (48,54). The second method is the most accurate and uses a longitudinal study of game performers and their later business success as proof of external validity (28,55).

In a correlational study, Vance and Gray (48) administered post-game tests to both college students and business executives in order to determine the relationship between game performance scores and personal attributes. The Edwards Personal Preference Schedule and the Ghiselli Self Description Inventory as well as college transcripts were utilized to collect data on the following independent variables : all business GPA, dominance, intelligence, decision making ability, occupational level, and initiative. The Pearson Product Moment Correlation was used to determine the relationships between game success and personal

characteristics, and between successful businessmen and successful business gamers. Correlational studies identified a positive relationship, significant at the 0.01 level, between gaming success and business success. Further, successful student participants exhibited the same individual characteristics as successful managers. In both businessmen and students, decision making ability had the highest correlation to gaming success. For these reasons, the authors inferred external validity (48).

The performance of businessmen and students in a management game was compared to effective performance behaviors of each in Wolfe's study of external validity. A controlled double group research design used the critical incident technique to identify effective performance behaviors in both students and businessmen, and correlated these behaviors to game performance scores. Additionally, businessmen's game and career successes were correlated using the Spearman Rank Difference Coefficient. Once again, effective performance behaviors were the same in both students and businessmen, and a significant, moderately high to high positive correlation was obtained between game and career success. Similarly, decision making and policy making correlated highest inferring external validity for these managerial skills (54).

Norris and Snyder (28) performed a longitudinal study

on fifty-four graduates of a large university's school of business comparing their gaming and career success. All participants played the same game five years earlier during undergraduate study. An analysis of variance conducted between career and game success demonstrated no correlation between gaming and career success and therefore failed to support external validity claims. The authors offered career success and game success criteria differences and management perspective differences between the game and the real world as possible causes of the failure.

Interpretation

The results of management gaming research strengthens the transferrability of findings between management games and war games. The majority of management gaming research identified problem solving and recognition, decision making skills, and peer skills (communication) as areas in which games effectively taught participants. Measurable learning increases in gaming participants demonstrates gaming's effectiveness (48,49,51,52,53,54,56). The skills developed corresponded directly to the skills common to managers and military leaders. Likewise, increases in perceived learning occurred in the areas of decision making, decision making under ambiguity, peer skills, and policy and doctrine implementation (5,8,29, 31,37). Here again, these skills correspond directly to those of both effective managers and

military leaders (22,24). Due to the similarity in the traits of effective managers and military leaders, it can be inferred war games are effective in teaching problem solving and recognition, decision making, and peer skills. Thus a simulation war game is an effective means of teaching anti-mechanized defense.

CURRENT MILITARY AND COMMERCIAL GAMES

Introduction

This section of the literature review researches current military and commercial war games as they apply to the research objective. No distinction between computerized and manual games is made, and all military games maintain the additional restriction of an "UNCLASSIFIED" security classification.

Scope of the Review

For this review, the games discussed were analyzed with respect to their ability to fulfill the research objective; to train combat engineer squad leaders, on the squad level, in the employment of engineer support in conjunction with anti-mechanized defense. Games were not analyzed with regard to their applicability in the prototype simulation war game as this is discussed in Chapter Two. The specific games analyzed resulted from personal experience, Defense Technical Information Center (DTIC) searches, Defense

Logistics Studies Information Exchange (DLSIE) searches and telephone interviews with Lieutenant Colonel R. J. Morra, Head, War Gaming Section, Marine Corps Development Center, Quantico, Virginia (25).

Military War Games

None of the numerous, existent military war games fulfilled the research objective. All were judged on the following criteria :

1. Size of the maneuver element (Fireteam/Demoteam and below acceptable).
2. Engineer assets available (landmine warfare and obstacle construction/destruction as a minimum).
3. USMC and Soviet-equipped forces involved to include combined arms support.

Approximately ten military war games exist which incorporate combined arms actions and Soviet-equipped enemy forces (10,25,26,46,47,50). All incorporate maneuver elements on the platoon to regimental level with the exception of "First to Fight", (26) a thesis effort by Captain R. J. Murawski, USMC. The games and their associated levels of play are as follows :

1. Tacwar - company level (25)
2. Dunn Kempf - Company through Regimental level (47)
3. Pegasus - Battalion through Division level (46)
4. Area Domination II - platoon through Company level (50)

5. Carmonette II - Platoon level (50)
6. Landing Force War Game (LFWG) - Company level (50)
7. Small Unit Action Simulation (SUAS) - squad level (50)
8. Infantry Combat Model - one through four platoon level (50)
9. Tactical Exercises Simulator and Evaluator (TESE) - Squad through Company level (50).

In addition to not meeting the maneuver element size requirements, none of these games include the implementation of engineer assets (10,25,26,46,47,50).

"First to Fight" is a two player, squad level, manual war game, incorporating USMC and Soviet weapons and tactics with combined arms support modeled into the game. The obvious disqualifying aspect of "First to Fight" exists in the lack of engineer support. Landmine warfare, demolitions, and obstacles are not modeled in "First to Fight" (26).

Only five military games exist which include the employment of engineer assets (landmine warfare and obstacle construction and destruction) (25,32,43,50,59). The Engineer Appendix to the Simulation of Tactical Alternative Responses (STAR) land combat model is a computerized simulation which is designed to be used only in conjunction with the STAR land combat model. This appendix allows the user of the STAR model to incorporate relevant engineer missions

into the play of the game. The drawback of the STAR model with its Engineer Appendix is its size limitation. The STAR land combat model uses platoon size and larger units as the basic maneuver element. Further, no decisions are made at the squad leader level. This did not meet the need for squad level training. Extensive rewriting was required to use this model in fulfilling the research objective (50).

The probabilistic model of a conventional minefield (PMCM)(59) describes a static war game which represents a single anti-tank weapon and various minefields. Basically, the PMCM allows only for the effect of the minefield. Defending units may not maneuver and the simulation makes all fire and maneuver decisions. This did not meet the research objective as the squad leader sees only the results of the simulation's decisions. Furthermore, PMCM does not provide for any reaction by the squad leader to changing enemy positions. Again, an extensive rewrite was necessary to bring the PMCM in line with the stated research objectives.

The Improved Tactical Deterrents Effects Model (ITDEM) (32) determines minefield effectiveness. The ITDEM allows for no maneuver or decision on the squad leader level. These attributes rejected the ITDEM as the solution to training the engineer squad leader (32).

The Small Arms Unit Leader Training Techniques (Rules

for Play for Two/ Multiplayer Infantry Mapboard) Games (heretofore called Unit Leader) was developed by the Army for training their junior enlisted in infantry tactics. Maneuver elements range from individuals to platoons (36). The game incorporates landmines, however they are encountered individually and not in minefields. Unit Leader fails to incorporate provisions for any wheeled or tracked vehicles. These two factors rendered Unit leader useless in training squad leaders in anti-mechanized defense, and therefore insufficient in fulfilling the research objectives (36).

The final model to include engineer assets was the Marine Corps Combat Analysis Model (MCCAM) (10,25). This game simulates a Marine Amphibious Force (MAF) assault over a single colored beach. Mines encountered, and mine/countermine operations are modeled probabalistically. The size of the maneuver elements constituted the major limitation of this model. MCCAM uses company size and larger maneuver elements, by far failing to meet the squad level requirement.

Commercial War Games

This portion of the review analyzes commercial war games subject to the same criteria as the military war games. As with the military games, none of the numerous games reviewed fulfilled the research objective

(1,2,38,39,40,41,42,45,57). All commercial games reviewed depict two player manual war games.

Six of the games analyzed met the first requirement of appropriate maneuver element size. City fight (38), Fire fight (39), Patrol (40), Sniper (43), Raid (41), and Squad Leader (2) incorporate maneuver elements at or below the fireteam/demoteam level, however none of these games include the use of engineer assets. Further, only Fire fight and Raid make use of USMC and Soviet equipment. For these reasons, these games failed to meet the research objective.

Of the three remaining games analyzed, only one game makes use of engineer assets, The Arab Israeli Wars (1). The disqualifiers for this game were the size of its maneuver elements (platoon and company) and the equipment and tactics used. While the Soviet-equipped forces partially satisfy our requirements, the lack of USMC equipment and doctrine further invalidated Arab Israeli Wars with respect to the research objective (1).

Summary

The review of military and commercial war games failed to identify any single war game or model sufficient in satisfying the research requirements. Table 1.1 contains a summary of the games reviewed. A plus (+) indicates the model or game fulfilled the designated requirements and a

zero (0) indicates the model or game failed to fulfill the designated requirements.

Table 1.1 Results of War Game Model Review

War Game/Model	Source	Unit Size	Engineer Assets	Weapons & Tactics
Tacwar (50)	Military	0	0	+
Dunn Kempf (47)	"	0	0	+
Pegasus (46)	"	0	0	+
Area Oomination II (50)	"	0	0	+
Carmonette II (50)	"	0	0	+
LFWG (50)	"	0	0	+
SUAS (50)	"	0	0	+
ICM (50)	"	0	0	+
TESE (50)	"	0	0	+
First to Fight (26)	"	+	0	+
Star Appendix (43)	"	0	+	+
PMCM (59)	"	0	+	+
ITDEM (32)	"	0	+	+
Unit Leader (36)	"	+	+	0
MCCAM (10,25)	"	0	+	+
City Fight (38)	Commercial	+	0	0
Fire Fight (39)	"	+	0	+
Patrol (40)	"	+	0	0
Sniper (43)	"	+	0	0
Raid (41)	"	+	0	+
Squad Leader (2)	"	+	0	0
Beachhead (57)	"	0	0	0
Operation Pegasus (26)	"	0	0	0
Arab Israeli Wars (1)	"	0	+	0

METHODOLOGY

Because no effective war game capable of providing training to the engineer squad leader was discovered, the alternative remained to develop a simulation war game to meet this need. The methodology applied in this effort is a combination of the management cybernetics and systems

simulation principles. The reasons for using this approach in developing an effective simulation war game is two fold. First, the applicability of cybernetic principles is easily transformed to meet the needs of this research. Specifically, the basic principle governing management cybernetics revolves around the " four pillars of systems thinking, namely organicism, holism, modeling, and understanding " (34). According to Schoderbek, Kefalas, and Schoderbek, the following four step process takes place in developing an understanding of any organization :

1. Organizations (squads) are viewed as organisms.
2. Organisms are studied as wholes (complete in themselves and yet part of a greater environment).
3. Holistic studies of complex organisms can only be studied through a multi-stage modeling process (gaming).
4. Modeling of complex organisms (creation of and participation in a simulation war game) can only lead to an appreciation of the structure, function, and evolution (abilities, control, and reactions) of the organism (squad) (34).

Second, the systems simulation process requires the modeling of a " real system and conducting experiments with it for the purpose of understanding the behavior of the system or the evaluation of various strategies being considered for the operation of the system" (33). These criteria relate directly to this research in that a squad (real system) can be modeled in the form of a war game and through participation in this war game the engineer squad leader develops an understanding of the behavior of his system. Further, he can evaluate the effectiveness of his strategies. Although

no strict experimentation is undertaken with a war game, each time the game is played, those involved can experiment with various tactics and planning at an insignificant cost to their subordinates or themselves.

APPLIED METHODOLOGY

Shannon (33) has described the system simulation process and determined eleven separate stages evident in creating and using the simulation. These stages are :

1. System Definition
2. Model Formulation
3. Data Preparation
4. Model Translation
5. Validation (verification)
6. Strategic Planning
7. Tactical Planning
8. Experimentation
9. Interpretation
10. Implementation
11. Documentation (33)

The following paragraphs explain how these stages were implemented in this research and Figure 1.1 presents a pictorial representation of this process. The iterative nature of simulation analysis is readily evident in Figure 1.1. With the exception of the experimentation portion of this process, all areas apply directly to this research. The experimentation stage is not directly applicable because, although each individual can see the results of various strategies, no sensitivity analysis is performed and no strict rules of experimentation are maintained. Only after repeated exposure to the game will the desired data;

competence in anti-mechanized defense, be generated.

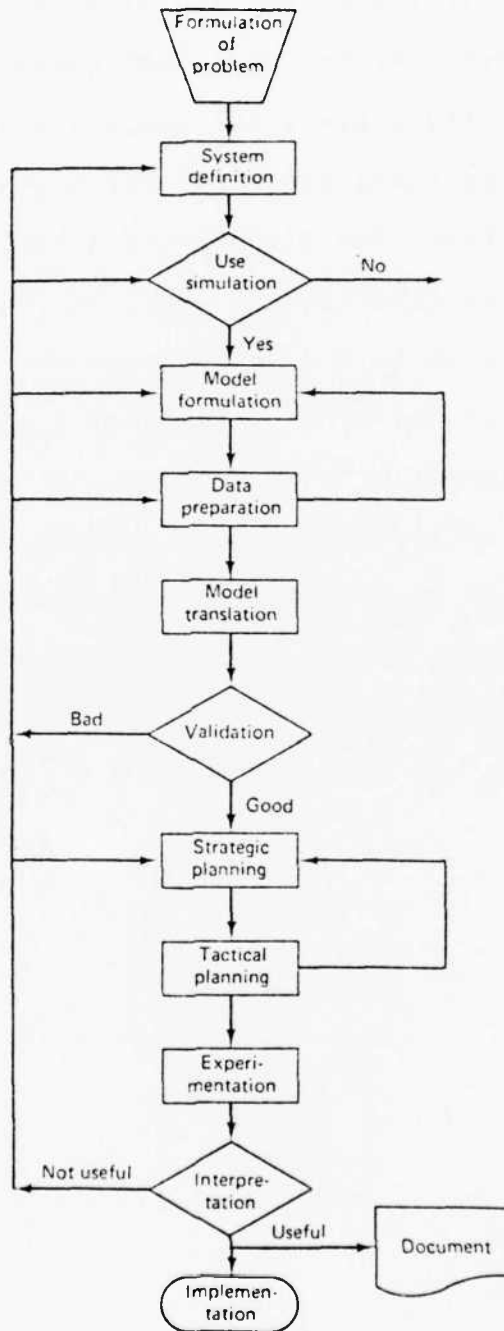


Figure 1.1 - Systems Simulation Process

The system definition used in this research was based on documented military doctrine and personal experience. Briefly, the system consists of a USMC combat engineer squad, augmented with organic BLT weapons systems, defending against a Soviet-equipped motorized rifle platoon. The engineer squad defends for a specified duration of time or to a given fighting capability. Combined arms assets available to all Marine units are implemented and integrated with landmines and other obstacles in defending against the Soviet-equipped opponent. The inclusion of Soviet equipment provides for realistic training against the most likely weapons an engineer squad leader will encounter. The majority of forces hostile to the United States maintain Soviet weapon systems. Figure 1.2 illustrates the reduction of this system into a logic flow diagram.

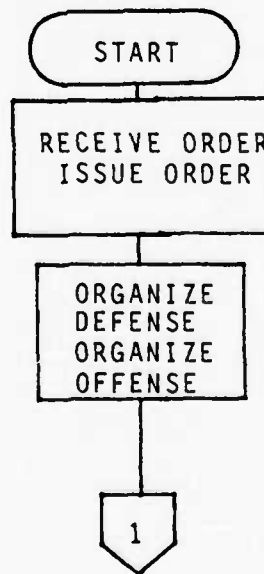


Figure 1.2 Logic Flow Diagram of Squad Combat Environment

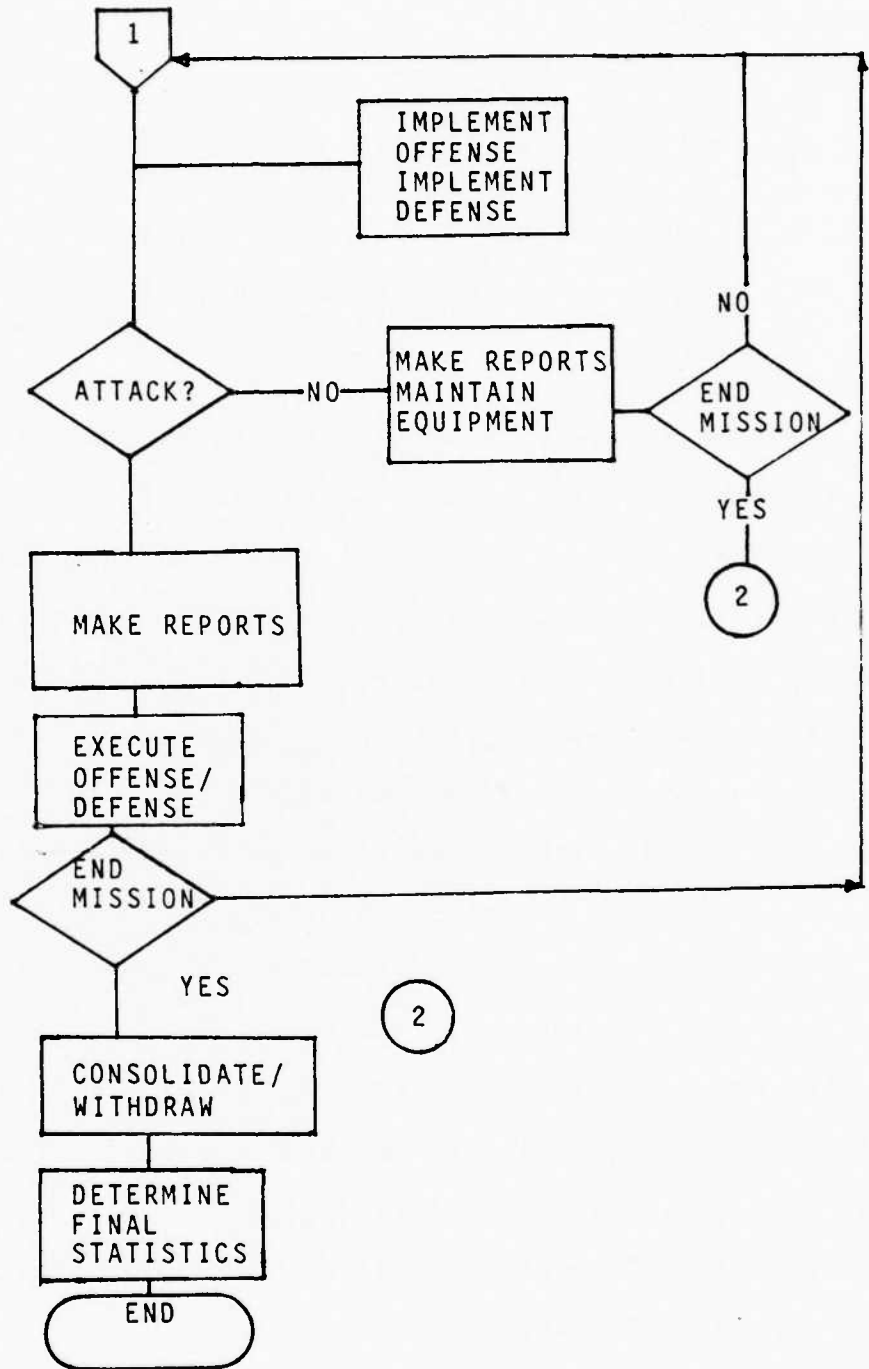


Figure 1.2 (continued)

In formulating the model (war game), the seven attributes of a good simulation (33) were used. As defined by

Shannon these are :

1. Simple to understand
2. Goal or purpose oriented
3. Robust in that it does not give absurd answers
4. Easy for the user to control and manipulate
5. Complete on important issues
6. Adaptive with an easy procedure for model modification or updating
7. Evolutionary, in that it should start simply and become more complex in conjunction with the user (33).

The analysis of commercial war games discovered unreferenced weapons effectiveness criteria used in determining the game's outcome. This rendered the commercial game's effectiveness criteria useless for implementation in the prototype simulation because the outcome from weapons employment was unverified. The data necessary for this simulation was taken from several previous studies and certain published weapons effectiveness criteria. Each weapon system, including landmines and obstacles, was modeled probabilistically in order to ascertain their effectiveness against specific targets. The exact nature of this data is explained in Chapter Two. The implementation of each weapons system by the user requires knowledge of each weapon and the manner in which it is executed. This was done in order to ingrain procedures as well as weapons system familiarity into the user.

In order to translate this model into a usable computer simulation, an acceptable computer language was chosen. The determination of this language was based on the systems

available for execution of the game. Because the purpose of the simulation was training of combat engineers and because of the limited computer assets available while deployed, it was determined the language chosen need be compatible with most micro computers. This narrowed the available choices to primarily two languages; BASIC and PASCAL. Due to the more powerful data structures available in the PASCAL language, PASCAL became the language of choice. The actual implementation of this model in PASCAL is discussed in Chapter Two.

Use of modeling techniques established in previous research efforts and technical data collected and proven on the battlefield provided validation of the game's output. Because all of the techniques were individually verified, the output from the game is verified. Although the probability distributions and their resultant deviates had to be checked for adherence to expected standards, the simulation required no further verification. The verification of the games output does not guarantee however, the realism or teaching effectiveness of the game (validity). Initial validation attempts (determining realism and teaching effectiveness) were gathered by means of play testing the prototype simulation and administering a post-game questionnaire. Interpretation of this data and its comparison to the results of MCCRES evaluation was then performed. The exact nature of this process is discussed in Chapter Three.

Strategic and tactical planning of the experimentation and the experimentation are beyond the scope of this research. For this reason these portions of the systems simulation methodology do not directly apply. Discussion of these steps is contained in the "recommendations" section of the final chapter.

ORDER OF PRESENTATION

The remainder of this report discusses the implementation of the research methodology, gaming results and evaluation, and recommendations for further research.

Chapter Two, The War Game, describes the actual development of the game to include the empirical justification of weapons systems performance. Additionally, U.S. Marine Corps and Soviet doctrine are discussed as they pertain to the simulation. The use of command and control procedures are developed and required reports within the game are described in order to provide meaning to the players input.

Discussed in Chapter Three, Analysis of Game Validity, are the results of comparing the requirements imposed on the squad leader by the game to those imposed by MCCRES standards and the results of play testing. Specifically, this chapter discusses the strengths and weaknesses of the game as perceived by the Marine enlisted personnel engaged in the

play testing.

Finally, Chapter Four (Summary, Recommendations, and Conclusions) outlines the conclusions drawn from this research and contains the recommendations for further study.

CHAPTER SUMMARY

Chapter One has presented the problem, research question, a literature review of the teaching effectiveness of games and existing war games pertinent to the research objective, and the methodology applied in this research. Chapter Two presents the development of the simulation war game.

CHAPTER 11
THE WAR GAME

This chapter describes Marine Corps doctrine, the engineer squad leader's tactical responsibilities, Soviet tactics and doctrine, and the modeling of these areas into the simulation war game. The incorporation of existing tactics and doctrine into the prototype war game occurred in three stages; development of the terrain, development of the engineer squad leader's anti-mechanized (antimech) defense decision process, and development of the specific weapons subroutines necessary in executing the decision making process. Each of these stages are discussed in detail, highlighting those areas which reinforce military doctrine and tactics.

MARINE CORPS DOCTRINE AND TACTICS

ORGANIZATION OF COMBAT ENGINEERS WITHIN THE BLT

As stated in Chapter One, Marine Corps doctrine currently requires deployment of one combat engineer platoon with each BLT. Figure 2.1 shows the normal organizational structure of the Marine BLT. The combat engineer platoon generally consists of approximately forty enlisted personnel and one officer, the platoon commander. The engineer platoon is further broken down into three squads of eleven to thirteen men, a platoon guide/construction foreman, and a

platoon sergeant/construction chief. Each squad consists of three demolition (demo) teams of three to four men, and a squad leader (usually a sergeant §E-5†). Demo teams (equivalent to a rifle squads fire team) consists of a demo team leader (usually a Corporal §E-4†) and two to three demo team members. Each member of the engineer platoon, with the exception of the platoon commander, platoon sergeant, and the M-60 machine gunners, is armed with the M16A1, 5.56mm rifle. Those not armed with the M16A1, are armed with the M1911A1 .45 cal pistol. In addition to the M1911A1, each machine gunner operates the 7.62mm M-60 machine gun.

Depending upon the tactical situation, any of the engineer squads may be attached to an infantry rifle company from the BLT. Figure 2.2 depicts the organizational structure of a standard reinforced rifle company. When attached to an infantry rifle company, the engineer squad leader becomes a special assistant to the rifle company commander for matters of antimech defense. He must know how to integrate engineer support, antimech weapons, and indirect fire weapons into the antimech defense plan. For this he must know the general principles of ground defense and as well the employment of antimech weapons and engineer obstacles.

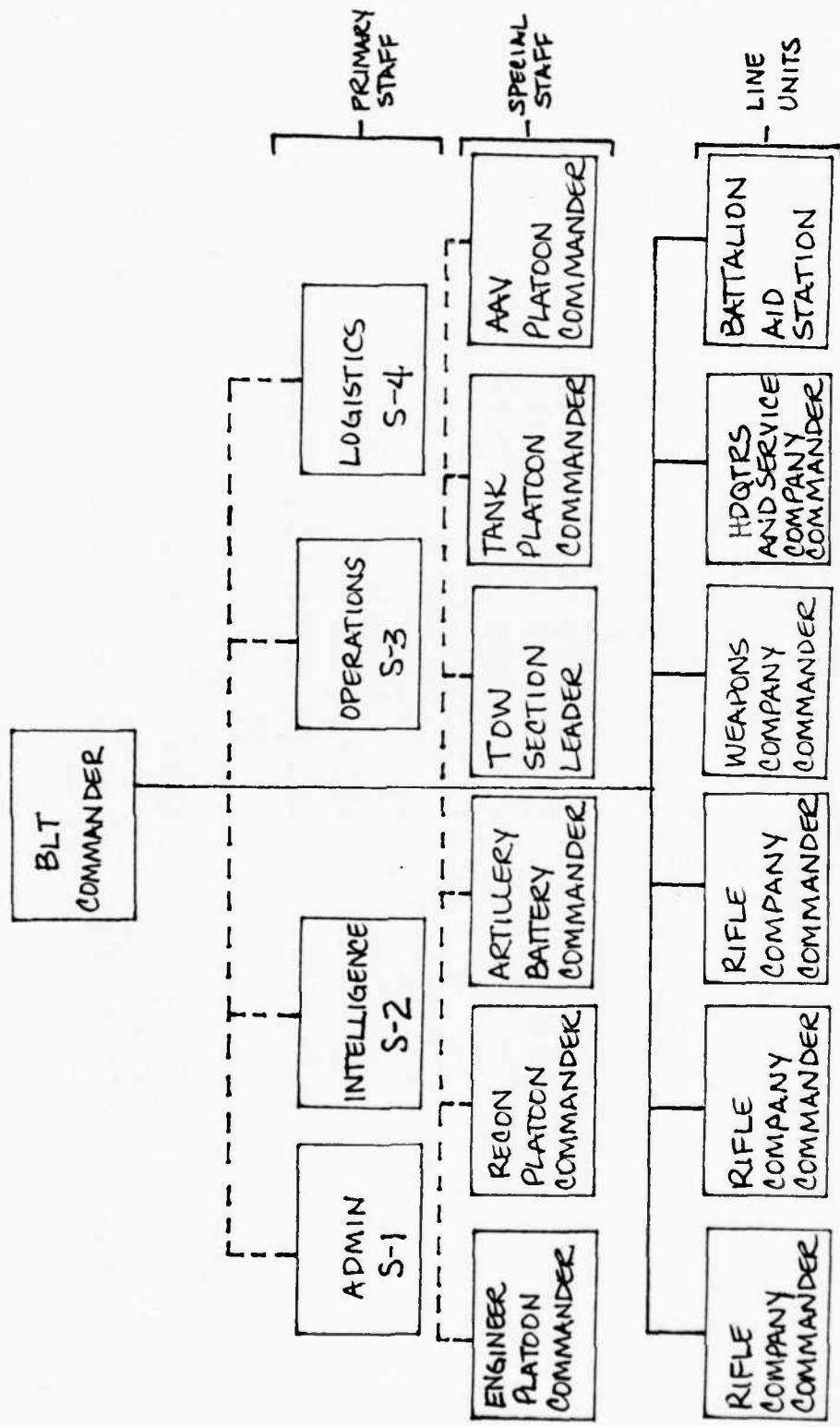


Figure 2.1 Organizational Structure of the BLT

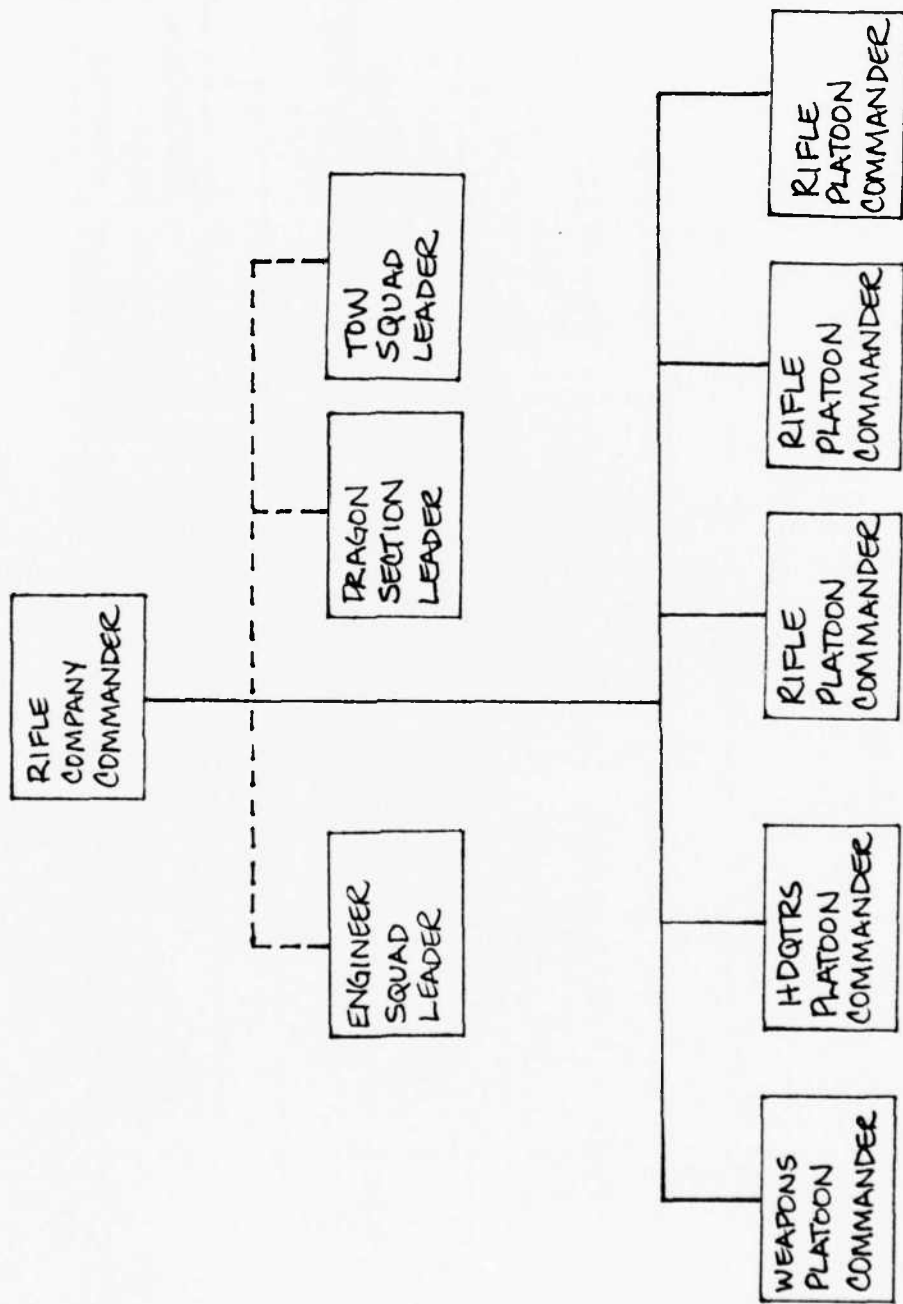


Figure 2.2 Structure of the Reinforced Rifle Company

GROUND DEFENSE

Ground defense is a general term encompassing all actions taken to:

1. Gain time pending development of more favorable attack conditions
2. Deny the enemy access to an area
3. Economize forces in one area to provide superior manpower elsewhere
4. Reduce enemy capability with minimum friendly force involvement
5. Destroy hostile forces
6. Permit employment of nuclear weapons
7. Ensure terrain security(19:134)

Two types of ground defense exist. The first, area defense, applies to squad level defense and emphasizes the destruction of the enemy force from strongly held forward positions. Area defense necessitates retention of specific terrain. Unlike area defense, the second type of defense, mobile defense, is not terrain specific. Only division and larger sized units employ mobile defense and thus it is unimportant to squad and demo team level operations (14). Military doctrine divides the defensive area into three zones with respect to distance from the forward edge of the battle area (FEBA). The first zone, designated the security zone, extends from the FEBA toward the enemy to a distance of 460 meters (small arms range). The second zone, called the forward defense zone, is an area extending 200 meters behind the FEBA (toward friendly forces). The third zone is designated the reserve area and the accompanying unit's size determines its dimensions. The reserve area is used only at

the company and above levels and therefore is not important in squad level tactics.

In addition to zoning the battle area with respect to distance from the FEBA, distances along the FEBA (frontages) are also assigned. Doctrine does not require assigned frontages for squad and demo team level units, however, the engineer squad, when reinforced with antimech weapons may be assigned frontages (14). Table 2.1 lists the standard assigned unit frontages in meters.

Table 2.1 - Unit Defensive Frontages(14)

UNIT	RESPONSIBLE FRONTAGE	PHYSICAL FRONTAGE
Company	1500 meters	1200 meters
Platoon	750 meters	460 meters
Squad	250 meters	150 meters
Fireteam/Demoteam	85 meters	50 meters

Organizing a defensive position involves concurrent accomplishment of various tasks. Depending on the tactical situation, individual tasks assume various priorities (11). Although the involved unit commander specifies the appropriate sequence of events, the normal sequence is:

1. Establish security,
2. Position weapons,
3. Clear fields of fire and determine probable target ranges,
4. Prepare weapons and individual emplacements,
5. Establish communications,

6. Emplace obstacles,
7. Prepare alternative positions, and
8. Prepare deceptive positions (11:84).

When the defense is organized and the enemy is discovered or has passed a designated engagement point, the unit commander employs supporting arms in order to break up the assault. As the enemy units come within range of the organic and attached weapons, the unit takes the enemy formation under fire. Once the assault is broken up, the unit reorganizes, redistributes ammunition, provides medical attention, and repairs damaged positions. Should the enemy break through, the unit responds with a counter attack, attempting to dislodge the enemy and regain their specific terrain.

THE PHILOSOPHY OF FIGHTING ARMOR

In situations dominated by enemy use of armor formations, success is largely dependent on proper use of, and unity of combined arms. The backbone of any armor formation is the tank, yet the tank cannot survive without the assistance of infantry, engineers, close air support, and extensive logistical support (21:37). Defending against enemy armor formations requires the use of direct fire anti-mechanized weapons in concert with infantry, engineers, and artillery support. Artillery, mortars, automatic weapons and small arms cause armored crews to button-up (seal all hatches), thus restricting vision and degrading their

weapons accuracy and availability to avoid obstacles (21:37).

To effectively engage an enemy mechanized force requires the concentration of antimech resources at a decisive place and time. The unit leader determines the place and time to engage the enemy and relies upon the concepts of antimech fires and the principles of their employment.

The concepts of antimech fires necessitate the engagement of armor targets at the farthest possible range with available artillery, air, and all classifications (heavy, medium, and light) of antimech weapons. The Marine Corps' heavy antimech weapon is the M220 tube-launched, optically-tracked, wire-guided (TOW) antitank guided missile, capable of effective target engagement at a range of 3000 meters. The M47 Dragon antitank guided missile constitutes the Marine medium antimech weapon, and the M72A1 Light Assault Anti-tank Weapon (LAAW) provides the Marine Corps with a light antimech weapon (21:39-40).

The principles of employment govern the successful use of organic and attached antimech weapons by small units (company, platoon, squad)(21:41). The first principle to be followed calls for the employment of anti-mechanized weapons in pairs wherever possible (mutual support). This provides continuous coverage of a sector of fire during the reloading

or moving of one of the weapons. The second principle deals with the positioning of antimech weapons. The following rules should be followed whenever possible (21:41-42)

1. Use terrain for cover and concealment.
2. Locate weapons in positions which provide good fields of fire out to their maximum effective range.
3. Position weapons so as to engage the enemy from the flank.
4. Integrate antimech weapons with nearby troops for security.
5. Avoid conspicuous terrain.

Several techniques of employment are essential to successful target engagement. For the unit leader, the most important of these techniques is establishing priorities of engagement. When engaging enemy armored formations, infantry should be separated from the accompanying tanks through the use of mortars, artillery, and small arms fires. When armored personnel carriers (APC's) accompany the tanks, the priority of engagement goes to the most dangerous target. Depending on the type of enemy formation, either flank-to-center (if the enemy is on line) or ends-to-center (if enemy is in a column) fire patterns will engage the most dangerous target and provide systematic destruction of the enemy (21:46). In addition to the use of organic, attached, and supporting weapons, antimech defenses incorporate the use of obstacles and barriers.

OBSTACLES AND BARRIERS

Regardless of the obstacle to be employed, numerous

considerations must be made in obstacle planning. First, one must consider the mission of the unit being supported. In antimech defense for example, wire is of limited use. Further, one must consider higher headquarters instructions as well as the current tactical and strategic situation. Time of enemy delay, obstacle preparation time, and supporting fires available all enter into these considerations. All obstacles should tie in with other natural and manmade obstacles and the planned defensive fires. In addition to these considerations obstacle manpower and material requirements, passage needs of friendly forces, possible reoccupation of the obstacle area, and the immediate and long term effect on the local population all affect the unit commander's obstacle planning.

Imagination is the only limit to the number of direct type obstacles. Any object used to delay or restrict enemy movement represents an obstacle. In planning ground defense however, prudence generally limits obstacles to the following types.

1. Minefields,
2. Road craters,
3. Anti-tank ditches,
4. Bridge demolitions,
5. Road block by log obstacles, and
6. Wire (43:36)

The following paragraphs discuss each of these obstacles and their application to anti-mechanized defense.

Minefields

Marine Corps doctrine classifies minefields into five types according to their function and method of employment (11). Table 2.2 outlines the characteristics of the various minefield types.

TABLE 2.2 - Minefield Types (11 :40,42)

MINEFIELD TYPE	PATTERN	ANTI-HANDLING DEVICES	AUTHORITY
Protective (Hasty)	None	None	Battalion
(Deliberate)	None	None	Area Cmdr
Tactical	Standard	Yes	Division
Point	Irregular	Yes	Division
Interdiction	Scatterable	None	Division
Phony	As Needed	N/A	As Needed

Tactically each of these minefield types provides a separate function. Protective minefields provide local, close-in protection for either deployed units (hasty) or semi-fixed structures (deliberate). The tactical minefield stops, delays, and disrupts an enemy attack; reduces enemy mobility, blocks penetrations, and strengthens manned positions. Point minefields delay and disorganize an enemy or restrict his use of key areas. Interdiction minefields provide results similar to point minefields, however they normally occur behind enemy lines and restrict use of facilities

instead of terrain. Phony minefields rely on a mine conscious enemy for effectiveness. This form of minefield uses its resemblance to one of the above minefield types to slow down and channelize the enemy.

Regardless of the minefield type, certain employment practices increase the effectiveness of any minefield (11:47). First, all minefields should be covered by fire (small arms and antimech weapons). Second, mine types, fuzes, and tripwires should be varied. Finally, some means of intrusion or breaching alert should be used to notify those units covering the minefield (11:47).

Road Craters and Anti-tank Ditches

As effective obstacles, road craters and anti-tank ditches require sufficient width to delay tracked vehicles, and sufficient depth and steepness to prevent any vehicle from passing. These obstacles cannot stop modern tanks or APC's indefinitely, however doctrine considers an obstacle efficient if the vehicle attempting to pass requires three or more attempts to cross the obstacle. This standard provides sufficient time for antimech weapons to destroy or disable their targets. Road craters are created either through emplacement of explosives, or use of earthmoving equipment. Explosives are preferred for short distance cratering, however earthmoving equipment is preferable when the length of the crater is greater than the road width.

Bridge Demolitions

The demolition of bridges delays the enemy's advance, however seldom do bridges require complete demolition to provide this benefit. Normally, emplaced explosives create a gap wider than the enemy's rapid bridging capability. This allows economical reconstruction of the bridge by friendly troops during future operations and still provides for enemy slowdown. Because bridges vary in their demolition requirements, each bridge must be studied and destroyed in a unique manner, bearing in mind the previous general principles.

Log Obstacles

Log obstacles define a general class of expedient obstacles used to stop mechanized forces. Triangular and rectangular log cribs, log hurdles, abatis' (a series of felled trees which remain attached to their stumps), and post obstacles are all effective means of slowing enemy forces. The drawback to the use and planning of log obstacles is reliance on the availability of sufficient lumber in the area of interest and the destruction of natural camouflage and concealment for antimech weapons (11:121).

Wire

Although wire obstacles are extremely effective in slowing and channelling infantry forces, their effectiveness

against mechanized forces is minimal. For this reason, no further discussion of wire obstacles is offered in this research (11:123).

SOVIET OFFENSIVE DOCTRINE AND TACTICS

SOVIET OFFENSIVE ACTIONS

"The offensive is the basic form of combat action. Only by a resolute offensive conducted at a high tempo and a great depth is total destruction of the enemy achieved [16:31]." The previous quote by Soviet General V. G. Reznichko verbalizes the basic Soviet military doctrine. For the Soviet, victory in war represents the only possible outcome, and victory is achieved through the offensive. The Soviet offensive depends on the transition from movement to assault. For this reason, the Soviets move in standardized formations to allow units to attack from the march (16:33). The principle Soviet movement elements consist of the battalion, regiment, and division (16:33).

Soviet doctrine acknowledges three three basic types of offensive action: the meeting engagement, the breakthrough attack, and the pursuit. The meeting engagement occurs when the Soviet element and his opponent meet on the move. The Soviets consider this their most important form of offensive action. The breakthrough attack develops when the opposing forces defend in place. Breakthrough attacks are further classified as hasty (no assembly area used) or deliberate

(extensive assembly and planning). The pursuit attack attempts to destroy a disengaging enemy force (16:33). For purposes of the Marine combat engineer, the most likely form of Soviet offensive action is the breakthrough attack.

THE COMBINED ARMS ASSAULT

The rudimentary elements of military tactics are fire and maneuver. Fire destroys the enemy while maneuver gains an advantageous position from which to implement fire. Movement without fire is suicidal. The Soviet combined arms assault attempts to maximize both fire and maneuver. The general Soviet Organization used for the combined arms assault is the motorized rifle battalion. Figure 2.3 indicates the organizational structure of the motorized rifle battalion. When on the move, the battalion creates an advance guard (one motorized rifle company). The advance guard creates a combat reconnaissance patrol traveling five to ten kilometers ahead of the advance guard and this element acts as the point element for the movement.

The combat reconnaissance patrol includes a motorized rifle platoon (3 APC's\$BMP's or BTR'st) and one half of a tank platoon (2 Tanks\$T-62's or T-72'st). Figure 2.4 outlines the structure of the combat reconnaissance patrol. Average daily movement of the combat reconnaissance patrol (and the motorized rifle battalion) is between twenty and forty kilometers per day. Soviet doctrine dictates the

advance guard engages the enemy and destroys enemy resistance or fights until the main body arrives (16:43). Likewise, the combat reconnaissance patrol engages any enemy resistance and either eliminates the resistance or continues the engagement until reinforced by the remainder of the advance guard. The amount of time the combat reconnaissance patrol operates alone is approximately thirty minutes.

As stated earlier, breakthrough attacks are either hasty or deliberate. Regardless of the type of attack, the tactical principles followed by the combat reconnaissance patrol remain the same. At a distance of 300 to 400 meters from the enemy's defensive positions, the Soviets dismount their APC's. Figure 2.5 diagrams the dismounting procedure and the standard attack formation used by the Soviet motorized infantry. The procedure diagrammed illustrates the rear debarkation used from the BMP. When the troops are mounted in the BTR, debarkation occurs over the sides of the vehicle, however the attack formation and final locations of each individual remains the same. Soviet motorized riflemen remain mounted only when nuclear, biological, or radiological weapons or conventional firepower have neutralized the defending forces. Once dismounted, the riflemen follow 100 meters behind the tanks and continue the assault. As the Soviets assault on line, the tanks provide suppressing fire. When the tanks arrive within 100 meters of the defending forces, doctrine dictates the cessation of the artillery

barrage.

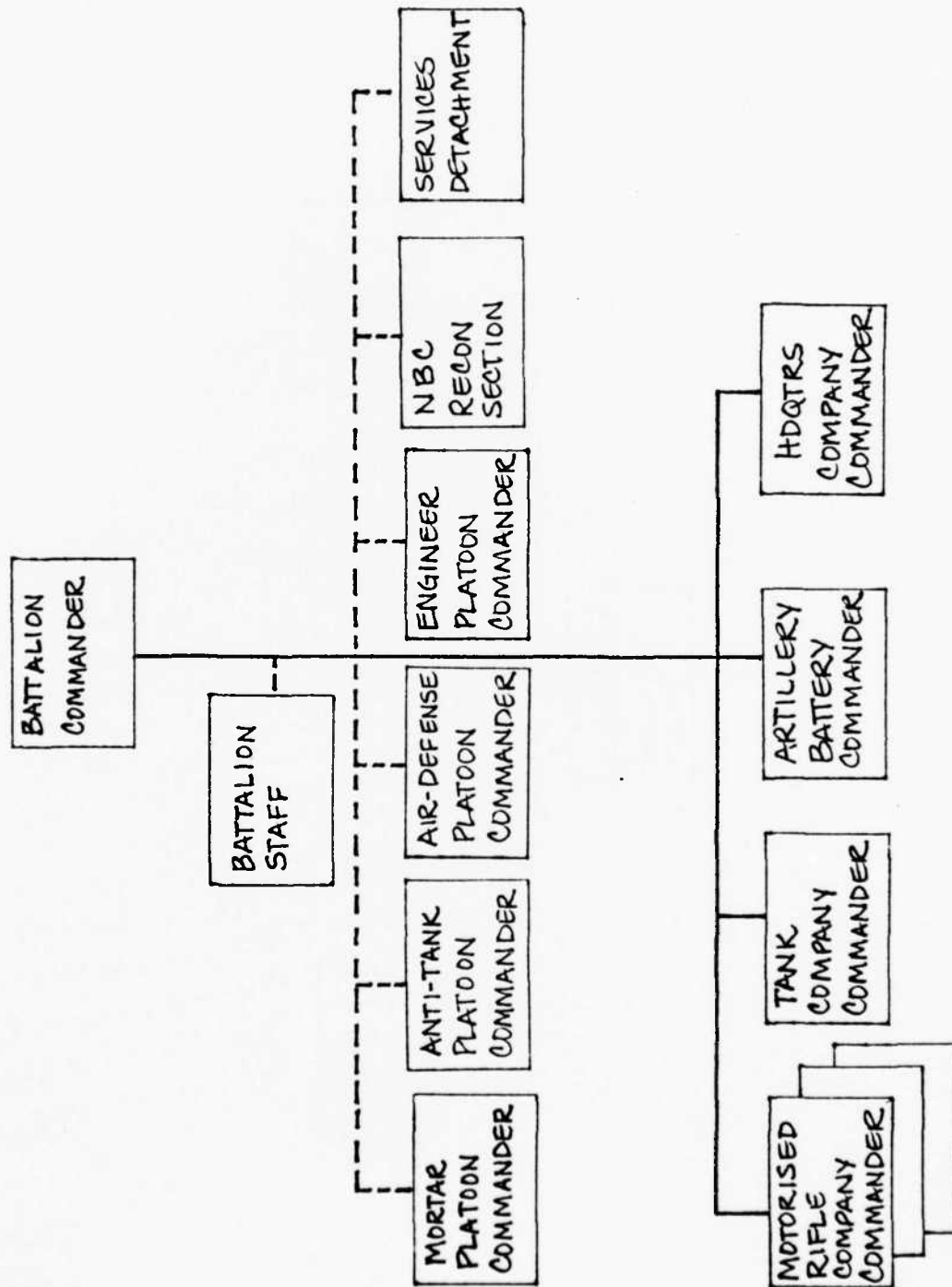


Figure 2.3 Structure of the Soviet Motorised Rifle Battalion

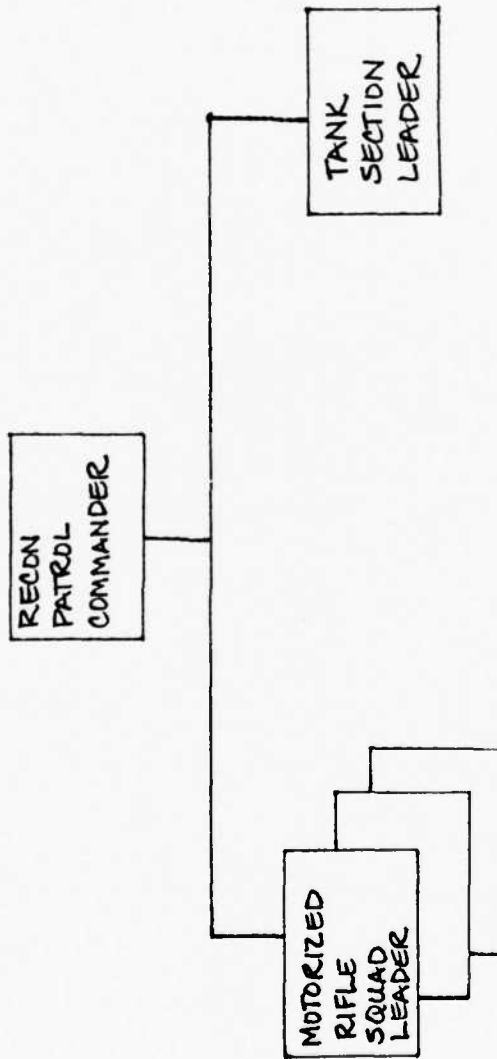


Figure 2.4 Structure of the Combat Recon Patrol

As the Soviet riflemen come within twenty-five to thirty meters of the defender's emplacements they cry "URRA", an old Russian battle cry, and complete the assault with grenades and automatic rifle fire. Figure 2.6 represents this combined arms assault by the combat reconnaissance patrol (16:47). Should the defenders ground the Soviet skirmish lines, the Soviets will alternately advance and fire in order to maintain the speed of the advance and also to provide protection to the accompanying tanks.

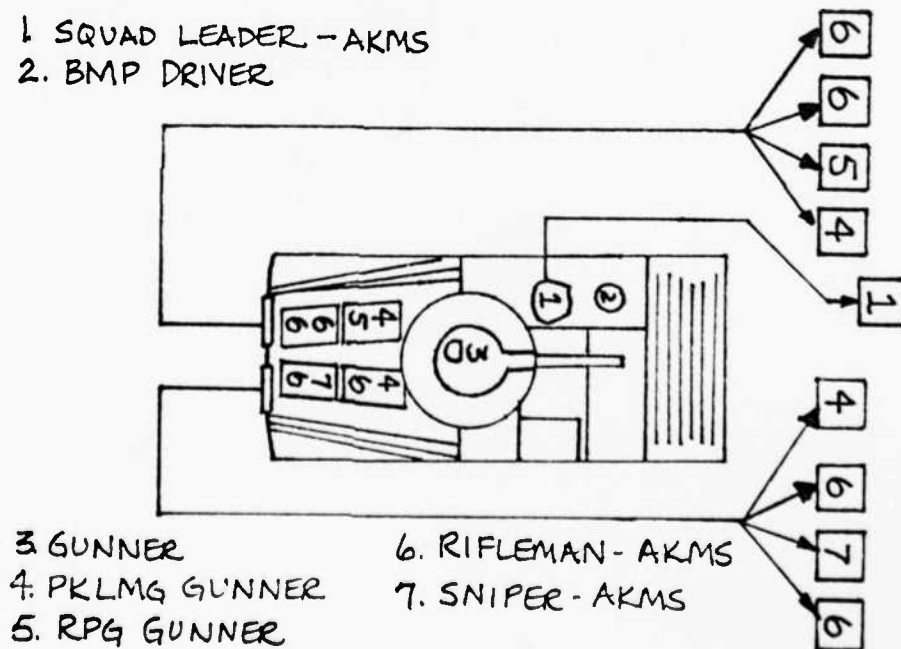


Figure 2.5 Soviet APC Dismount Procedures

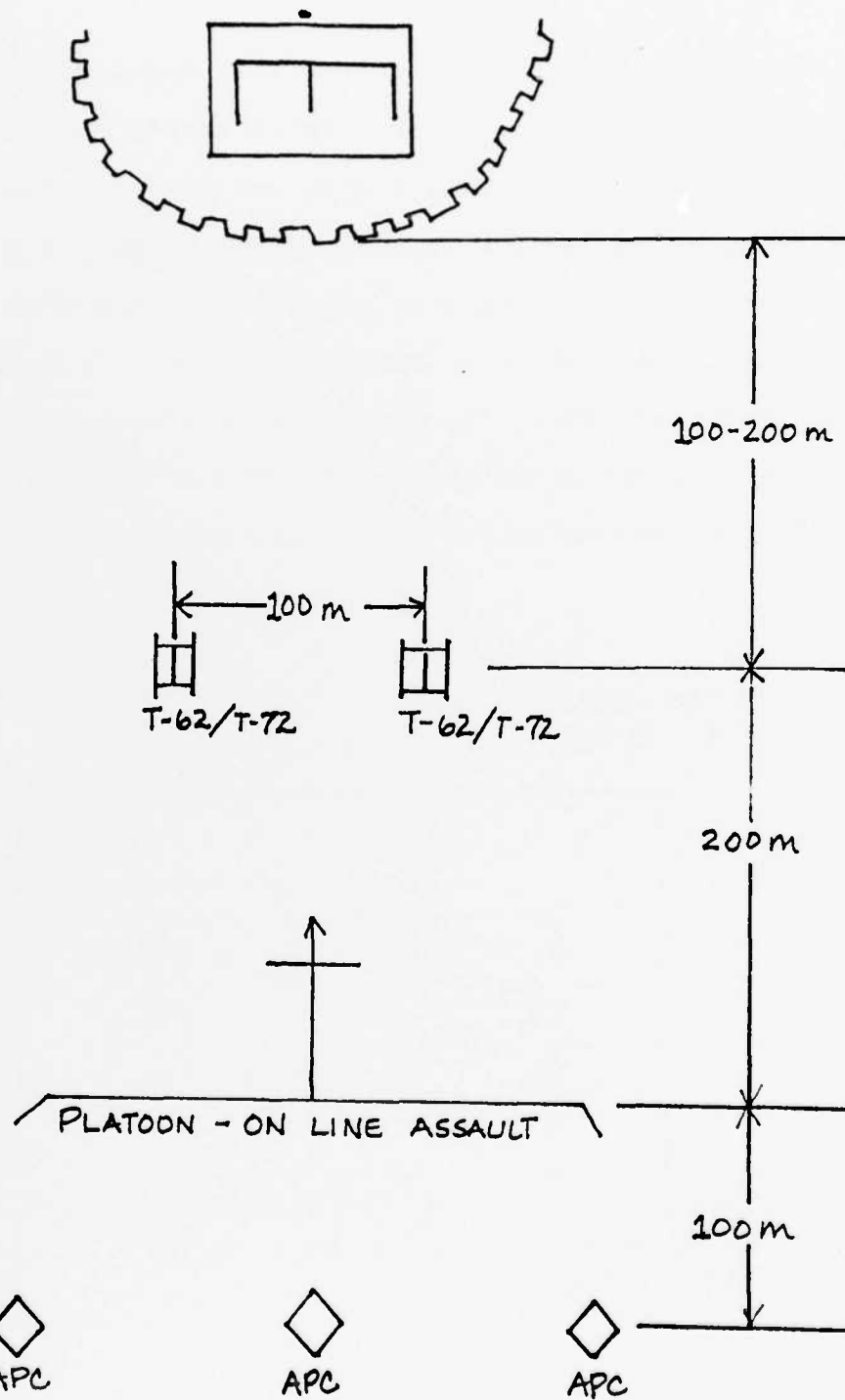


Figure 2.6 Combined Arms Assault by Combat Recon Patrol

If the assault is stopped, the Soviets will take up hasty defensive positions and await the arrival of the remainder of the advance guard (16:46).

Although the Soviet doctrine has many obvious flaws and possible means of defeat, exercises carried out using the Soviet-style combined arms assault have shown their system to be able to achieve an undoubtable success (16:50).

The preceding discussion outlined current Marine Corps and Soviet doctrine. The following discussion outlines the implementation of this doctrine in the prototype war game and how the prototype game reinforces both doctrine and tactics.

DEVELOPMENT OF THE WAR GAME

GENERAL

This portion of Chapter Two discusses the development of the war game beginning with a description of the simulated terrain, and is followed by discussion of the main sequence of the game, its derivation, and discussion of the supporting subroutines necessary in implementation of the main program. Discussion of the terrain provides a basis for evaluation of the realism in the prototype simulation. Likewise, discussion of the main program and appropriate subroutines emphasize the reinforcement of doctrine previously discussed. As outlined in the methodology section of

decision model was PASCAL. The use of PASCAL resulted in several problems, none of which were insurmountable. Each of these problems are discussed as they pertain to the development of the model.

TERRAIN

The development of the terrain representation within the prototype game resulted from an iterative process balancing computing power, realism, and desired resolution in the combat operating area. In order to provide realistic, three-dimensional terrain and yet remain within computer limitations, the vertical dimension of the simulated terrain was implemented strictly on the playing board in the form of contour lines. Graphically described, the four dimensional array representing the terrain is a matrix of six squares across and four squares down, each of which is further divided into fifty elements across and down. This corresponds directly to the game map provided in Appendix C and gives two meter by two meter resolution in the emplacement of forces. Figure 2.7 pictorially represents the array.

Although the terrain array portion would compile separately, it was too large to be implemented in the playing sequence of the game. As an alternative, the coding which loaded the initial integer values into the array was developed as a separate program (see Appendix D). This

separate program then created a separate data file of integers which provided the initial terrain values for the four dimensional terrain array. In order to load the terrain values into the main program, the values are merely read from the external data file.

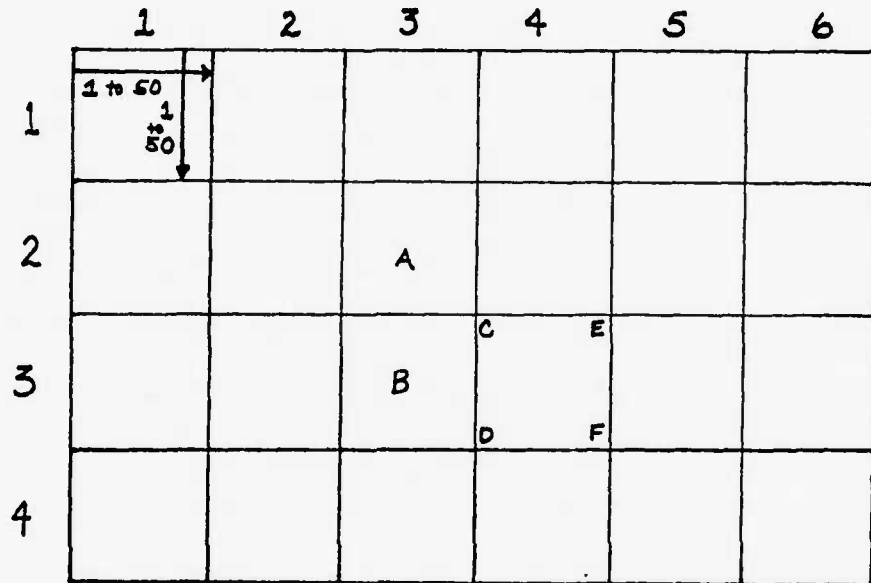


Figure 2.7 - Pictorial Representation of the Terrain Array

The four digit identifier used to determine the value of location "A" in the terrain array would be 2-3-25-25. Similarly, location "B" is at value storage location 3-3-25-25. Likewise, "C" represents location 3-4-1-1, "D" represents location 3-4-1-50, "E" represents 3-4-50-1, and "F" represents 3-4-50-50. Each storage location (3-3-3-3) simulates a two meter by two meter section of terrain. Attempts at larger resolution (squares representing more than two meter by two meter plots) resulted in insufficient

resolution for realistic emplacement of individual personnel.

The program represents terrain using the integers zero through three, one representing inclined terrain, two representing a building, three representing water, and zero representing flat ground. The use of these integers in addition to those representing men (four), APC's (five), tanks (six), and landmines (eight) reduces the record keeping required of the game's players and allows discriminating scoring when the players employ specific weapons. As an example, the results of small arms against tanks is negligible, while the effect of small arms against personnel is quite substantial. The use of terrain features allows the program, not the player to discriminate between weapons employment results.

An increase in computing power could provide greater resolution and an expanded area of operations by allowing a larger array representation. As an example, one meter by one meter resolution of the same sized operating area would require an array four times as large as the existant array. If the vertical dimension of the terrain were implemented, an array more than eighty times as large would be required. These additions are not essential to realistic terrain representation however, they only further enhance the existant realism.

SQUAD LEADER'S DECISION PROCESS

Having developed the terrain suitable for realistic squad level combat, further game development required incorporating Marine and Soviet tactics and doctrine into a general sequence of actions for both players. Analysis of the ground defensive scenario involving a Marine force defending against a Soviet armored force determined the Marine unit commander as the principle planner in any engagement. As stated earlier, the Soviet combat reconnaissance patrol commander merely advances along a predetermined route, engaging and destroying any encountered resistance. For this reason, the squad level decision process involved in establishing ground defensive positions in the antimech environment created the basis for the playing sequence.

Analysis of this decision process occurred in two stages. First, the decision process was reduced to a flowchart, highlighting the important decisions. Next, the decision process was modeled using Integrated Computer Assisted Manufacturing (ICAM) Definition modeling (IDEF modeling) techniques incorporating inputs, outputs, controls, and mechanisms involved in the decision process. Interpretation of these decision process representations resulted in the general sequence of action in the prototype simulation. The PASCAL implementation of this sequence exists in the main program coding of the prototype simula-

tion. Appendices E and F contain the flowcharting and IDEF modeling of the decision process.

SEQUENCE OF ACTION IN THE MAIN PROGRAM

In brief, the squad leaders decision process is as follows:

1. Identify the threat.
2. Create and implement a squad defensive plan to include weapons and obstacle placement.
3. Execute the defensive plan to include engaging the enemy with organic and supporting weapons and obstacles.
4. Consolidate forces and complete reports.

Appendix A contains a listing of the complete computer program resulting from analysis of the flowchart and IDEF representations of the squad leader's decision process. The following discussion describes the incorporation of the decision process within the prototype war game.

The first portions of the war game program initialize key variables in the simulation and provide a trace on weapons system output. The request for identification of a system test versus actual play allows the developer to trace the random numbers generated for determination of weapons effectiveness and the follow on seed. The specific nature of the random number generator is discussed in the subroutine portion of this chapter.

Actual play of the game commences when the player at the terminal identifies himself (Marine or Enemy), whereupon

the terminal identifies himself (Marine or Enemy), whereupon he receives his combat operation order. This is followed by the printing of his opponent's combat operation order. Both of these actions are consistent with the decision process as developed in the IDEF and flowchart representations. Following delivery of the combat orders, the program loads the terrain with the integer values maintained on the external file, "file1". This initializes the terrain array, creating an internal representation of the map used by the players.

After loading the terrain, the main program calls a subroutine and generates an enemy arrival time. By adding thirty minutes (the time the combat recon patrol operates alone) to the arrival time, the program generates the completion time of the simulation. Although either player may terminate the game depending on manpower attrition, the game automatically terminates at the completion time.

Once the program establishes the enemy arrival and completion times, it requires the Marine player to emplace his weapons and personnel. The Marine player interactively enters the locations he wishes to occupy on his map board which correspond to the storage locations in the terrain array.

Upon completion of this task sixty minutes of simulated time is added to the clock and the program questions the Marine player about the emplacement of obstacles. If the

menu of choices including a minefield, antitank ditch, demolition charges, and a road crater. Depending on the player's choice, the program calls a subroutine and calculates the time to complete the task. Having calculated task completion time, the program questions the player regarding further emplacement of obstacles.

Once the player terminates choosing obstacles, the program provides feedback on those tasks accomplished before the enemy arrival time. Should sufficient time exist, the Marine player next decides on the preparation of fighting emplacements (foxholes) and the registration of artillery fires. The priority of accomplishment of these tasks has been purposefully adjusted from the priority outlined in the doctrine section of this chapter. The wise squad leader will reject the chance to emplace obstacles before he has prepared foxholes and registered his defensive fires. The combined arms subroutine portion of this chapter discusses the importance of personnel emplacements and registration of combined arms (mortars and artillery) fires.

Having completed the defensive planning and deployment of forces phases of the squad leader's decision process, the program notifies the players of imminent attack. If the Marine player has properly prepared the ground defense and all obstacles are in place, he has the first option to engage the enemy. This process corresponds to real combat

in that the advancing Soviet forces would be unaware of the Marine defenders until engaged by organic weapons. Conversely, should the Marine player have personnel emplacing obstacles as the Soviet forces arrive, first choice goes to the Soviet, simulating the advancing forces surprise of the defenders. Should the Marine be surprised, he must readjust his forces and relocate them as outlined in Appendix C, Rules for Play.

At this point in the main program the player exercising the engagement option employs a portion of his forces depending on the tactical needs of the situation. The Soviet player must choose from the following menu.

- 1 - STOP AND DISMOUNT
- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - A - BMP
 - B - BTR
 - C - T-62
 - D - T-72
- 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - A - AKMS
 - B - PK LMG
 - C - RPG-7
- 4 - MOVE/RETREAT
- 5 - MOUNT VEHICLES
- 6 - EMPLOY COMBINED ARMS
 - A - 120mm MORTAR

B - 122mm SELF-PROPELLED GUN

Similarly the Marine player must choose from the following menu.

1 - ENGAGE WITH ORGANIC WEAPONS

A - M16A1 5.56mm RIFLE

B - M-60 LMG

C - TOW

D - DRAGON

E - LAAW

2 - REQUEST FIRE SUPPORT

A - 81mm MORTAR

B - 105mm GUN

3 - WAIT

4 - DISENGAGE RETREAT

Depending on the players choice of action, the main program calls a subroutine, executes it, displays the results, and completes the players turn by adding one-half minute of simulated time to the clock. The main program then requests the next player's identity (Marine or Enemy) signifying the commencement of another turn. From this point on the players exercise their forces until one of two situations occurs. The first situation involves the attrition of Soviet infantry manpower from the original twenty-seven to any strength less than twelve. If this occurs, the main program questions the Soviet player regarding continuation

of the engagement. Should the Soviet player decide to continue, he is notified he has made a poor strategic decision and play continues as before. However, should he decide not to continue, he is notified he has made a wise strategic decision and the Marine is notified he has successfully defended by the printing of the final results. Similarly, if the Marine squad strength falls below six the Marine is queried regarding continuation of the defense. As with the Soviet, the main program chastises the Marine for his poor strategic decision. The purpose for allowing each of the players to make their own decision regarding termination is to provide a positive learning experience for both players. Even if a player loses (fails to maintain sufficient manpower), he still receives a positive reinforcement in the form of the message regarding his wise decision.

The only portion of the squad leader's decision process not directly modeled in the prototype simulation consists of the reporting phase. Because reporting varies from unit to unit the reporting phase is dealt with at the conclusion of each game and is performed manually. Reporting normally occurs at the conclusion of a battle, thus maintaining realism in the play of the game and maximizing computer usage. Appendix C, Rules for Play, outlines the procedures used in reporting.

DETERMINING THE EFFECTIVENESS OF WEAPONS AND OBSTACLES

The entire basis of determining weapons and obstacle effectiveness centers around random number generation and existent weapons effectiveness criteria. If the random numbers generated in the simulation (game) conform to the uniform distribution, then the probability of generating a value is the same for all values. Likewise, the probability of generating a random number less than or equal to 0.95 is 95%. The prototype simulation generates random numbers and by comparing these to effectiveness criteria, determine weapons hits and misses. As an example, if the probability of a first round TOW missile hit on a Soviet tank is 0.95, and the number generated is less than or equal to 0.95, then a hit occurs. Conversely, if the number generated is greater than 0.95, the simulated TOW missile misses the target.

In the prototype simulation a PASCAL derived function ("rnum") generates random deviates. Pascal functions compute and represent values (6:220). Unlike procedures (subroutines), functions represent values and therefore can be manipulated as such. Because no verified random deviate generator normally exists (for PASCAL implementation) in a microcomputer, one was constructed using the multiplicative congruent method (33:352).

In the multiplicative congruent method, an initial

value (seed) is chosen and then manipulated to create a random number (the next seed) and another random number between zero and one. The multiplicative method uses the following basic relationship in creating a random number.

$$X2 = A * X1 \pmod{M}$$

This relationship uses non-negative numbers (A and M), the seed (X1), and integer arithmetic to create random numbers (33:350). The random number (next seed) provides a deviate between zero and one when divided by M. No random number generator can create an infinite string of random deviates. The maximum number of deviates depends on the computer implementing the coding and the modulus (M) chosen. The statistical properties of the sequence (correlation and autocorrelation of terms) depend on the seed (X1) and the multiplier (A).

The proper choice of a modulus depends on the computer used to implement the coding. To maximize the number of different deviates generated, the modulus (M) equals two raised to the "b" power, where "b" equals the word size of the computer. For purposes of this simulation "b" equals sixteen and the modulus equals 65,536. Having selected the modulus, the resultant length of the deviate sequence is 16,384. The value of the multiplier (A) was chosen using the established rule requiring it to be an integer of five or more digits void of long strings of zeroes or ones (33:351).

The following summarizes the process of computing random numbers between zero and one (33:352).

1. Choose the seed (nine digits or less)
2. Multiply the seed by a five digit number (A)
3. Divide the result from step two by the modulus (M) and use the integer remainder as the next seed
4. Divide the new seed by the modulus and use the decimal as a random number ($0 < X2/M < 1$)
5. Repeat steps two through five as necessary.

Verification of the simulation is guaranteed if all parts of the simulation are independently verified. Verification requires actual model behavior correspond to expected model behavior. In the prototype game, all weapons, vehicle and obstacle effectiveness criteria are based on experimentally or experientially verified probabilities. Because the gaming output depends on both the effectiveness criteria and the random number generated in determining weapons system effectiveness, gaming output verification requires generator verification.

Verification of the generator involves acquiring statistical proof that the generator creates uniformly distributed deviates. Two common tests used to determine the "goodness-of-fit" of an unknown distribution (deviates) to a known distribution (uniform) are the Chi-square and Kolmogrov-Smirnov goodness-of-fit tests (33:355). When testing large sample sizes the Chi-square test is preferable to the Kolmogrov-Smirnov test (33:79). In using the Chi-square

test, the null hypothesis states no difference exists between the sample distribution and the known distribution. The following formula calculates the Chi-square statistic:

$$\chi^2 = \sum^k \frac{(f_o - f_e)^2}{f_e}$$

where:

f_o = observed frequency in each class

f_e = expected frequency in each class

\sum^k = the sum over all k classes

Use of "S" (a statistical package available on the VAX 11/780 computer), 16,000 random numbers created with the developed generator, and ten classes, resulted in the following statistics;

CLASSES	TEST STATISTIC	DEGREES OF FREEDOM	P-VALUE
10	0.17625	8	0.999998

Interpretation of these results indicate the generator does produce uniformly distributed random numbers. The confidence with which we can say this is 99.9998%. The low Chi-square statistic caused us to fail to reject the null hypothesis (no difference between sample and known distributions), thus verifying the generator, and in turn, verifying the probabilistic output of the game (weapons and obstacle effectiveness).

SUBROUTINES TO THE MAIN PROGRAM

In the foregoing discussion, several references identified separate subroutines as the generators of specific output. The PASCAL language identifies subroutines with the keyword "procedure". Clancy and Cooper define procedures as "subprograms that cannot be run on their own, but do part of the work of the main program [6:72]." Subroutines were used in the prototype game to facilitate easy updating of weapons characteristics, to simplify additions to existent weapons systems, and to minimize the coding involved. The following paragraphs describe each of the subroutines used in the prototype war game and any significant implications of that subroutine.

Procedure Skipblanks

This subroutine enables the main program to read integer values from an external text file. Reading integer values creates the terrain array and is therefore essential to the operation of the main program. Procedure skipblanks was obtained directly from Clancy and Cooper's book Oh! Pascal!.

Procedure Rangefinder

Several subroutines call this procedure because it calculates both range from the weapon to the target, as well as distance from present position to final destination. By

requesting start and stop grid locations (weapon and target grid locations) this subroutine calculates the straightline distance between these points using the pythagorean theorem. Output from this subroutine consists of range/distance, and the vertical and horizontal components of the range/distance vector.

Procedure Marord

This procedure prints the company combat order issued to the Marine squad leader. It consists of the standard five paragraphs of the 5-paragraph order, however it has been streamlined to contain only information pertinent to the engineer squad leader.

Procedure Enemyord

The main program uses this subroutine to print the Soviet player's marching orders. It contains the assets available to the Soviet patrol commander and his basic order, to destroy all enemy resistance along his direction of movement.

Procedure Minefield

When called from the main program, procedure minefield calculates the time necessary to implement a minefield of a given frontage in a standard 1-1-1 (one Anti-tank mine, one Anti-personnel blast mine, one Anti-personnel fragmentation

mine) minefield density and changes the terrain integers to represent landmines. As in each of the other obstacle sub-routines, procedure minefield considers movement time as well as manpower assigned in computing completion time for the obstacle. Both the minefield frontage (50,100,150, or 200) and the manpower assigned to emplace the obstacle determine the required obstacle completion time. All minefields, regardless of frontage, use a sixty meter depth. The number of rows in the minefield determines the depth of the minefield and the minefield density determines the number of rows. Because all of the minefields use the standard 1-1-1 density, all use the sixty meter minefield depth (11:48). Depending on the location desired, the minefield occupies twenty-five elements horizontally (1-25 or 25-50 in the x direction) for each fifty meters of frontage and all minefields occupy the first thirty elements vertically (1-30 in the y direction) in the designated grid square. Appendix C, Rules for Play, outlines the specifics of emplacing minefields in the prototype wargame.

Procedure Atditch

One of the obstacle choices available to the Marine player consists of an anti-tank ditch. When called by the main program, this procedure notifies the Marine player of the necessity for earth moving equipment held by the service support group, and then asks for the length of the desired

anti-tank ditch. With this information the subroutine calculates the obstacle completion time and passes this information back to the main program (43:83).

Procedure Demchrg

Calling this procedure provides bridge demolition capability to the Marine player. Using standard manpower requirement calculations for the bridge type existent in the prototype terrain (primary two-lane highway), this subroutine calculates the time necessary to destroy the existing structure (43:72). Destruction of the bridge is defined as the time required to cut the span at each end (43:71).

Procedure Crater

A standard, demolition prepared, road crater results from successful enactment of this subroutine. Through interactive input, the player establishes the length of the road crater and the number of personnel involved in creating the obstacle. With this data the subroutine generates the completion time for the obstacle and passes this information back to the main program (43:71).

Procedure Arrive

Impending enemy arrival limits defensive planning and emplacement of obstacles. This subroutine creates the enemy arrival time by assigning a specific value (720 minutes) to

the enemy arrival time variable. The use of a twelve hour time limit forces the Marine player to budget his resources in accordance with this restraint. Feedback on the Marine player's time management ability occurs when he is either surprised by the advancing forces or he is totally prepared at the time of engagement.

Procedure Akms

Employment of Soviet small arms requires calling this subroutine. Because the akms is the personal weapon of all Soviet infantry, the weapon is employed in squad sized elements. Using the range from the employing unit (one of the two BTR mounted squads or the BMP mounted squad) to the target and a random number generated from the function "rnum", this subroutine determines if a hit occurs for each weapon in the employing unit. Should the employed weapon hit the target, another random number determines the seriousness of the wound. Table 2.3 lists the specific weapons effectiveness criteria (16:299) and Table 2.4 represents the probabilities of each wound severity classification (26:134). Printed results of the weapons firing appear before the player, providing force update input for the opposing player. Each weapon in the squad is fired only once as the time simulated per turn is only thirty seconds. When the range to the target exceeds the maximum effective range of any weapon system, the player is notified and all rounds are

tallied as misses. If the Soviet player decides to fire while mounted in the BMP/BTR, the availability of only four firing ports reduces his firepower accordingly. Additionally, firing while mounted reduces the weapons effectiveness by a factor of six (16:299).

Table 2.3 Probability of a Hit with Soviet Small Arms

RANGE(meters)	AKMS	PKLMG	RPG7
50	0.81	0.97	0.97
100	0.67	0.83	0.91
175	0.50	0.69	0.52
200	0.50	0.69	0.52
250	0.33	0.69	0.27
300	0.33	0.42	0.27
400	0.33	0.42	0.10
500	N/A	0.42	0.05
750	N/A	0.31	N/A
1000	N/A	0.03	N/A

Table 2.4 Probability of Wound Severity

WEAPON	NE	WW	LC	KIA
AKMS/M16A1	0.19	0.25	0.22	0.34
PKLMG/M-60	0.19	0.25	0.22	0.34
RPG-7	0.00	0.00	0.67	0.33

NE = NO EFFECT

WW = WALKING WOUNDED

LC = LITER CASUALTY

KIA = KILLED

Procedure Pk1mg

Each of the Soviet squads maintains one PK light machine gun (LMG). When employed by the Soviet player, this subroutine determines the weapons effectiveness and wound severity just as did the procedure akms. Due to the thirty second span of each turn, the PK LMG engages only one target

per turn. As a result, only one casualty results from the employment of this weapon. The advantage of the PK LMG over the AKMS lies in its ability to engage targets at greater range with superior accuracy (16:301). Tables 2.3 and 2.4 display the effectiveness data for the PK LMG.

Procedure Rpg7

One RPG-7 (rocket propelled grenade) gunner is designated in each Soviet squad. This subroutine calculates weapons firing results in the same manner as the AKMS subroutine. Tables 2.3 and 2.4 contain the appropriate effectiveness measures. Unlike small arms fire, the RPG-7 either immobilizes or totally destroys the targets it hits. Similar to the AKMS subroutine, random numbers determine the severity of each hit.

Procedures Arty122 and Mort120

The Soviet offensive is based on the combined arms assault. Combined arms support is provided to the advance guard from the towed 120mm mortars and the 122mm self-propelled guns (SAU-122). Procedures mort120 and arty122 simulate these weapons in the prototype war game. These procedures simulate combined arms support by searching an area in the vicinity of the target location (interactive input from the player) and generating random numbers for each non-terrain integer encountered. The procedure then

assigns wound severity (killed, walking wounded, no effect) in accordance with another random number and the guidelines established in Table 2.5. Because the Marine defenders may be dug-in (in emplacements), the procedure discriminates between dug-in troops and troops in the open when determining hits. The size of the area searched depends on the weapon type (120mm or 122mm) and the location designated as the target. The 120mm mortar battery creates a casualty zone 45 meters deep and 65 meters wide while the 122mm gun's casualty zone extends 50 meters deep and 70 meters wide (16:179). Procedure mort120 simulates this by searching an area plus and minus eleven elements in the vertical (y) direction and plus and minus sixteen elements in the horizontal (x) direction. Procedure arty122 searches an area plus and minus twelve elements in the vertical direction and plus and minus seventeen elements in the horizontal direction. Figure 2.8 depicts these search areas on the terrain array.

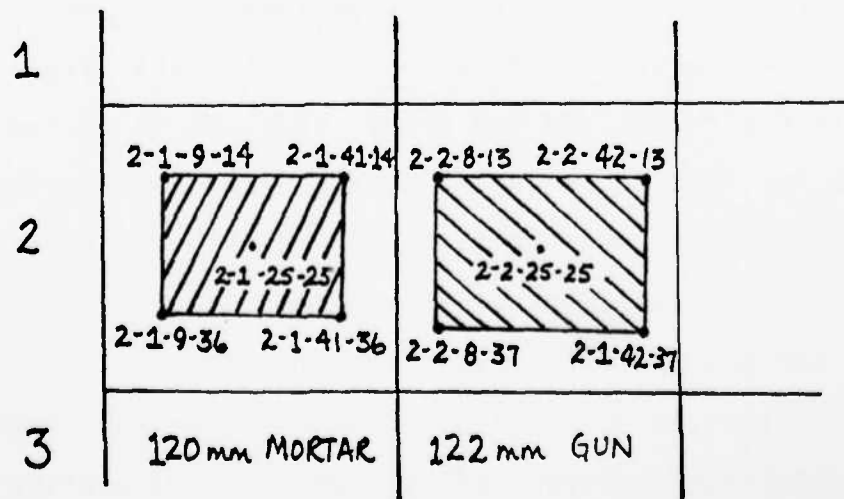


Figure 2.8 Artillery Search Areas

Although neither procedure accounts directly for first round inaccuracies (probabilistic determination of round impact), both procedures render first round fires ineffective because the Soviets have no opportunity to register fires. Similarly, each procedure only searches within the major grid square of the target designation, simulating inaccuracies in delivered rounds.

Procedures T62 and T72

The main battle tank of the Soviet forces currently consists of the T-62 which is being replaced by the T-72 main battle tank. For training purposes the prototype war game includes one of each type in the combat recon patrol. In actual combat both tanks would be of the same type. Soviet doctrine requires tanks to engage only other tanks and anti-tank weapons. General infantry targets are engaged with combined arms (SAU-122 or 120mm Mortar) support (16:73). For these reasons, both procedures require the player to identify his target and the weapon he plans to employ against it. Should he choose to employ the main gun against infantry targets, the procedure reminds him of Soviet doctrine and terminates the players turn. Should the player engage the appropriate target, the procedure determines main gun effectiveness by calling a random number and comparing it to established weapons effectiveness for the given range. Similar to other weapons subroutines, once a hit is

registered, a separate random number determines the severity of the hit. Tables 2.5 and 2.6 contain the weapons effectiveness and hit severity characteristics for the T-62 and T-72. If the player chooses to employ the 7.62mm coaxial machine gun the procedure pklmg is called and weapons effectiveness is determined.

Procedures Bmp and Btr

Soviet doctrine deploys either the BMP (tracked APC) or the BTR-60 (six-wheeled APC) as the main armored personnel carrier in the Soviet motorized rifle battalion. Controversy over the actual classification of the BMP as an APC and not a tank seems to have subsided and for the purposes of this research it is referred to as an APC. Although all APC's within a platoon would normally be BTR-60's, each Division has one BMP equipped regiment. For training purposes, the prototype war game equips the combat recon patrol with one BMP and two BTR's. As in the tank subroutines, both the BMP and the BTR procedures require the player to identify the target and the weapon he wishes to use. The 73mm gun on the BMP is, according to doctrine, employed against obstacles and anti-tank weapons (16:132). Variance from this doctrine by the player forfeits his turn as it does when the player improperly employs the main gun of the T-62 or T-72. Similarly the 12.7mm anti-aircraft gun on the BTR is, according to doctrine, employed only against air-

craft or anti-tank targets. Effectiveness of the weapons (main gun or coaxial 7.62mm machine gun) are determined exactly as in the T-62 and T-72 subroutines. Tables 2.5 and 2.6 contain weapons effectiveness data for the BMP (73 mm gun) and the BTR-60 (12.7mm heavy machine gun).

Table 2.5 Soviet Armored Weapons Hit Probabilities (6)

RANGE	TANKS		RANGE	APC'S	
	HIT PROBABILITY			HIT PROBABILITY	
	T-62	T-72		BMP	BTR-60
500	0.98	0.98	50	0.97	0.95
1000	0.79	0.94	100	0.89	0.95
1500	0.50	0.75	175	0.89	0.80
2000	0.27	0.55	250	0.83	0.70
2500	0.14	0.40	500	0.64	0.50
3000	0.08	0.35	800	0.50	0.40
			1000	0.40	0.20
			1300	0.28	N/A
			1800	0.24	N/A

Table 2.6 Soviet Effect's Probabilities for Armored Weapons (6)

EFFECT	WEAPON			
	T-62	T-72	BMP	BTR
Destroy	0.71	0.71	0.50	0.35
Immobilize	0.29	0.29	0.50	0.65

Procedures M16A1 and M60

The M-16A1 5.56mm rifle is the standard Marine weapon

and roughly equates to the Soviet AKMS. Marine Corps doctrine has established the M-60 as the standard Marine Corps light machine gun, roughly corresponding to the Soviet PK LMG. The procedures M16A1 and M60 determine weapons effectiveness and hit effects in exactly the same manner as the procedures akms and pklmg. As with the AKMS, the M-16A1 is employed in unit element exchanges. The standard unit employed is the demo team, thus the maximum firepower in any single exchange becomes four weapons. Similar to the procedure akms, each demoteam member fires one round during the thirty seconds simulated by a turn. As with the PK LMG, the M-60 engages only one target during a single turn resulting in a single casualty. The advantage of the M-60 is its superior accuracy at extended ranges as outlined in Table 2.7. The effect of a hit from Marine small arms is the same as that for Soviet small arms and Table 2.4 lists the specific probabilities.

Procedures TOW, Dragon, and LAAW

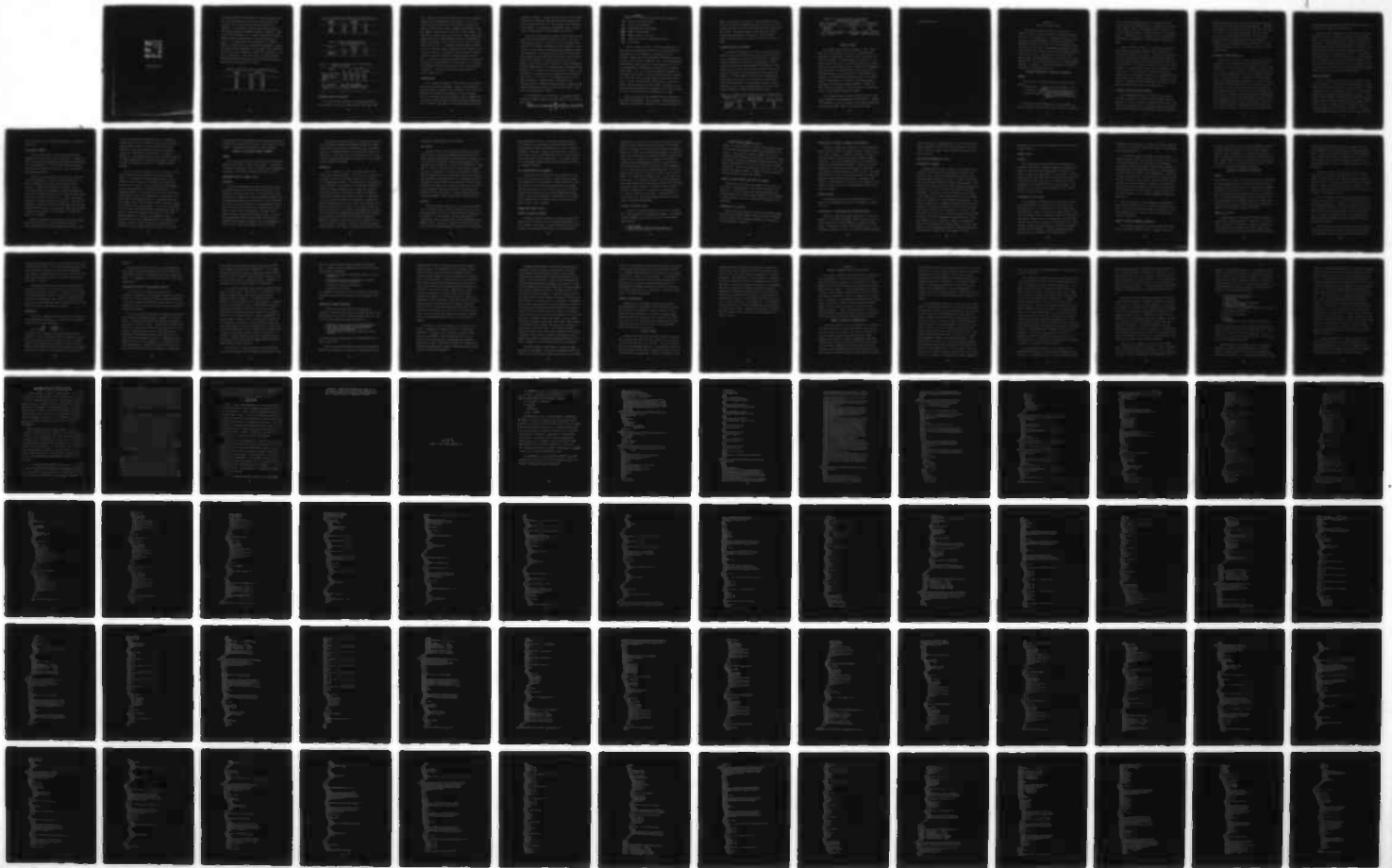
These procedures calculate employment results for the Marine antimech weapons. Each procedure calls procedure rangefinder and combines target range and a random number to determine the results of specific weapon employment. Should a hit occur, the procedure uses another number to determine the hit effects. The result of a hit with any of these weapons is either target destruction or immobilization. If

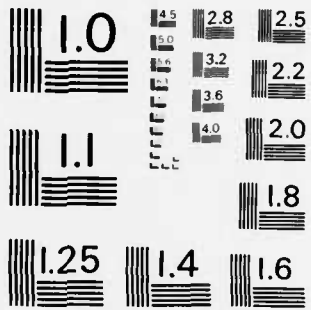
AD-A134 962

ANTI-MECHANIZED DEFENSE: A COMPUTERIZED SIMULATION FOR
SQUAD LEADER TRAINING(U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. J E WISSLER
SEP 83 AFIT-LSSR-77-83 F/G 5/9

2/4

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

the simulated missile (TOW, Dragon, or LAAW) misses the target, the appropriate subroutine notifies the player and requires him to give the exact weapon location to his opponent. This simulates positive enemy identification of the antimech weapon's signature caused by backblast. Each of the antimech weapons has a specific ammunition allowance and each time a player employs a weapon he expends one round. As a player fires his last round for a specific weapon he is notified by the appropriate subroutine. Should he attempt further employment of this weapon, the subroutine informs him he has exceeded his ammunition allowance and his turn is terminated. Table 2.8 lists the antimech weapons effectiveness probabilities and Table 2.9 gives the associated hit effects probabilities (16:78).

Table 2.7 USMC Small Arms Hit Probabilities (26)

RANGE (meters)	WEAPON	
	M-16A1	M-60
50	0.73	0.81
100	0.56	0.64
200	0.44	0.53
300	0.36	0.44
400	0.31	0.39
500	0.25	0.33
1000	N/A	0.19

Table 2.8 USMC Antimech Weapons Hit Probabilities (6)

RANGE (meters)	TOW	WEAPON Dragon	LAAW
50	0.00	0.00	0.97
250	0.75	0.75	0.17
1000	0.90	0.90	N/A
3000	0.90	N/A	N/A

Table 2.9 USMC Antimech Weapons Hit Effects Probabilities (6)

EFFECT	TOW	WEAPON Dragon	LAAW
Destroy	0.90	0.80	0.33
Immobilize	0.10	0.20	0.67

Table 2.10 Indirect Fire Weapons Hit Probabilities (USMC and Soviet)

TARGET	HIT EFFECT			
	NE	WW	KIA	DESTROY*
Troops in the Open	0.50	0.19	0.31	N/A
Troops Dug In	0.75	0.095	0.155	N/A
Armored Vehicles	0.50	N/A	N/A	0.50
Tanks	0.64	N/A	N/A	0.36

NE = NO EFFECT

WW = WALKING WOUNDED

NA = KILLED

DESTROY = VEHICLE DESTROYED

* = Applies to Tanks and Armored Vehicles Only

Procedures Mort81 and Arty105

U.S. Marine Corps indirect fire weapons available in the simulation include the 81mm mortar and the towed 105mm

gun. Procedures mort81 and arty105 calculate the casualties resulting from employment of these weapons. As in procedures mort120 and arty122, the subroutine searches the terrain array for non-terrain integers and generates a random number to determine the effect of a chosen weapon. The 81mm mortar section creates an effective casualty area forty meters deep and fifty-five meters wide while the 105mm gun produces casualties in an area forty meters wide and sixty meters wide (20:97). To simulate the 81mm mortar casualty zone the subroutine mort81 searches the terrain matrix in an area plus and minus ten elements (from the target location) vertically and plus and minus thirteen elements horizontally. Similarly, procedure arty105 simulates the 105mm gun casualty area by searching the terrain array plus and minus ten elements vertically and plus and minus fifteen elements horizontally. Table 2.10 lists the indirect fire hit effects probabilities.

Procedure Move

This procedure provides for the second of the two basic principles of tactics, maneuver. When a player desires to move his assets he invokes this subroutine. The first item necessary for movement calculations is travel distance. Table 2.11 outlines maximum allowable travel distances per turn based on mode of travel (wheeled vehicle, tracked vehicle, or on foot) and type of terrain traversed (clear/flat,

inclined, or water). These maximum distances are calculated using tactical movement rates and the thirty seconds simulated in each turn (26:121). The intended travel distance is calculated in the procedure rangefinder just as target ranges were calculated for the weapons subroutines.

Once the distance, mode of travel, and terrain type are established, the subroutine updates the terrain array for each vacated location. In order to allow 360 degree movement and still check the movement path for obstacles (minefields), the subroutine identifies any grid borders crossed during movement. Once the crossing points are established the procedure checks these locations and the start and stop points for obstacles. By checking start, stop, and grid border points, the simulation checks all possible encounters because the minefields (if present) occupy grid elements one to twenty-five, twenty-five to fifty, or one to fifty in the horizontal (x) direction and grid elements one to thirty in the vertical (y) direction. If obstacles exist, the procedure generates a random number to determine if an encounter occurs. Should an encounter occur, another random number determines the effect of the encounter based on probability and the mode of travel.

The probability of an encounter in a standard pattern minefield (0.9328) resulted from manipulation of the following formula:

$$\text{PROBABILITY OF ENCOUNTER} = \sum_{i=1}^{N_{MT}} N_{Mj} \frac{A_i}{A} P_{cij} T_{vj} \quad (10:D-4)$$

$$T_{vj} = 1 - e^{-\psi_j \eta_L / L_w} = \text{traffic density function (10:D-8)}$$

A_1 = area of the traveled lane

A = area of the minefield

P_{cij} = countermeasure effectiveness

N_{MT} = number of mine types

ψ_j = damage width of the mines

η_L = number of vehicles transiting minefield

L_w = lane width

Since the number of mines is directly proportional to the area of the minefield and the area of the minefield is proportional to the frontage, the probability of an encounter remains the same regardless of minefield frontage, given all other factors remain the same. The countermeasure effectiveness equals one for all cases because of the lack of countermeasures employed by the Soviets in the combat recon patrol. In a 1-1-1 density minefield the number of mine types equals three. The anti-handling devices emplaced with each mine create a damage width of one meter for each mine. Finally, the lane width (wheel/track or foot path width) covers 1.16 meters and the number of vehicles or personnel entering the minefield remains one (one vehicle moved per turn, one person enters the minefield at a time).

Table 2.12 displays the encounter effect probabilities for landmine encounters. When a player's forces encounter a landmine, the procedure terminates his turn and replaces his

forces at the point of encounter. Upon successful completion of the move the procedure notifies the player of a successful move and places his forces appropriately in the terrain array. Crossing of water by any means other than a bridge requires vehicular assistance. This and other specifics of movement are covered in Appendix C, Rules for Play.

Procedures Mount and Dismount

To effectively employ his infantry assets and maintain Soviet doctrine, the Soviet player must have the ability to mount and dismount his troops from their APC's. These procedures provide this flexibility and adjust the terrain array to reflect simulated mounting or dismounting. When dismounting a vehicle, the procedure dismount asks for the number of personnel to be deployed and their prospective location. It then checks the location for landmines and either places the person at his location or notifies the player the individual has encountered a landmine. When mounting a vehicle, the procedure mount merely clears the terrain locations vacated by the mounting forces.

Table 2.11 Maximum Travel Distances per Turn (meters)(6,26)

TERRAIN TYPE	MODE OF TRAVEL		
	ON FOOT	TRACKED VEHICLE	WHEELED VEHICLE
Flat/Clear	50	150	100
Inclined	25	100	40
Water	N/A	25	25

Table 2.12 Casualty Effects Probabilities
from Landmine Encounters (10)

MODE OF ENCOUNTER	WW/IMMOBILIZE	KILL/DESTROY
Personnel	0.67	0.33
Vehicles	1.00	0.00

WW = Walking Wounded IMMOBILIZE = Weapons function
 KILL = Killed DESTROY = Nothing functions

CHAPTER SUMMARY

This chapter began with a discussion of both Marine Corps and Soviet doctrine and tactics including ground defense, the philosophy of fighting armor, the Soviet combined arms assault, and USMC obstacles and barriers. Following these discussions, the chapter treated the development of the prototype war game to include the development of prototype terrain, implementation of the squad leader's decision process, and the specifics of the random deviate generator and each subroutine supporting the main program. General information on the play of the prototype game is contained in the chapter, however Appendix C, Rules for Play, contains the specific rules necessary for implementation of the prototype simulation wargame.

This chapter treated the model translation and verification phases of the methodology of this research. Chapter Three discusses initial validation of the game through comparison with MCCRES criteria and discussion of the

1

playtesting results.

CHAPTER III
ANALYSIS OF GAME VALIDITY

This chapter contains discussion of the various approaches to simulation validation, the general approach chosen for this research, and a detailed discussion of the specific approaches employed. The specific techniques employed consisted of an analysis of game playtesting and a comparison of the actions and planning required by the game as opposed to that required by Marine Corps Combat Readiness Evaluation criteria. Validation as discussed in this chapter deals with the determination of the game's teaching effectiveness and reinforcement of critical antimech defense concepts. In general, is the simulation game's behavior comparable to real system behavior.

STANDARD APPROACHES TO SIMULATION VALIDATION

GENERAL

The process of evaluation consists of three sections (33:210):

1. verification - to insure the model behaves as intended.
2. validation - to test the agreement between behavior of the model and system behavior.
3. problem analysis - analysis and interpretation of the data generated by the simulation.

As stated in the methodology portion of Chapter One, gaming in general and the scope of this research in particu-

lar do not lend themselves directly to problem analysis. This is not to say experimentation is impossible with simulation games, rather that effective data collection and problem analysis differ from normal analysis of simulation data. Validity therefore, remains the only determination applicable to development of the prototype simulation war game.

Several different theories of scientific inquiry and the following paragraphs summarize their differences as described by Shannon (33:211-217). Almost more important to war game validation than agreement between model behavior and real system behavior is the extent to which the simulation war game is an isomorphic reflection of the real system (33:210). A simulation war game which is homomorphic is of little value in the teaching of concepts and principles because it is the isomorphic nature of a simulation war game which makes it an effective teaching tool. Because of this emphasis, isomorphic versus homomorphic, the choice of validation techniques included these considerations.

SUBJECTIVE VERSUS OBJECTIVE METHODS

The development phase of any simulation war game is primarily a subjective experience where subjective beliefs (opinion, intuition, gut-feel, experience) mold a model from the infinite possibilities. Due to the iterative nature of simulation development, the development process alternates

between construction and verification, thus requiring alternating between subjective and objective methods. Although the creation of any simulation entails the iterative process of subjective input (construction) and objective input (model verification) final validation of the end product requires objective measurement of the game's reality, separate from any subjective biases (33:211-212). The following discussion outlines four objective means of simulation validation.

RATIONALIST VERSUS EMPIRICIST

Rationalist thinking is closely aligned with logic and mathematics. The rationalist view of validation holds a simulation model to be merely a collection of logical deductions based on a set of premises. These premises may or may not be open to objective verification or subjective experience. In their purest form, rationalist premises become premises of unquestionable truth (33:211). Applied to the validation of the prototype simulation, rationalists validation would not require controlled procedures because the basic premises upon which the war game was developed are so much a part of everyday life, merely stating them makes the result obvious. The critical discrepancy involved in using the rationalist approach is the "obviousness" of the premises and their result. Nothing dealing with combat is so much a part of everyday life as to be obvious, and further,

rapidly changing technology and tactics complicate even the most basic of assumptions (33:212-214).

Opposite the rationalists on the philosophical spectrum are the empiricists. Generally, the empiricist viewpoint emphasizes the necessity of basing a model on facts and not assumptions. Strict proofs using statistical testing provides the basis of empiricist validation. "In short, in its purest form, empiricism asks that we begin with proven or verifiable facts, not assumptions [33:214]." The detrimental aspects of this approach lie in the fact that no simulation involving human decision making in the combat environment can possibly begin with proven facts. Given any set of circumstances, any two people may make drastically different decisions based on their training and experience.

ABSOLUTE PRAGMATIST

Whereas rationalist and empiricist validation involve the entire model, a third view, absolute pragmatism concerns itself only with the end product of the simulation. If the simulation fulfills the purpose for which it was developed, the absolute pragmatist assumes validity (33:214). In validation of the prototype simulation, the absolute pragmatist approach offers the best alternative yet discussed. Difficulties arise in implementing this approach because the internal operation of a simulation war game is critical in the development of teaching effectiveness, thus, measuring

the end result overlooks important parameters in simulation validation.

UTILITARIAN APPROACH

As could be expected, black and white distinction between the previous approaches seldom occurs. Because of this, the utilitarian approach was developed incorporating all three approaches in a multi-stage validation process. The utilitarian approach was used in initial validation of the prototype war game.

Stage one of the utilitarian process seeks face validity of the internal structure of the model based on "a priori knowledge, past research, and existing theory [33:215]." Execution of stage one validation in this research constituted development of the main program and each of the supporting subroutines in compliance with Marine Corps and Soviet doctrine and tactics. This is discussed extensively in Chapter Two of this research. Stage one is therefore, a modified rationalist's approach, requiring the assumptions used merely to be sensible. Numerous executions of each of the subroutines were necessary in completing stage one validation.

Stage two validation also concerns the internal structure of the simulation. Unlike stage one, stage two requires empirical testing of the assumptions used in each

of the building blocks (procedures) of the simulation. Because each of the subroutines is based on statistically substantiated hypotheses, the only empirical testing required in stage two concerned the uniform generator developed in the PASCAL function "rnum". As stated in Chapter Two, this generator was empirically tested using the Chi-square goodness of fit test and was shown to produce uniformly distributed deviates at a confidence level of 99.9998%.

The final stage of validation requires vigorous verification that the model represents real world behaviors (33:216). This portion of the validation requires the developer to convince the user his model will perform to specifications, namely, teach the principles and concepts of anti-mechanized defense on the squad leader level. The choices available for third stage analysis vary from complicated spectral analysis to behaviorally oriented tests, to field tests and prototype displays. Time constraints and the original scope of this research effort limited the stage three analysis techniques employed. In an effort to provide initial validation of the prototype simulation war game, two means of stage three analysis were applied. First, the decisions germane to the game were compared to those required by Marine Corps Combat Readiness Evaluation System (MCCRES) standards. Second, the game was administered to several Marine Corps squad leaders and analysis of a post-

game questionnaire subjectively measured the teaching effectiveness of the prototype simulation. The remainder of this chapter is dedicated to discussion of these analyses.

ANALYSIS OF APPLICABLE MCCRES STANDARDS

GENERAL

The following discussions highlight each of the MCCRES standards applicable to squad level defense. The numbers following the applicable topics correspond to the subheading designators used within the MCCRES publication (12,13).

CONTINUING ACTION BY MARINES (S2A.1)

Discipline

Of the nine sub-categories detailing discipline, the prototype simulation only effectively measures two, fire discipline and supply discipline. Fire discipline defines the process of controlling rifle and automatic weapons fires and precisely executing unit fire orders. Fire discipline is essential in maximizing unit fire effectiveness (15:60). Supply discipline constitutes the effective use of ammunition, rations, water, and equipment. Doctrine allots specific loads for each man and weapon system. The prototype accomplishes these through limited availability of antimech rounds (supply discipline) and the employment of M-16A1 fires in demo team elements (fire discipline).

The remaining seven categories, including items such as self discipline, weapons and equipment discipline, communication discipline, noise and light discipline, and hygenic discipline, represent areas only reinforceable under field conditions. These areas are not reinforceable in any simulation war game and therefore do not reflect on the validity of the prototype simulation.

Dispersion

Correct dispersion allows for minimum effect from a single enemy weapons exchange. This results in minimal loss of combat power from both enemy direct fire and indirect fire fragmentation weapons. The prototype war game specifically reinforces these standards for individual dispersion (distance between personnel), unit dispersion (distance between demo teams), dispersion of leaders, and weapons dispersion by allowing the players to position individuals in demo team order, weapons, and themselves. Feedback on proper dispersion occurs in the form of the opposing forces direct and indirect fire results. With proper dispersion fewer casualties will be suffered when engaged by the enemy. The only element of dispersion not modeled in the prototype and required by MCCRES deals with material dispersion. Material dispersion constitutes the spread loading of supplies throughout the squad. Because of the purely administrative nature of this task, no provisions for such activity

were made in the construction of the game.

Use of Cover

The principle of cover dictates positioning of personnel where they may not be observed by hostile forces and where they are protected from enemy direct fire weapons. As in the area of discipline, certain sub-categories of this standard are only feasible in actual field conditions. This does not detract from the realism of the prototype simulation but is a weakness of simulation war games in general. Certain categories of this performance standard do, however, lend themselves to implementation in a simulation, and the prototype war game includes these decisions. With an understanding of the terrain and personnel emplacement portions of the prototype simulation, the player makes decisions necessary to take advantage of covered movement routes and crew-served weapons (TOW, Dragon, M-60) firing positions.

Security

Preventing enemy observation of and information gathering on friendly forces, preserving freedom of action, and preventing enemy surprise all define parts of the principle of security. In the defense, security concentrates on preventing surprise and denying the enemy information on the defensive plan. Security is normally attained through the posting of crew-served weapons for observation and enforcing

noise discipline (15:161). The model effectively models this subtask in its entirety by rewarding proper security and planning by the Marine with the first option in the combat phase of the game. Should the Marine fail to provide sufficient security, the element of surprise is lost and the first option goes to the Soviet player. In numerous tests of the prototype, maintaining the first option was critical to successful defense.

Use of Camouflage and Concealment

The principles of camouflage and concealment are similar to the the principle of cover. Camouflage and concealment provide only for prevention of enemy observation and do not provide for protection from enemy direct fire weapons. The model effectively includes this action when the Marine organizes the defense so as to prevent detection by enemy forces. The use of camouflage is not modeled in the prototype simulation and as in other areas this is better measured in actual field conditions.

COMMAND AND CONTROL (S2A.2)

Control of Organic Firepower

In general, control of organic firepower requires the employing unit leader be aware of weapons effectiveness criteria (ranges, shell types , and burst patterns) and be able to employ these weapons effectively. The prototype game

incorporates all decisions and actions required of the squad leader by MCCRES standard with the exception of the squad leader's awareness and ability to use alternative communication assets linked to his fire support weapons. Use of 81mm mortar, antitank weapon, and organic firepower control techniques exist in various forms throughout the simulation including demo team employment of M-16's, registration of artillery and mortar fires, and use of an armor engagement line in conjunction with the antimech weapons. The initial combat order addresses a majority of these issues and the choice of availability and weapon type is an integral part of the game. The inability to model the various communication assets stems from the two-player format of the game and the scope of this research. Because the squad leader is the only "communicator" in the game, he communicates over all assets in the play of the game. Differentiation in assets would only further complicate the game and detract from its teaching effectiveness.

Control of Artillery Fires.

Indirect fire weapons (mortars and artillery) require two or more personnel to engage enemy targets. The requesting unit commander uses the following call to implement these weapons.

1. FIRE MISSION
2. KNOWN REFERENCE POINT OR GRID LOCATION
3. DIRECTION FROM OBSERVER TO TARGET (OPTIONAL)

4. DESCRIPTION OF TARGET
5. SHELL TYPE REQUESTED (OPTIONAL)

Control of artillery fires is based on knowledge and familiarity with the preceding procedures and knowledge of the terrain. The prototype simulation models most of the required standards dealing with control of artillery fires. The sequence involved in employing simulated artillery reinforces the standard call for fire, and the rounds must be registered in order to achieve first round hits. As in the control of organic firepower, however, the alternate means of communication have not been modeled.

Control of Naval Gunfire and Close Air Support

Naval gunfire and close air support are strictly controlled by forward observers specifically designated for that task. Neither of these performance objectives were modeled because they require only knowledge of the existence of these assets, a task more efficiently performed in the classroom.

Coordination of Logistics

The duration and purpose of the simulated combat negate the need for logistical support during the play of the game. For this reason, the prototype game does not include decisions pertinent to logistics.

Coordination of Casualty Treatment and Evacuation

Casualty treatment and evacuation are the responsibilities of the unit leader and attached medical support (usually a Navy corpsman). Efficient treatment of casualties directly affects morale and the unit's further fighting capability. The prototype game models only the reporting phase of this performance objective. The casualty report completed at the conclusion of the game satisfies the reporting of casualties however it fails to test the actual administration of first aid and demonstration of these techniques by other members of the squad. Once again, this feature is symptomatic of all simulation war games and not a specific lack of realism or teaching effectiveness on the part of the game.

Reports Control

The reporting phase of the simulation fulfills all squad level performance objectives (see Appendix C, Rules for Play).

Coordination of Intelligence and Comm Coordination

Neither of these performance objectives is explicitly modeled in the play of the game, however submission of the SALUTE report implies the forwarding of gathered intelligence. No modeling of POWs or POW handling occurs in the prototype simulation. As well, the combat order establishes

wire as the means of communication and the time required to emplace personnel includes the time to establish wire land lines. This is, however, indirect modeling of this performance objective.

FIRE SUPPORT COORDINATION (S2A.3)

Defensive Fire Support

Although similar to the "control of fire support" and "control of artillery fires" performance objectives, this standard involves more of the planning of artillery fires than the actual employment of fires. Primarily, this objective stresses the planning and registering of targets. The prototype simulation reinforces these concepts by requiring registration of fires for accurate delivery and casualty assessment. The areas not directly modeled by the simulation include use of a final protective fire (FPF) and planning for illumination in the night defensive scenario. The first of these areas is modeled in principle because the FPF is merely a planned and registered target fired on command. All of the artillery fire is treated in this manner in the simulation. In effect, all fires which have been registered are FPFs. The lack of appropriate night planning is a general weakness of the simulation. None of the parameters take into the account of the night defense. The final area covered in this performance objective includes coordination with superiors on matters of fire support. The only

modeling of this portion of the objective occurs in the end of game reports.

DEFENSE (S2B.6)

Planning

This requires the squad leader to receive the five-paragraph order from his company commander, synthesize this order into a squad five-paragraph order, and deliver his order to include the supervision of its execution. The prototype war game does not require the physical writing of his five-paragraph order, however he is responsible for the placement of his personnel and crew served weapons. This requires him to plan for their employment even if he does not put his plan on paper.

Organization of the Ground

The "planning " performance objective deals strictly with the generation and supervision of the squad five-paragraph order. The "organization of the ground" performance objective emphasizes the actual implementation of the plan and requires use of the general sequence of planning as described in Chapter Two. These objectives include establishing local security, digging in, positioning crew served weapons, establishing communications, preparing obstacles, and planning fire support. Play of the prototype game satisfies these requirements with the exception of

establishing communications. Specific responses requested in the play of the game require the players to execute these performance objectives.

In addition to these requirements, Combat Support MCCRES standards require the combat engineer be able to calculate the requirements for minefields, log obstacles, bridge demolitions, road craters, and antitank ditches (13). Once planned, MCCRES objectives require the combat engineer be technically proficient in their emplacement. Simulation of these concepts occur in the prototype war game during the choice of obstacles, the manpower assigned to each obstacle, and the size of each obstacle. Feedback on the effectiveness of squad leader planning consists of the opening play of the game where the Marine squad is either prepared for the Soviet advance, or he is caught attempting to prepare obstacles.

Play of the game does not provide any reinforcement or simulation of technical skills involved in obstacle placement. This again stems from the basic shortcomings of simulation gaming and not a specific lack of validity in the prototype simulation.

SUMMARY OF MCCRES STANDARDS COMPARISON

The prototype simulation effectively reinforces those skills required by MCCRES standards. Several items not

included in the model are an alternate communication means, no reinforcement of technical skills (first aid, weapon cleaning, mine emplacement), and night combat effects. The lack of available communication assets and incorporation of night combat factors result from the limits of the scope of this research. The inability to reinforce technical skills is merely a limitation of gaming in general.

ANALYSIS OF PROTOTYPE PLAYTESTING

GENERAL

The second test of game validity involved actual playtesting of the prototype war game by seven Marine Corps enlisted personnel and the analysis of their perceptions as obtained through a post-game questionnaire. Appendix H contains a copy of the questionnaire administered following playtesting. The following paragraphs discuss the conduct of the test, demographics of the sample population, interpretive results of the post-game questionnaire, and observations regarding the playtesting phase of validation.

CONDUCT OF THE TEST

A random sample of seven Marine enlisted personnel comprised the sample population. Randomness in the selection of personnel was obtained by requesting support from the Inspector and Instructor (I&I) Staff, Dayton, Ohio. Initial guidelines established participant qualifications as

enlisted Marines between the ranks of Private (E-1) and Staff Sergeant (E-6). No other qualifications were stipulated. Selection of the participants was solely dependent on individual availability. The Administrative Chief, I & I Staff, Dayton, Ohio performed participant selections and game participation or the lack thereof provided no reward or punishment.

The author conducted playtesting at the Air Force Institute of Technology, buildings 640 and 641. Computer assets involved included the VISUAL 550 remote terminal and printer located in room 133, building 640, and the Teletype Model 43 remote terminals in room 312, building 641. All terminals accessed the VAX 11/780 computer for processing of the compiled simulation program.

Prior to playtesting, the author instructed the participants in the rules for play and the administration of the post-game questionnaire. Further, the author issued a general statement of ambivalence toward the results of play and the perceptions of those individuals involved in playtesting. This general statement stressed the importance of gathering honest feedback and the unimportance of purely positive perceptions.

The participants were divided into three teams consisting of two two-man teams and one three-man team. Playtesting consisted of three to four runs per two-man section.

Each Marine played both the role of the Soviet and the role of Marine squad leader. One of the two-man groups utilized both the Model 43 terminal and the VISUAL 550 terminal. Total time of playtesting was four and one-half hours, with each game ranging from forty-five minutes to one and one-half hours in length.

Following playtesting, each individual completed the post-game questionnaire and took part in a general discussion of the prototype simulation. Discussion of the results from these evolutions appears in the following paragraphs. Due to the limited sample size, rigorous statistical measures were not performed but rather interpretive results from the questionnaire responses were assembled.

DEMOGRAPHICS

The initial responses on the questionnaire provided the sample population demographics. Analysis of the responses indicated the following averages:

AGE	26 YEARS
GRADE	SERGEANT (E-5)
TIME IN SERVICE	7 YEARS

In addition, all respondents had previous squad leader experience and all maintained military occupational specialties in the combat (infantry, tanks, aviation) or combat support (artillery, engineers, amphibious vehicles) fields. These qualities ensure accurate interpretation of the game's realism and establish face validity in the questionnaire

responses.

Approximately fifty percent of the respondents had active duty experience and educational levels ranged from high school graduates to graduates of two year degree programs. All respondents were currently serving in the Marine Corps Reserve.

INTERPRETIVE RESULTS OF QUESTIONNAIRE ANALYSIS

A five point Likert-type scale measured the respondent's agreement or disagreement regarding the sixteen statements on the questionnaire covering their perceptions of the game's teaching effectiveness and realism. The scale ranged from strongly agree to strongly disagree with neutral as the modal response.

Two of the sixteen questionnaire statements (statements one and twelve) commanded unanimous responses of strongly agree. Statement one reflected the unanimous perception of enjoyment in playing the game. Investigating related statements eight and eleven revealed further support to this perception. Statement eight responses indicated general disagreement regarding the need to force individuals to train using the prototype simulation. Although all statements were not in the same category, all statements indicated disagreement. Statement eleven responses also supported the perception of playing enjoyment. Responses to

this statement established the game was not too difficult (complicated) for squad level implementation. The second statement gathering a unanimous response was number twelve. Response to this statement established the perception of the game providing effective shipboard training. Responses to statements four and sixteen support this perception.

All players' responses to the remaining statements were similar in their tone. Specifically, all responses to individual statements were either agree-strongly agree or disagree-strongly disagree. The following provides a synopsis of the interpretation of these responses. Overall, the players perceived the game provided effective training (teaching effectiveness) not only in the squad leader's employment of antimech defense but as well in the weapons and tactics of the Soviet forces. Several perceptions led to this general feeling. First, the decisions required in the simulation were germane to the squad leader level and they incorporated all areas of ground defense. Second, the players perceived both the use of barriers and combined arms essential to successful defense, both in the game and in reality. Further, defensive planning in the game required an appreciation for the time and support effort required in constructing antimech obstacles.

Aside from the overall perception of teaching effectiveness, the players perceived the provided materials (map

and rules) sufficient to conduct training at the squad level. Comments regarding improvement of the game included the following suggestions:

1. Addition of graphics ranging from simple to three-dimensional.
2. Addition of more units, perhaps three squads to provide unit leader interaction.
3. Addition of new Soviet technology.
4. Expanded terrain model.

All suggestions were positive and no suggestions mentioned deleting or reworking any portion of the prototype simulation.

OBSERVATIONS DURING PLAYTESTING

In addition to interpretation of questionnaire responses, the author used personal observations made during the playtesting to further substantiate game validity. The following list generalizes these observations.

1. Measurable learning occurred during playtesting.
2. Game play was enjoyable for the participants.
3. The terrain grid system caused problems in understanding the prototype.
4. The game provided a realistic experience to the players.

The following discussion expands and substantiates each of these observations.

Several occurrences established the first observation. Several of the players were unaware at the beginning of the

playtesting of many of the characteristics of the Soviet weapons systems. At completion of the playtesting, these same individuals made intelligent employment decisions regarding Soviet weapons which demonstrated their learning. Not only did the players recognize the physical characteristics of the weapons systems (wheeled versus tracked vehicles), they also knew which weapons were more effective (T-72 versus T-62) at given ranges. Additionally, certain players were initially ignorant of time and manpower requirements needed for the various obstacles. Again, by completion of the playtesting, intelligent manpower and obstacle frontage decisions were obvious among the players. The final area in which measurable learning occurred was employment of combined arms. By the end of the game, each player could anticipate the requests for necessary information and the processing time of calls for fire rapidly reduced.

The additional sessions engaged in by several of the players evidenced the enjoyment involved in playing the simulation. Originally, each team was to complete three games per team member. Most teams preferred to play at least one (time permitting) and sometimes two additional rounds of the game. Good natured competition furthered the enthusiasm and enjoyment ignited by immediate feedback from weapons and obstacle employment.

Although not mentioned in any of the post-game questionnaires, several players had difficulty in initially understanding the grid reference system. Most players required one full game before feeling comfortable with the system. The major barrier to understanding developed from the difference between the prototype grid reference system and the standard military grid identification system taught during land navigation training. The game uses the first two digits of the grid number to identify the major grid of interest and the last two integers to define the variance in the horizontal (x) and vertical (y) directions. Conversely, the military system uses the first two integers to identify the major grid horizontally and the distance horizontally within that grid, and the second two integers to identify the major grid vertically and the distance vertically within that grid. Further, a major grid square in the prototype simulation represents a 100 meter by 100 meter area, whereas in the standard grid system, each major grid represents a 1000 meter by 1000 meter area. This caused confusion in calculating mental map ranges used to determine which weapon to employ. This problem is solved by thoroughly indoctrinating the players in the game's coordinate system prior to play. Appendix C contains guidelines for this procedure.

The game provided a realistically structured combat problem to the players. Individuals' comments provided the basis for this observation, both during the play of the game

basis for this observation, both during the play of the game and during the general discussion which followed playtesting. Comments highlighted the rapid response of the system as the key to realism in the simulation. The employment of weapons within prescribed ranges produced expected results for the players, further enhancing the game's realism. Additionally, 360 degree movement and the ability to load and unload troops was seen as essential to realistic simulation of the combat environment.

SUMMARY OF PLAYTESTING

Playtesting the prototype simulation using Marine enlisted personnel established initial simulation validity. Both perceived and measurable learning occurred in the players during playtesting. All players strongly agreed playing the game was enjoyable and it provided very effective training. All playtesting participants perceived the prototype simulation to be realistic and to effectively teach antimech defense principles.

CHAPTER SUMMARY

Chapter Three described several approaches to validation, the approach chosen for this research, and the specifics of the chosen tests for validity. A comparison of the decisions and knowledge required in the prototype simulation and those decisions and actions required by MCCRES criteria revealed similar requirements. The major limitations of the

communication assets and night time defensive parameters. The source of this limitation stems from the scope of this research and is not an oversight or weakness of the prototype game. The determination of the simulation's inability to reinforce technical skills was expected from the literature review and did not reduce the validity of the prototype simulation. Analysis of game playtesting and resultant post-game questionnaires substantiated the validity claim established through MCCRES evaluation and established the teaching effectiveness of the prototype through the perceptions of those involved in the playtesting. In addition to perceived learning, the author observed measurable learning in several participants. Chapter Four presents the summary and conclusions of this research and recommendations for further research.

CHAPTER IV
SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

This chapter summarizes the research effort discussing the accomplishment of each research objective, how the research objectives answered the research question, recommendations for further research, and the general conclusion drawn from this research. The research objectives summary includes a brief synopsis of the actions involved in playing the prototype simulation, noting its strengths and limitations. Discussion of the means by which the research objectives satisfied the research question emphasizes further research and the effort required to fully satisfy the research question. Finally, the suggestions for further research summarize possible follow-on research efforts and lead to the final conclusions drawn from this research.

SUMMARY OF RESEARCH ACCOMPLISHMENTS

The primary objective of this research was to develop a validated simulation war game incorporating decisions pertinent to direct and indirect fire weapons, landmine warfare, and other obstacles pertinent to Marine combat engineer squad leaders. Several intermediate objectives provided for evaluation of applicable military and commercial war games, comparison of the decisions and actions required by the prototype game to those required by Marine Corps Combat Readiness Evaluation System (MCCRES) standards,

and evaluation of the teaching effectiveness and realism of the game as perceived by Marine squad leaders through actual playtesting. Accomplishment of the objectives of this research required utilization of the system simulation and management cybernetics principles. An interactive, two-player, PASCAL-based, computerized simulation war game resulted from implementation of this methodology and answered the primary research question. Appendices A and B include copies of the resultant program and a sample of its output.

The prototype war game consists of a simulated Marine engineer squad defending against a simulated Soviet combat reconnaissance patrol (reinforced motorized rifle platoon). The game requires the simulated Marine squad leader to create a defensive plan and offers the opportunity to strategically locate all personnel (three four-man demolition teams), direct fire antimech weapons (one TOW and two Dragons), himself, and various obstacles (minefield, road craters, anti-tank ditches, and bridge demolitions). Upon either completion of the defense or arrival of the enemy, the engagement portion of the simulation begins. Each player selects a course of action from a menu provided by the prototype program, the simulation then determines the outcome of the selected action, time is added to the simulated clock, and play continues, allowing the second player his choice of action. Play continues until the completion

criteria, time since the engagement began or manpower attrition, have been met.

The prototype war game incorporates pertinent decisions in all areas outlined in the primary research objective providing a solution to specific research question "a". The game incorporates direct fire decisions by allowing the Marine player his choice of employing; the M-16A1, 5.56mm rifle; the M-60, 7.62mm light machine gun; the M72A1, 66mm Light Assault Anti-tank Weapon (LAAW); the M 47, Dragon Anti-tank Guided Missile; and the M 220, TOW Anti-tank Guided Missile. Indirect fire weapons modeled include the M101A1, 105mm gun and the 81mm mortar. Fire support planning occurs in the registration of fires during the defensive planning phase of the game and decisions pertinent to protection from enemy indirect fire weapons exist in the simulated preparation of personal emplacements (fox holes). The defensive preparation phase of the war game incorporates the use and implementation of landmine warfare and other obstacles. The play of the game offers the choice of emplacing a minefield, anti-tank ditch, road crater, or bridge demolitions, fulfilling the second and third decision criteria of the primary research objective.

All enemy weapons included in the simulation are modeled probabilistically from known Soviet weapons characteristics. The number and types of weapons included in the

simulated Soviet arsenal correspond to those currently in use by frontline Soviet military units. The rules for play incorporate Soviet tactics by requiring the Soviet player to advance and attack in certain patterns. All of these measures provide a realistic enemy and a scenario applicable to the Marine combat engineer. Inclusion of these items answer the basic research question and specifically sub-question "a".

Accomplishment of intermediate objectives one and two of this research resulted in negative findings with regard to fulfilling the primary research question. All military and commercial war games failed to meet either the pertinent decision or level of play requirements established in the primary research question. Commercial war games further failed to be of use because the weapons, obstacle, and vehicle movement data were unverifiable. Unverifiable data is useless in developing a war game designed for training because the nature of the game is designed to reinforce real world systems characteristics. Several of the military war games provided either experimentally or experientially verified data included in the prototype simulation.

Completion of intermediate objective three, MCCRES versus prototype evaluation, resulted in initial validation of the realism and teaching effectiveness of the prototype war game. Further, completion of this objective provided an

answer to research sub-question "b". A comparison of the decisions and planning required by MCCRES standards and those required in the simulation indicated all pertinent decisions were modeled with the exceptions of alternative communication assets and conduct of the night defense. The following MCCRES performance objectives are effectively modeled in the prototype game (12,13):

1. Continuing Actions by Marines
 - a. Discipline (fire/supply)
 - b. Dispersion
 - c. Use of Cover
 - d. Use of Camouflage and Concealment
 - e. Control of Firepower
 - f. Coordination of Intelligence
 - g. Coordination of Casualty Treatment and Evacuation
2. Fire Support Coordination
3. Defensive Fire Support
4. Defense
 - a. Planning
 - b. Organizing the Ground (weapons and obstacles)

The major action not included in the game and discovered during the MCCRES comparison constituted the game's inability to test or require technical competence. This is characteristic of gaming in general and not a specific weakness of the prototype simulation.

Accomplishment of the fourth and final intermediate objective, validation through playtesting, identified several positive aspects of the simulation and answered research sub-question "c". A post-game questionnaire admin-

istered to the sample population after playtesting indicated enjoyment in playing the game and the effectiveness of the game in shipboard training as the two outstanding perceptions. Further, analysis of the post-game questionnaire indicated the players perceived the game to be realistic and a true representation antimech defense on the squad leader level. All players maintained combined arms and barrier implementation were essential to successful mission completion. Observations made of the game's play produced findings similar to those obtained through questionnaire analysis. Observations differed from the questionnaire analysis on two counts. First, the grid reference system implemented in the game produced initial difficulties in player understanding due to its variance from the standard military grid reference system. Second, in addition to the perceived learning documented by questionnaire analysis, the author observed measurable learning in several players. A majority of the learning occurred in the areas of Soviet weapons systems characteristics and obstacle planning and support requirements.

In summary, completion of research objectives 1, 2, 3, and 4 has answered the primary research question and research sub-questions a, b, and c. The satisfaction of these questions has produced a game effective in training combat engineer squad leaders in antimech defense.

RECOMMENDATIONS FOR FURTHER RESEARCH

Several avenues of further research exist. First, due to the scope of this research, only a limited validation was possible. Final validation of this model involving a larger test population is necessary prior to acceptance and implementation of the game as a training technique. The alternate avenue for further research entails embellishment of the prototype model and its use in evaluating new combat engineer strategy and tactics. This expands the use of the game and provides a secondary benefit from its further development.

Most important to Marine Corps adaptation of this "training through simulation" concept is the statistical validation of the prototype model. The validation tests performed to date demonstrated the game's realism and teaching effectiveness through direct observation and the perceptions of a limited sample size. Certainly no dynamic model ever becomes totally complete. Nor does any war game achieve absolute validity. Specific steps, however, may be taken to provide established statistical validity within the war game.

The literature review portion of this research established the teaching effectiveness of management gaming and outlined several suitable approaches in determining statistically significant validity in the prototype simulation. In

general, follow-on research could validate the prototype war game by creating an appropriate research design and test for validity using a Marine Corps wide sample population of enlisted personnel. Compilation and interpretation of pre-game and post-game testing would establish the statistical significance of the teaching effectiveness of the simulation war game.

As stated in the methodology section of this research, the approach used in the conduct of this research generally followed the system simulation process. Strategic and tactical planning, and their resultant experimentation were beyond the scope of this research. These portions of the process however, provide a tremendous opportunity for follow-on research. Experimentation in areas such as engineer squad reorganization, implementation of engineers in the Light Armored Vehicle (LAV) battalion, and introduction of new weapons systems (U.S. and Soviet) could provide valuable information to Marine Corps tactical planners.

Prior to either further validation or experimentation with the prototype war game, the involved researchers could embellish the game to provide for those areas not modelled due to the scope of this research. As identified in this research, this would include establishment of alternative communication assets, night fighting capabilities, and the inclusion of graphics and multiple forces into the scenario.

The inclusion of these additional aspects to the game would provide a more realistic experience to the players by involving their visual senses to a greater degree.

CONCLUSIONS

The prototype game developed in this research satisfies the research question and all research sub-questions, and provides realistic training of anti-mechanized defense on the squad leader level. Use of this simulation provides effective training and an appreciation for the effectiveness of Marine Corps weapons and obstacles and Soviet weapons and equipment. Teaching effectiveness and initial game validity were demonstrated in limited playtesting involving Marine enlisted personnel. Further statistical validation is necessary prior to Marine Corps wide implementation.

Marine Corps wide adaptation of the prototype war game could provide excellent training at minimal cost. With the increasing costs of fuel and ammunition, limited availability of training areas, and a need for quality leadership in the junior enlisted ranks, new and effective training methods must be developed. In the words of Marshall Saxe, "Wars are not won by big armies, but by good ones [16:11]." Adaptation of new training methods are necessary in creating the "good armies". Implementation of simulation war games for training provides

...an opportunity that is both trivial and immense

- immense in that they can embed the computer in the decision making activities where they can provide large payoffs and trivial in that they represent no major advance in technique [17:243].

APPENDIX A
PROTOTYPE WAR GAME PROGRAM LISTING

This appendix contains a complete listing of the Pascal program used in creating the prototype simulation. The program maintains the following general format:

1. Declaration statements
2. Functions
3. Subroutines
4. Main program

The subroutines begin with the obstacle subroutines, followed by the Soviet weapons system subroutines, USMC weapons subroutines, and the movement subroutines including mounting and dismounting vehicles. The main program begins with the placement of engineer personnel, and is followed by the placement of obstacles, preparation of emplacements, registration of artillery fires, and the engagement by either player of his opponent. The final portion of the main program prints the final statistics for each side. As play switches from player to player within the main, updates are made by the player beginning his turn.

All subroutines and functions are separated by lines constructed of asteriks (*) and the structured nature of the coding is highlighted using indentation.

```

program thesis (output file1);
label 1000,2000,3000,3050,3075,4000;
type board= array[1..4,1..6,1..50,1..50] of integer;
type mines = array[1..4,1..12] of integer;
var file1: text;
    a, e, n, x, y, d, ctr, constant, mpwr, tompwr, obstype, build, answ: integer;
    switch, seed, bmppwr, btr1pwr, btr2pwr, t62pwr, t72pwr, arm: integer;
    firepwr1, firepwr2, firepwr3, i, wpns, update, sovpwr, register: integer;
    firepwr, engage, digin, minepwr, demopwr, craterpwr, ditchpwr: integer;
    dock, stopt, demot, cratert, ditcht, minet, arvt, readyt: real;
    map: board;
    mine: mines;
(*****)
procedure skipblanks(var file1: text);
var finished: boolean;
begin
    'finished:= false;
    :repeat
        if eof(file1) then
            finished:= true
        else if file1<< ' ' then get(file1)
            else finished:= true;
    :until finished
end;
(*****)
function ranum:(var seed: integer): real;
const m= 65536;
    a= 25173;
:begin
    seed:= (seed*a) mod m;
    ranum:= seed/m;
:end;
(*****)
procedure rangefinder(var n, n1, e, e1, x, x1, y, y1: integer; var ns, ew, range
*
: real);
begin
    'writeln;
    'writeln('What is the location of your weapon/demotearn?');
    'writeln('Enter a four digit code as before. ');
    'writeln('Example 1 2 34 45');
    'writeln('?');
    read(n, e, x, y);
    'writeln;
    'writeln('What is the approximate location of your');
    'writeln('target/destination? ');
    'writeln('Enter a four digit code as before. ');
    'writeln('Example 1 2 34 45');
    'writeln('?');
    read(n1, e1, x1, y1);
    'writeln;
    begin
        if (n= n1) then
            ns:= (abs(y-y1))*2;

```

```

    if (e= e1) then
      ew:= (abs(x-x1))*2;
    end;
  begin
    if (n> n1) and (abs(n-n1)> 1) then
      ns= (((n-n1-1)*100) + 2*y) + ((50 - y1)*2));
    end;
  begin
    if (n1> n) and (abs(n-n1)> 1) then
      ns= (((n1-n-1)*100) + 2*y1) + ((50 - y)*2));
    end;
  begin
    if (e> e1) and (abs(e-e1)> 1) then
      ew:= (((e-e1-1)*100) + 2*x) + ((50 - x1)*2));
    end;
  begin
    if (e1> e) and (abs(e-e1)> 1) then
      ew:= (((e1-e-1)*100) + 2*x1) + ((50 - x)*2));
    end;
  begin
    if (n> n1) and ((n-n1)= 1) then
      ns= 2*(y + (50 - y1));
    end;
  begin
    if (n1> n) and ((n1-n)= 1) then
      ns= 2*(y1 + (50 - y));
    end;
  begin
    if (e> e1) and ((e-e1)= 1) then
      ew:= 2*(x + (50 - x1));
    end;
  begin
    if (e1> e) and ((e1-e)= 1) then
      ew:= 2*(x1 + (50 - x));
    end;
  range:= sqrt(sqr(ns) + sqr(ew));
  writeln;
  writeln('Range to the target/destination is',(range):4,'meters');
  writeln;
end;
(*****).
procedure marord;
begin
  writeln;
  writeln;
  writeln('SITUATION');
  writeln('Friendly-The company to which you are attached is');
  writeln('defending the access routes to battalion objective "A"');
  writeln('The remainder of the company is located to your rear,');
  writeln('preparing extensive defensive positions in the vicinity');
  writeln('of battalion objective "A"');
  writeln('Enemy-A battalion sized enemy motorized rifle battalion');
  writeln('was recently observed moving toward your position. The');

```

```

writeln ('lead element of this movement-to-contact is a reinforced');
writeln ('motorised rifle platoon consisting of a BMP, two BTRs,one');

writeln ('T-62 tank, and one T-72 tank. Expected enemy arrival is');
writeln ('in twelve (12) hours.');
```

Attachments and Detachments-In addition to your engineer';
squad, the company has both TOW and Dragon assets.');

```

writeln ('No detachments.');
```

MISSION');

```

writeln ('Your company is to provide anti-mecharized defense in');
writeln ('order to delay/destroy the enemy in the vicinity of the');
writeln ('crossroads bridge area, thus providing the remainder of');
writeln ('the battalion sufficient time to prepare adequate defen-');
writeln ('ses and ample warning of the enemy advance.');
```

EXECUTION');

```

writeln ('Engineer squad, you will have one TOW and two Dragons');
writeln ('attached. The TOW has 3 rounds and the Dragons have');
writeln ('four (4) rounds each. Your squad is responsible for an');
writeln ('area 100 meters west of the bridge to approximately');
writeln ('100 meters east of the crossroads and extending from');
writeln ('the armor alert line [approximately 300 meters north of');
writeln ('the bridge] to a line 100 meters south of the bridge.');
```

This area covers all of your detailed map. You will tie';
in with first platoon on your right and second platoon';
on your left. Fire support is available from 'Z' battery';
and the 81mm mortars of weapons company. Priority for';
the 60mm mortars goes to the line platoons.');

ADMINISTRATION AND LOGISTICS');

```

writeln ('Chow will be drawn prior to your departure from this ');
writeln ('area. The battalion aid station is located 1500 meters');
writeln ('to our rear. Engineer squad, draw 12 LAAWs from weapons');
writeln ('platoon and standard ammunition load for your personal');
writeln ('weapons. Additionally mines are available, upon request');
writeln ('from the MSSG. All POWs will be processed at the bat-');
writeln ('talion CP. ');
```

COMMAND AND SIGNAL');

```

writeln ('No enemy engagement is to be undertaken until the enemy');
writeln ('is located on your detailed map. This constitutes cros-');
writeln ('sing the armor alert line. Primary communication will be');
writeln ('by wire, alternate is messenger. I will be located with');
writeln ('the first platoon. ANY QUESTIONS?.....GOOD LUCK!');
```

```

writeln;
writeln;
end;
(*****
procedure enemyord;
begin
writeln;
writeln;
writeln ('You are a Soviet motonised rifle platoon com-');
writeln ('mander. You have a T-62, T-72, BMP, and two');
writeln ('BTR 60PBs at your disposal. Attack and conquer');
writeln ('the capitalist dogs defending in your area. Your');
```

```

writeln ('company is acting as the lead company in a bat-');
writeln ('talion movement to contact. GOOD LUCK COMRADE!!!');
writeln;
writeln;
end;
(*****)
procedure minefield (var minet : real; var minepwr : integer;
*      var map : board; var mine : mines);
var minefmt, x, y, a, b, h, z, ctr, minearea : integer;
begin
  writeln;
  writeln(' This requires delivery of mines from the M SSG. ');
  writeln;
  writeln(' What meter of minefield frontage do you wish to emplace? ');
  writeln(' Enter one of the following 50 100 150 200 ');
  writeln(' Example 100 ');
  writeln('? ');
  writeln;
  read(minefmt);
  minet:= (((minefmt*0.66)/minepwr)*60.0) + 72.0;
  writeln;
  writeln('How many grid squares does the minefield reside in? ');
  writeln('If you have over 100 meters of frontage, you must be in ');
  writeln(' two (2) or more squares. Enter the appropriate number. ');
  writeln;
  read(ctr);
  for i:= 1 to ctr do
    begin
      writeln;
      writeln('Enter a grid that the minefield either totally or ');
      writeln('partially covers. If the mine field is in square ');
      writeln('1-2, enter 1 2. ');
      writeln('? ');
      read(h,z);
      writeln('What high portion of the square does the minefield cover? ');
      writeln('***Enter 1 for west***2 for east***3 for entire square ');
      writeln('? ');
      read(minearea);
      if (minearea= 1) then
        begin
          a:= (z*2)-1;
          mine[h,a]:= 1;
          for x:= 1 to 25 do
            for y:= 1 to 30 do
              map[h,z,x,y]:= 8;
            end;
          end;
        if (minearea= 2) then
          begin
            b:= (z*2);
            mine[h,b]:= 1;
            for x:= 26 to 50 do
              for y:= 1 to 30 do
                map[h,z,x,y]:= 8;
              end;
            end;
          end;
        end;
      end;
    end;
  end;

```

```

    end;
    if (minearea= 3) then
    begin
        a= (z*2)-1;
        b:= z*2;
        mine[h,a]:= 1;
        mine[h,b]:= 1;
        for x:= 1 to 50 do
            for y:= 1 to 30 do
                map[h,z,x,y]:= 8;
            end;
        end;
    end;
end;
end;
(*****
procedure atditch (var ditcht : real; var ditchpwr :integer);
var ditchlen :integer;
begin
    writeln;
    writeln(' This requires a dozer [Case 1150] and a scoop loader');
    writeln(' from the MSSG. ');
    writeln;
    writeln(' What length of anti tank ditch do you wish to construct? ');
    writeln(' Enter one of the following 50 100 150 200 ');
    writeln('? ');
    writeln;
    read(ditchlen);
    ditcht:= (0.6*ditchlen) + 150.0;
end;
(*****
procedure demdchrg (var demot : real; var demopwr :integer);
begin
    demot:= ((26/demopwr)*60.0) + 10.0;
end;
(*****
procedure crater (var cratert : real; var craterpwr :integer);
var craterlen :integer;
begin
    writeln;
    writeln(' What is the length of road you wish to crater? ');
    writeln(' Enter the number in meters Example- 20 ');
    writeln;
    read(craterlen);
    cratert:= (((2.6*craterlen)/craterpwr)*60.0) + 10.0;
end;
(*****
procedure arrive (var arvt : real);
begin
    arvt:= 720.0;
    writeln;
    writeln(' EXPECTED ENEMY ARRIVAL IN ', (arvt/60.0):3, ' HOURS');
    writeln;
end;
(*****

```

```

procedure akms(var bmppwr,btr1pwr,btr2pwr,seed,switch : integer);
var n,n1,e,e1,x,x1,y,y1,demonum,avwpns,ne,ww,lc,kia,i : integer;
    mount,a : integer;
    prob,kill,ns,ew,range : real;
begin
  ww:= 0;
  ne:= 0;
  lc:= 0;
  kia:= 0;
  writeln;
  writeln('W hich squad do you wish to employ?');
  writeln('*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2');
  writeln('?');
  read(demonum);
  begin
    if (demonum= 1) then
      avwpns:= bmppwr;
    if (demonum= 2) then
      avwpns:= btr1pwr;
    if (demonum= 3) then
      avwpns:= btr2pwr;
  end;
  writeln;
  writeln('Is your squad dismounted (out of the vehicle) or mounted');
  writeln('(inside the vehicle) ?');
  writeln('*****Enter 1 mounted***** 0 for dismounted');
  writeln('?');
  read(a);
  if (a= 1) then
    begin
      mount:= 6;
      avwpns:= 4;
    end;
  if (a= 0) then
    mount:= 1;
  rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
  ctr:= 0;
  for i:= 1 to avwpns do
    begin
      prob:= ranum(seed);
      if (switch= 1) then
        begin
          writeln;
          writeln('probability = ',prob);
          writeln('seed = ',seed);
          writeln;
        end;
      begin
        if (range< 50.0) then
          begin
            if (prob< (0.81/mount)) then
              begin
                kill:= ranum(seed);
              end;
            end;
          end;
        end;
      end;
    end;
  end;

```



```

    if (kill < 0.19) then
      ne := ne + 1;
    if (kill > 0.19) and (kill < 0.44) then
      ww := ww + 1;
    if (kill > 0.44) and (kill < 0.67) then
      lc := lc + 1;
    if (kill > 0.67) and (kill < 1.0) then
      kia := kia + 1;
    end
  else
    ne := ne + 1;
  end
else if (range > 50.0) and (range < 100.0) then
begin
  if (prob < (0.67/mount)) then
    begin
      kill := ranum(seed);
      if (kill < 0.19) then
        ne := ne + 1;
      if (kill > 0.19) and (kill < 0.44) then
        ww := ww + 1;
      if (kill > 0.44) and (kill < 0.67) then
        lc := lc + 1;
      if (kill > 0.67) and (kill < 1.0) then
        kia := kia + 1;
    end
  else
    ne := ne + 1;
  end
else if (range > 100.0) and (range < 200.0) then
begin
  if (prob < (0.50/mount)) then
    begin
      kill := ranum(seed);
      if (kill < 0.19) then
        ne := ne + 1;
      if (kill > 0.19) and (kill < 0.44) then
        ww := ww + 1;
      if (kill > 0.44) and (kill < 0.67) then
        lc := lc + 1;
      if (kill > 0.67) and (kill < 1.0) then
        kia := kia + 1;
    end
  else
    ne := ne + 1;
  end
else if (range > 200.0) and (range < 250.0) then
begin
  if (prob < (0.33/mount)) then
    begin
      kill := ranum(seed);
      if (kill < 0.19) then
        ne := ne + 1;
    end
  end
end

```

```

    if (kill > 0.19) and (kill < 0.44) then
      ww:= ww + 1;
    if (kill > 0.44) and (kill < 0.67) then
      lc:= lc + 1;
    if (kill > 0.67) and (kill < 1.0) then
      kia:= kia + 1;
    end
  else
    ne:= ne + 1;
  end
else if (range > 250.0) and (range < 400.0) then
begin
  if (prob < (0.05/nmount)) then
    begin
      kill:= ranum(seed);
      if (kill < 0.19) then
        ne:= ne + 1;
      if (kill > 0.19) and (kill < 0.44) then
        ww:= ww + 1;
      if (kill > 0.44) and (kill < 0.67) then
        lc:= lc + 1;
      if (kill > 0.67) and (kill < 1.0) then
        kia:= kia + 1;
      end
    else
      ne:= ne + 1;
    end
  else if (range > 400.0) then
    begin
      writeln;
      writeln('You are out of range for the AKMS. ');
      writeln;
      ne:= ne + 1;
    end
end;
begin
  writeln;
  writeln('Results of squad firing are below');
  writeln;
  writeln('No Effect.....', ne:2);
  writeln('Walking Wounded.....', ww:2);
  writeln('Litter Casualties.....', lc:2);
  writeln('Killed.....', kia:2);
  writeln;
  writeln('Casualties occurred in vicinity');
  writeln('grid ', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);
end;
end;
end;
(.....)
procedure pking(var seed, switch : integer);
var n, n1, e, e1, x, x1, y, y1, ne, ww, lc, kia : integer;
    prob, kill, ns, ew, range : real;

```

```

begin
  ww:= 0;
  ne:= 0;
  lc:= 0;
  kia:= 0;
  rangefinder(n, n1, e, e1, x, x1, y, y1, ns, ew, range);
  ctr:= 0;
  begin
    prob:= ranum(seed);
    if (switch= 1) then
      begin
        writeln;
        writeln('probability = ', prob);
        writeln('seed = ', seed);
        writeln;
      end;
    begin
      if (range< 50.0) then
        begin
          if (prob< 0.97) then
            begin
              kill:= ranum(seed);
              if (kill< 0.19) then
                ne:= ne + 1;
              if (kill> 0.19) and (kill< 0.44) then
                ww:= ww + 1;
              if (kill> 0.44) and (kill< 0.67) then
                lc:= lc + 1;
              if (kill> 0.67) and (kill< 1.0) then
                kia:= kia + 1;
            end
          else
            ne:= ne + 1;
          end
        else if (range> 50.0) and (range< 100.0) then
          begin
            if (prob< 0.83) then
              begin
                kill:= ranum(seed);
                if (kill< 0.19) then
                  ne:= ne + 1;
                if (kill> 0.19) and (kill< 0.44) then
                  ww:= ww + 1;
                if (kill> 0.44) and (kill< 0.67) then
                  lc:= lc + 1;
                if (kill> 0.67) and (kill< 1.0) then
                  kia:= kia + 1;
              end
            else
              ne:= ne + 1;
            end
          else if (range> 100.0) and (range< 175.0) then
            begin

```

```

if (prob< 0.59) then
  begin
    kill:= ranum(seed);
    if (kill< 0.19) then
      ne:= ne + 1;
    if (kill> 0.19) and (kill< 0.44) then
      ww:= ww + 1;
    if (kill> 0.44) and (kill< 0.67) then
      lc:= lc + 1;
    if (kill> 0.67) and (kill< 1.0) then
      kia:= kia + 1;
  end
else
  ne:= ne + 1;
end
else if (range> 175.0) and (range< 250.0) then
begin
if (prob< 0.56) then
  begin
    kill:= ranum(seed);
    if (kill< 0.19) then
      ne:= ne + 1;
    if (kill> 0.19) and (kill< 0.44) then
      ww:= ww + 1;
    if (kill> 0.44) and (kill< 0.67) then
      lc:= lc + 1;
    if (kill> 0.67) and (kill< 1.0) then
      kia:= kia + 1;
  end
else
  ne:= ne + 1;
end
else if (range> 250.0) and (range< 500.0) then
begin
if (prob< 0.42) then
  begin
    kill:= ranum(seed);
    if (kill< 0.19) then
      ne:= ne + 1;
    if (kill> 0.19) and (kill< 0.44) then
      ww:= ww + 1;
    if (kill> 0.44) and (kill< 0.67) then
      lc:= lc + 1;
    if (kill> 0.67) and (kill< 1.0) then
      kia:= kia + 1;
  end
else
  ne:= ne + 1;
end
else if (range> 500.0) and (range< 750.0) then
begin
if (prob< 0.31) then
  begin

```

```

    kill:= ranum(seed);
    if (kill < 0.19) then
        ne:= ne + 1;
        if (kill > 0.19) and (kill < 0.44) then
            ww:= ww + 1;
            if (kill > 0.44) and (kill < 0.67) then
                lc:= lc + 1;
            if (kill > 0.67) and (kill < 1.0) then
                kia:= kia + 1;
            end
        else
            ne:= ne + 1;
        end
    else if (range > 750.0) and (range < 1000.0) then
        begin
            if (prob < 0.03) then
                begin
                    kill:= ranum(seed);
                    if (kill < 0.19) then
                        ne:= ne + 1;
                    if (kill > 0.19) and (kill < 0.44) then
                        ww:= ww + 1;
                    if (kill > 0.44) and (kill < 0.67) then
                        lc:= lc + 1;
                    if (kill > 0.67) and (kill < 1.0) then
                        kia:= kia + 1;
                    end
                else
                    ne:= ne + 1;
                end
            else if (range > 1000.0) then
                begin
                    writeln;
                    writeln('You are out of range for the PK LMG .');
                    writeln;
                    ne:= ne + 1;
                end
            end;
        begin
            writeln;
            writeln('Results of PK machinegun firing are below:');
            writeln;
            writeln('No Effect.....',ne:2);
            writeln('Walking W ounded.....',ww:2);
            writeln('Liter Casualties.....',lc:2);
            writeln('Killed.....',kia:2);
            writeln;
            writeln('Casualties occurred in vicinity');
            writeln('grid ',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
        end;
    end;
end;
end;
(.....)

```

```

procedure rpg7(var seed,switch: integer);
var n,n1,e,e1,x,x1,y,y1 : integer;
    prob,kill,range,ns,ew : real;
begin
    prob:= rnum(seed);
    if (switch= 1) then
        begin
            writeln;
            writeln('probability = ',prob);
            writeln('seed = ',seed);
            writeln;
        end;
    begin
        rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
    end;
    begin
        if (range< 50.0) and (prob> 0.98) then
            begin
                writeln;
                writeln('Rocket has missed the target!');
                writeln;
            end
        else if (range < 50.0) and (prob< 0.97) then
            begin
                writeln;
                writeln('Rocket hit Marine target in vicinity');
                writeln('location',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
                writeln('Good shooting!!!');
                writeln;
                kill:= rnum(seed);
                begin
                    if (kill> 0.33) then
                        begin
                            writeln;
                            writeln('Marine target immobilized - not destroyed. ');
                            writeln;
                        end
                    else
                        begin
                            writeln;
                            writeln('Target destroyed!!');
                            writeln;
                        end
                end
            end
        end;
    begin
        if ((range> 50.0) and (range< 100.0)) and (prob> 0.91) then
            begin
                writeln;
                writeln('Rocket has missed the target!');
                writeln;
            end
        end
    end;
end;

```

```

else if ((range > 50.0) and (range < 100.0)) and (prob < 0.91) then
begin
  writeln;
  writeln('Rocket hit Marine target in vicinity');
  writeln('location', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);
  writeln('Good shooting!!!');
  writeln;
  kill := ranum(seed);
  begin
    if (kill > 0.33) then
      begin
        writeln;
        writeln('Marine target immobilized - not destroyed. ');
        writeln;
      end
    else
      begin
        writeln;
        writeln('Target destroyed!!');
        writeln;
      end
    end
  end
end;
begin
  if ((range > 100.0) and (range < 200.0)) and (prob > 0.52) then
    begin
      writeln;
      writeln('Rocket has missed the target!');
      writeln;
    end
  else if ((range > 100.0) and (range < 200.0)) and (prob < 0.52) then
    begin
      writeln;
      writeln('Rocket hit Marine target in vicinity');
      writeln('location', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);
      writeln('Good shooting!!!');
      writeln;
      kill := ranum(seed);
      begin
        if (kill > 0.33) then
          begin
            writeln;
            writeln('Marine target immobilized - not destroyed. ');
            writeln;
          end
        else
          begin
            writeln;
            writeln('Target destroyed!!');
            writeln;
          end
        end
      end
    end
  end
end

```

```

end
end;
begin
if ((range> 200.0) and (range< 300.0)) and (prob> 0.27) then
begin
writeln;
writeln('Rocket has missed the target!');
writeln;
end
else if ((range> 200.0) and (range< 300.0)) and (prob< 0.27) then
begin
writeln;
writeln('Rocket hit Marine target in vicinity');
writeln('location',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
writeln('Good shooting!!!');
writeln;
kill:= ranum(seed);
begin
if (kill> 0.33) then
begin
writeln;
writeln('Marine target immobilized - not destroyed. ');
writeln;
end
else
begin
writeln;
writeln('Target destroyed!!');
writeln;
end
end
end
end;
begin
if ((range> 300.0) and (range< 400.0)) and (prob> 0.10) then
begin
writeln;
writeln('Rocket has missed the target!');
writeln;
end
else if ((range> 300.0) and (range< 400.0)) and (prob< 0.10) then
begin
writeln;
writeln('Rocket hit Soviet target in vicinity');
writeln('location',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
writeln('Good shooting!!!');
writeln;
kill:= ranum(seed);
begin
if (kill> 0.33) then
begin
writeln;
writeln('Marine target immobilized - not destroyed. ');

```



```

        writeln;
    end
else
    begin
        writeln;
        writeln('Target destroyed!!');
        writeln;
    end
end
end
end;
begin
    if ((range > 400.0) and (range < 500.0)) and (prob > 0.05) then
        begin
            writeln;
            writeln('Rocket has missed the target!');
            writeln;
        end
    else if ((range > 400.0) and (range < 500.0)) and (prob < 0.05) then
        begin
            writeln;
            writeln('Rocket hit Marine target in vicinity');
            writeln('location', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);
            writeln('Good shooting!!!');
            writeln;
            kill := ranum(seed);
            begin
                if (kill > 0.33) then
                    begin
                        writeln;
                        writeln('Marine target immobilized - not destroyed. ');
                        writeln;
                    end
                else
                    begin
                        writeln;
                        writeln('Target destroyed!!');
                        writeln;
                    end
            end
        end
    end;
begin
    if (range > 500.0) then
        begin
            writeln;
            writeln('The target is out of your range. ');
            writeln;
        end
    end;
end;
(.....)
procedure arty122(var seed, register, digin : integer; var map : board);

```

```

var n,n1,e,e1,x,x1,y,y1,hard,kia,ww,ne,tdest,apodest : integer;
    startx,endx,starty,endy,effect : integer;
    prob : real;
begin
    kia:= 0;
    ww:= 0;
    ne:= 0;
    tdest:= 0;
    apodest:= 0;
    if (digin= 1) then
        effect:= 2;
    if (digin= 0) then
        effect:= 1;
    writeln;
    writeln('What is the approximate location of your target?');
    writeln('Enter a four digit code - Example 1 2 34 45');
    writeln('?');
    writeln;
    read(n1,e1,x1,y1);
    writeln;
    writeln('Is your target enemy armor or troops in the open?');
    writeln('*****Enter 1 for armor ***** 0 for troops');
    writeln('?');
    writeln;
    read(hard);
    if (register= 0) then
        begin
            writeln;
            writeln('You have not registered your fires. ');
            writeln('your initial rounds are ineffective however');
            writeln('all further calls for fire should have some impact. ');
            writeln;
        end;
    if (register= 1) then
        begin
            if ((x1 >= 17) and (x1 <= 33)) and ((y1 >= 12) and (y1 <= 38)) then
                begin
                    startx:= x1 - 17;
                    endx:= x1 + 17;
                    starty:= y1 - 12;
                    endy:= y1 + 12;
                end;
            if (x1 < 17) and ((y1 >= 12) and (y1 <= 38)) then
                begin
                    startx:= 1;
                    endx:= x1 + 17;
                    starty:= y1 - 12;
                    endy:= y1 + 12;
                end;
            if (x1 > 33) and ((y1 >= 12) and (y1 <= 38)) then
                begin
                    startx:= x1 - 17;
                    endx:= 50;
                end;
        end;
    end;
end;

```

```

    starty:= y1 - 12;
    endy:= y1 + 12;
end;
if ((x1 >= 17) and (x1 <= 33)) and (y1 < 12) then
begin
    startx:= x1 - 17;
    endx:= x1 + 17;
    starty:= 1;
    endy:= y1 + 12;
end;
if ((x1 >= 17) and (x1 <= 33)) and (y1 > 38) then
begin
    startx:= x1 - 17;
    endx:= x1 + 17;
    starty:= y1 - 12;
    endy:= 50;
end;
if (x1 < 17) and (y1 < 12) then
begin
    startx:= 1;
    endx:= x1 + 17;
    starty:= 1;
    endy:= y1 + 12;
end;
if (x1 < 17) and (y1 > 38) then
begin
    startx:= 1;
    endx:= x1 + 17;
    starty:= y1 - 12;
    endy:= 50;
end;
if (x1 > 33) and (y1 < 12) then
begin
    startx:= x1 - 17;
    endx:= 50;
    starty:= 1;
    endy:= y1 + 12;
end;
if (x1 > 33) and (y1 > 38) then
begin
    startx:= x1 - 17;
    endx:= 50;
    starty:= y1 - 12;
    endy:= 50;
end;
begin
for x:= startx to endx do
for y:= starty to endy do
begin
    prob:= ranum(seed);
    if (map[n1,e1,x,y]= 4) then
begin
    if (prob < (0.31/effect)) then

```

```

      :kia:= kia + 1;
      if (prob> (0.31/effect)) and (prob< (0.50/effect)) then
        :ww:= ww + 1;
        if (prob> (0.50/effect)) then
          :ne:= ne + 1;
        end
      else if (map[n1,e1,x,y]= 5) and (hard= 1) then
        begin
          if (prob> 0.50) then
            :apodest:= apodest + 1;
          if (prob< 0.50) then
            :ne:= ne + 1;
          end
        else if (map[n1,e1,x,y]= 5) and (hard= 0) then
          begin
            writeln;
            writeln('Artillery has no effect on APC because');
            writeln('anti-personnel ammunition was requested.');
```

```

          end
        else if (map[n1,e1,x,y]= 6) and (hard= 1) then
          begin
            if (prob> 0.64) then
              :tdest:= tdest + 1;
            if (prob< 0.64) then
              :ne:= ne + 1;
            end
          else if (map[n1,e1,x,y]= 6) and (hard= 0) then
            begin
              writeln;
              writeln('Artillery has no effect on tanks because');
              writeln('anti-personnel ammunition was requested.');
```

```

            end
          end
        end;
      end;
      register:= 1;
      writeln;
      writeln('RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS:');
      writeln('  Enemy Killed.....',kia:2);
      writeln('  Enemy wounded.....',ww:2);
      writeln('  No effect on the enemy...',ne:2);
      writeln('  Enemy APC s destroyed...',apodest:2);
      writeln('  Enemy Tanks destroyed...',tdest:2);
      writeln;
    end;
  (*****
  procedure mort120(var seed,register,digin : integer;var map : board);
  var n,n1,e,e1,x,x1,y,y1,hard,kia,ww,ne,tdest,apodest : integer;
      startx,endx,starty,endy,effect : integer;
      prob : real;
  begin
    kia= 0;
    ww:= 0;

```

```

ne:= 0;
tdest:= 0;
apodest:= 0;
if (digin= 1) then
  effect:= 2;
if (digin= 0) then
  effect:= 1;
writeln;
writeln('What is the approximate location of your target?');
writeln('Enter a four digit code - Example 1 2 34 45');
writeln('?');
writeln;
read(n1,e1,x1,y1);
writeln;
writeln('Is your target enemy armor or troops in the open?');
writeln('*****Enter 1 for armor ***** 0 for troops');
writeln('?');
writeln;
read(hard);
if (register= 0) then
  begin
    writeln;
    writeln('You have not registered your fires,');
    writeln('your initial rounds are ineffective however');
    writeln('all further calls for fire should have some impact');
    writeln;
  end;
if (register= 1) then
  begin
    if ((x1 >= 16) and (x1 <= 34) and ((y1 >= 11) and (y1 <= 39))) then
      begin
        startx:= x1 - 16;
        endx:= x1 + 16;
        starty:= y1 - 11;
        endy:= y1 + 11;
      end;
    if (x1 < 16) and ((y1 >= 11) and (y1 <= 39)) then
      begin
        startx:= 1;
        endx:= x1 + 16;
        starty:= y1 - 11;
        endy:= y1 + 11;
      end;
    if (x1 > 34) and ((y1 >= 11) and (y1 <= 39)) then
      begin
        startx:= x1 - 16;
        endx:= 50;
        starty:= y1 - 11;
        endy:= y1 + 11;
      end;
    if ((x1 >= 16) and (x1 <= 34) and (y1 < 11)) then
      begin
        startx:= x1 - 16;

```

```

    endx:= x1 + 16;
    starty:= 1;
    endy:= y1 + 11;
end;
if ((x1 >= 16) and (x1 <= 34)) and (y1 > 39) then
begin
    startx:= x1 - 16;
    endx:= x1 + 16;
    starty:= y1 - 11;
    endy:= 50;
end;
if (x1 < 16) and (y1 < 11) then
begin
    startx:= 1;
    endx:= x1 + 16;
    starty:= 1;
    endy:= y1 + 11;
end;
if (x1 < 16) and (y1 > 39) then
begin
    startx:= 1;
    endx:= x1 + 16;
    starty:= y1 - 11;
    endy:= 50;
end;
if (x1 > 34) and (y1 < 11) then
begin
    startx:= x1 - 16;
    endx:= 50;
    starty:= 1;
    endy:= y1 + 11;
end;
if (x1 > 34) and (y1 > 39) then
begin
    startx:= x1 - 16;
    endx:= 50;
    starty:= y1 - 11;
    endy:= 50;
end;
begin
    for x:= startx to endx do
        for y:= starty to endy do
            begin
                prob:= ranum(seed);
                if (map[n1,e1,x,y]= 4) then
                    begin
                        if (prob < (0.31/effect)) then
                            kia:= kia + 1;
                        if (prob > (0.31/effect)) and (prob < (0.50/effect)) then
                            ww:= ww + 1;
                        if (prob > (0.50/effect)) then
                            ne:= ne + 1;
                    end
                end
            end
        end
    end
end

```

```

else if (map[n1,e1,x,y]= 5) and (hard= 1) then
:begin
  if (prob> 0.50) then
    apcdest:= apcdest + 1;
  if (prob< 0.50) then
    ne:= ne + 1;
  end
else if (map[n1,e1,x,y]= 5) and (hard= 0) then
:begin
  writeln;
  writeln('Artillery has no effect on APC because');
  writeln('anti-personnel ammunition was requested.');
```

```

end
else if (map[n1,e1,x,y]= 6) and (hard= 1) then
:begin
  if (prob> 0.64) then
    tdest:= tdest + 1;
  if (prob< 0.64) then
    ne:= ne + 1;
  end
else if (map[n1,e1,x,y]= 6) and (hard= 0) then
:begin
  writeln;
  writeln('Artillery has no effect on tanks because');
  writeln('anti-personnel ammunition was requested.');
```

```

end
end
end;
end;
register:= 1;
writeln;
writeln('RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS:');
writeln('  Enemy Killed.....',kia:2);
writeln('  Enemy wounded.....',ww:2);
writeln('  No effect on the enemy...',ne:2);
writeln('  Enemy APC s destroyed...',apcdest:2);
writeln('  Enemy Tanks destroyed...',tdest:2);
writeln;
end;
(.....)
:procedure t62(var seed,switch : integer);
var n,n1,e,e1,x,x1,y,y1,ne,ww,lc,kia hard :integer;
    prob,kill,ns,ew,range,hit : real;
:begin
  ww:= 0;
  ne:= 0;
  lc:= 0;
  kia:= 0;
  rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
  ctr:= 0;
  writeln;
  writeln('Is your target enemy armor,vehicles or troops ');
  writeln('in the open ?  Enemy Dragon and TOW positions');
```

```

writeln('are considered armor/vehicle targets. ');
writeln(' *****Enter 1 for armor/vehides ***** 0 for troops');
writeln('?');
read(hard);
if (hard= 0) then
begin
writeln;
writeln('Soviet policy dictates artillery or the coaxial');
writeln('7.62mm machinegun be used against troops. ');
writeln;
end;
if (hard= 1) then
begin
prob:= ranum(seed);
if (switch= 1) then
begin
writeln;
writeln('probability = ',prob);
writeln('seed = ',seed);
writeln;
end;
begin
if (range< 500.0) then
begin
hit:= 0.98;
end
else if (range> 500.0) and (range< 1000.0) then
begin
hit:= 0.79;
end
else if (range> 1000.0) and (range< 1500.0) then
begin
hit:= 0.50;
end
else if (range> 1500.0) and (range< 2000.0) then
begin
hit:= 0.27;
end
else if (range> 2000.0) and (range< 2500.0) then
begin
hit:= 0.14;
end
else if (range> 2500.0) and (range< 3000.0) then
begin
hit:= 0.08;
end;
begin
if (prob< hit) then
begin
kill:= ranum(seed);
if (kill< 0.29) then
ww:= ww + 1;
if (kill> 0.29) then

```



```

        kia= kia + 1;
    end
    else
        ne:= ne + 1;
    end
    else if (range> 3000.0) then
    begin
        writeln;
        writeln('You are out of range for the T-62. ');
        writeln;
        ne:= ne + 1;
    end
end;
begin
    writeln;
    writeln('Results of T-62 tank firing are below: ');
    writeln;
    writeln('No Effect.....',ne:2);
    writeln('Disabled Vehides.....',ww:2);
    writeln('Destroyed Vehides.....',kia:2);
    writeln;
    writeln('Casualties occurred in vicinity ');
    writeln('grid ',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
end;
end;
end;
(*****)
procedure t72(var seed,switch : integer);
var n,n1,e,e1,x,x1,y,y1,ne,ww,lc,kia,hard :integer;
    prob,kill,ns,ew,range,hit : real;
begin
    ww:= 0;
    ne:= 0;
    lc:= 0;
    kia:= 0;
    rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
    ctr:= 0;
    writeln;
    writeln('Is your target enemy armor/vehicles or troops ');
    writeln('in the open ? Enemy Dragon and TOW positions ');
    writeln('are considered armor/vehide targets. ');
    writeln(' *****Enter 1 for armor/vehides ***** 0 for troops ');
    writeln('? ');
    read(hard);
    if (hard= 0) then
    begin
        writeln;
        writeln('Soviet policy dictates artillery or the coaxial ');
        writeln('7.62mm machinegun be used against troops. ');
        writeln;
    end;
    if (hard= 1) then
    begin

```

```

prob:= ranum(seed);
if (switch= 1) then
  begin
    writeln;
    writeln('probability = ',prob);
    writeln('seed = ',seed);
    writeln;
  end;
begin
  if (range< 500.0) then
    begin
      hit:= 0.98;
    end
  else if (range> 500.0) and (range< 1000.0) then
    begin
      hit:= 0.94;
    end
  else if (range> 1000.0) and (range< 1500.0) then
    begin
      hit:= 0.75;
    end
  else if (range> 1500.0) and (range< 2000.0) then
    begin
      hit:= 0.55;
    end
  else if (range> 2000.0) and (range< 2500.0) then
    begin
      hit:= 0.40;
    end
  else if (range> 2500.0) and (range< 3000.0) then
    begin
      hit:= 0.35;
    end;
  begin
    if (prob< hit) then
      begin
        kill:= ranum(seed);
        if (kill< 0.29) then
          ww:= ww + 1;
        if (kill> 0.29) then
          kia:= kia + 1;
        end
      end
    else
      ne:= ne + 1;
    end
  else if (range> 3000.0) then
    begin
      writeln;
      writeln('You are out of range for the T-72. ');
      writeln;
      ne:= ne + 1;
    end
  end;
end;

```

```

begin
  writeln;
  writeln('Results of T-72 tank firing are below:');
  writeln;
  writeln('No Effect.....',ne:2);
  writeln('Disabled Vehides.....',ww:2);
  writeln('Destroyed Vehides.....',kia:2);
  writeln;
  writeln('Casualties occurred in vicinity');
  writeln('grid ',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
end;
end;
end;
(*****)
procedure bmp(var seed, switch : integer);
var n,n1,e,e1,x,x1,y,y1,ne,ww,lc,kia,hard :integer;
    prob,kill,ns,ew,range,hit : real;
begin
  ww:=0;
  ne:=0;
  lc:=0;
  kia:=0;
  rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
  ctr:=0;
  writeln;
  writeln('Is your target enemy armor/vehicles or troops');
  writeln('in the open ? Enemy Dragon and TOW positions');
  writeln('are considered armor/vehicle targets. ');
  writeln(' *****Enter 1 for armor/vehicles ***** 0 for troops');
  writeln('?');
  read(hard);
  if (hard=0) then
  begin
    writeln;
    writeln('Soviet policy dictates artillery or the coaxial');
    writeln('7.62mm machinegun be used against troops. ');
    writeln;
  end;
  if (hard=1) then
  begin
    prob:=ranum(seed);
    if (switch=1) then
    begin
      writeln;
      writeln('probability = ',prob);
      writeln('seed = ',seed);
      writeln;
    end;
  begin
    if (range<50.0) then
    begin
      hit:=0.97;
    end
  end
  end;

```

```

else if (range > 50.0) and (range < 100.0) then
begin
  hit = 0.89;
end
else if (range > 100.0) and (range < 175.0) then
begin
  hit = 0.89;
end
else if (range > 175.0) and (range < 250.0) then
begin
  hit = 0.83;
end
else if (range > 250.0) and (range < 500.0) then
begin
  hit = 0.64;
end
else if (range > 500.0) and (range < 800.0) then
begin
  hit = 0.50;
end
else if (range > 800.0) and (range < 1000.0) then
begin
  hit = 0.40;
end
else if (range > 1000.0) and (range < 1300.0) then
begin
  hit = 0.28;
end
else if (range > 1300.0) and (range < 1800.0) then
begin
  hit = 0.24;
end;
begin
  if (prob < hit) then
  begin
    kill = ranum(seed);
    if (kill < 0.50) then
      ww = ww + 1;
    if (kill > 0.50) then
      kia = kia + 1;
    end
  else
    ne = ne + 1;
  end
else if (range > 1800.0) then
begin
  writeln;
  writeln('You are out of range for the BM P-73mm Gun. ');
  writeln;
  ne = ne + 1;
end
end;
begin

```

```

        writeln;
        writeln('Results of BM P-73mm gun firing are below:');
        writeln;
        writeln('No Effect.....',ne:2);
        writeln('Disabled Vehicles.....',ww:2);
        writeln('Destroyed Vehicles.....',kia:2);
        writeln;
        writeln('Casualties occurred in vicinity');
        writeln('grid ',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
    end;
end;
end;
(*****)
procedure btr(var seed,switch : integer);
var n,n1,e,e1,x,x1,y,y1,ne,ww,lc,kia,hard :integer;
    prob,kill,ns,ew,range,hit : real;
begin
    ww:= 0;
    ne:= 0;
    lc:= 0;
    kia:= 0;
    rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
    ctr:= 0;
    writeln;
    writeln('Is your target enemy armor/vehides or troops ');
    writeln('in the open ? Enemy Dragon and TOW positions');
    writeln('are considered armor/vehicle targets. ');
    writeln(' *****Enter: 1 for armor,/vehicles ***** 0 for troops');
    writeln('?');
    read(hard);
    if (hard= 0) then
        begin
            writeln;
            writeln('Soviet policy dictates artillery or the coaxial');
            writeln('7.62mm machinegun be used against troops. ');
            writeln;
        end;
    if (hard= 1) then
        begin
            prob:= ranum(seed);
            if (switch= 1) then
                begin
                    writeln;
                    writeln('probability = ',prob);
                    writeln('seed = ',seed);
                    writeln;
                end;
            begin
                if (range< 100.0) then
                    begin
                        hit:= 0.95;
                    end
                else if (range> 100.0) and (range< 200.0) then

```

```

begin
  hit:= 0.80;
end
else if (range> 200.0) and (range< 300.0) then
begin
  hit:= 0.70;
end
else if (range> 300.0) and (range< 500.0) then
begin
  hit:= 0.50;
end
else if (range> 500.0) and (range< 800.0) then
begin
  hit:= 0.40;
end
else if (range> 800.0) and (range< 1000.0) then
begin
  hit:= 0.20;
end;
begin
  if (prob< hit) then
  begin
    kill:= ranum(seed);
    if (kill< 0.35) then
      ww:= ww + 1;
    if (kill> 0.35) then
      kia:= kia + 1;
    end
  else
    ne:= ne + 1;
  end
else if (range> 1000.0) then
!begin
  writeln;
  writeln('You are out of range for the BTR-60. ');
  writeln;
  ne:= ne + 1;
!end
end;
begin
  writeln;
  writeln('Results of BTR-60 12.7mm MG firing are below: ');
  writeln;
  writeln('No Effect.....',ne:2);
  writeln('Disabled Vehicles.....',ww:2);
  writeln('Destroyed Vehicles.....',kia:2);
  writeln;
  writeln('Casualties occurred in vicinity ');
  writeln('grid ',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
end;
end;
end;
(.....)

```

```

procedure M 16A 1(var firepwr1,firepwr2,firepwr3,seed,switch : integer);
var n,n1,e,e1,x,x1,y,y1,demonum,avwpns,ne,ww,lc,kia,i : integer;
    prob,kill,ns,ew,range : real;
begin
    ww:= 0;
    ne:= 0;
    lc:= 0;
    kia:=0;
    writeln;
    writeln('Which demoteam do you wish to employ?');
    writeln('****Enter 1, 2, or 3');
    writeln('?');
    read(demonum);
    begin
        if (demonum= 1) then
            avwpns:= firepwr1;
        if (demonum= 2) then
            avwpns:= firepwr2;
        if (demonum= 3) then
            avwpns:= firepwr3;
    end;
    rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
    ctr:= 0;
    for i:= 1 to avwpns do
        begin
            prob:= ranum(seed);
            if (switch= 1) then
                begin
                    writeln;
                    writeln('probability = ',prob);
                    writeln('seed = ',seed);
                    writeln;
                end;
            begin
                if (range< 50.0) then
                    begin
                        if (prob< 0.73) then
                            begin
                                kill:= ranum(seed);
                                if (kill< 0.19) then
                                    ne:= ne + 1;
                                if (kill> 0.19) and (kill< 0.44) then
                                    ww:= ww + 1;
                                if (kill> 0.44) and (kill< 0.67) then
                                    lc:= lc + 1;
                                if (kill> 0.67) and (kill< 1.0) then
                                    kia:= kia + 1;
                            end
                        else
                            ne:= ne + 1;
                        end
                    else if (range> 50.0) and (range< 100.0) then
                        begin

```

```

if (prob< 0.56) then
  begin
    kill:= ranum(seed);
    if (kill< 0.19) then
      ne:= ne + 1;
    if (kill> 0.19) and (kill< 0.44) then
      ww:= ww + 1;
    if (kill> 0.44) and (kill< 0.67) then
      lc:= lc + 1;
    if (kill> 0.67) and (kill< 1.0) then
      kia:= kia + 1;
  end
else
  ne:= ne + 1;
end
else if (range> 100.0) and (range< 200.0) then
begin
  if (prob< 0.44) then
    begin
      kill:= ranum(seed);
      if (kill< 0.19) then
        ne:= ne + 1;
      if (kill> 0.19) and (kill< 0.44) then
        ww:= ww + 1;
      if (kill> 0.44) and (kill< 0.67) then
        lc:= lc + 1;
      if (kill> 0.67) and (kill< 1.0) then
        kia:= kia + 1;
    end
  else
    ne:= ne + 1;
  end
else if (range> 200.0) and (range< 300.0) then
begin
  if (prob< 0.36) then
    begin
      kill:= ranum(seed);
      if (kill< 0.19) then
        ne:= ne + 1;
      if (kill> 0.19) and (kill< 0.44) then
        ww:= ww + 1;
      if (kill> 0.44) and (kill< 0.67) then
        lc:= lc + 1;
      if (kill> 0.67) and (kill< 1.0) then
        kia:= kia + 1;
    end
  else
    ne:= ne + 1;
  end
else if (range> 300.0) and (range< 400.0) then
begin
  if (prob< 0.31) then
    begin

```



```

        kill:= ranum(seed);
    if (kill < 0.19) then
        ne:= ne + 1;
    if (kill > 0.19) and (kill < 0.44) then
        ww:= ww + 1;
    if (kill > 0.44) and (kill < 0.67) then
        lc:= lc + 1;
    if (kill > 0.67) and (kill < 1.0) then
        kia:= kia + 1;
    end
else
    ne:= ne + 1;
end
else if (range > 400.0) and (range < 500.0) then
begin
    if (prob < 0.25) then
    begin
        kill:= ranum(seed);
        if (kill < 0.19) then
            ne:= ne + 1;
        if (kill > 0.19) and (kill < 0.44) then
            ww:= ww + 1;
        if (kill > 0.44) and (kill < 0.67) then
            lc:= lc + 1;
        if (kill > 0.67) and (kill < 1.0) then
            kia:= kia + 1;
        end
    else
        ne:= ne + 1;
    end
end
else if (range > 500.0) then
begin
    writeln;
    writeln('you are out of range for the M-16A 1. ');
    writeln;
    ne:= ne + 1;
end
end;
begin
    writeln;
    writeln('Results of demoteam', (demonum):2, 'firing are below');
    writeln;
    writeln('No Effect.....', ne:2);
    writeln('Walking Wounded.....', ww:2);
    writeln('Litter Casualties.....', lc:2);
    writeln('Killed.....', kia:2);
    writeln;
    writeln('Casualties occurred in vicinity');
    writeln('grid ', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);
end;
end;
end;
(*****)

```

```

procedure M60(var seed, switch : integer);
var n,n1,e,e1,x,x1,y,y1,ne,ww,lc,kia :integer;
    prob,kill,ns,ew,range : real;
begin
  ww:= 0;
  ne:= 0;
  lc:= 0;
  kia:= 0;
  rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
  ctr:= 0;
  begin
    prob:= ranum(seed);
    if (switch= 1) then
      begin
        writeln;
        writeln('probability = ',prob);
        writeln('seed = ',seed);
        writeln;
      end;
    begin
      if (range< 50.0) then
        begin
          if (prob< 0.81) then
            begin
              kill:= ranum(seed);
              if (kill< 0.19) then
                ne:= ne + 1;
              if (kill> 0.19) and (kill< 0.44) then
                ww:= ww + 1;
              if (kill> 0.44) and (kill< 0.67) then
                lc:= lc + 1;
              if (kill> 0.67) and (kill< 1.0) then
                kia:= kia + 1;
            end
          else
            ne:= ne + 1;
          end
        end
      else if (range> 50.0) and (range< 100.0) then
        begin
          if (prob< 0.64) then
            begin
              kill:= ranum(seed);
              if (kill< 0.19) then
                ne:= ne + 1;
              if (kill> 0.19) and (kill< 0.44) then
                ww:= ww + 1;
              if (kill> 0.44) and (kill< 0.67) then
                lc:= lc + 1;
              if (kill> 0.67) and (kill< 1.0) then
                kia:= kia + 1;
            end
          else
            ne:= ne + 1;
          end
        end
      end
    end
  end
end

```

```

end
else if (range > 100.0) and (range < 200.0) then
begin
  if (prob < 0.53) then
  begin
    kill := ranum(seed);
    if (kill < 0.19) then
      ne := ne + 1;
    if (kill > 0.19) and (kill < 0.44) then
      ww := ww + 1;
    if (kill > 0.44) and (kill < 0.67) then
      lc := lc + 1;
    if (kill > 0.67) and (kill < 1.0) then
      kia := kia + 1;
  end
  else
    ne := ne + 1;
  end
else if (range > 200.0) and (range < 300.0) then
begin
  if (prob < 0.44) then
  begin
    kill := ranum(seed);
    if (kill < 0.19) then
      ne := ne + 1;
    if (kill > 0.19) and (kill < 0.44) then
      ww := ww + 1;
    if (kill > 0.44) and (kill < 0.67) then
      lc := lc + 1;
    if (kill > 0.67) and (kill < 1.0) then
      kia := kia + 1;
  end
  else
    ne := ne + 1;
  end
else if (range > 300.0) and (range < 400.0) then
begin
  if (prob < 0.39) then
  begin
    kill := ranum(seed);
    if (kill < 0.19) then
      ne := ne + 1;
    if (kill > 0.19) and (kill < 0.44) then
      ww := ww + 1;
    if (kill > 0.44) and (kill < 0.67) then
      lc := lc + 1;
    if (kill > 0.67) and (kill < 1.0) then
      kia := kia + 1;
  end
  else
    ne := ne + 1;
  end
else if (range > 400.0) and (range < 500.0) then

```

```

begin
  if (prob< 0.33) then
    begin
      kill:= ranum(seed);
      if (kill< 0.19) then
        ne:= ne + 1;
      if (kill> 0.19) and (kill< 0.44) then
        ww:= ww + 1;
      if (kill> 0.44) and (kill< 0.67) then
        lc:= lc + 1;
      if (kill> 0.67) and (kill< 1.0) then
        kia:= kia + 1;
    end
  else
    ne:= ne + 1;
  end
else if (range> 500.0) and (range< 1000.0) then
begin
  if (prob< 0.19) then
    begin
      kill:= ranum(seed);
      if (kill< 0.19) then
        ne:= ne + 1;
      if (kill> 0.19) and (kill< 0.44) then
        ww:= ww + 1;
      if (kill> 0.44) and (kill< 0.67) then
        lc:= lc + 1;
      if (kill> 0.67) and (kill< 1.0) then
        kia:= kia + 1;
    end
  else
    ne:= ne + 1;
  end
else if (range> 1000.0) then
begin
  writeln;
  writeln('You are out of range for the M-60. ');
  writeln;
  ne:= ne + 1;
end
end;
begin
  writeln;
  writeln('Results of M 60 machinegun firing are below:');
  writeln;
  writeln('No Effect.....',ne:2);
  writeln('Walking Wounded.....',ww:2);
  writeln('Litter Casualties.....',lc:2);
  writeln('Killed.....',kia:2);
  writeln;
  writeln('Casualties occurred in vicinity');
  writeln('grid ',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
end;

```

```

end;
end;
(*****)
procedure TOW (var seed,switch: integer);
var n,n1,e,e1,x,x1,y,y1,rounds : integer;
    prob,kill,range,ns,ew : real;
begin
rounds:=0;
if (rounds<=2) then
begin
prob:=ranum(seed);
if (switch=1) then
begin
writeln;
writeln('probability = ',prob);
writeln('seed = ',seed);
writeln;
end;
begin
rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
end;
begin
if (range<:50.0) then
begin
writeln;
writeln('The TOW missile is ineffective at this short range. ');
writeln;
end;
end;
begin
if ((range>50.0) and (range<250.0)) and (prob>0.75) then
begin
writeln;
writeln('TOW missile has missed the target');
writeln('Give the exact weapon location to your');
writeln('opponent. Your weapon signature has given');
writeln('away your position. ');
writeln;
end
end
else if ((range > 50.0) and (range<250.0)) and (prob<0.75) then
begin
writeln;
writeln('TOW missile hit Soviet target in vicinity');
writeln('location',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
writeln('Good shooting!!!');
writeln;
kill:=ranum(seed);
begin
if (kill>0.90) then
begin
writeln;
writeln('Soviet target immobilized - not destroyed. ');
writeln;
end;
end;
end;
end;
end;
end;
end;

```

```

        end
      else
        begin
          writeln;
          writeln('Target destroyed!!');
          writeln;
        end
      end
    end;
  begin
    if ((range > 250.0) and (range < 3000.0)) and (prob > 0.90) then
      begin
        writeln;
        writeln('TOW missile has missed the target!');
        writeln('Give the exact weapon location to your');
        writeln('opponent. Your weapon signature has given');
        writeln('away your position. ');
        writeln;
      end
    else if ((range > 250.0) and (range < 3000.0)) and (prob < 0.90) then
      begin
        writeln;
        writeln('TOW missile hit Soviet target in vicinity');
        writeln('location', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);
        writeln('Good shooting!!!');
        writeln;
        kill := ranum(seed);
        begin
          if (kill > 0.90) then
            begin
              writeln;
              writeln('Soviet target immobilized - not destroyed. ');
              writeln;
            end
          else
            begin
              writeln;
              writeln('Target destroyed!!!');
              writeln;
            end
          end
        end
      end
    end;
  begin
    if (range > 3000.0) then
      begin
        writeln;
        writeln('The target is out of your range. ');
        writeln;
      end
    end;
  end;
end;

```

```

rounds:=rounds + 1;
if (rounds>= 3) then
  begin
    writeln;
    writeln('You have met/exceeded your TOW ammunition allowance.');
```

```

    writeln;
  end;
end;
!(*****)
;procedure D ragon(var seed,switch : integer);
var n,n1,e,e1,x,x1,y,y1,rounds : integer;
    prob,kill,range,ns,ew : real;
!begin
!rounds= 0;
!if (rounds<= 3) then
  begin
    prob:= ranum(seed);
    if (switch= 1) then
      begin
        writeln;
        writeln('probability = ',prob);
        writeln('seed = ',seed);
        writeln;
      end;
    begin
      rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
    end;
    begin
      if (range< 50) then
        begin
          writeln;
          writeln('The D ragon missile is ineffective at this short range.');
```

```

          writeln;
        end;
      end;
    begin
      if ((range> 50.0) and (range< 250.0)) and (prob> 0.75) then
        begin
          writeln;
          writeln('D ragon missile has missed the target!');
```

```

          writeln('Give the exact weapon location to your');
          writeln('opponent. Your weapon signature has given');
          writeln('away your position.');
```

```

          writeln;
        end
      else if ((range > 50.0) and (range< 250.0)) and (prob< 0.75) then
        begin
          writeln;
          writeln('D ragon missile hit Soviet target in vicinity');
```

```

          writeln('location',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
          writeln('Good shooting!!!');
```

```

          writeln;
          kill:= ranum(seed);

```

```

begin
  if (kill > 0.80) then
    begin
      writeln;
      writeln('Soviet target immobilized - not destroyed. ');
      writeln;
    end
  else
    begin
      writeln;
      writeln('Target destroyed!!');
      writeln;
    end
  end
end
end;
!begin
  if ((range > 250.0) and (range < 1000.0)) and (prob > 0.90) then
    begin
      writeln;
      writeln('D ragon missile has missed the target!');
      writeln('G ive the exact weapon location to your ');
      writeln('opponent. Your weapon signature has given');
      writeln('away your position. ');
      writeln;
    end
  else if ((range > 250.0) and (range < 1000.0)) and (prob < 0.90) then
    begin
      writeln;
      writeln('D ragon missile hit Soviet target in vicinity');
      writeln('location', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);
      writeln('G ood shooting!!!');
      writeln;
      kill := ranum(seed);
      begin
        if (kill > 0.80) then
          begin
            writeln;
            writeln('Soviet target immobilized - not destroyed. ');
            writeln;
          end
        else
          begin
            writeln;
            writeln('Target destroyed!!');
            writeln;
          end
        end
      end
    end
  end;
!begin
  if (range > 1000.0) then
    begin

```



```

        writeln;
        writeln('The target is out of your range. ');
        writeln;
    end
end;
end;
rounds:= rounds + 1;
if (rounds>= 4) then
begin
    writeln;
    writeln('You have met/exceeded your D ragon ammunition allowance. ');
    writeln;
end;
end;
(*****)
procedure LAAW (var seed,switch: integer);
var n,n1,e,e1,x,x1,y,y1,rounds : integer;
    prob,kill,range,ns,ew : real;
begin
    rounds:= 0;
    if (rounds<= 11) then
    begin
        prob:= ranum(seed);
        if (switch= 1) then
        begin
            writeln;
            writeln('probability = ',prob);
            writeln('seed = ',seed);
            writeln;
        end;
        rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
    end;
    begin
        if (range< 50.0) and (prob> 0.97) then
        begin
            writeln;
            writeln('LAAW rocket has missed the target!');
            writeln('Give the exact weapon location to your');
            writeln('opponent. Your weapon signature has given');
            writeln('away your position. ');
            writeln;
        end
        else if (range < 50.0) and (prob< 0.97) then
        begin
            writeln;
            writeln('LAAW rocket hit Soviet target in vicinity');
            writeln('location',n1:2,'-',e1:2,'-',x1:2,'-',y1:2);
            writeln('Good shooting!!!');
            writeln;
            kill:= ranum(seed);
            begin
                if (kill> 0.33) then

```

```

        .begin
            writeln;
            writeln('Soviet target immobilized - not destroyed.');
```

writeln;

end

else

.begin

writeln;

writeln('Target destroyed!!');

writeln;

end

end

end

end;

begin

if ((range > 50.0) and (range < 250.0)) and (prob > 0.17) then

begin

writeln;

writeln('LAAW rocket has missed the target!');

writeln('Give the exact weapon location to your');

writeln('opponent. Your weapon signature has given');

writeln('away your position.');

writeln;

end

else if ((range > 50.0) and (range < 250.0)) and (prob < 0.17) then

begin

writeln;

writeln('LAAW rocket hit Soviet target in vicinity');

writeln('location', n1:2, '-', e1:2, '-', x1:2, '-', y1:2);

writeln('Good shooting!!!');

writeln;

kill := ranum(seed);

begin

if (kill > 0.33) then

begin

writeln;

writeln('Soviet target immobilized - not destroyed.');

writeln;

end

else

.begin

writeln;

writeln('Target destroyed!!');

writeln;

end

end

end

end

end;

begin

if (range > 250.0) then

begin

writeln;

writeln('The target is out of your range.');

```

        writeln;
        end
    end;
end;
end;
rounds:= rounds + 1;
if (rounds> = 12) then
    begin
        writeln;
        writeln('You have met/exceeded your LAAW ammunition allowance.');
```

```

        writeln;
        end;
end;
end;
(*****
procedure mortB1(var seed,register : integer;var map : board);
var n,n1,e,e1,x,x1,y,y1,hard,kia,ww,ne,tdest,apocdest : integer;
    startx,endx,starty;endy : integer;
    prob : real;
begin
    kia:= 0;
    ww:= 0;
    ne:= 0;
    tdest:= 0;
    apocdest:= 0;
    writeln;
    writeln('What is the approximate location of your target?');
    writeln('Enter a four digit code - Example 1 2 34 45');
    writeln('?');
    writeln;
    read(n1,e1,x1,y1);
    writeln;
    writeln('Is your target enemy armor or troops in the open?');
    writeln(' *****Enter 1 for armor ***** 0 for troops');
    writeln('?');
    writeln;
    read(hard);
    if (register= 0) then
        begin
            writeln;
            writeln('You have not registered your defensive fires.');
```

```

            writeln('your initial rounds are ineffective however');
            writeln('all further calls for fire should have some impact.');
```

```

            writeln;
            end;
        end;
    if (register= 1) then
        begin
            if ((x1> = 13) and (x1< = 37)) and ((y1> = 10) and (y1< = 40)) then
                begin
                    startx:= x1 - 13;
                    endx:= x1 + 13;
                    starty:= y1 - 10;
                    endy:= y1 + 10;
                end;
            if (x1< 13) and ((y1> = 10) and (y1< = 40)) then

```

```

begin
  startx= 1;
  endx= x1 + 13;
  starty:= y1 - 10;
  endy:= y1 + 10;
end;
if (x1 > 37) and ((y1 >= 10) and (y1 <= 40)) then
  begin
    startx= x1 - 13;
    endx= 50;
    starty:= y1 - 10;
    endy:= y1 + 10;
  end;
if ((x1 >= 13) and (x1 <= 37)) and (y1 < 10) then
  begin
    startx= x1 - 13;
    endx= x1 + 13;
    starty:= 1;
    endy:= y1 + 10;
  end;
if ((x1 >= 13) and (x1 <= 37)) and (y1 > 40) then
  begin
    startx= x1 - 13;
    endx= x1 + 13;
    starty:= y1 - 10;
    endy:= 50;
  end;
if (x1 < 13) and (y1 < 10) then
  begin
    startx= 1;
    endx= x1 + 13;
    starty:= 1;
    endy:= y1 + 10;
  end;
if (x1 < 13) and (y1 > 40) then
  begin
    startx= 1;
    endx= x1 + 13;
    starty:= y1 - 10;
    endy:= 50;
  end;
if (x1 > 37) and (y1 < 10) then
  begin
    startx= x1 - 13;
    endx= 50;
    starty:= 1;
    endy:= y1 + 10;
  end;
if (x1 > 37) and (y1 > 40) then
  begin
    startx= x1 - 13;
    endx= 50;
    starty:= y1 - 10;
  end;

```

```

endy:= 50;
end;
begin
for x:= startx to endx do
for y:= starty to endy do
begin
prob:= ranum(seed);
if (map[n1,e1,x,y]= 4) then
begin
if (prob< 0.31) then
kia:= kia + 1;
if (prob> 0.31) and (prob< 0.50) then
ww:= ww + 1;
if (prob> 0.50) then
ne:= ne + 1;
end
else if (map[n1,e1,x,y]= 5) and (hard= 1) then
begin
if (prob> 0.50) then
apodest:= apodest + 1;
if (prob< 0.50) then
ne:= ne + 1;
end
else if (map[n1,e1,x,y]= 5) and (hard= 0) then
begin
writeln;
writeln('Artillery has no effect on APC because');
writeln('anti-personnel ammunition was requested.');
```

```

end
else if (map[n1,e1,x,y]= 6) and (hard= 1) then
begin
if (prob> 0.64) then
tdest:= tdest + 1;
if (prob< 0.64) then
ne:= ne + 1;
end
else if (map[n1,e1,x,y]= 6) and (hard= 0) then
begin
writeln;
writeln('Artillery has no effect on tanks because');
writeln('anti-personnel ammunition was requested.');
```

```

end
end
end;
end;
register:= 1;
writeln;
writeln('RESULTS OF MORTAR FIRES ARE AS FOLLOWS:');
writeln(' Enemy Killed.....',kia:2);
writeln(' Enemy wounded.....',ww:2);
writeln(' No effect on the enemy...',ne:2);
writeln(' Enemy APC s destroyed...',apodest:2);
writeln(' Enemy Tanks destroyed...',tdest:2);

```

```

        writeln;
    end;
    (*****
    procedure arty105(var seed,register : integer;var map : board);
    var n,n1,e,e1,x,x1,y,y1;hard,kia,ww,ne,tdest,apodest : integer;
        : startx,endx,starty,endy : integer;
        prob : real;
    begin
        kia:= 0;
        ww:= 0;
        ne:= 0;
        tdest:= 0;
        apodest:= 0;
        writeln;
        writeln('W hat is the approximate location of your target?');
        writeln('Enter a four digit code - Example 1 2 34 45');
        writeln('?');
        writeln;
        read(n1,e1,x1,y1);
        writeln;
        writeln('Is your target enemy armor or troops in the open?');
        writeln('*****Enter 1 for armor ***** 0 for troops');
        writeln('?');
        writeln;
        read(hard);
        if (register= 0) then
            :begin
                writeln;
                writeln('You have not registered your defensive fires. ');
                writeln('your initial rounds are ineffective however');
                writeln('all further calls for fire should have some impact. ');
                writeln;
            :end;
        if (register= 1) then
            :begin
                if ((x1>= 15) and (x1<= 35)) and ((y1>= 10) and (y1<= 40)) then
                    :begin
                        startx:= x1 - 15;
                        endx:= x1 + 15;
                        starty:= y1 - 10;
                        endy:= y1 + 10;
                    :end;
                if (x1< 15) and ((y1>= 10) and (y1<= 40)) then
                    :begin
                        startx:= 1;
                        endx:= x1 + 15;
                        starty:= y1 - 10;
                        endy:= y1 + 10;
                    :end;
                if (x1> 35) and ((y1>= 10) and (y1<= 40)) then
                    :begin
                        startx:= x1 - 15;
                        endx:= 50;
                    :end;
            :end;
        :end;
    *****
    )

```

```

    starty:= y1 - 10;
    endy:= y1 + 10;
end;
if ((x1 >= 15) and (x1 <= 35)) and (y1 < 10) then
begin
    startx:= x1 - 15;
    endx:= x1 + 15;
    starty:= 1;
    endy:= y1 + 10;
end;
if ((x1 >= 15) and (x1 <= 35)) and (y1 > 40) then
begin
    startx:= x1 - 15;
    endx:= x1 + 15;
    starty:= y1 - 10;
    endy:= 50;
end;
if (x1 < 15) and (y1 < 10) then
begin
    startx:= 1;
    endx:= x1 + 15;
    starty:= 1;
    endy:= y1 + 10;
end;
if (x1 < 15) and (y1 > 40) then
begin
    startx:= 1;
    endx:= x1 + 15;
    starty:= y1 - 10;
    endy:= 50;
end;
if (x1 > 35) and (y1 < 10) then
begin
    startx:= x1 - 15;
    endx:= 50;
    starty:= 1;
    endy:= y1 + 10;
end;
if (x1 > 35) and (y1 > 40) then
begin
    startx:= x1 - 15;
    endx:= 50;
    starty:= y1 - 10;
    endy:= 50;
end;
begin
    for x:= startx to endx do
        for y:= starty to endy do
            begin
                prob:= ranum(seed);
                if (map[n1,e1,x,y]= 4) then
                    begin
                        if (prob < 0.31) then

```

```

kia:= kia + 1;
iif (prob> 0.31) and (prob< 0.50) then
  ww:= ww + 1;
iif (prob> 0.50) then
  ne:= ne + 1;
end
else if (map[n1,e1,x,y]= 5) and (hard= 1) then
  begin
    iif (prob> 0.50) then
      apodest:= apodest + 1;
    iif (prob< 0.50) then
      ne:= ne + 1;
    end
  else if (map[n1,e1,x,y]= 5) and (hard= 0) then
    begin
      writeln;
      writeln(' Artillery has no effect on APC because');
      writeln(' anti-personnel ammunition was requested');
    end
  else if (map[n1,e1,x,y]= 6) and (hard= 1) then
    begin
      iif (prob> 0.64) then
        tdest:= tdest + 1;
      iif (prob< 0.64) then
        ne:= ne + 1;
      end
    else if (map[n1,e1,x,y]= 6) and (hard= 0) then
      begin
        writeln;
        writeln(' Artillery has no effect on tanks because');
        writeln(' anti-personnel ammunition was requested');
      end
    end
  end
end;

```

```

register:= 1;
writeln;
writeln(' RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS');
writeln(' Enemy Killed.....',kia:2);
writeln(' Enemy wounded.....',ww:2);
writeln(' No effect on the enemy...',ne:2);
writeln(' Enemy APC's destroyed...',apodest:2);
writeln(' Enemy Tanks destroyed....',tdest:2);
writeln;
end;

```

```

(.....)
procedure move(var seed : integer;var map : board;var mine : mines);
label 50;
var n,n1,e,e1,x,x1,y,y1,h,h1,z,z1,a,b,c,d,s,t,u,v,ctr1,q : integer;
    ttype,ctr,i,j,mode,r,l,r1,l1 : integer;
    prob,kill,ns,ew,range,dist : real;
begin
  ctr:= 0;

```



```

i:= 0;
50:  rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
    writeln;
    writeln('What is your mode of travel?');
    writeln(' Enter one of the following. ');
    writeln(' 1 - on foot');
    writeln(' 2 - tracked vehicle');
    writeln(' 3 - wheeled vehicle');
    writeln;
    read(mode);
    writeln;
    writeln('What type of terrain are you travelling over?');
    writeln(' Enter one of the following. ');
    writeln(' 1 - clear/fat');
    writeln(' 2 - uphill/downhill');
    writeln(' 3 - across water');
    writeln;
    read(ttype);
    if (mode= 1) then
        begin
            if (ttype= 1) then
                dist:= 50.0;
            if (ttype= 2) then
                dist:= 25.0;
            if (ttype= 3) then
                begin
                    writeln;
                    writeln('Personnel must be in vehicles in order to');
                    writeln('cross the river. You may only travel to the near');
                    writeln('shore. ');
                    writeln;
                    rangefinder(n,n1,e,e1,x,x1,y,y1,ns,ew,range);
                end;
            writeln;
            writeln('How many men do you have to move?');
            writeln(' Enter the number in your demo team/vehicle. ');
            writeln('?');
            read(ctr);
            for i:= 1 to ctr do
                begin
                    writeln;
                    writeln('Enter the location of a spot you are vacating. ');
                    writeln(' Enter a four digit location as before');
                    writeln('Example 1 1 23 34');
                    writeln;
                    read(s,t,u,v);
                    map[s,t,u,v]:= 1;
                end;
            end;
        if (mode= 2) then
            begin
                writeln;
                writeln('Enter the location of the spot you are vacating. ');

```

```

writeln(' Enter a four digit location as before');
writeln(' Example 1 1 23 34');
writeln;
read(s,t,u,v);
map[s,t,u,v]:= 1;
if (ttype = 1) then
  dist:= 150.0;
if (ttype = 2) then
  dist:= 100.0;
if (ttype = 3) then
  dist:= 25.0;
end;
if (mode= 3) then
begin
writeln;
writeln(' Enter the location of a spot you are vacating. ');
writeln(' Enter a four digit location as before');
writeln(' Example 1 1 23 34');
writeln;
read(s,t,u,v);
map[s,t,u,v]:= 1;
if (ttype = 1) then
  dist:= 100.0;
if (ttype = 2) then
  dist:= 40.0;
if (ttype = 3) then
  dist:= 25.0;
end;
if (range<= dist) then
begin
writeln;
writeln(' How many grid borders do you cross? ');
writeln(' example - if you go from square 1-2 to ');
writeln(' square 1-3, you cross One (1) boundary. ');
writeln(' You would then enter 1 ');
writeln(' If you move within the same square, enter 1 ');
writeln(' ? ');
writeln;
read(ctr);
prob:= ranum(seed);
if (ctr > 0) then
begin
for i:= 1 to ctr do
begin
writeln(' A pproximately where do you cross a grid ');
writeln(' border. Enter the coordinates of the square ');
writeln(' you are leaving and the square you are entering. ');
writeln(' If you are moving within a square, enter your ');
writeln(' starting and ending locations. ');
writeln(' Example - 1 2 50 25 ');
writeln(' 1 3 1 25 ');
writeln;
read(h,z,a,c);

```

```

read(h1,z1,b,d);
r:= (z*2);
l:= (z*2)-1;
r1:= (z1*2);
l1:= (z1*2)-1;
if (a<= 25) and (c<= 30) then
begin
if (mine[h,1]= 1) then
begin
if (prob< 0.9329) then
begin
kill:= ranum(seed);
if (mode>= 2) then
begin
writeln;
writeln('Your vehicle is immobilized due to');
writeln('mine damage at grid location,');
writeln(h:2,'-',z:2,'-',a:2,'-',c:2);
writeln;
map[h,z,a,c]:= 5;
end
else if (kill< 0.33) and (mode= 1) then
begin
writeln;
writeln('Your point man has been killed by a ');
writeln('landmine at grid location,');
writeln(h:2,'-',z:2,'-',a:2,'-',c:2);
writeln('How many remaining personnel do you ');
writeln('have to emplace?');
writeln('?');
read(ctr1);
for q:= 1 to ctr1 do
begin
writeln;
writeln('Enter the four digit grid to');
writeln('be occupied. Example 1 1 1 2');
writeln('?');
writeln;
read(s,t,u,v);
map[s,t,u,v]:= 4;
end
end
else if (kill> 0.33) and (mode= 1) then
begin
writeln;
writeln('Your point man has been wounded ');
writeln('by landmines. ');
writeln('You must remain in this position until');
writeln(' your next turn');
writeln('Disperse your personnel');
writeln('How many personnel do you ');
writeln('have to emplace?');
writeln('?');

```

```

        read(ctrl);
        for q:= 1 to ctrl do
            begin
                writeln;
                writeln('Enter the four digit grid .');
                writeln('be occupied. Example 1 1 1 2');
                writeln('?');
                writeln;
                read(s,t,u,v);
                map[s,t,u,v]:= 4;
            end
        end
    end
end
end;
if (a >= 26) and (c <= 30) then
begin
    if (mine[h,r]= 1) then
        begin
            if (prob < 0.9328) then
                begin
                    kill:= ranum(seed);
                    if (mode >= 2) then
                        begin
                            writeln;
                            writeln('Your vehicle is immobilized due to');
                            writeln('mine damage at grid location,');
                            writeln(h:2,'-',z:2,'-',a:2,'-',c:2);
                            writeln;
                            map[h,z,a,c]:= 5;
                        end
                    else if (kill < 0.33) and (mode = 1) then
                        begin
                            writeln;
                            writeln('Your point man has been killed by a ');
                            writeln('landmine at grid location,');
                            writeln(h:2,'-',z:2,'-',a:2,'-',c:2);
                            writeln('How many remaining personnel do you ');
                            writeln('have to emplace?');
                            writeln('?');
                            read(ctrl);
                            for q:= 1 to ctrl do
                                begin
                                    writeln;
                                    writeln('Enter the four digit grid to');
                                    writeln('be occupied. Example 1 1 1 2');
                                    writeln('?');
                                    writeln;
                                    read(s,t,u,v);
                                    map[s,t,u,v]:= 4;
                                end
                            end
                        end
                    else if (kill > 0.33) and (mode = 1) then

```

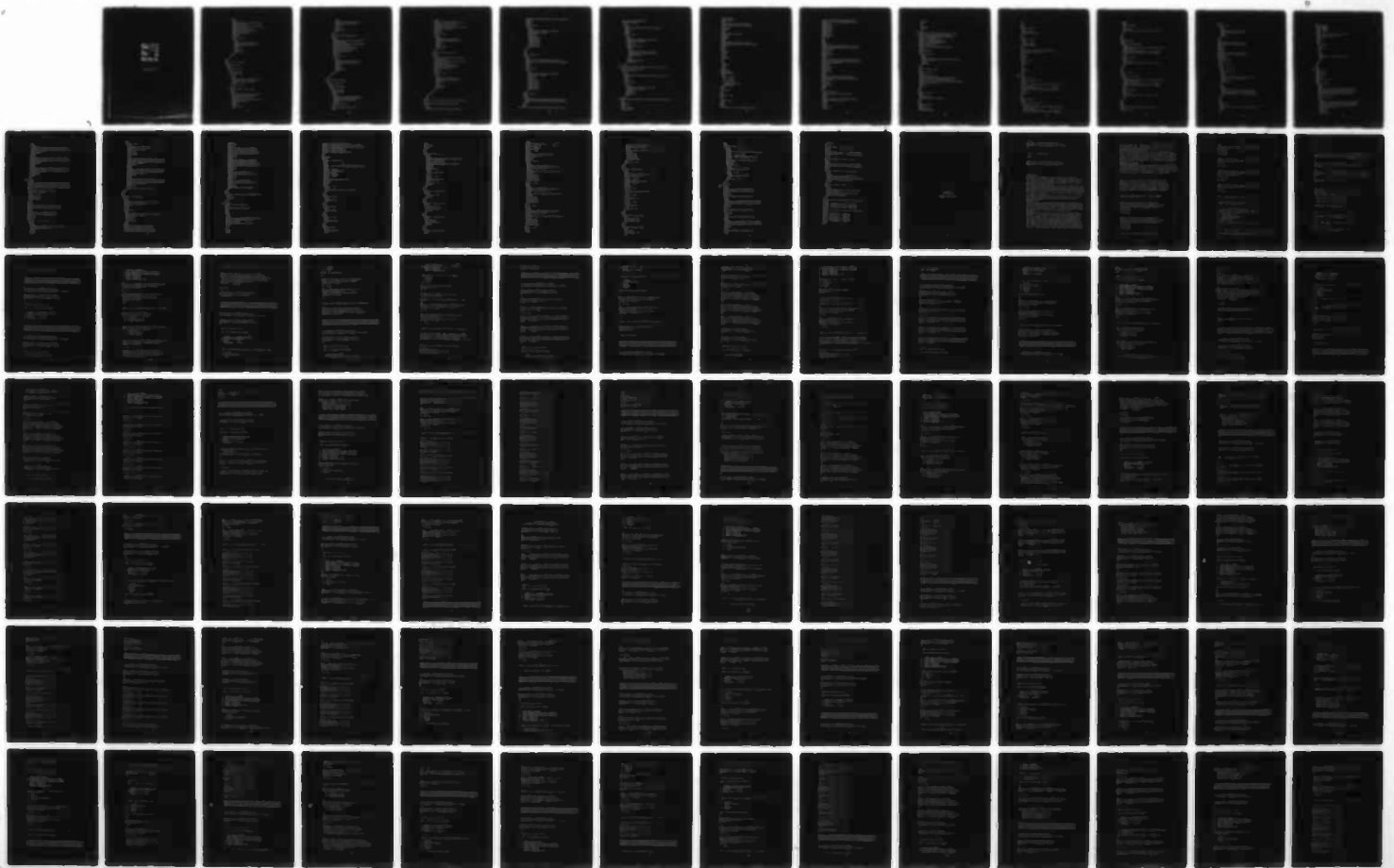
AD-A134 962

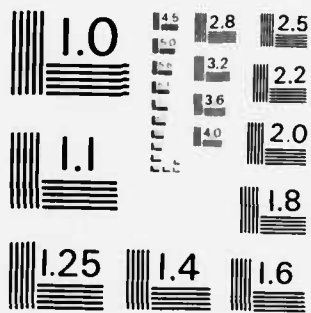
ANTI-MECHANIZED DEFENSE: A COMPUTERIZED SIMULATION FOR
SQUAD LEADER TRAINING(U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. J E WISSLER
SEP 83 AFIT-LSSR-77-83 F/G 5/9

34

UNCLASSIFIED

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A

```

begin
  writeln;
  writeln('Your point man has been wounded ');
  writeln('by landmines. ');
  writeln('You must remain in this position until');
  writeln(' your next turn');
  writeln('Disperse your personnel');
  writeln('How many personnel do you ');
  writeln('have to emplace?');
  writeln('?');
  read(ctrl);
  for q:= 1 to ctrl do
    begin
      writeln;
      writeln('Enter the four digit grid to');
      writeln('be occupied. Example 1 1 1 2');
      writeln('?');
      writeln;
      read(s,t,u,v);
      map[s,t,u,v]:= 4;
    end
  end
end
end;
if (b<= 25) and (d<= 30) then
begin
  if (mine[h1,l1]= 1) then
  begin
    if (prob< 0.9328) then
    begin
      kill:= ranum(seed);
      if (mode>=.2) then
      begin
        writeln;
        writeln('Your vehicle is immobilized due to');
        writeln('mine damage at grid location,');
        writeln(h1:2,'-',z1:2,'-',b:2,'-',d:2);
        writeln;
        map[h1,z1,b,d]:= 5;
      end
    else if (kill<0.33) and (mode= 1) then
    begin
      writeln;
      writeln('Your point man has been killed by a ');
      writeln('landmine at grid location,');
      writeln(h1:2,'-',z1:2,'-',b:2,'-',d:2);
      writeln('How many remaining personnel do you ');
      writeln('have to emplace?');
      writeln('?');
      read(ctrl);
      for q:= 1 to ctrl do
        begin

```

```

        writeln;
        writeln('Enter the four digit grid to');
        writeln('be occupied. Example 1 1 1 2');
        writeln('?');
        writeln;
        read(s,t,u,v);
        map[s,t,u,v]:= 4;
    end
end
else if (kill > 0.33) and (mode = 1) then
begin
    writeln;
    writeln('Your point man has been wounded by ');
    writeln('landmines. ');
    writeln('You must remain in this position until');
    writeln(' your next turn');
    writeln('Disperse your personnel');
    writeln('How many personnel do you ');
    writeln('have to emplace?');
    writeln('?');
    read(ctrl);
    for q = 1 to ctrl do
    begin
        writeln;
        writeln('Enter the four digit grid to');
        writeln('be occupied. Example 1 1 1 2');
        writeln('?');
        writeln;
        read(s,t,u,v);
        map[s,t,u,v]:= 4;
    end
    end
end
end;
if (b >= 26) and (d <= 30) then
begin
    if (mine[h1,r1] = 1) then
    begin
        if (prob < 0.9323) then
        begin
            kill := ranum(seed);
            if (mode >= 2) then
            begin
                writeln;
                writeln('Your vehicle is immobilized due to');
                writeln('mine damage at grid location. ');
                writeln(h1:2, '-', z1:2, '-', b:2, '-', d:2);
                writeln;
                map[h1,z1,b,d] := 5;
            end
            else if (kill < 0.33) and (mode = 1) then
            begin

```



```

writeln;
writeln('Your point man has been killed by a ');
writeln('landmine at grid location,');
writeln(h1:2,'-',z1:2,'-',b:2,'-',d:2);
writeln('How many remaining personnel do you ');
writeln('have to emplace?');
writeln('?');
read(ctrl);
for c:= 1 to ctrl do
begin
writeln;
writeln('Enter the four digit grid to');
writeln('be occupied. Example 1 2 1 2');
writeln('?');
writeln;
read(s,t,u,v);
map[s,t,u,v]:= 4;
end
end
else if (kill> 0.33) and (mode= 1) then
begin
writeln;
writeln('Your point man has been wounded by');
writeln('landmines. ');
writeln('You must remain in this position until');
writeln(' your next turn');
writeln('Disperse your personnel');
writeln('How many personnel do you ');
writeln('have to emplace?');
writeln('?');
read(ctrl);
for c:= 1 to ctrl do
begin
writeln;
writeln('Enter the four digit grid to');
writeln('be occupied. Example 1 1 1 2');
writeln('?');
writeln;
read(s,t,u,v);
map[s,t,u,v]:= 4;
end
end
end
end
end;
end;
if ((mine[h,r]= 0) and (mine[h,l]= 0) and (mine[h1,r1]= 0)) then
begin
if (mine[h1,l1]= 0) and (map[n1,e1,x1,y1]< > 8) then
begin
writeln;
writeln('You have successfully completed your move. ');

```

```

writeln('How many personnel/vehides do you have to emplace?');
writeln('?');
writeln;
read(ctr);
for i:= 1 to ctr do
  begin
    writeln;
    writeln('Enter a four digit grid to be occupied. ');
    writeln('Example 1 2 23 45');
    writeln('?');
    read(s,t,u,v);
    if (mode= 1) then
      map[s,t,u,v]:= 4;
    if (mode= 2) then
      map[s,t,u,v]:= 6;
    if (mode= 3) then
      map[s,t,u,v]:= 5;
  end
end
end;
end;
if (prob> 0.9323) then
begin
  writeln;
  writeln('You have successfully completed your move. ');
  writeln('How many personnel/vehides do you have to emplace?');
  writeln('?');
  writeln;
  read(ctr);
  for i:= 1 to ctr do
    begin
      writeln;
      writeln('Enter a four digit grid to be occupied. ');
      writeln('Example 1 2 23 45');
      writeln('?');
      read(s,t,u,v);
      if (mode= 1) then
        map[s,t,u,v]:= 4;
      if (mode= 2) then
        map[s,t,u,v]:= 6;
      if (mode= 3) then
        map[s,t,u,v]:= 5;
    end
  end
end
if (range> dist) then
begin
  writeln;
  writeln('You cannot travel fast enough by your present means');
  writeln('to cover your intended distance. Pick a new destination');
  goto 50
end;
end;
(.....)

```

```

procedure dismount(var map : board);
var s,t,u,v,ctr,i : integer;
begin
  writeln;
  writeln('How many personnel do you have to emplace?');
  writeln('?');
  writeln;
  read(ctr);
  for i:= 1 to ctr do
    begin
      writeln;
      writeln('Enter a four digit grid to be occupied. ');
      writeln('Example 1 2 23 45');
      writeln('?');
      read(s,t,u,v);
      if (map[s,t,u,v]= 8) then
        begin
          writeln;
          writeln('This individual has been killed by');
          writeln('a landmine, update your forces as');
          writeln('necessary. ');
          writeln;
        end;
      if (map[s,t,u,v]< > 8) then
        map[s,t,u,v]:= 4;
      end
    end;
  end;
(.....)
procedure mount(var map : board);
var s,t,u,v,ctr,i : integer;
begin
  writeln;
  writeln('How many personnel do you have to load on the vehicle?');
  writeln('?');
  writeln;
  read(ctr);
  for i:= 1 to ctr do
    begin
      writeln;
      writeln('Enter a four digit grid to be vacated. ');
      writeln('Example 1 2 23 45');
      writeln('?');
      read(s,t,u,v);
      map[s,t,u,v]:= 1;
    end
  end;
(.....)
MAIN PROGRAM
begin
  sovpr:= 27;
  t62pr:= 1;
  t72pr:= 1;
  minet:= 100000.0;
  demot:= 100000.0;

```

```

cratert:= 100000.0;
ditch:= 100000.0;
writeln;
writeln ('Is this a system test or actual play?');
writeln ('*****Enter 1 for test, ***** 0 for play');
writeln ('?');
read(switch);
writeln;
writeln;
writeln(' Enter a random seed ');
writeln('?');
read(seed);
writeln;
writeln;
writeln(' Enter your status (Marine or enemy)');
writeln('****Enter a "1" for Marine **** "0" for Enemy');
writeln('?');
writeln;
writeln;
readln(a);
if a= 1 then
  begin
    marord;
    enemyord;
  end
else
  begin
    enemyord;
    marord;
  end;
reset(file1);
skipblanks(file1);
while not eof(file1) do
  begin
    for n:= 1 to 4 do
      for e:= 1 to 6 do
        for y:= 1 to 50 do
          for x:= 1 to 50 do
            read(file1,map[n,e,x,y]);
            skipblanks(file1)
          end;
        end;
      end;
    end;
    arrive(arvt);
  end;
  begin
    stopt:= arvt + 30.0
  end;
  ctr:= 1;
  while ctr<= 3 do
    begin
      writeln;
      writeln;
      writeln ('W here do you wish to locate demo team',ctr);
    end;
  end;

```

```

writeln (' Give a 4 digit location, example 2 1 40 40 ');
writeln (' for each of your four demoteam members. ');
read(n, e, x, y);
map[n, e, x, y]:= 4;
read(n, e, x, y);
map[n, e, x, y]:= 4;
read(n, e, x, y);
map[n, e, x, y]:= 4;
read(n, e, x, y);
map[n, e, x, y]:= 4;
ctr:= ctr+ 1;
end;
begin
writeln;
writeln;
writeln (' Where do you wish to locate your TOW crew? ');
writeln (' Give a four digit location as you did for each ');
writeln (' Marine. ');
writeln (' ? ');
read(n, e, x, y);
map[n, e, x, y]:= 4;
writeln;
writeln;
writeln (' Where do you wish to locate your DRAGON s ? ');
writeln (' Give a four digit location for each weapon as you ');
writeln (' did for each Marine. ');
writeln (' ? ');
read(n, e, x, y);
map[n, e, x, y]:= 4;
read(n, e, x, y);
map[n, e, x, y]:= 4;
writeln;
writeln;
writeln (' Where do you wish to locate yourself ? ');
writeln (' Give a four digit location as you did for each ');
writeln (' Marine. ');
writeln (' ? ');
read(n, e, x, y);
map[n, e, x, y]:= 4;
writeln;
writeln;
end;
clock:= clock+ 60.0;
writeln (' Enemy forces enroute to square 1-3 ');
writeln;
writeln;
writeln (' Marine, do you wish to emplace obstacles? ');
writeln (' enter 1 for yes, 0 for no ');
writeln;
read(d);
begin
if (d= 1) then
begin

```

```

        goto 1000
    end
else
    begin
        goto 2000
    end;
end;
1000:writeln (' Enter the obstacle type and the number of men');
:writeln (' you are sending to complete this task');
:writeln (' The table below identifies the obstacle type. ');
:writeln (' 1 - MINEFIELD');
:writeln (' 2 - ANTI-TANK DITCH');
:writeln (' 3 - DEMOLITION CHARGES');
:writeln (' 4 - ROAD CRATER');
:writeln (' example : 1 4');
:writeln (' This is a minefield emplaced by 4 men');
:writeln;
:read(obstype, mpwr);
begin
    :if (mpwr= 0) then
        begin
            :writeln;
            :writeln(' Impossible to accomplish a task without assigning');
            :writeln(' personnel. ');
            :writeln;
            :goto:1000
        end
    end;
:totmpwr:= totmpwr + mpwr;
begin
    if (totmpwr> 13) then
        :begin
            :totmpwr:= totmpwr - mpwr;
            :writeln ('You do not have enough engineer personnel!!!');
            :writeln ('This obstacle is incapable of construction. ');
            :writeln ('You only have',(13 - totmpwr):2,' Marines not working');
            :writeln ('on another obstacle. ');
            :writeln;
            :goto 2000;
        end
    end;
begin
    if (obstype = 1) then
        :begin
            :minepwr:= mpwr;
            :minefield(minet, minepwr, map, mine);
            :end
        end;
begin
    if (obstype = 2) then
        :begin
            :ditchpwr:= mpwr;
            :atditch(ditch, ditchpwr);

```

```

    end
end;
begin
if (obstype = 3) then
    begin
    demopwr:= mpwr;
    demochg(demot,demopwr);
    end
end;
begin
if (obstype = 4) then
    begin
    craterpwr:= mpwr;
    crater(crater,craterpwr);
    end
end;
writeln ('Do you wish to emplace another obstacle?');
writeln ('enter 1 for yes, 0 for no');
writeln ('?');
writeln;
read(build);
begin
if (build = 1) then
    begin
    goto 1000
    end
else
    begin
    goto 2000
    end
end;
2000: begin
if (demot< arvt) then
    begin
    totmpwr:= totmpwr - demopwr;
    writeln;
    writeln ('Demolitions are in place - your squad members have');
    writeln ('returned. ');
    writeln(' Squad members in place.....',13 - totmpwr);
    writeln(' Squad members emplacing obstacles... ',totmpwr);
    writeln;
    clock:= demot;
    end
end;
begin
if (minet< arvt) then
    begin
    totmpwr:= totmpwr - minepwr;
    writeln;
    writeln('The minefield is in place - your squad members have');
    writeln('returned. ');
    writeln(' Squad members in place.....',13 - totmpwr);
    writeln(' Squad members emplacing obstacles... ',totmpwr);

```

```

        writeln;
    begin
    if (minet > clock) then
        begin
        clock = minet;
        writeln(' Enemy expected in ',(arvt - minet):4,' minutes');
        end
    end
end;
begin
if (cratert < arvt) then
begin
totmpwr = totmpwr - craterpwr;
writeln;
writeln(' The road has been cratered - your squad members have ');
writeln(' returned. ');
writeln(' Squad members in place.....',13 - totmpwr);
writeln(' Squad members emplacing obstades... ',totmpwr);
writeln;
begin
if (cratert > clock) then
begin
clock = cratert;
writeln(' Enemy expected in ',(arvt - cratert):4,' minutes');
end
end
end;
begin
if (ditcht < arvt) then
begin
totmpwr = totmpwr - ditchpwr;
writeln;
writeln(' The anti-tank ditch is in place - your squad members ');
writeln(' have returned. ');
writeln(' Squad members in place.....',13 - totmpwr);
writeln(' Squad members emplacing obstades... ',totmpwr);
writeln;
begin
if (ditcht > clock) then
begin
clock = ditcht;
writeln(' Enemy expected in ',(arvt - ditcht):4,' minutes');
end
end
end;
begin
writeln;
writeln(' Enemy expected in ',(arvt-clock):4,' minutes');
writeln;
if (clock < arvt) then

```



```

begin
  if (digin= 1) then
    begin
      writeln;
      writeln('Enemy attack is imminent!!!');
      writeln('Prepare to engage the enemy.');
```

```

      writeln;
      goto 3000
    end
  end;
begin
  writeln ('D o you wish to prepare foxholes ?');
  writeln ('*****Enter 1 for yes***** 0 for no');
  writeln ('?');
  writeln;
  read(digin);
  writeln;
  writeln('D o you wish to register defensive fires?');
  writeln(' *****Enter 1 for yes ***** 0 for no');
  writeln('?');
  read(register);
  if (register= 1) then
    clock:= clock + 30.0;
    begin
      if (digin = 1) then
        begin
          readyt:= clock + 120.0;
          begin
            if (readyt< arvt) then
              begin
                digin:= 1;
                writeln('Your squad is dug in, enemy attack expected');
                writeln('in',(arvt - readyt):3,'minutes.');
```

```

                writeln;
                clock:= readyt;
              end
            else
              begin
                digin:= 0;
                writeln('Enemy Forces have arrived, your squad is not');
                writeln('properly dug in, however you still have the');
                writeln('advantage of surprise - you have the first option');
```

```

              end
            end;
          end
        end
      else
        begin
          readyt:= clock;
          writeln;
          writeln('Enemy attack expected in',(arvt - readyt):3,'minutes');
```

```

          writeln;
          end
        end
      end;
end;

```

```

begin
  rminet:= 100000.0;
  demot:= 100000.0;
  crater:= 100000.0;
  ditch:= 100000.0;
  writeln;
  writeln ('Marine, do you wish to emplace obstacles?');
  writeln ('enter 1 for yes, 0 for no');
  writeln ('?');
  writeln;
  read (d);
  begin
    if (d= 1) then
      begin
        goto 1000
      end
    else
      begin
        writeln;
        writeln('The enemy is approaching square 1-3.'):
        writeln;
      end
    end
  end
end
end
end;
3000: writeln;
dock= arvt;
map[1,3,1,1]= 6;
map[1,4,1,1]= 6;
firepwr1:= 4;
firepwr2:= 4;
firepwr3:= 4;
firepwr:= 13 - totmpwr;
begin
  if (firepwr< 13) then
    begin
      writeln;
      writeln ('Soviet forces have surprised the Marine defenders');
      writeln ('The Soviet player now has the first option!');
      writeln ('The Marines have only ',(firepwr):2,' defenders in');
      writeln ('addition to the dragon and TOW crewmen.'):
      writeln;
      for i:= 1 to totmpwr do
        begin
          writeln;
          writeln('Update personnel locations vacated by enemy surprise.'):
          writeln('Enter one of the original locations which is empty');
          writeln('due to the Marine being caught emplacing obstacles.'):
          writeln('Example 1 1 8 25');
          writeln('?');
          read(n,e,x,y);
          map[n,e,x,y]:= 1;
        end
      end
    end
  end
end

```

```

end;
writeln;
writeln('What is the updated strength of demoteam one?');
writeln('Enter the number of in-place Marines from this team');
writeln('Example - 2');
read(firepwr1);
writeln;
writeln;
writeln('What is the updated strength of demoteam two?');
writeln('Enter the number of in-place Marines from this team');
writeln('Example - 2');
read(firepwr2);
writeln;
writeln;
writeln('What is the updated strength of demoteam three?');
writeln('Enter the number of in-place Marines from this team');
writeln('Example - 2');
read(firepwr3);
writeln;
end
end;
3050: writeln;
writeln;
writeln('*****');
writeln('Identify yourself *** Marine enter 1 *** Enemy enter 0');
writeln('*****');
writeln;
firepwr:= firepwr1 + firepwr2 + firepwr3;
if (clock= arvt+ 1.0) then
begin
map[1,3,15,15]:= 5;
map[1,4,15,15]:= 5;
map[1,5,15,15]:= 5;
end;
read(a);
writeln;
writeln('It has been', (clock - arvt):3, 'minutes since');
writeln('the defense of battalion objective "A" began. ');
writeln;
writeln;
writeln('Do you need to update your forces?');
writeln('*****Enter 1 for yes ***** 0 for no. ');
writeln('?');
read(update);
begin
if (update = 1) and (a= 1) then
begin
writeln;
writeln('How many positions do you need to update?');
writeln('Enter the number i.e. 3');
writeln('?');
writeln;
read(ctr);

```

```

begin
  for i:= 1 to ctr do
    begin
      writeln('Enter the four digit code you wish to change. ');
      writeln('Example...1 1:2 24');
      writeln('?');
      read(n,e,x,y);
      map[n,e,x,y]:= 1;
      end;
      writeln;
      writeln('What is the updated strength of demoteam one?');
      writeln('Enter the number of in-place Marines from this');
      writeln('team Example - 2');
      read(firepwr1);
      writeln;
      writeln;
      writeln('What is the updated strength of demoteam two?');
      writeln('Enter the number of in-place Marines from this');
      writeln('team Example - 2');
      read(firepwr2);
      writeln;
      writeln;
      writeln('What is the updated strength of demoteam three?');
      writeln('Enter the number of in-place Marines from this');
      writeln('team Example - 2');
      read(firepwr3);
      writeln;
      firepwr:= firepwr1 + firepwr2 + firepwr3;
    end
  end;
end;
begin
  if (update = 1) and (a= 0) then
    begin
      writeln;
      writeln('How many positions do you need to update?');
      writeln('Enter the number i.e. 3');
      writeln('?');
      writeln;
      read(ctr);
      for i:= 1 to ctr do
        begin
          writeln('Enter the four digit code you wish to change. ');
          writeln('Example...1 1 2 24');
          writeln('?');
          read(n,e,x,y);
          map[n,e,x,y]:= 1;
          end;
          writeln;
          writeln('What is the manpower in the BMP?');
          writeln('If no casualties have been suffered,');
          writeln('enter 9. Otherwise, enter 9 minus the');
          writeln('number of killed or severely wounded. ');
        end
      end;
    end;
  end;
end;

```

```

        writeln('?');
        read(bmppwr);
        writeln;
        writeln('What is the manpower in BTR-1 ?');
        writeln('If no casualties have been suffered,');
        writeln('enter '9'. Otherwise, enter 9 minus the');
        writeln('number of killed or severely wounded.');
```

```

        writeln('?');
        read(btr1pwr);
        writeln;
        writeln('What is the manpower in BTR-2 ?');
        writeln('If no casualties have been suffered,');
        writeln('enter '9'. Otherwise, enter 9 minus the');
        writeln('number of killed or severely wounded.');
```

```

        writeln('?');
        read(btr2pwr);
        writeln;
        writeln('Is your T-62 operational?');
        writeln(' *****Enter 1 for yes ***** 0 for no');
        writeln('?');
        read(t62pwr);
        writeln;
        writeln('Is your T-72 operational?');
        writeln(' *****Enter 1 for yes ***** 0 for no');
        writeln('?');
        read(t72pwr);
        sovpwr:= bmppwr + btr1pwr + btr2pwr;
    end
end;
begin
    if ((clock >= stopt) or (sovpwr < 12) or (firepwr < 6)) then
        begin
            goto 4000
        end
    end;
3075: writeln;
    writeln (' What do you wish to do ?');
    writeln;
    writeln ('Enter the appropriate number.');
```

```

    writeln;
    begin
        if (a= 1) then
            begin
                writeln;
                writeln ('1 - ENGAGE WITH ORGANIC WEAPONS');
                writeln ('2 - REQUEST FIRE SUPPORT');
                writeln ('3 - WAIT');
                writeln ('4 - DISENGAGE /RETREAT');
                writeln;
            end
        else
            begin
                writeln;
            end
        end
    end
end;

```

```

writeln ('1 - STOP AND DISMOUNT');
writeln ('2 - STOP/ENGAGE WITH VEHICLE WEAPONS');
writeln ('3 - STOP/ENGAGE WITH INFANTRY WEAPONS');
writeln ('4 - MOVE /RETREAT');
writeln ('5 - MOUNT VEHICLES ');
writeln ('6 - EMPLOY COMBINED ARMS ');
end
end;
read(engage);
begin
if (engage = 1) and (a= 1) then
begin
writeln;
writeln (' Choose the appropriate weapons to engage the enemy. ');
writeln;
writeln(' 1 - M-16A 1');
writeln(' 2 - M-60 machinegun');
writeln(' 3 - TOW ');
writeln(' 4 - Dragon');
writeln(' 5 - LAAW ');
writeln;
writeln('Enter the appropriate number. ');
writeln('? ');
read(wpns);
begin
if (wpns = 1) then
begin
M 16A 1(firepwr1, firepwr2, firepwr3, seed, switch);
end
end;
begin
if (wpns = 2) then
begin
M 60(seed, switch);
end
end;
begin
if (wpns = 3) then
begin
TOW (seed, switch);
end
end;
begin
if (wpns = 4) then
begin
Dragon(seed, switch);
end
end;
begin
if (wpns = 5) then
begin
LAAW (seed, switch);
end
end
end
end;

```

```

end;
clock:= clock + 0.50;
goto 3050
end
end;
begin
if (engage = 2) and (a= 1) then
begin
writeln;
writeln('Choose the appropriate weapon to engage the enemy. ');
writeln(' 1 - 81mm Mortar ');
writeln(' 2 - 105mm Gun ');
writeln('Enter one of the above numbers - Example...3. ');
writeln('? ');
read(wpns);
if (wpns = 1) then
begin
mort81(seed,register,map);
end;
if (wpns = 2) then
begin
arty105(seed,register,map);
end;
clock:= clock + 0.50;
goto 3050
end
end;
begin
if (engage = 3) and (a= 1) then
begin
clock:= clock + 0.50;
goto 3050
end
end;
begin
if (engage = 4) and (a= 1) then
begin
move(seed,map,mine);
clock:= clock + 0.50;
goto 3050
end
end;
begin
if (engage = 1) and (a= 0) then
begin
dismount(map);
clock:= clock + 0.50;
goto 3050
end;
end;
begin
if (engage = 2) and (a= 0) then
begin

```

```

writeln;
writeln(' Which vehide do you wish to employ?');
writeln(' 1 - BM P');
writeln(' 2 - BTR-60P');
writeln(' 3 - T-62');
writeln(' 4 - T-72');
writeln;
writeln(' Enter one of the above numbers. ');
writeln(' example.....3');
writeln('?');
read(wpns);
if (wpns = 1) then
begin
writeln;
writeln(' Do you wish to employ the main gun or the');
writeln(' 7.62mm machine gun?');
writeln;
writeln(' *****Enter 1 for main gun ***** 0 for 7.62mm M G');
read(arm);
if (arm= 1) then
brmp(seed,switch);
if (arm= 0) then
pkdmg(seed,switch);
end;
if (wpns = 2) then
begin
writeln;
writeln(' Do you wish to employ the main gun or the');
writeln(' 7.62mm machine gun?');
writeln;
writeln(' *****Enter 1 for main gun ***** 0 for 7.62mm M G');
read(arm);
if (arm= 1) then
btr(seed,switch);
if (arm= 0) then
pkdmg(seed,switch);
end;
if (wpns = 3) then
begin
writeln;
writeln(' Do you wish to employ the main gun or the');
writeln(' 7.62mm machine gun?');
writeln;
writeln(' *****Enter 1 for main gun ***** 0 for 7.62mm M G');
read(arm);
if (arm= 1) then
t62(seed,switch);
if (arm= 0) then
pkdmg(seed,switch);
end;
if (wpns = 4) then
begin
writeln;

```



```

writeln('Do you wish to employ the main gun or the');
writeln('7.62mm machine gun?');
writeln;
writeln('*****Enter 1 for main gun ***** 0 for 7.62mm M G');
read(arm);
if (arm= 1) then
  t72(seed,switch);
if (arm= 0) then
  pklmg(seed,switch);
end;
clock= clock + 0.50;
end
end;
begin
if (engage = 3) and (a= 0) then
begin
writeln;
writeln('Choose the appropriate weapon from the');
writeln('following menu. ');
writeln;
writeln(' 1 - AKMS');
writeln(' 2 - PK Light Machinegun');
writeln(' 3 - RPG-7');
writeln;
read(wpns);
if (wpns = 1) then
begin
akms(brnppwr,btr1pwr,btr2pwr,seed,switch);
end;
if (wpns = 2) then
begin
pklmg(seed,switch);
end;
if (wpns = 3) then
begin
rpg7(seed,switch);
end;
clock= clock + 0.50;
end
end;
begin
if (engage = 4) and (a= 0) then
begin
move(seed,map,mine);
clock= clock + 0.50;
end
end;
begin
if (engage = 5) and (a= 0) then
begin
mount(map);
clock= clock + 0.50;
end
end

```

```

end;
begin
  if (engage = 6) and (a= 0) then
    begin
      writeln;
      writeln(' Choose the appropriate weapon to engage the enemy. ');
      writeln;
      writeln(' 1 - 120mm Mortar ');
      writeln(' 2 - SA U 122mm Self-propelled Gun ');
      writeln;
      writeln(' Enter one of the above numbers i.e. 2 ');
      writeln('? ');
      read(wpns);
      if (wpns = 1) then
        begin
          mort120(seed, register, digin, map);
          end;
      if (wpns = 2) then
        begin
          arty122(seed, register, digin, map);
          end;
      rclock= clock+ 0.50;
      end
    end;
  goto 3050;
4000: begin
  writeln;
  writeln(' Do you wish to continue the battle? ');
  writeln(' *****Enter 1 for yes ***** 0 for no ');
  writeln('? ');
  read(answ);
  if (a= 1) and (firepwr < 6) and (answ= 1) then
    begin
      writeln;
      writeln(' This is a poor strategic decision due to limited ');
      writeln(' manpower resources....live to fight another day! ');
      writeln;
      goto 3075;
    end;
  if (a= 1) and (firepwr > 5) and (answ= 1) then
    begin
      goto 3075;
    end;
  if (a= 0) and (sovpwr < 12) and (answ= 1) then
    begin
      writeln;
      writeln(' This is a poor strategic decision due to limited ');
      writeln(' manpower resources....live to fight another day! ');
      writeln;
      goto 3075;
    end;
  if (a= 0) and (firepwr > 11) and (answ= 1) then
    begin

```

```

      goto 3075;
    end;
  if (a= 1) and (firepwr< 6) and (answ= 0) then
    begin
      writeln;
      writeln('This is a wise strategic decision due to limited');
      writeln('manpower resources...live to fight another day!');
      writeln;
      end;
  if (a= 0) and (sovpwr< 12) and (answ= 0) then
    begin
      writeln;
      writeln('This is a wise strategic decision due to limited');
      writeln('manpower resources...live to fight another day!');
      writeln;
      end;
  if (dock >= stop) or ((answ= 0) and (a= 0)) then
    begin
      writeln;
      writeln('Marines have successfully defended!');
      writeln('Soviets withdrew after',(clock - arvt):3,'minutes');
      writeln('of beginning the engagement');
      writeln;
      end
  else if (a= 1) and (answ= 0) then
    begin
      writeln;
      writeln('Soviet player has cleared the path for Soviet');
      writeln('advancement');
      writeln('Marines retreated after',(clock - arvt):3);
      writeln('minutes of combat');
      end
  end;
  writeln(' FINAL MARINE STATISTICS ARE AS FOLLOWS');
  writeln;
  writeln(' Demoteam one survivors...',firepwr:2);
  writeln(' Demoteam two survivors...',firepwr:2);
  writeln(' Demoteam three survivors...',firepwr:2);
  writeln;
  writeln(' SOVIET FINAL STATISTICS ARE AS FOLLOWS');
  writeln;
  writeln(' BMP survivors .....',bmppwr:2);
  writeln(' BTR1 survivors .....',btr1pwr:2);
  writeln(' BTR2 survivors .....',btr2pwr:2);
  writeln(' T-62s operational ...',t62pwr:2);
  writeln(' T-72s operational ...',t72pwr:2);
  writeln;
end

```

APPENDIX B
SAMPLE GAME OUTPUT

a.out

Is this a system test or actual play?
*****Enter 1 for test,***** 0 for play
?
0

Enter a random seed
?
6063

Enter your status (Marine or enemy)
****Enter a "1" for Marine **** "0" for Enemy
?

1

SITUATION

Friendly-The company to which you are attached is defending the access routes to battalion objective "A". The remainder of the company is located to your rear, preparing extensive defensive positions in the vicinity of battalion objective "A".

Enemy-A battalion sized enemy motorized rifle battalion was recently observed moving toward your position. The lead element of this movement-to-contact is a reinforced motorised rifle platoon consisting of a BMP, two BTRs, one T-62 tank, and one T-72 tank. Expected enemy arrival is in twelve (12) hours.

Attachments and Detachments-In addition to your engineer squad, the company has both TOW and Dragon assets. No detachments.

MISSION

Your company is to provide anti-mechanized defense in order to delay/destroy the enemy in the vicinity of the crossroads bridge area, thus providing the remainder of the battalion sufficient time to prepare adequate defenses and ample warning of the enemy advance.

EXECUTION

Engineer squad, you will have one TOW and two Dragons attached. The TOW has 3 rounds and the Dragons have four (4) rounds each. Your squad is responsible for an area 100 meters west of the bridge to approximately 100 meters east of the crossroads and extending from the armor alert line [approximately 300 meters north of the bridge] to a line 100 meters south of the bridge. This area covers all of your detailed map. You will tie in with first platoon on your right and second platoon

on your left. Fire support is available from "Z" battery and the 81mm mortars of weapons company. Priority for the 60mm mortars goes to the line platoons.

ADMINISTRATION AND LOGISTICS

Chow will be drawn prior to your departure from this area. The battalion aid station is located 1500 meters to our rear. Engineer squad, draw 12 LAAWs from weapons platoon and standard ammunition load for your personal weapons. Additionally mines are available, upon request from the MMSG. All POWs will be processed at the battalion CP.

COMMAND AND SIGNAL

No enemy engagement is to be undertaken until the enemy is located on your detailed map. This constitutes crossing the armor alert line. Primary communication will be by wire, alternate is messenger. I will be located with the first platoon. ANY QUESTIONS?.....GOOD LUCK!

You are a Soviet motorised rifle platoon commander. You have a T 32, T-72, BMP, and two BTR 60PBs at your disposal. Attack and conquer the capitalist dogs defending in your area. Your company is acting as the lead company in a battalion movement to contact. GOOD LUCK COMRADE!!!

EXPECTED ENEMY ARRIVAL IN 1.2e+01 HOURS

Where do you wish to locate demo team 1
Give a 4 digit location, example 2 1 40 40
for each of your four demoteam members.
2 1 10 10
2 1 10 12
2 1 10 14
2 1 10 16

Where do you wish to locate demo team 2
Give a 4 digit location, example 2 1 40 40
for each of your four demoteam members.
4 4 20 25
4 4 22 25
4 4 24 25
4 4 26 25

Where do you wish to locate demo team 3

Give a 4 digit location, example 2 1 40 40
for each of your four demoteam members.

4 4 36 25
4 4 38 25
4 4 40 25
4 4 42 25

Where do you wish to locate your TOW crew?
Give a four digit location as you did for each
Marine.

?
2 1 10 20

Where do you wish to locate your DRAGON s ?
Give a four digit location for each weapon as you
did for each Marine.

?
2 1 15 35
4 4 30 27

Where do you wish to locate yourself ?
Give a four digit location as you did for each
Marine.

?
4 4 28 27

Enemy forces enroute to square 1-3

Marine, do you wish to emplace obstacles?
enter 1 for yes, 0 for no

1
Enter the obstacle type and the number of men
you are sending to complete this task.
The table below identifies the obstacle type.

1 - MINEFIELD
2 - ANTI-TANK DITCH
3 - DEMOLITION CHARGES
4 - ROAD CRATER

example : 1 4
This is a minefield emplaced by 4 men

1 9

This requires delivery of mines from the MSSG.

What meter of minefield frontage do you wish to emplace?
Enter one of the following 50 100 150 200

Example 100

?

100

How many grid squares does the minefield reside in?
If you have over 100 meters of frontage, you must be in
two (2) or more squares. Enter the appropriate number.

1

Enter a grid that the minefield either totally or
partially covers. If the mine field is in square
1-2, enter 1 2.

?

2 3

Which portion of the square does the minefield cover?
Enter 1 for west2 for east***3 for entire square

?

3

Do you wish to emplace another obstacle ?
enter 1 for yes, 0 for no

?

0

The minefield is in place - your squad members have
returned.

Squad members in place.....	13
Squad members emplacing obstacles....	0

Enemy expected in 2.1e+02 minutes

Enemy expected in 2.1e+02 minutes.

Do you wish to prepare foxholes ?

*****Enter 1 for yes***** 0 for no

?

1

Do you wish to register defensive fires?

*****Enter 1 for yes ***** 0 for no

?

0

Your squad is dug in, enemy attack expected
in 8.8e+01minutes.

Marine, do you wish to emplace obstacles ?

enter 1 for yes, 0 for no

?

0

The enemy is approaching square 1-3.

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 0.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

3

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 5.0e-01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 4

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 1 1

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 1 1

Range to the target/destination is 1.0e+02meters

What is your mode of travel ?

Enter one of the following.

- 1 - on foot
- 2 - tracked vehicle
- 3 - wheeled vehicle

2

What type of terrain are you travelling over ?

Enter one of the following.

- 1 - clear/flat
- 2 - uphill/downhill
- 3 - across water

1

Enter the location of the spot you are vacating.

Enter a four digit location as before

Example 1 1 23 34

1 3 1 1

How many grid borders do you cross?

example - if you go from square 1-2 to square 1-3, you cross One (1) boundary.

You would then enter 1

If you move within the same square, enter 1
?

1
Approximately where do you cross a grid
border. Enter the coordinates of the square
you are leaving and the square you are entering.
If you are moving within a square, enter your
starting and ending locations.
Example - 1 2 50 25
 1 3 1 25

1 3 1 50
2 3 1 1

Your vehicle is immobilized due to
mine damage at grid location,
2- 3- 1- 1

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

1 - ENGAGE WITH ORGANIC WEAPONS
2 - REQUEST FIRE SUPPORT
3 - WAIT
4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

1 - M-16A1
2 - M-60 machinegun
3 - TOW

- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?
4

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 15 35

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 1 1

Range to the target/destination is 1.8e+02meters

Dragon missile has missed the target!

Give the exact weapon location to your opponent. Your weapon signature has given away your position.

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.5e+00minutes since the defense of battalion objective 'A' began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS

- 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
- 4 - MOVE / RETREAT
- 5 - MOUNT VEHICLES
- 6 - EMPLOY COMBINED ARMS
- 2

Which vehicle do you wish to employ?

- 1 - BMP
- 2 - BTR-60P
- 3 - T-62
- 4 - T-72

Enter one of the above numbers.

example.....3

?
3

Do you wish to employ the main gun or the 7.62mm machine gun?

*****Enter 1 for main gun ***** 0 for 7.62mm MG

1

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?
2 3 1 1

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?
2 1 15 35

Range to the target/destination is 1.8e+02meters

Is your target enemy armor/vehicles or troops in the open ? Enemy Dragon and TOW positions are considered armor/vehicle targets.

*****Enter 1 for armor/vehicles ***** 0 for troops

?
1

Results of T-62 tank firing are below:

No Effect..... 0
Disabled Vehicles..... 0
Destroyed Vehicles..... 1

Casualties occurred in vicinity
grid 2- 1-15-35

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.
Example...1 1 2 24

?

2 1 15 35

What is the updated strength of demoteam one?
Enter the number of in-place Marines from this
team. Example - 2

4

What is the updated strength of demoteam two?
Enter the number of in-place Marines from this
team. Example - 2

4

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2

4

What do you wish to do ?

Enter the appropriate number.

1 - ENGAGE WITH ORGANIC WEAPONS

- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAN

Enter the appropriate number.

?

4

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 30 27

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 1 1

Range to the target/destination is 3.0e+02meters

Dragon missile hit Soviet target in vicinity
location 2- 3- 1- 1
Good shooting!!!

Target destroyed!!

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.5e+00minutes since
the defense of battalion objective 'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.
Example...1 1 2 24

?

2 3 1 1

What is the manpower in the BMP ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?

9

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?

9

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?

9

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no

?

0

Is your T-72 operational?
*****Enter 1 for yes ***** 0 for no

?

1

What do you wish to do ?

Enter the appropriate number.

1 - STOP AND DISMOUNT

- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 2

Which vehicle do you wish to employ?

- 1 - BMP
- 2 - BTR-60P
- 3 - T-62
- 4 - T-72

Enter one of the above numbers.
example.....3

?
4

Do you wish to employ the main gun or the
7.62mm machine gun? :

*****Enter 1 for main gun ***** 0 for 7.62mm MG
1

What is the location of your weapon/demoteam?

Enter a four digit code as before.
Example 1 2 34 45

?
1 4 1 1

What is the approximate location of your
target/destination ?

Enter a four digit code as before.
Example 1 2 34 45

?
4 4 30 27

Range to the target/destination is 3.6e+02meters

Is your target enemy armor/vehicles or troops
in the open ? Enemy Dragon and TOW positions
are considered armor/vehicle targets.

*****Enter 1 for armor/vehicles ***** 0 for troops
?
1

Results of T-72 tank firing are below:

No Effect..... 0
Disabled Vehicles..... 1
Destroyed Vehicles..... 0

Casualties occurred in vicinity
grid 4- 4-30-27

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 3.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
****Enter 1 for yes **** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.
Example...1 1 2 24

?

4 4 30 27

What is the updated strength of demoteam one?
Enter the number of in-place Marines from this
team. Example - 2

4

What is the updated strength of demoteam two?
Enter the number of in-place Marines from this
team. Example - 2

4

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2

4

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?
3

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?
2 1 10 20

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?
1 4 1 1

Range to the target/destination is 3.1e+02meters

TOW missile has missed the target!
Give the exact weapon location to your opponent. Your weapon signature has given away your position.

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 3.5e+00minutes since the defense of battalion objective 'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 4

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 4 1 1

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 4 1 1

Range to the target/destination is 1.0e+02meters

What is your mode of travel ?

Enter one of the following.

- 1 - on foot
- 2 - tracked vehicle
- 3 - wheeled vehicle

2

What type of terrain are you travelling over ?

Enter one of the following.

- 1 - clear/flat
- 2 - uphill/downhill
- 3 - across water

1

Enter the location of the spot you are vacating.

Enter a four digit location as before

Example 1 1 23 34

2 4 1 1

How many grid borders do you cross?

example - if you go from square 1-2 to square 1-3, you cross One (1) boundary.

You would then enter 1

If you move within the same square, enter 1
?

1
Approximately where do you cross a grid border. Enter the coordinates of the square you are leaving and the square you are entering. If you are moving within a square, enter your starting and ending locations.

Example - 1 2 50 25
 1 3 1 25

2 4 1 50

2 4 1 1

You have successfully completed your move.
How many personnel/vehicles do you have to emplace?
?

1

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

2 4 1 1

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 4.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?

3

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 20

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 4 1 1

Range to the target/destination is 2.8e+02meters

TOW missile hit Soviet target in vicinity

location 2- 4- 1- 1

Good shooting!!!

Target destroyed!!

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 4.5e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
1

How many positions do you need to update?
Enter the number i.e. 3

?
1

Enter the four digit code you wish to change.
Example...1 1 2 24

?
2 4 1 1

What is the manpower in the BMP ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.

?
9

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.

?
9

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.

?
9

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no

?
0

Is your T-72 operational?
*****Enter 1 for yes ***** 0 for no

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
- 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
- 4 - MOVE / RETREAT
- 5 - MOUNT VEHICLES
- 6 - EMPLOY COMBINED ARMS

1

How many personnel do you have to emplace?
?

9

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 6 17

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 8 17

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 10 17

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 12 17

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 14 17

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 16 17

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 18 17

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

1 3 20 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

1 3 22 17

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 5.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

1 - 81mm Mortar

2 - 105mm Gun

Enter one of the above numbers - Example...3.

?

1

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

1 3 15 15

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

You have not registered your defensive fires,
your initial rounds are ineffective however
all further calls for fire should have some impact.

RESULTS OF MORTAR FIRES ARE AS FOLLOWS;

Enemy Killed..... 0
Enemy wounded..... 0
No effect on the enemy... 0
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 5.5e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the
following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

1

Which squad do you wish to employ?

*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2

?
1

Is your squad dismounted (out of the vehicle) or mounted
(inside the vehicle) ?

*****Enter 1 mounted***** 0 for dismounted

?
0

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 15 15

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 20

Range to the target/destination is 2.4e+02meters

Results of squad firing are below

No Effect..... 0
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 0
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 0
Walking Wounded..... 0
Litter Casualties..... 2
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 2
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 1
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 3
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 4
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Results of squad firing are below

No Effect..... 5
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 1

Casualties occurred in vicinity
grid 2- 1-10-20

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 6.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
****Enter 1 for yes **** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.
Example...1 1 2 24

?

2 1 10 20

What is the updated strength of demoteam one?
Enter the number of in-place Marines from this
team. Example - 2

4

What is the updated strength of demoteam two?
Enter the number of in-place Marines from this
team. Example - 2

4

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2

4

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

- 1 - 81mm Mortar
- 2 - 105mm Gun

Enter one of the above numbers - Example...3.

?

2

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

1 3 15 15

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

Artillery has no effect on APC because
anti-personnel ammunition was requested.

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed.....	4
Enemy wounded.....	2
No effect on the enemy...	3
Enemy APC s destroyed....	0
Enemy Tanks destroyed....	0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 6.5e+00minutes since
the defense of battalion objective 'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

4

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 12 17

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 14 17

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 16 17

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 18 17

What is the manpower in the BMP ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?

5

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?

9

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?

9

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no

?

0

Is your T-72 operational?

*****Enter 1 for yes ***** 0 for no

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 4

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 4 15 15

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 15 15

Range to the target/destination is 1.4e+02meters

What is your mode of travel ?

Enter one of the following.

- 1 - on foot
- 2 - tracked vehicle
- 3 - wheeled vehicle

3

What type of terrain are you travelling over ?

Enter one of the following.

- 1 - clear/flat
- 2 - uphill/downhill
- 3 - across water

1

Enter the location of a spot you are vacating.

Enter a four digit location as before

Example 1 1 23 34

1 4 15 15

You cannot travel fast enough by your present means
to cover your intended distance. Pick a new destination

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 4 15 15

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 50 1

Range to the target/destination is 7.8e+01meters

What is your mode of travel ?

Enter one of the following.

- 1 - on foot
- 2 - tracked vehicle
- 3 - wheeled vehicle

3

What type of terrain are you travelling over ?

Enter one of the following.

- 1 - clear/flat
- 2 - uphill/downhill
- 3 - across water

1

Enter the location of a spot you are vacating.

Enter a four digit location as before

Example 1 1 23 34

1 4 15 15

How many grid borders do you cross?

example - if you go from square 1-2 to
square 1-3, you cross One (1) boundary.

You would then enter 1

If you move within the same square, enter 1

?

1

Approximately where do you cross a grid border. Enter the coordinates of the square you are leaving and the square you are entering. If you are moving within a square, enter your starting and ending locations.

Example - 1 2 50 25
 1 3 1 25

1 4 1 50

2 3 50 1

Your vehicle is immobilized due to mine damage at grid location,
2- 3-50- 1

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 7.0e+00minutes since the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

- 1 - 81mm Mortar
- 2 - 105mm Gun

Enter one of the above numbers - Example...3.

?
1

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

1 3 15 15

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

1

RESULTS OF MORTAR FIRES ARE AS FOLLOWS;

Enemy Killed..... 2

Enemy wounded..... 1

No effect on the enemy... 2

Enemy APC s destroyed.... 1

Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 7.5e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?

Enter the number i.e. 3

?

3

Enter the four digit code you wish to change.

Example...1 1 2 24

?

1 3 15 15

Enter the four digit code you wish to change.

Example...1 1 2 24

?

1 3 8 17

Enter the four digit code you wish to change.

Example...1 1 2 24

?

1 3 10 17

What is the manpower in the BMP ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.
?
3

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.
?
9

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.
?
9

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no
?
0

Is your T-72 operational?
*****Enter 1 for yes ***** 0 for no
?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 1

How many personnel do you have to emplace?
?
9

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

2 3 48 8

This individual has been killed by
a landmine, update your forces as
necessary.

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

2 3 48 6

This individual has been killed by
a landmine, update your forces as
necessary.

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

2 3 48 4

This individual has been killed by
a landmine, update your forces as
necessary.

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

2 3 48 2

This individual has been killed by
a landmine, update your forces as
necessary.

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

2 3 48 50

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

1 3 48 48

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

1 3 48 46

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

1 3 48 44

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

1 3 48 42

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 9.0e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAN

Enter the appropriate number.

?

1

Which demoteam do you wish to employ?

*****Enter 1, 2, or 3

?

1

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 15 15

Range to the target/destination is 2.3e+02meters

Results of demoteam 1 firing are below

No Effect.....	1
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 1- 3-15-15

Results of demoteam 1 firing are below

No Effect.....	2
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 1- 3-15-15

Results of demoteam 1 firing are below

No Effect.....	3
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 1- 3-15-15

Results of demoteam 1 firing are below

No Effect.....	4
Walking Wounded.....	0

Liter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 1- 3-15-15

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 8.5e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the
following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

1

Which squad do you wish to employ?
*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2

?

1

Is your squad dismounted (out of the vehicle) or mounted
(inside the vehicle) ?

*****Enter 1 mounted***** 0 for dismounted

?

0

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 15 15

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

Range to the target/destination is 2.3e+02meters

Results of squad firing are below :

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 9.0e+00minutes since
the defense of battalion objective 'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.
Example...1 1 2 24

?

2 1 10 10

What is the updated strength of demoteam one?
Enter the number of in-place Marines from this
team. Example - 2

3

What is the updated strength of demoteam two?
Enter the number of in-place Marines from this
team. Example - 2

4

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2

4

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?
2

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?
2 1 10 10

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?
1 3 15 15

Range to the target/destination is 2.3e+02meters

Results of M60 machinegun firing are below:

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 1- 3-15-15

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 9.5e+00minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

1

Which squad do you wish to employ?

*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2

?

2

Is your squad dismounted (out of the vehicle) or mounted (inside the vehicle) ?

*****Enter 1 mounted***** 0 for dismounted

?

0

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 48 50

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

Range to the target/destination is 2.8e+02meters

Results of squad firing are below

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 3
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 4
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 4
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 5
Walking Wounded..... 0
Litter Casualties..... 1

Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 6
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 7
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Results of squad firing are below

No Effect..... 8
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.0e+01minutes since
the defense of battalion objective 'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?

1

How many positions do you need to update?
Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.

Example...1 1 2 24

?

2 1 10 12

What is the updated strength of demoteam one?

Enter the number of in-place Marines from this team. Example - 2

2

What is the updated strength of demoteam two?

Enter the number of in-place Marines from this team. Example - 2

4

What is the updated strength of demoteam three?

Enter the number of in-place Marines from this team. Example - 2

4

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

1 - 81mm Mortar

2 - 105mm Gun

Enter one of the above numbers - Example...3.

?

1

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

1 3 50 50

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

RESULTS OF MORTAR FIRES ARE AS FOLLOWS;

Enemy Killed..... 3
Enemy wounded..... 1
No effect on the enemy... 1
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.1e+01minutes since
the defense of battalion objective 'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

3

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 50

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 48

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 46

What is the manpower in the BMP ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of Killed or severely wounded.

?

3

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?
6

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?
9

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no

?
0

Is your T-72 operational? :
*****Enter 1 for yes ***** 0 for no

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 6

Choose the appropriate weapon to engage the enemy.

- 1 - 120mm Mortar
- 2 - SAU 122mm Self-propelled Gun

Enter one of the above numbers i.e. 2

?
1

What is the approximate location of your target?
Enter a four digit code - Example 1 2 34 45

?

2 1 10 10

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops
?

0

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 0
Enemy wounded..... 0
No effect on the enemy... 2
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.1e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAM

Enter the appropriate number.

?

1

Which demoteam do you wish to employ?

*****Enter 1, 2, or 3

?

2

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 20 25

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 50 50

Range to the target/destination is 2.5e+02meters

Results of demoteam 2firing are below

No Effect..... 0

Walking Wounded..... 1

Liter Casualties..... 0

Killed..... 0

Casualties occurred in vicinity

grid 1- 3-50-50

Results of demoteam 2firing are below

No Effect..... 1

Walking Wounded..... 1

Liter Casualties..... 0

Killed..... 0

Casualties occurred in vicinity

grid 1- 3-50-50

Results of demoteam 2firing are below

No Effect..... 1

Walking Wounded..... 1

Liter Casualties..... 0

Killed..... 1

Casualties occurred in vicinity

grid 1- 3-50-50

Results of demoteam 2firing are below

No Effect..... 2
Walking Wounded..... 1
Litter Casualties..... 0
Killed..... 1

Casualties occurred in vicinity
grid 1- 3-50-50

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.2e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

5

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 50

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 44

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 44

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 44

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 44

What is the manpower in the BMP ?
If no casualties have been suffered,

enter '9'. Otherwise, enter 9 minus the number of killed or severely wounded.

?

3

What is the manpower in BTR-1 ?

If no casualties have been suffered, enter '9'. Otherwise, enter 9 minus the number of killed or severely wounded.

?

1

What is the manpower in BTR-2 ?

If no casualties have been suffered, enter '9'. Otherwise, enter 9 minus the number of killed or severely wounded.

?

9

Is your T-62 operational? :

*****Enter 1 for yes ***** 0 for no

?

0

Is your T-72 operational? :

*****Enter 1 for yes ***** 0 for no

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

1

Which squad do you wish to employ?

*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2

?
3

Is your squad dismounted (out of the vehicle) or mounted (inside the vehicle) ?

*****Enter 1 mounted***** 0 for dismounted

?
1

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?
1 5 15 15

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?
4 4 20 25

Range to the target/destination is 3.3e+02meters

Results of squad firing are below

No Effect.....	1
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect.....	2
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect.....	3
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect..... 4
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 4- 4-20-25

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.2e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.
?
5

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 36 25

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

1 5 15 15

Range to the target/destination is 3.3e+02meters

The target is out of your range.

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.3e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 6

Choose the appropriate weapon to engage the enemy.

- 1 - 120mm Mortar
- 2 - SAU 122mm Self-propelled Gun

Enter one of the above numbers i.e. 2

?
2

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

4 4 40 35

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 1

Enemy wounded..... 1

No effect on the enemy... 5

Enemy APC s destroyed.... 0

Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.3e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?

Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.

Example...1 1 2 24

?

4 4 40 25

What is the updated strength of demoteam one?

Enter the number of in-place Marines from this

team. Example - 2
2

What is the updated strength of demoteam two?
Enter the number of in-place Marines from this
team. Example - 2
4

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2
3

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?
2

What is the location of your weapon/demoteam?

Enter a four digit code as before.
Example 1 2 34 45

?
4 4 20 25

What is the approximate location of your
target/destination ?

Enter a four digit code as before.
Example 1 2 34 45

?
1 3 48 42

Range to the target/destination is 2.7e+02meters

Results of M60 machinegun firing are below:

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 1- 3-48-42

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.4e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

3

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.4e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 2

Which vehicle do you wish to employ?

- 1 - BMP
- 2 - BTR-60P
- 3 - T-62
- 4 - T-72

Enter one of the above numbers.

example.....3

?

1

Do you wish to employ the main gun or the
7.62mm machine gun?

*****Enter 1 for main gun ***** 0 for 7.62mm MG
0

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 1 1

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

Range to the target/destination is 1.8e+02meters

Results of PK machinegun firing are below:

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 2- 1-10-10

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.5e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?

5

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 1 1

Range to the target/destination is 1.8e+02meters

LAAW rocket has missed the target!

Give the exact weapon location to your opponent. Your weapon signature has given away your position.

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.5e+01minutes since the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 2

Which vehicle do you wish to employ?

- 1 - BMP
- 2 - BTR-60P
- 3 - T-62
- 4 - T-72

Enter one of the above numbers.

example.....3

?

1

Do you wish to employ the main gun or the
7.62mm machine gun?

*****Enter 1 for main gun ***** 0 for 7.62mm MG

1

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 3 1 1

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

Range to the target/destination is 1.8e+02meters

Is your targer enemy armor/vehicles or troops
in the open ? Enemy Iragon and TOW positions
are considered armor/vehicle targets.

*****Enter 1 for armor/vehicles ***** 0 for troops

?

0

Soviet policy dictates artillery or the coaxial
7.62mm machinegun be used against troops.

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.6e+01minutes since
the defense of battalion objective 'A' began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

- 1 - 81mm Mortar
- 2 - 105mm Gun

Enter one of the above numbers - Example...3.

?
2

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

1 3 48 48

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 0
Enemy wounded..... 0
No effect on the enemy... 1
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.6e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

3

What is the location of your weapon/demoteam?
Enter a four digit code as before.
Example 1 2 34 45

?
1 3 6 17

What is the approximate location of your target/destination ?
Enter a four digit code as before.
Example 1 2 34 45

?
2 1 10 10

Range to the target/destination is 2.1e+02meters

Rocket has missed the target!

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

1
It has been 1.7e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?
1

Which demoteam do you wish to employ?

*****Enter 1, 2, or 3

?
1

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 6 15

Range to the target/destination is 2.1e+02meters

Results of demoteam 1 firing are below

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 1- 3- 6-15

Results of demoteam 1 firing are below

No Effect..... 2
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 1- 3- 6-15

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.7e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
****Enter 1 for yes **** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
- 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
- 4 - MOVE / RETREAT
- 5 - MOUNT VEHICLES
- 6 - EMPLOY COMBINED ARMS

4

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

1 5 15 15

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 5 15 15

Range to the target/destination is 1.0e+02meters

What is your mode of travel ?

Enter one of the following.

1 - on foot

2 - tracked vehicle

3 - wheeled vehicle

3

What type of terrain are you travelling over ?

Enter one of the following.

1 - clear/flat

2 - uphill/downhill

3 - across water

1

Enter the location of a spot you are vacating.

Enter a four digit location as before

Example 1 1 23 34

1 5 15 15

How many grid borders do you cross?

example - if you go from square 1-2 to square 1-3, you cross One (1) boundary.

You would then enter 1

If you move within the same square, enter 1

?

1

Approximately where do you cross a grid border. Enter the coordinates of the square you are leaving and the square you are entering.

If you are moving within a square, enter your starting and ending locations.

Example - 1 2 50 25

1 3 1 25

1 5 15 50
2 5 15 1

You have successfully completed your move.
How many personnel/vehicles do you have to emplace?
?

1

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

2 5 15 15

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.8e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?

5

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 38 25

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

2 5 15 15

Range to the target/destination is 2.3e+02meters

LAAW rocket has missed the target!
Give the exact weapon location to your opponent. Your weapon signature has given away your position.

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.8e+01minutes since the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
- 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
- 4 - MOVE / RETREAT
- 5 - MOUNT VEHICLES
- 6 - EMPLOY COMBINED ARMS

2

Which vehicle do you wish to employ?

- 1 - BMF
- 2 - BTR-60P
- 3 - T-62
- 4 - T-72

Enter one of the above numbers.

example.....3

?

2

Do you wish to employ the main gun or the
7.62mm machine gun?

*****Enter 1 for main gun ***** 0 for 7.62mm MG

0

What is the location of your weapon/demoteam?

Enter a four digit code as before,

Example 1 2 34 45

?

2 5 15 15

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 38 25

Range to the target/destination is 2.3e+02meters

Results of PK machinegun firing are below:

No Effect..... 1
Walking Wounded..... 0
Leter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 4- 4-38-25

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 1.9e+01minutes since

the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAM

Enter the appropriate number.

?
1

Which demoteam do you wish to employ?

*****Enter 1, 2, or 3

?
2

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 20 25

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 48 50

Range to the target/destination is 2.5e+02meters

Results of demoteam 2firing are below

No Effect..... 0
Walking Wounded..... 0
Liter Casualties..... 0
Killed..... 1

Casualties occurred in vicinity
grid 1- 3-48-50

Results of demoteam 2firing are below

No Effect..... 1
Walking Wounded..... 0
Liter Casualties..... 0
Killed..... 1

Casualties occurred in vicinity
grid 1- 3-48-50

Results of demoteam 2firing are below

No Effect..... 1
Walking Wounded..... 1
Liter Casualties..... 0
Killed..... 1

Casualties occurred in vicinity
grid 1- 3-48-50

Results of demoteam 2firing are below

No Effect..... 1
Walking Wounded..... 1
Liter Casualties..... 0
Killed..... 2

Casualties occurred in vicinity
grid 1- 3-48-50

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 1.9e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.
Example...1 1 2 24

?

1 3 48 42

What is the manpower in the BMP ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of killed or severely wounded.

?

3

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of killed or severely wounded.

?

0

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of killed or severely wounded.

?

9

Is your T-62 operational?

*****Enter 1 for yes ***** 0 for no

?

0

Is your T-72 operational?

*****Enter 1 for yes ***** 0 for no

?

0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
- 3 - STOP/ENGAGE WITH INFANTRY WEAPONS

- 4 - MOVE / RETREAT
- 5 - MOUNT VEHICLES
- 6 - EMPLOY COMBINED ARMS
- 6

Choose the appropriate weapon to engage the enemy.

- 1 - 120mm Mortar
- 2 - SAU 122mm Self-propelled Gun

Enter one of the above numbers i.e. 2

?
2

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

4 4 20 25

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 1
Enemy wounded..... 1
No effect on the enemy... 4
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.0e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?

Enter the number i.e. 3

?

1
Enter the four digit code you wish to change.

Example...1 1 2 24

?

4 4 20 25

What is the updated strength of demoteam one?
Enter the number of in-place Marines from this
team. Example - 2

2

What is the updated strength of demoteam two?
Enter the number of in-place Marines from this
team. Example - 2

3

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2

3

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

1 - 81mm Mortar

2 - 105mm Gun

Enter one of the above numbers - Example...3.

?

1

What is the approximate location of your target?
Enter a four digit code - Example 1 2 34 45

?

1 3 48 42

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

RESULTS OF MORTAR FIRES ARE AS FOLLOWS;

Enemy Killed..... 0
Enemy wounded..... 0
No effect on the enemy... 0
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.0e+01minutes since
the defense of battalion objective ;'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the
following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

1

Which squad do you wish to employ?
*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2
?
3

1
Is your squad dismounted (out of the vehicle) or mounted
(inside the vehicle) ?

*****Enter 1 mounted***** 0 for dismounted

?

1

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 5 15 15

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 36 25

Range to the target/destination is 2.3e+02meters

Results of squad firing are below

No Effect.....	1
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect.....	2
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect.....	3
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-36-25

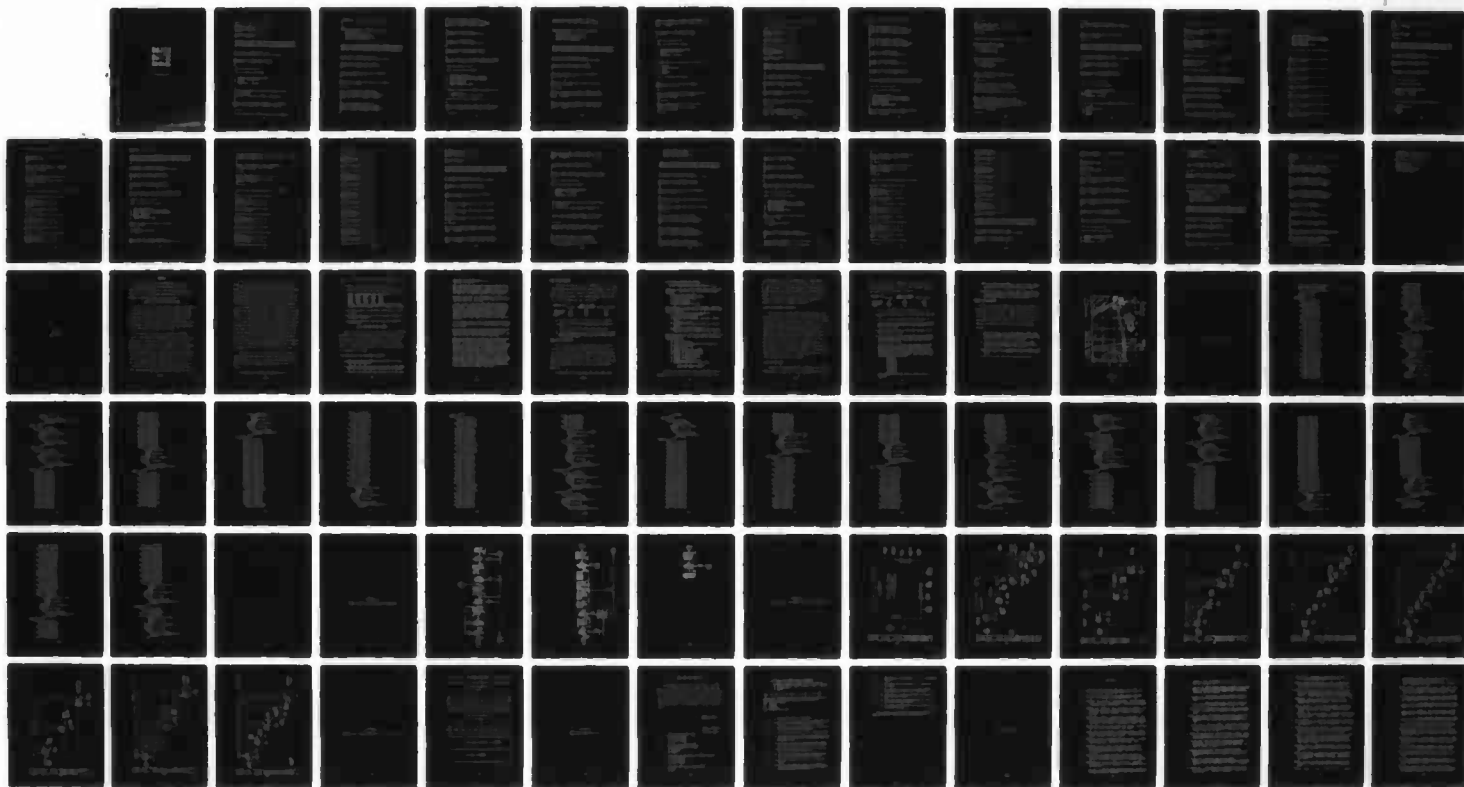
AD-A134 962

ANTI-MECHANIZED DEFENSE: A COMPUTERIZED SIMULATION FOR
SQUAD LEADER TRAINING(U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. J E WISSLER
SEP 83 AFIT-LSSR-77-83 F/G 5/9

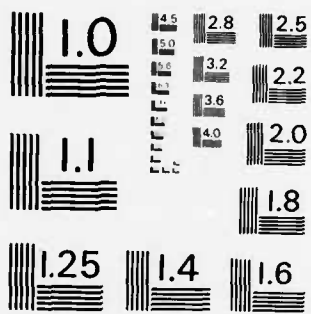
4/4

UNCLASSIFIED

NL



END
DATE
FILMED
12-83
DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Results of squad firing are below

No Effect..... 3
Walking Wounded..... 1
Litter Casualties..... 0
Killed..... 0

Casualties occurred in vicinity
grid 4- 4-36-25

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.1e+01minutes since
the defense of battalion objective ("A" began.

Do you need to update your forces?
****Enter 1 for yes **** 0 for no.

?
0

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

- 1 - 81mm Mortar
- 2 - 105mm Gun

Enter one of the above numbers - Example...3.

?
2

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

1 3 6 17

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops
?

0

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 1
Enemy wounded..... 0
No effect on the enemy... 1
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.1e+01minutes since
the defense of battalion objective 'A' began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
1

How many positions do you need to update?
Enter the number i.e. 3

?

1
Enter the four digit code you wish to change.
Example...1 1 2 24

?
1 3 6 17

What is the manpower in the BMP ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?
1

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?
0

What is the manpower in BTR-2 ?
If no casualties have been suffered, .
enter '9'. Otherwise, enter 9 minus the
number of Killed or severely wounded.

?

9

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no

?

0

Is your T-72 operational?
*****Enter 1 for yes ***** 0 for no

?

0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no

?

1

This is a poor strategic decision due to limited
manpower resources....live to fight another day!

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 6

Choose the appropriate weapon to engage the enemy.

- 1 - 120mm Mortar
- 2 - SAU 122mm Self-propelled Gun

Enter one of the above numbers i.e. 2

?

2

What is the approximate location of your target?
Enter a four digit code - Example 1 2 34 45

?

4 4 20 25

Is your target enemy armor or troops in the open?

****Enter 1 for armor **** 0 for troops

?

0

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 1

Enemy wounded..... 0

No effect on the enemy... 4

Enemy APC s destroyed.... 0

Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.2e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

****Enter 1 for yes **** 0 for no.

?

1

How many positions do you need to update?

Enter the number i.e. 3

?

1

Enter the four digit code you wish to change.

Example...1 1 2 24

?

4 4 22 25

What is the updated strength of demoteam one?

Enter the number of in-place Marines from this
team. Example - 2

2

What is the updated strength of demoteam two?

Enter the number of in-place Marines from this
team. Example - 2

2

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2
3

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no
?
1

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?
1

Which demoteam do you wish to employ?
*****Enter 1, 2, or 3

?
1

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

2 1 10 10

What is the approximate location of your
target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

1 3 20 17

Range to the target/destination is 2.4e+02meters

Results of demoteam 1 firing are below

No Effect..... 0
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 1

Casualties occurred in vicinity
grid 1- 3-20-17

Results of demoteam 1 firing are below

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 0
Killed..... 1

Casualties occurred in vicinity
grid 1- 3-20-17

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.2e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
1

How many positions do you need to update?
Enter the number i.e. 3

?

1
Enter the four digit code you wish to change.
Example...1 1 2 24

?
1 3 20 22

What is the manpower in the BMP ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the

number of Killed or severely wounded.
?
1

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of Killed or severely wounded.
?
0

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of Killed or severely wounded.
?
9

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no
?
0

Is your T-72 operational?
*****Enter 1 for yes ***** 0 for no
?
0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no
?
1

This is a poor strategic decision due to limited
manpower resources....live to fight another day!

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 4

What is the location of your weapon/demoteam?
Enter a four digit code as before.
Example 1 2 34 45

?
2 5 15 15

What is the approximate location of your target/destination ?

Enter a four digit code as before.
Example 1 2 34 45

?
3 5 15 15

Range to the target/destination is 1.0e+02meters

What is your mode of travel ?

Enter one of the following.

- 1 - on foot
- 2 - tracked vehicle
- 3 - wheeled vehicle

3

What type of terrain are you travelling over ?

Enter one of the following.

- 1 - clear/flat
- 2 - uphill/downhill
- 3 - across water

1

Enter the location of a spot you are vacating.

Enter a four digit location as before
Example 1 1 23 34

2 5 15 15

How many grid borders do you cross?

example - if you go from square 1-2 to square 1-3, you cross One (1) boundary.
You would then enter 1

If you move within the same square, enter 1

?

1

Approximately where do you cross a grid border. Enter the coordinates of the square you are leaving and the square you are entering.
If you are moving within a square, enter your starting and ending locations.

Example - 1 2 50 25
1 3 1 25

2 5 15 50

3 5 15 1

You have successfully completed your move.
How many personnel/vehicles do you have to emplace?
?

1

Enter a four digit grid to be occupied.
Example 1 2 23 45

?

3 5 15 15

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.3e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.
?
0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no
?
1

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?

5

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 42 25

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

3 5 15 15

Range to the target/destination is 1.3e+02meters

LAAW rocket hit Soviet target in vicinity
location 3- 5-15-15
Good shooting!!!

Soviet target immobilized - not destroyed.

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.3e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no

?

1

This is a poor strategic decision due to limited
manpower resources....live to fight another day!

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
- 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
- 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
- 4 - MOVE / RETREAT
- 5 - MOUNT VEHICLES
- 6 - EMPLOY COMBINED ARMS

1

How many personnel do you have to emplace?

?

9

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 6 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 8 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 10 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 12 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 14 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 16 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 18 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 20 17

Enter a four digit grid to be occupied.

Example 1 2 23 45

?

3 5 22 17

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.4e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no

?

1

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

1

Choose the appropriate weapons to engage the enemy.

- 1 - M-16A1
- 2 - M-60 machinegun
- 3 - TOW
- 4 - Dragon
- 5 - LAAW

Enter the appropriate number.

?

1

Which demoteam do you wish to employ?

****Enter 1, 2, or 3

?

3

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 36 25

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

3 5 12 17

Range to the target/destination is 1.3e+02meters

Results of demoteam 3firing are below

No Effect.....	1
Walking Wounded.....	0
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 3- 5-12-17

Results of demoteam 3firing are below

No Effect.....	1
Walking Wounded.....	1
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 3- 5-12-17

Results of demoteam 3firing are below

No Effect.....	2
Walking Wounded.....	1
Liter Casualties.....	0
Killed.....	0

Casualties occurred in vicinity
grid 3- 5-12-17

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.4e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no

?

1

This is a poor strategic decision due to limited
manpower resources....live to fight another day!

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the
following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

1

Which squad do you wish to employ?
*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2

?

3

Is your squad dismounted (out of the vehicle) or mounted (inside the vehicle) ?

****Enter 1 mounted**** 0 for dismounted

?

0

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

3 5 12 17

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 36 25

Range to the target/destination is 1.3e+02meters

Results of squad firing are below

No Effect.....	0
Walking Wounded.....	0
Liter Casualties.....	1
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect.....	0
Walking Wounded.....	0
Liter Casualties.....	1
Killed.....	1

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect.....	1
Walking Wounded.....	0
Liter Casualties.....	1
Killed.....	1

Casualties occurred in vicinity

grid 4- 4-36-25

Results of squad firing are below

No Effect..... 1
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 2

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 2

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 3

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 4

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect..... 3
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 4

Casualties occurred in vicinity
grid 4- 4-36-25

Results of squad firing are below

No Effect..... 4
Walking Wounded..... 0
Litter Casualties..... 1
Killed..... 4

Casualties occurred in vicinity
grid 4- 4-36-25

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.5e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?
Enter the number i.e. 3

?

3

Enter the four digit code you wish to change.
Example...1 1 2 24

?

4 4 36 25

Enter the four digit code you wish to change.
Example...1 1 2 24

?

4 4 38 25

Enter the four digit code you wish to change.
Example...1 1 2 24

?

4 4 42 25

What is the updated strength of demoteam one?
Enter the number of in-place Marines from this
team. Example - 2

2

What is the updated strength of demoteam two?
Enter the number of in-place Marines from this
team. Example - 2

2

What is the updated strength of demoteam three?
Enter the number of in-place Marines from this
team. Example - 2
0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no
?
1

This is a poor strategic decision due to limited
manpower resources....live to fight another day!

What do you wish to do ?

Enter the appropriate number.

- 1 - ENGAGE WITH ORGANIC WEAPONS
- 2 - REQUEST FIRE SUPPORT
- 3 - WAIT
- 4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

- 1 - 81mm Mortar
- 2 - 105mm Gun

Enter one of the above numbers - Example...3.

?
2

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

3 5 12 17

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

Artillery has no effect on APC because
anti-personnel ammunition was requested.

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 2

Enemy wounded..... 2
No effect on the enemy... 5
Enemy APC s destroyed.... 0
Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.5e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?
1

How many positions do you need to update?
Enter the number i.e. 3

? :

2
Enter the four digit code you wish to change.
Example...1 1 2 24

? :

3 5 12 17
Enter the four digit code you wish to change.
Example...1 1 2 24

? :

3 5 14 17

What is the manpower in the BMP ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?
1

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the
number of killed or severely wounded.

?
0

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter '9'. Otherwise, enter 9 minus the

number of killed or severely wounded.

?

7

Is your T-62 operational?

*****Enter 1 for yes ***** 0 for no

?

0

Is your T-72 operational?

*****Enter 1 for yes ***** 0 for no

?

0

Do you wish to continue the battle?

*****Enter 1 for yes ***** 0 for no

?

1

This is a poor strategic decision due to limited manpower resources....live to fight another day!

What do you wish to do ?

Enter the appropriate number.

- 1 - STOP AND DISMOUNT
 - 2 - STOP/ENGAGE WITH VEHICLE WEAPONS
 - 3 - STOP/ENGAGE WITH INFANTRY WEAPONS
 - 4 - MOVE / RETREAT
 - 5 - MOUNT VEHICLES
 - 6 - EMPLOY COMBINED ARMS
- 3

Choose the appropriate weapon from the following menu.

- 1 - AKMS
- 2 - PK Light Machinegun
- 3 - RPG-7

1

Which squad do you wish to employ?

*****Enter 1 for BMP***** 2 for BTR1***** 3 for BTR2

?

3

Is your squad dismounted (out of the vehicle) or mounted (inside the vehicle) ?

*****Enter 1 mounted***** 0 for dismounted

?
0

What is the location of your weapon/demoteam?

Enter a four digit code as before.

Example 1 2 34 45

?

3 5 12 17

What is the approximate location of your target/destination ?

Enter a four digit code as before.

Example 1 2 34 45

?

4 4 20 25

Range to the target/destination is 1.4e+02meters

Results of squad firing are below

No Effect.....	0
Walking Wounded.....	0
Liter Casualties.....	1
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect.....	0
Walking Wounded.....	1
Liter Casualties.....	1
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect.....	1
Walking Wounded.....	1
Liter Casualties.....	1
Killed.....	0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect.....	1
----------------	---

Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect..... 2
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect..... 3
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 0

Casualties occurred in vicinity
grid 4- 4-20-25

Results of squad firing are below

No Effect..... 4
Walking Wounded..... 1
Litter Casualties..... 2
Killed..... 0

Casualties occurred in vicinity
grid 4- 4-20-25

Identify yourself *** Marine enter 1 *** Enemy enter 0

1

It has been 2.6e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?
*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?

Enter the number i.e. 3

?

2

Enter the four digit code you wish to change.

Example...1 1 2 24

?

4 4 24 25

Enter the four digit code you wish to change.

Example...1 1 2 24

?

4 4 26 25

What is the updated strength of demoteam one?

Enter the number of in-place Marines from this team. Example - 2

2

What is the updated strength of demoteam two?

Enter the number of in-place Marines from this team. Example - 2

0

What is the updated strength of demoteam three?

Enter the number of in-place Marines from this team. Example - 2

0

Do you wish to continue the battle?

*****Enter 1 for yes ***** 0 for no

?

1

This is a poor strategic decision due to limited manpower resources....live to fight another day!

What do you wish to do ?

Enter the appropriate number.

1 - ENGAGE WITH ORGANIC WEAPONS

2 - REQUEST FIRE SUPPORT

3 - WAIT

4 - DISENGAGE / RETREAT

2

Choose the appropriate weapon to engage the enemy.

1 - 81mm Mortar

2 - 105mm Gun

Enter one of the above numbers - Example...3.

?

2

What is the approximate location of your target?

Enter a four digit code - Example 1 2 34 45

?

3 5 12 17

Is your target enemy armor or troops in the open?

*****Enter 1 for armor ***** 0 for troops

?

0

Artillery has no effect on APC because
anti-personnel ammunition was requested.

RESULTS OF ARTILLERY FIRES ARE AS FOLLOWS;

Enemy Killed..... 2

Enemy wounded..... 0

No effect on the enemy... 5

Enemy APC s destroyed.... 0

Enemy Tanks destroyed.... 0

Identify yourself *** Marine enter 1 *** Enemy enter 0

0

It has been 2.6e+01minutes since
the defense of battalion objective "A" began.

Do you need to update your forces?

*****Enter 1 for yes ***** 0 for no.

?

1

How many positions do you need to update?

Enter the number i.e. 3

?

2

Enter the four digit code you wish to change.

Example...1 1 2 24

?
3 5 10 17
Enter the four digit code you wish to change.
Example...1 1 2 24

?
3 5 16 17

What is the manpower in the BMP ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.

?
1

What is the manpower in BTR-1 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.

?
0

What is the manpower in BTR-2 ?
If no casualties have been suffered,
enter "9". Otherwise, enter 9 minus the
number of Killed or severely wounded.

?
5

Is your T-62 operational?
*****Enter 1 for yes ***** 0 for no

?
0

Is your T-72 operational?
*****Enter 1 for yes ***** 0 for no

?
0

Do you wish to continue the battle?
*****Enter 1 for yes ***** 0 for no

?
0

This is a wise strategic decision due to limited
manpower resources....live to fight another day!

Marines have successfully defended !
Soviets withdrew after 2.6e+01minutes
of beginning the engagement.

FINAL MARINE STATISTICS ARE AS FOLLOWS:

Demoteam one survivors.... 2
Demoteam two survivors.... 0
Demoteam three survivors.. 0

SOVIET FINAL STATISTICS ARE AS FOLLOWS

BMP survivors 1
BTR1 survivors 0
BTR2 survivors 5
T-62s operational ... 0
T-72s operational ... 0

%

APPENDIX C
RULES FOR PLAY

GENERAL

The following rules are provided to ease the play of the game and insure a realistic experience for those involved in playing the game. The rules are divided into three sets, one for the game administrator, one for the Marine player, and one for the Soviet player.

RULES FOR THE GAME ADMINISTRATOR

Understanding of the grid reference system incorporated in the game is essential to productive and enjoyable play. The grid reference system used in this simulation war game varies from the standard military grid reference system. To aid in understanding a description of the game's grid reference system, read the following paragraphs and locate the points discussed on the game map provided.

The game map is divided into twenty-four squares (grids), four vertically (north-south), and six horizontally (east-west). Each of the grids is identified by a two-number code corresponding to its location. As an example, the northwest corner of the map contains grid 1-1. Similarly, the southwest corner contains grid 4-1, the northeast corner, grid 1-6, and the southeast corner, grid 4-6. From north to south, the river lies in grids 1-2, 2-2, 3-2, 4-2. The lone highground in the southern portion of the map lies in grids 4-3, 4-4, and 4-5. Each of the twenty-four major grids represents a 100 meter by 100meter section of terrain.

Each of the major grids is further divided into fifty elements across and fifty elements down. Each of the sub-elements of a major grid represents a two meter by two meter section of terrain. To locate an object, a four-number sequence must be provided. The first two numbers identify the major grid, and the last two identify the exact location within that major grid square. As an example, coordinates for the bridge would be, 3-2-45-48. The center of grid 3-3 would be designated 3-3-25-25. The third number in the four number sequence identifies how far the point is with respect to the left edge of the major grid. Remember, each grid is divided into fifty elements across and down, so the element nearest the left edge is one, while the element along the right edge is fifty. Similarly, the fourth number identifies the distance (number of elements) from the top of the major grid to the point of interest. A point centered at the top of grid 4-1 would be represented by the coordinates 4-1-25-1. A point centered along the bottom edge of grid 3-2 would be represented by the coordinates 3-2-25-50.

Instruction should be provided to all participants regarding the grid reference system prior to play. As the administrator you must be intimately familiar with this system and insure each player understands its use prior to play.

In addition to preparing the players for use of the

grid system, the administrator's duties include the following:

1. Begin execution of the simulation wargame.
2. Enter "0" for game play, when prompted by the game.
3. Enter a random number from the following list
6793 6904 9564 7026 7513
2158 7327 5384 1301 7211
5995 8902 3333 4353 4491
1791 6684 6021 2116 3085
8484 7810 7772 1169 5720
Insure a different random number is entered each time the game is played until all numbers are used.
4. Collect reports as required by each player's rules for play.
5. Assist players only with the mechanics of play, not strategy or tactics.
6. Critique players (if desired) only upon completion of the game.

RULES FOR THE MARINE PLAYER

Rules for the Marine player are broken down into three categories, Rules for Weapons and Personnel Placement, Rules for Movement, and Rules for Engagement. These rules are based on Marine Corps doctrine and the needs of the computer. Any deviation from these rules lessens the realism and enjoyment of the game.

RULES FOR WEAPONS AND PERSONNEL PLACEMENT

1. Only one person or weapon may be placed in a single four-digit coordinate.
2. Locations must be given for each person in each demo team and each major weapons system (TOW and Dragon).
3. Locations (coordinates) must be given as a four num-

ber sequence separated by spaces.
Example...2 2 25 37

4. When responding to the game's prompts (questions), respond with the appropriate number provided. Any deviation from the numbers provided will result in termination of the game. BE CAREFUL TO TYPE ZERO (0) AND NOT "o" WHEN RESPONDING TO GAME PROMPTS!
5. Remember, you have only thirteen men available to emplace obstacles. Your attached weapons crews are not available for this task.
6. If the Soviets catch your men emplacing obstacles, you have the initial move, however you must choose your 'MOVE ' option and place your men in the location of the obstacle being completed. When first asked the location vacated, enter the coordinates (one for each man emplacing the obstacle) of the obstacle. When asked again to enter a location being vacated, enter their respective demo team locations.
7. If the Soviet forces catch your men emplacing obstacles, the obstacles not yet completed have no effect on the enemy.
8. All obstacles completed will be annotated on the opponents map with the exception of the minefield. These obstacles (demolished bridge, road crater, and anti-tank ditch) are all visible obstacles.
9. When the Soviet player passes you the results of his weapons employment, you must adjust locations for personnel in either the liter casualty or killed status. This reduces the fighting power of the demo team in the vicinity of the casualties and appropriate adjustments must be made. If the number of killed and liter casualty personnel exceed the number remaining in that demo team, only reduce your forces by the number of personnel remaining. Example... If the Soviet passes 3 KIAs and 4 liter casualties, and you only have 2 personnel in the demo team, only update two positions corresponding to the two remaining members. The extra shots merely represent overkill. Those shots listed as no effect or wounded DO NOT affect your fighting capability and there is no need to update personnel locations.

RULES FOR MOVEMENT

Movement on the battlefield is limited by the simulated time duration of each turn. The time simulated in each turn equals thirty seconds. Movement is further limited by terrain and mode of travel. The following table lists the maximum travel distance per turn, in meters.

TERRAIN TYPE	MODE OF TRAVEL		
	ON FOOT	TRACKED VEHICLE	WHEELED VEHICLE
Flat/Clear	50	150	100
Inclined	25	100	40
Water	N/A	25	25

1. Travel over water must be completed in a vehicle.
2. Only one demo team or attached weapon may move per turn.
3. You may not move and shoot in the same turn.
4. You may not move through buildings, however you may move to a building in one turn, and through it on the following turn.

RULES FOR ENGAGEMENT

Prior to playing the game, you should have received training in the specific effectiveness characteristics of the weapons at your disposal. Remember the maximum effective range of the weapons you employ, and do not attempt to engage armor targets with small arms. Be aware of the limitations in available rounds for each of your attached weapons.

1. When you fire at the enemy, you must report your

- approximate position to him if;
- a. He has dismounted troops
 - b. You engage him with TOW, Dragon, or LAAW
2. You must write out a SALUTE report upon sighting of the enemy. The report will be in the following format:
- S Size of the enemy unit
 - A Activity of the unit sighted
 - L Location (coordinates)
 - U Unit description
 - T Time of sighting
 - E Enemy equipment observed
3. Upon completion of the enemy engagement, complete the following casualty report for each of your demo team casualties.
- a. Initial and SSN of injured Marine
 - b. Time of injury (approximate)
 - c. Location (coordinates)
 - d. Type of wound (gunshot, shrapnel, concussion)
 - e. Location of wound
 - f. Seriousness of wound (serious, non-serious, dead)
 - g. Evacuation status (yes or no)
 - h. Activity currently engaged in (patrol, offensive tactics, defensive tactics, other)
4. You must write out a SPOT report upon completion of enemy engagement. This report will be in the following format:
- a. Your unit
 - b. Time of sighting
 - c. Location of (1) your unit (2) enemy unit
 - d. Means of sighting
 - e. Action taken
 - f. Number of friendly killed
 - g. Number of friendly wounded
 - h. Number of friendly missing
 - i. Number of enemy killed
 - j. Number of enemy wounded
 - k. Number of POWs taken
 - l. Weapons captured or lost
 - m. Equipment captured or destroyed

RULES FOR SOVIET PLAYER

The rules for the Soviet player are divided into three separate categories, Rules for Personnel Placement, Rules

for Movement and Rules for Engagement. Strict compliance with these rules is necessary to provide a realistic and enjoyable experience for both players. These rules are based on Soviet tactics and doctrine and the needs of the game. When responding to the system prompts (questions), enter the appropriate numbered response. ALWAYS TYPE IN NUMBERS, LETTERS WILL TERMINATE THE GAME!

RULES FOR PERSONNEL PLACEMENT

When the Marine player passes you the results of his weapons employment, you must adjust locations for personnel in either the liter casualty or killed status. This reduces the fighting power of the squad in the vicinity of the casualties and appropriate adjustments must be made. If the number of killed and liter casualty personnel exceed the number remaining in that squad, only reduce your forces by the number of personnel remaining. Example... If the Marine passes 3 KIAs and 4 liter casualties, and you only have 2 personnel in the squad, only update two positions corresponding to the two remaining members. The extra shots merely represent overkill. Those personnel merely wounded still maintain the ability to fight.

RULES FOR MOVEMENT

Movement on the battlefield is limited by the simulated time duration of each turn. The time simulated in each turn

equals thirty seconds. Movement is further limited by terrain and mode of travel. The following table lists the maximum travel distance per turn, in meters.

TERRAIN TYPE	MODE OF TRAVEL		
	ON FOOT	TRACKED VEHICLE	WHEELED VEHICLE
Flat/Clear	50	150	100
Inclined	25	100	40
Water	N/A	25	25

1. Travel over water must be completed in a vehicle.
2. Only one infantry squad or vehicle/tank may move per turn.
3. You may not move and shoot in the same turn.
4. You may not move through buildings, however you may move to a building in one turn, and through it on the following turn.
5. Immobilized vehicles may fire their weapons, however they may not move.
6. If you attempt to cross an anti-tank ditch or road crater, you must wait three turns on your side before proceeding. This simulates the delaying action of the obstacle.
7. When dismounting a vehicle, all of your squad must dismount. Those personnel dismounting will be placed on line in front of their vehicle, two or three squares apart, evenly divided on either side of the vehicle. As an example, if your vehicle is located at 1-3-15-15, you would deploy your forces in the following locations:
 - 1-3-6-17
 - 1-3-8-17
 - 1-3-10-17
 - 1-3-12-17
 - 1-3-14-17
 - 1-3-16-17
 - 1-3-18-17
 - 1-3-20-17
 - 1-3-22-17

The crewmen inside the vehicle, remain inside the vehicle.

8. At the start of the game, you have only your T-62 and T-72 on the battlefield. They are located at coordinates 1-3-1-1 (T-62) and 1-4-1-1 (T-72).
9. After one minute of simulated time, your APCs arrive at locations 1-3-15-15 (BMP), 1-4-15-15 (BTR), and 1-5-15-15 (BTR). At this point, movement and employment of weapons are your decisions.

RULES OF ENGAGEMENT

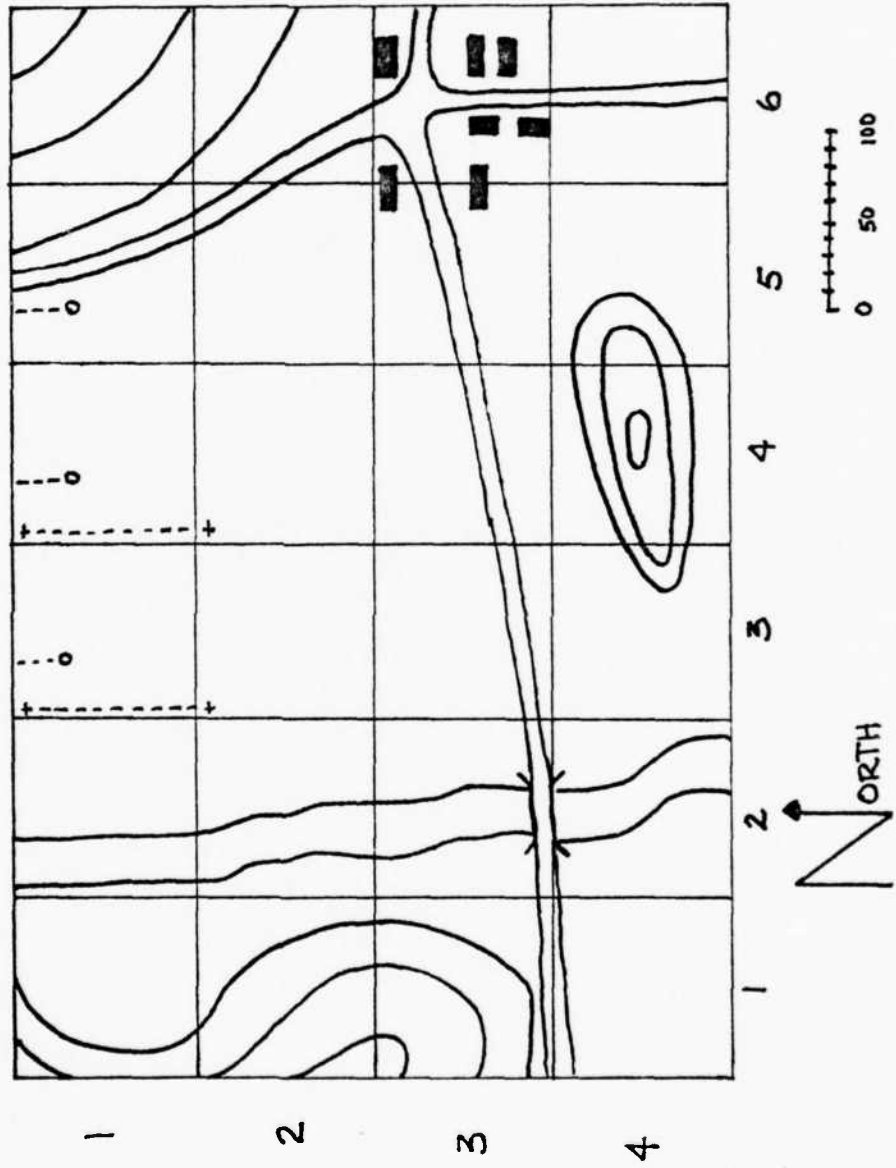
Prior to playing the game, you should have received training in the specific effectiveness characteristics of the weapons at your disposal. Remember the maximum effective range of the weapons you employ, and do not attempt to engage armor targets with small arms. Be aware of the limitations in available rounds for each of your attached weapons.

1. The main guns on each of the vehicles (tanks and APCs) will engage only anti-tank weapons and other vehicle targets. Failure to comply with these rules will result in forfeiture of your turn.
2. Indirect fire weapons will be ineffective until initially fired at enemy targets. This simulates adjustment of the indirect fire weapons.
3. You may not fire at the Marine players weapons until he has fired. This simulates his cover and concealment.
4. No reports are required of the Soviet player.

----- PATH OF MOVEMENT

+ - INITIAL TANK POSITIONS

o - INITIAL APC POSITIONS



GAME MAP

APPENDIX D
TERRAIN CREATION PROGRAM LISTING

```

program thesis (file1,output);
type text = file of char;
var a,e,n,x,y : integer;
    map : array[1..4,1..6,1..50,1..50] of integer;
    file1: text;
begin
rewrite(file1);
(* SQUARE 1-1*)
for x:=1 to 3 do
  for y:=1 to 50 do
    map[1,1,x,y]:=1;
for x:=4 to 4 do
  for y:=1 to 54 do
    map[1,1,x,y]:=1;
for x:= 4 to 4 do
  for y:=36 to 50 do
    map[1,1,x,y]:=1;
for x:=5 to 5 do
  for y:=1 to 24 do
    map[1,1,x,y]:=1;
for x:=5 to 5 do
  for y:= 42 to 50 do
    map[1,1,x,y]:=1;
for x:=6 to 6 do
  for y:=1 to 20 do
    map[1,1,x,y]:=1;
for x:= 6 to 6 do
  for y:= 46 to 50 do
    map[1,1,x,y]:=1;
for x:=7 to 7 do
  for y:=1 to 16 do
    map[1,1,x,y]:=1;
for x:=7 to 7 do
  for y:= 48 to 50 do
    map[1,1,x,y]:=1;
for x:=8 to 8 do
  for y:=1 to 13 do
    map[1,1,x,y]:=1;
for x:= 8 to 8 do
  for y:= 48 to 50 do
    map[1,1,x,y]:=1;
for x:=9 to 10 do
  for y:=1 to 10 do
    map[1,1,x,y]:=1;
for x:=11 to 11 do
  for y:=1 to 9 do
    map[1,1,x,y]:=1;
for x:=12 to 12 do
  for y:=1 to 7 do
    map[1,1,x,y]:=1;
for x:=13 to 13 do
  for y:=1 to 5 do

```

```

    map[1,1,x,y]:=1;
  for x:=14 to 14 do
    for y:=1 to 4 do
      map[1,1,x,y]:=1;
    for x:=15 to 15 do
      for y:=1 to 3 do
        map[1,1,x,y]:=1;
      for x:=16 to 16 do
        for y:=1 to 2 do
          map[1,1,x,y]:=1;
        for x:=17 to 17 do
          for y:=1 to 1 do
            map[1,1,x,y]:=1;
          for x:= 1 to 50 do
            for y:=1 to 50 do
              if map[1,1,x,y]<>1 then
                begin
                  map[1,1,x,y]:=0;
                end;
              writeln('This is square 1-1 ');
              writeln;
              for y:= 1 to 50 do
                begin
                  for x:= 1 to 50 do
                    write(file1,map[1,1,x,y]:2);
                    writeln;
                  end;
                end;
              (* SQUARE 1-2*)
              for x:= 1 to 3 do
                for y:= 1 to 50 do
                  map[1,2,x,y]:=1;
                for x:= 15 to 50 do
                  for y:= 1 to 50 do
                    map[1,2,x,y]:=1;
                  for x:= 1 to 50 do
                    for y:= 1 to 50 do
                      begin
                        if (map[1,2,x,y]<>1) then
                          begin
                            map[1,2,x,y]:=3;
                          end
                        end;
                      end;
                    for x:= 1 to 50 do
                      for y:= 1 to 50 do
                        begin
                          if (map[1,2,x,y]=1) then
                            begin
                              map[1,2,x,y]:=0;
                            end
                          end;
                        end;
                      end;
                    writeln('This is square 1-2 ');
                    writeln;

```



```

        for y:= 1 to 50 do
            begin
                for x:= 1 to 50 do
                    write(file1,map[1,2,x,y]:2);
                    writeln;
                end
            end
        (* SQUARE 1-3*)
        for x:= 1 to 50 do
            for y:= 1 to 50 do
                map[1,3,x,y]:=0;
                writeln('This is square 1-3 ');
                writeln;
                for y:= 1 to 50 do
                    begin
                        for x:= 1 to 50 do
                            write(file1,map[1,3,x,y]:2);
                            writeln;
                        end
                    end
                end
            end
        (* SQUARE 1-4*)
        for x:= 1 to 50 do
            for y:= 1 to 50 do
                map[1,4,x,y]:=0;
                writeln('This is square 1-4 ');
                writeln;
                for y:= 1 to 50 do
                    begin
                        for x:= 1 to 50 do
                            write(file1,map[1,4,x,y]:2);
                            writeln;
                        end
                    end
                end
            end
        (* SQUARE 1-5*)
        for y:= 1 to 5 do
            map[1,5,31,y]:=1;
        for y:= 1 to 9 do
            map[1,5,32,y]:=1;
        for y:= 1 to 12 do
            map[1,5,33,y]:=1;
        for y:= 1 to 15 do
            map[1,5,34,y]:=1;
        for y:= 1 to 18 do
            map[1,5,35,y]:=1;
        for y:= 1 to 20 do
            map[1,5,36,y]:=1;
        for y:= 1 to 22 do
            map[1,5,37,y]:=1;
        for y:= 1 to 24 do
            map[1,5,38,y]:=1;
        for y:= 1 to 27 do
            map[1,5,39,y]:=1;
        for y:= 1 to 29 do
            map[1,5,40,y]:=1;
        for y:= 1 to 31 do

```

```

    map[1,5,41,y]:=1;
  for y:= 1 to 33 do
    map[1,5,42,y]:=1;
  for y:= 1 to 36 do
    map[1,5,43,y]:=1;
  for x:= 44 to 45 do
    for y:= 1 to 38 do
      map[1,5,x,y]:=1;
    for y:= 1 to 40 do
      map[1,5,46,y]:=1;
    for y:= 1 to 42 do
      map[1,5,47,y]:=1;
    for y:= 1 to 43 do
      map[1,5,48,y]:=1;
    for y:= 1 to 44 do
      map[1,5,49,y]:=1;
    for y:= 1 to 45 do
      map[1,5,50,y]:=1;
  for x:= 1 to 50 do
    for y:= 1 to 50 do
      if (map[1,5,x,y]<>1) then
        begin
          map[1,5,x,y]:=0;
        end;
      writeln('This is square 1-5 ');
      writeln;
      for y:= 1 to 50 do
        begin
          for x:= 1 to 50 do
            write(file1,map[1,5,x,y]:2);
            writeln;
          end
        end
      end
    end
  (* SQUARE 1-6*)
  for x:= 1 to 50 do
    for y:= 1 to 45 do
      map[1,6,x,y]:=1;
    for x:= 2 to 50 do
      for y:= 46 to 46 do
        map[1,6,x,y]:=1;
      for x:= 3 to 50 do
        for y:= 47 to 47 do
          map[1,6,x,y]:=1;
        for x:= 4 to 50 do
          for y:= 48 to 48 do
            map[1,6,x,y]:=1;
          for x:= 5 to 50 do
            for y:= 49 to 49 do
              map[1,6,x,y]:=1;
            for x:= 6 to 50 do
              for y:= 50 to 50 do
                map[1,6,x,y]:=1;
              for x:= 1 to 50 do

```

```

for y:= 1 to 50 do
  if (map[1,6,x,y]<>1) then
    begin
      map[1,6,x,y]:=0;
    end;
  writeln('This is square 1-6 ');
  writeln;
  for y:= 1 to 50 do
    begin
      for x:= 1 to 50 do
        write(file1,map[1,6,x,y]:2);
        writeln;
      end
    end
  end
(* SQUARE 2-1*)
for x:= 1 to 8 do
  map[2,1,x,1]:=1;
for x:= 1 to 10 do
  map[2,1,x,2]:=1;
for x:= 1 to 12 do
  map[2,1,x,3]:=1;
for x:= 1 to 14 do
  map[2,1,x,4]:=1;
for x:= 1 to 15 do
  map[2,1,x,5]:=1;
for x:= 1 to 17 do
  map[2,1,x,6]:=1;
for x:= 1 to 18 do
  map[2,1,x,7]:=1;
for x:= 1 to 20 do
  map[2,1,x,8]:=1;
for x:= 1 to 21 do
  map[2,1,x,9]:=1;
for x:= 1 to 22 do
  map[2,1,x,10]:=1;
for x:= 1 to 23 do
  map[2,1,x,11]:=1;
for x:= 1 to 23 do
  map[2,1,x,12]:=1;
for x:= 1 to 24 do
  map[2,1,x,13]:=1;
for x:= 1 to 25 do
  for y:= 14 to 15 do
    map[2,1,x,y]:=1;
  end
for x:= 1 to 26 do
  map[2,1,x,16]:=1;
for x:= 1 to 27 do
  map[2,1,x,17]:=1;
for x:= 1 to 28 do
  map[2,1,x,18]:=1;
for x:= 1 to 29 do
  for y:= 19 to 20 do
    map[2,1,x,y]:=1;
  end
end

```

```

for x:= 1 to 30 do
  for y:= 21 to 21 do
    map[2,1,x,y]:=1;
for x:= 1 to 31 do
  for y:= 22 to 22 do
    map[2,1,x,y]:=1;
for x:= 1 to 32 do
  for y:= 23 to 24 do
    map[2,1,x,y]:=1;
for x:= 1 to 33 do
  for y:= 25 to 26 do
    map[2,1,x,y]:=1;
for x:= 1 to 34 do
  for y:= 27 to 28 do
    map[2,1,x,y]:=1;
for x:= 1 to 35 do
  for y:= 29 to 30 do
    map[2,1,x,y]:=1;
for x:= 1 to 36 do
  for y:= 31 to 31 do
    map[2,1,x,y]:=1;
for x:= 1 to 37 do
  for y:= 32 to 33 do
    map[2,1,x,y]:=1;
for x:= 1 to 38 do
  for y:= 34 to 35 do
    map[2,1,x,y]:=1;
for x:= 1 to 39 do
  for y:= 36 to 38 do
    map[2,1,x,y]:=1;
for x:= 1 to 40 do
  for y:= 39 to 42 do
    map[2,1,x,y]:=1;
for x:= 1 to 41 do
  for y:= 43 to 46 do
    map[2,1,x,y]:=1;
for x:= 1 to 42 do
  for y:= 47 to 50 do
    map[2,1,x,y]:=1;
for x:= 1 to 50 do
  for y:=1 to 50 do
    if map[2,1,x,y]<>1 then
      begin
        map[2,1,x,y]:=0;
      end;
  writeln('This is square 2-1 ');
  writeln;
  for y:= 1 to 50 do
    begin
      for x:= 1 to 50 do
        write(file1,map[2,1,x,y]:2);
        writeln;

```

```

end
(* SQUARE 2-2*)
for x:= 1 to 3 do
  for y:= 1 to 17 do
    map[2,2,x,y]:=1;
  for x:= 15 to 50 do
    for y:= 1 to 17 do
      map[2,2,x,y]:=1;
    for x:= 1 to 4 do
      map[2,2,x,18]:=1;
    for x:= 16 to 50 do
      map[2,2,x,18]:=1;
    for x:= 1 to 5 do
      map[2,2,x,19]:=1;
    for x:= 17 to 50 do
      map[2,2,x,19]:=1;
    for x:= 1 to 6 do
      for y:= 20 to 30 do
        map[2,2,x,y]:=1;
      for x:= 18 to 50 do
        for y:= 20 to 30 do
          map[2,2,x,y]:=1;
        for x:= 1 to 7 do
          map[2,2,x,31]:=1;
        for x:= 19 to 50 do
          map[2,2,x,31]:=1;
        for x:= 1 to 8 do
          map[2,2,x,32]:=1;
        for x:= 20 to 50 do
          map[2,2,x,32]:=1;
        for x:= 1 to 9 do
          map[2,2,x,33]:=1;
        for x:= 21 to 50 do
          map[2,2,x,33]:=1;
        for x:= 1 to 10 do
          map[2,2,x,34]:=1;
        for x:= 22 to 50 do
          map[2,2,x,34]:=1;
        for x:= 1 to 11 do
          for y:= 35 to 39 do
            map[2,2,x,y]:=1;
          for x:= 23 to 50 do
            for y:= 35 to 39 do
              map[2,2,x,y]:=1;
            for x:= 1 to 12 do
              map[2,2,x,40]:=1;
            for x:= 24 to 50 do
              map[2,2,x,40]:=1;
            for x:= 1 to 13 do
              map[2,2,x,41]:=1;
            for x:= 25 to 50 do
              map[2,2,x,41]:=1;

```

```

for x:= 1 to 13 do
  for y:= 42 to 50 do
    map[2,2,x,y]:=1;
  for x:= 26 to 50 do
    for y:= 42 to 50 do
      map[2,2,x,y]:=1;
    for x:= 1 to 50 do
      for y:= 1 to 50 do
        begin
          if (map[2,2,x,y]<>1) then
            begin
              map[2,2,x,y]:=3;
            end
          end;
        for x:= 1 to 50 do
          for y:= 1 to 50 do
            begin
              if (map[2,2,x,y]=1) then
                begin
                  map[2,2,x,y]:=0;
                end
              end;
            writeln('This is square 2-2 ');
            writeln;
            for y:= 1 to 50 do
              begin
                for x:= 1 to 50 do
                  write(file1,map[2,2,x,y]:2);
                  writeln;
                end
              end
            end
          (*SQUARE 2-3*)
          for x:= 1 to 50 do
            for y:= 1 to 50 do
              map[2,3,x,y]:=0;
              writeln('This is square 2-3 ');
              writeln;
              for y:= 1 to 50 do
                begin
                  for x:= 1 to 50 do
                    write(file1,map[2,3,x,y]:2);
                    writeln;
                  end
                end
              end
            end
          (*SQUARE 2-4*)
          for x:=1 to 50 do
            for y:= 1 to 50 do
              map[2,4,x,y]:=0;
            writeln('This is square 2-4 ');
            writeln;
            for y:= 1 to 50 do
              begin
                for x:= 1 to 50 do
                  write(file1,map[2,4,x,y]:2);

```

```

        writeln;
    end;
(*SQUARE 2-5*)
    for x:=1 to 50 do
        for y:= 1 to 50 do
            map[2,5,x,y]:=0;
            writeln('This is square 2-5 ');
            writeln;
            for y:= 1 to 50 do
                begin
                    for x:= 1 to 50 do
                        write(file1,map[2,5,x,y]:2);
                        writeln;
                    end
                end
            end
        end
    end
(*SQUARE 2-6*)
    for x:= 6 to 50 do
        map[2,6,x,1]:=1;
    for x:= 8 to 50 do
        map[2,6,x,2]:=1;
    for x:= 9 to 50 do
        map[2,6,x,3]:=1;
    for x:= 11 to 50 do
        map[2,6,x,4]:=1;
    for x:= 13 to 50 do
        map[2,6,x,5]:=1;
    for x:= 15 to 50 do
        map[2,6,x,6]:=1;
    for x:= 17 to 50 do
        map[2,6,x,7]:=1;
    for x:= 18 to 50 do
        map[2,6,x,8]:=1;
    for x:= 19 to 50 do
        map[2,6,x,9]:=1;
    for x:= 21 to 50 do
        map[2,6,x,10]:=1;
    for x:= 22 to 50 do
        map[2,6,x,11]:=1;
    for x:= 24 to 50 do
        map[2,6,x,12]:=1;
    for x:= 26 to 50 do
        map[2,6,x,13]:=1;
    for x:= 28 to 50 do
        map[2,6,x,14]:=1;
    for x:= 30 to 50 do
        map[2,6,x,15]:=1;
    for x:= 32 to 50 do
        map[2,6,x,16]:=1;
    for x:= 35 to 50 do
        map[2,6,x,17]:=1;
    for x:= 37 to 50 do
        map[2,6,x,18]:=1;
    for x:= 39 to 50 do

```

```

    map[2,6,x,19]:=1;
    for x:= 41 to 50 do
        map[2,6,x,20]:=1;
    for x:= 44 to 50 do
        map[2,6,x,21]:=1;
    for x:= 47 to 50 do
        map[2,6,x,22]:=1;
    for x:= 50 to 50 do
        map[2,6,x,23]:=1;
    for x:=1 to 50 do
        for y:= 1 to 50 do
            if (map[2,6,x,y]<>1) then
                begin
                    map[2,6,x,y]:=0;
                end;
            writeln('This is square 2-6 ');
            writeln;
            for y:= 1 to 50 do
                begin
                    for x:= 1 to 50 do
                        write(file1,map[2,6,x,y]:2);
                        writeln;
                    end
                end
            end

```

(*SQUARE 3-1*)

```

    for x:= 1 to 42 do
        for y:= 1 to 21 do
            map[3,1,x,y]:=1;
        for x:= 1 to 41 do
            for y:= 22 to 23 do
                map[3,1,x,y]:=1;
            for x:= 1 to 40 do
                for y:= 24 to 25 do
                    map[3,1,x,y]:=1;
                for x:= 1 to 39 do
                    for y:= 26 to 27 do
                        map[3,1,x,y]:=1;
                    for x:= 1 to 38 do
                        map[3,1,x,28]:=1;
                    for x:= 1 to 37 do
                        for y:= 29 to 30 do
                            map[3,1,x,y]:=1;
                        for x:= 1 to 36 do
                            map[3,1,x,31]:=1;
                        for x:= 1 to 34 do
                            for y:= 32 to 33 do
                                map[3,1,x,y]:=1;
                            for x:= 1 to 33 do
                                map[3,1,x,34]:=1;
                            for x:= 1 to 32 do
                                map[3,1,x,35]:=1;
                            for x:= 1 to 31 do
                                map[3,1,x,36]:=1;

```



```

for x:= 1 to 30 do
  map[3,1,x,37]:=1;
for x:= 1 to 29 do
  map[3,1,x,38]:=1;
for x:= 1 to 28 do
  map[3,1,x,39]:=1;
for x:= 1 to 27 do
  map[3,1,x,40]:=1;
for x:= 1 to 26 do
  map[3,1,x,41]:=1;
for x:= 1 to 25 do
  map[3,1,x,42]:=1;
for x:= 1 to 24 do
  map[3,1,x,43]:=1;
for x:=1 to 50 do
  for y:= 1 to 50 do
    if (map[3,1,x,y]<>1) then
      begin
        map[3,1,x,y]:=0;
      end;
    writeln('This is square 3-1 ');
    writeln;
    for y:= 1 to 50 do
      begin
        for x:= 1 to 50 do
          write(file1,map[3,1,x,y]:2);
          writeln;
        end
      end
    end
  end
end
(*SQUARE 3-2*)
for x:= 1 to 13 do
  for y:= 1 to 23 do
    map[3,2,x,y]:=1;
  for x:= 26 to 50 do
    for y:= 1 to 23 do
      map[3,2,x,y]:=1;
    for x:= 1 to 14 do
      map[3,2,x,24]:=1;
    for x:= 27 to 50 do
      map[3,2,x,24]:=1;
    for x:= 1 to 15 do
      map[3,2,x,25]:=1;
    for x:= 28 to 50 do
      map[3,2,x,25]:=1;
    for x:= 1 to 16 do
      for y:= 26 to 35 do
        map[3,2,x,y]:=1;
      for x:= 29 to 50 do
        for y:= 26 to 35 do
          map[3,2,x,y]:=1;
        for x:= 1 to 17 do
          map[3,2,x,36]:=1;
        for x:= 30 to 50 do

```

```

    map[3,2,x,36]:=1;
  for x:= 1 to 18 do
    map[3,2,x,37]:=1;
  for x:= 31 to 50 do
    map[3,2,x,37]:=1;
  for x:= 1 to 19 do
    for y:= 38 to 45 do
      map[3,2,x,y]:=1;
    for x:= 32 to 50 do
      for y:= 38 to 45 do
        map[3,2,x,y]:=1;
      for x:= 1 to 50 do
        for y:= 46 to 50 do
          map[3,2,x,y]:=1;
        for x:= 1 to 50 do
          for y:= 1 to 50 do
            begin
              if (map[3,2,x,y]<>1) then
                begin
                  map[3,2,x,y]:=3;
                end
              end;
            for x:= 1 to 50 do
              for y:= 1 to 50 do
                begin
                  if (map[3,2,x,y]=1) then
                    begin
                      map[3,2,x,y]:=0;
                    end
                  end;
                writeln('This is square 3-2 ');
                writeln;
                for y:= 1 to 50 do
                  begin
                    for x:= 1 to 50 do
                      write(file1,map[3,2,x,y]:2);
                      writeln;
                    end
                  end
                end
            end
          (* SQUARE 3-3*)
          for x:= 1 to 50 do
            for y:= 1 to 50 do
              map[3,3,x,y]:=0;
              writeln('This is square 3-3 ');
              writeln;
              for y:= 1 to 50 do
                begin
                  for x:= 1 to 50 do
                    write(file1,map[3,3,x,y]:2);
                    writeln;
                  end
                end
              end
            end
          (* SQUARE 3-4*)
          for x:= 1 to 50 do

```

```

for y:= 1 to 50 do
  map[3,4,x,y]:=0;
  writeln('This is square 3-4 ');
  writeln;
  for y:= 1 to 50 do
    begin
      for x:= 1 to 50 do
        write(file1,map[3,4,x,y]:2);
        writeln;
      end
    end
  end
(* SQUARE 3-5*)
for x:= 43 to 50 do
  for y:= 2 to 6 do
    map[3,5,x,y]:=2;
  end
for x:= 43 to 50 do
  for y:= 26 to 30 do
    map[3,5,x,y]:=2;
  end
for x:=1 to 50 do
  for y:= 1 to 50 do
    if (map[3,5,x,y]<>2) then
      begin
        map[3,5,x,y]:=0;
      end;
    end
  end
  writeln('This is square 3-5 ');
  writeln;
  for y:= 1 to 50 do
    begin
      for x:= 1 to 50 do
        write(file1,map[3,5,x,y]:2);
        writeln;
      end
    end
  end
(* SQUARE 3-6*)
for x:= 1 to 2 do
  for y:= 2 to 6 do
    map[3,6,x,y]:=2;
  end
for x:= 1 to 2 do
  for y:= 26 to 30 do
    map[3,6,x,y]:=2;
  end
for x:= 6 to 10 do
  for y:= 26 to 35 do
    map[3,6,x,y]:=2;
  end
for x:= 6 to 10 do
  for y:= 41 to 50 do
    map[3,6,x,y]:=2;
  end
for x:= 26 to 35 do
  for y:= 2 to 6 do
    map[3,6,x,y]:=2;
  end
for x:= 26 to 35 do
  for y:= 24 to 28 do
    map[3,6,x,y]:=2;
  end
for x:= 26 to 35 do
  for y:= 31 to 35 do

```

```

        map[3,6,x,y]:=2;
for x:=1 to 50 do
  for y:= 1 to 50 do
    if (map[3,6,x,y]<>2) then
      begin
        map[3,6,x,y]:=0;
      end;
    writeln('This is square 3-6 ');
    writeln;
    for y:= 1 to 50 do
      begin
        for x:= 1 to 50 do
          write(file1,map[3,6,x,y]:2);
          writeln;
        end
      end
    end
  end
end
(* SQUARE 4-1*)
for x:= 1 to 50 do
  for y:= 1 to 50 do
    map[4,1,x,y]:=0;
    writeln('This is square 4-1 ');
    writeln;
    for y:= 1 to 50 do
      begin
        for x:= 1 to 50 do
          write(file1,map[4,1,x,y]:2);
          writeln;
        end
      end
    end
  end
end
(* SQUARE 4-2*)
for x:= 1 to 19 do
  for y:= 1 to 18 do
    map[4,2,x,y]:=1;
  for x:= 32 to 50 do
    for y:= 1 to 18 do
      map[4,2,x,y]:=1;
    for x:= 1 to 20 do
      map[4,2,x,19]:=1;
    for x:= 33 to 50 do
      map[4,2,x,19]:=1;
    for x:= 1 to 21 do
      map[4,2,x,20]:=1;
    for x:= 34 to 50 do
      map[4,2,x,20]:=1;
    for x:= 1 to 22 do
      map[4,2,x,21]:=1;
    for x:= 35 to 50 do
      map[4,2,x,21]:=1;
    for x:= 1 to 23 do
      map[4,2,x,22]:=1;
    for x:= 36 to 50 do
      map[4,2,x,22]:=1;
    for x:= 1 to 24 do
      map[4,2,x,23]:=1;

```

```

for x:= 37 to 50 do
  map[4,2,x,23]:=1;
for x:= 1 to 25 do
  map[4,2,x,24]:=1;
for x:= 38 to 50 do
  map[4,2,x,24]:=1;
for x:= 1 to 26 do
  map[4,2,x,25]:=1;
for x:= 39 to 50 do
  map[4,2,x,25]:=1;
for x:= 1 to 27 do
  map[4,2,x,26]:=1;
for x:= 40 to 50 do
  map[4,2,x,26]:=1;
for x:= 1 to 28 do
  map[4,2,x,27]:=1;
for x:= 41 to 50 do
  map[4,2,x,27]:=1;
for x:= 1 to 29 do
  map[4,2,x,28]:=1;
for x:= 42 to 50 do
  map[4,2,x,28]:=1;
for x:= 1 to 30 do
  map[4,2,x,29]:=1;
for x:= 43 to 50 do
  map[4,2,x,29]:=1;
for x:= 1 to 31 do
  map[4,2,x,30]:=1;
for x:= 44 to 50 do
  map[4,2,x,30]:=1;
for x:= 1 to 32 do
  map[4,2,x,31]:=1;
for x:= 45 to 50 do
  map[4,2,x,31]:=1;
for x:= 1 to 33 do
  for y:= 32 to 50 do
    map[4,2,x,y]:=1;
for x:= 46 to 50 do
  for y:= 32 to 50 do
    map[4,2,x,y]:=1;
for x:= 1 to 50 do
  for y:= 1 to 50 do
    begin
      if (map[4,2,x,y]<>1) then
        begin
          map[4,2,x,y]:=3;
        end
      end;
for x:= 1 to 50 do
  for y:= 1 to 50 do
    begin
      if (map[4,2,x,y]=1) then

```

```

        begin
            map[4,2,x,y]:=0;
        end
    end;
    writeln('This is square 4-2 ');
    writeln;
    for y:= 1 to 50 do
        begin
            for x:= 1 to 50 do
                write(file1,map[4,2,x,y]:2);
                writeln;
            end
        end
    end
(* SQUARE 4-3*)
    for y:= 22 to 25 do
        map[4,3,41,y]:=1;
    end
    for y:= 21 to 26 do
        map[4,3,42,y]:=1;
    end
    for y:= 20 to 27 do
        map[4,3,43,y]:=1;
    end
    for y:= 19 to 29 do
        map[4,3,44,y]:=1;
    end
    for y:= 18 to 30 do
        map[4,3,45,y]:=1;
    end
    for y:= 17 to 31 do
        map[4,3,46,y]:=1;
    end
    for y:= 16 to 32 do
        map[4,3,47,y]:=1;
    end
    for y:= 15 to 33 do
        map[4,3,48,y]:=1;
    end
    for y:= 14 to 34 do
        map[4,3,49,y]:=1;
    end
    for y:= 13 to 35 do
        map[4,3,50,y]:=1;
    end
    for x:= 1 to 50 do
        for y:= 1 to 50 do
            if (map[4,3,x,y]<>1) then
                begin
                    map[4,3,x,y]:=0;
                end;
            end
        end
        writeln('This is square 4-3 ');
        writeln;
        for y:= 1 to 50 do
            begin
                for x:= 1 to 50 do
                    write(file1,map[4,3,x,y]:2);
                    writeln;
                end
            end
        end
    end
(* SQUARE 4-4*)
    for x:= 1 to 2 do
        for y:= 13 to 35 do
            map[4,4,x,y]:=1;
        end
    end
    for x:= 3 to 8 do

```

```

    for y:= 12 to 35 do
      map[4,4,x,y]:=1;
    for x:= 9 to 14 do
      for y:= 11 to 35 do
        map[4,4,x,y]:=1;
      for x:= 15 to 22 do
        for y:= 10 to 35 do
          map[4,4,x,y]:=1;
        for x:= 23 to 30 do
          for y:= 9 to 35 do
            map[4,4,x,y]:=1;
          for x:= 31 to 39 do
            for y:= 7 to 35 do
              map[4,4,x,y]:=1;
            for y:= 5 to 35 do
              map[4,4,40,y]:=1;
            for x:= 41 to 44 do
              for y:= 5 to 34 do
                map[4,4,x,y]:=1;
              for x:= 45 to 46 do
                for y:= 4 to 34 do
                  map[4,4,x,y]:=1;
                for x:= 47 to 49 do
                  for y:= 4 to 33 do
                    map[4,4,x,y]:=1;
                  for y:= 5 to 33 do
                    map[4,4,50,y]:=1;
                  for x:= 1 to 50 do
                    for y:= 1 to 50 do
                      if (map[4,4,x,y]<>1) then
                        begin
                          map[4,4,x,y]:=0;
                        end;
                      writeln('This is square 4-4 ');
                      writeln;
                    for y:= 1 to 50 do
                      begin
                        for x:= 1 to 50 do
                          write(file1,map[4,4,x,y]:2);
                          writeln;
                        end
                      end
                    end
                  end
                end
              end
            end
          end
        end
      end
    end
  end
end
(* SQUARE 4-5*)
for x:= 1 to 6 do
  for y:= 5 to 33 do
    map[4,5,x,y]:=1;
  for x:= 7 to 10 do
    for y:= 6 to 33 do
      map[4,5,x,y]:=1;
    for x:= 11 to 11 do
      for y:= 6 to 32 do
        map[4,5,x,y]:=1;
      for x:= 12 to 14 do

```

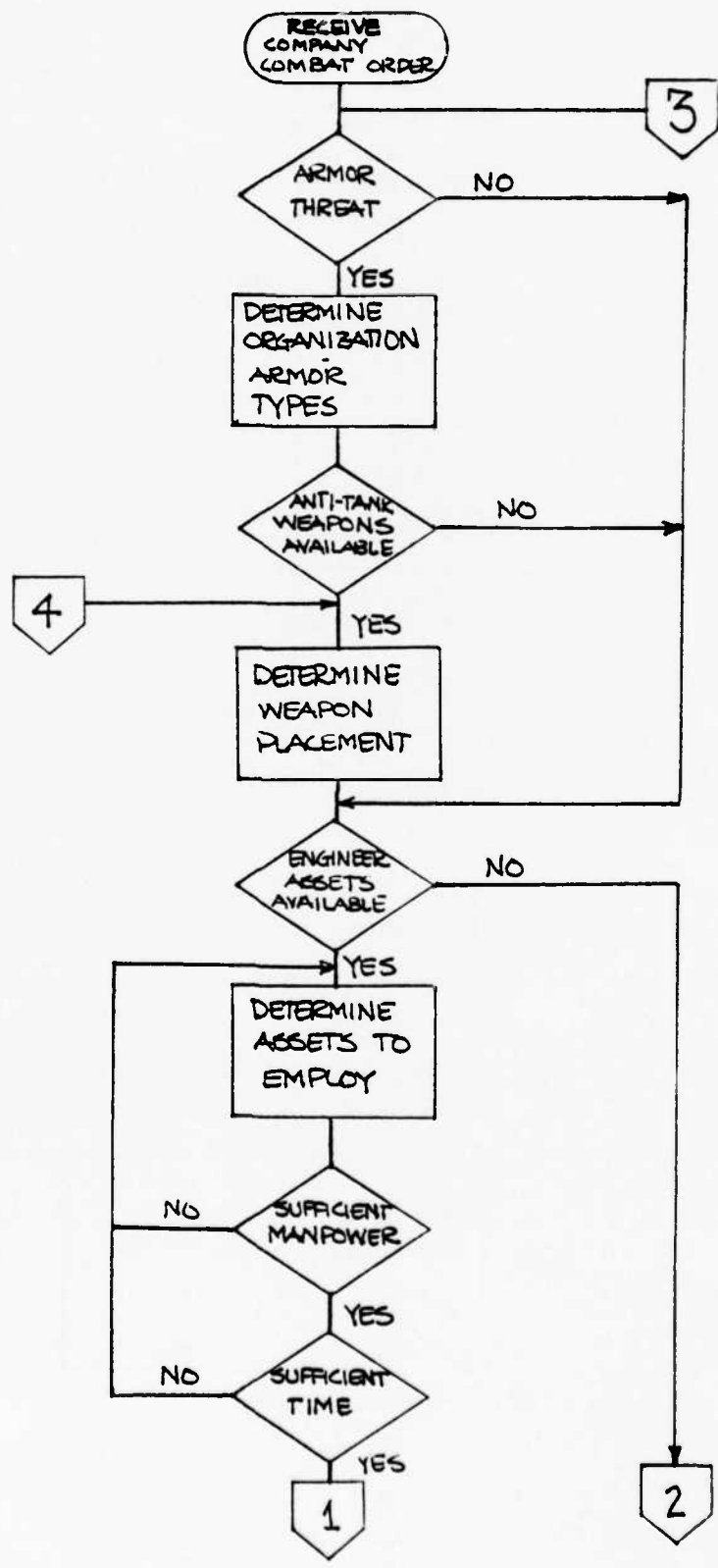
```

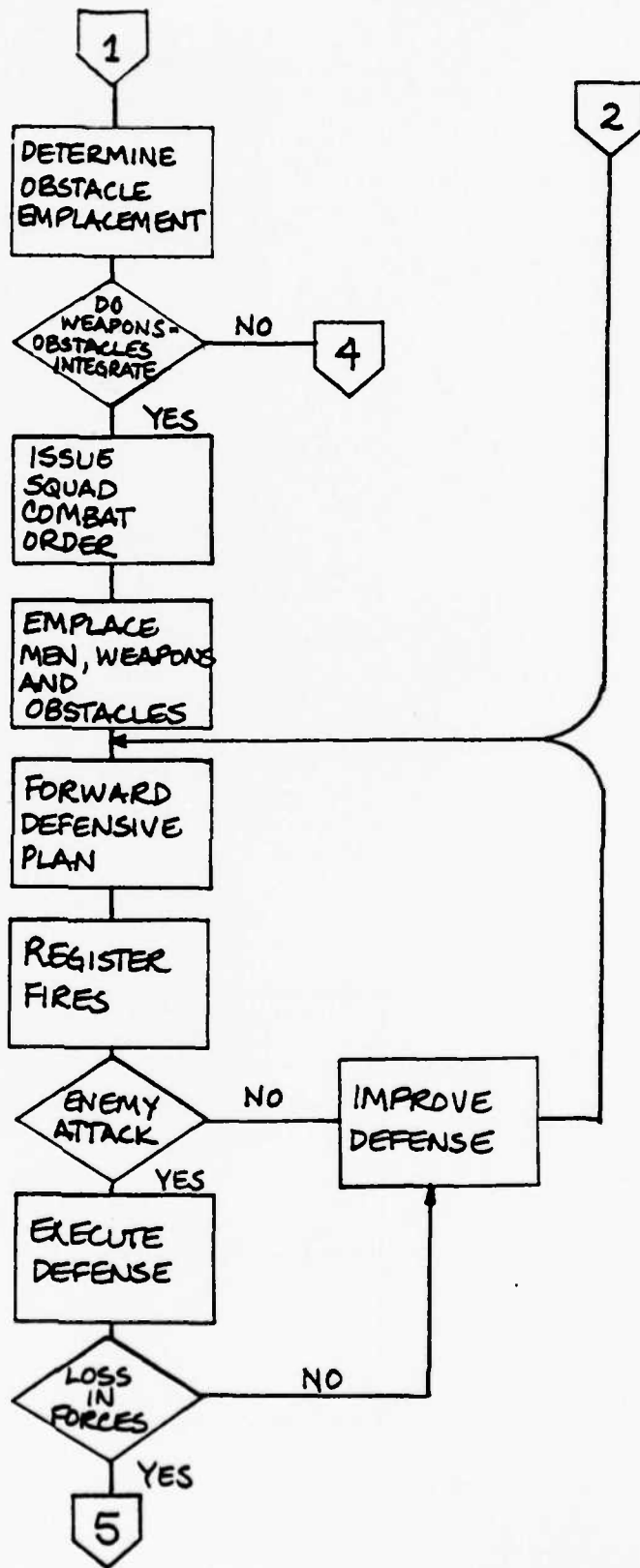
    for y:= 7 to 32 do
      map[4,5,x,y]:=1;
    for x:= 15 to 16 do
      for y:= 8 to 32 do
        map[4,5,x,y]:=1;
      for x:= 17 to 18 do
        for y:= 9 to 32 do
          map[4,5,x,y]:=1;
        for x:= 19 to 20 do
          for y:= 10 to 26 do
            map[4,5,x,y]:=1;
          for x:= 21 to 21 do
            for y:= 11 to 25 do
              map[4,5,x,y]:=1;
            for x:= 22 to 23 do
              for y:= 12 to 24 do
                map[4,5,x,y]:=1;
              for x:= 24 to 24 do
                for y:= 13 to 22 do
                  map[4,5,x,y]:=1;
                for x:= 1 to 50 do
                  for y:= 1 to 50 do
                    if (map[4,5,x,y]<>1) then
                      begin
                        map[4,5,x,y]:=0;
                      end;
                    writeln('This is square 4-5 ');
                    writeln;
                    for y:= 1 to 50 do
                      begin
                        for x:= 1 to 50 do
                          write(file1,map[4,5,x,y]:2);
                          writeln;
                        end
                      end
                    end
                (* SQUARE 4-6*)
                for x:= 6 to 10 do
                  for y:= 1 to 5 do
                    map[4,6,x,y]:=2;
                  for x:= 1 to 50 do
                    for y:= 1 to 50 do
                      if (map[4,6,x,y]<>2) then
                        begin
                          map[4,6,x,y]:=0;
                        end;
                      writeln('This is square 4-6 ');
                      writeln;
                      for y:= 1 to 50 do
                        begin
                          for x:= 1 to 50 do
                            write(file1,map[4,6,x,y]:2);
                            writeln;
                          end
                        end
                      end
                end

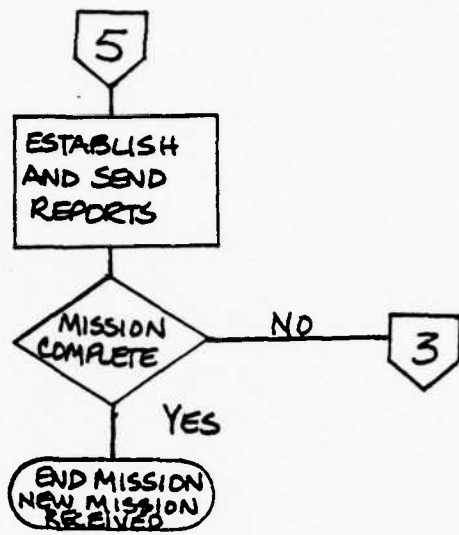
```


end.

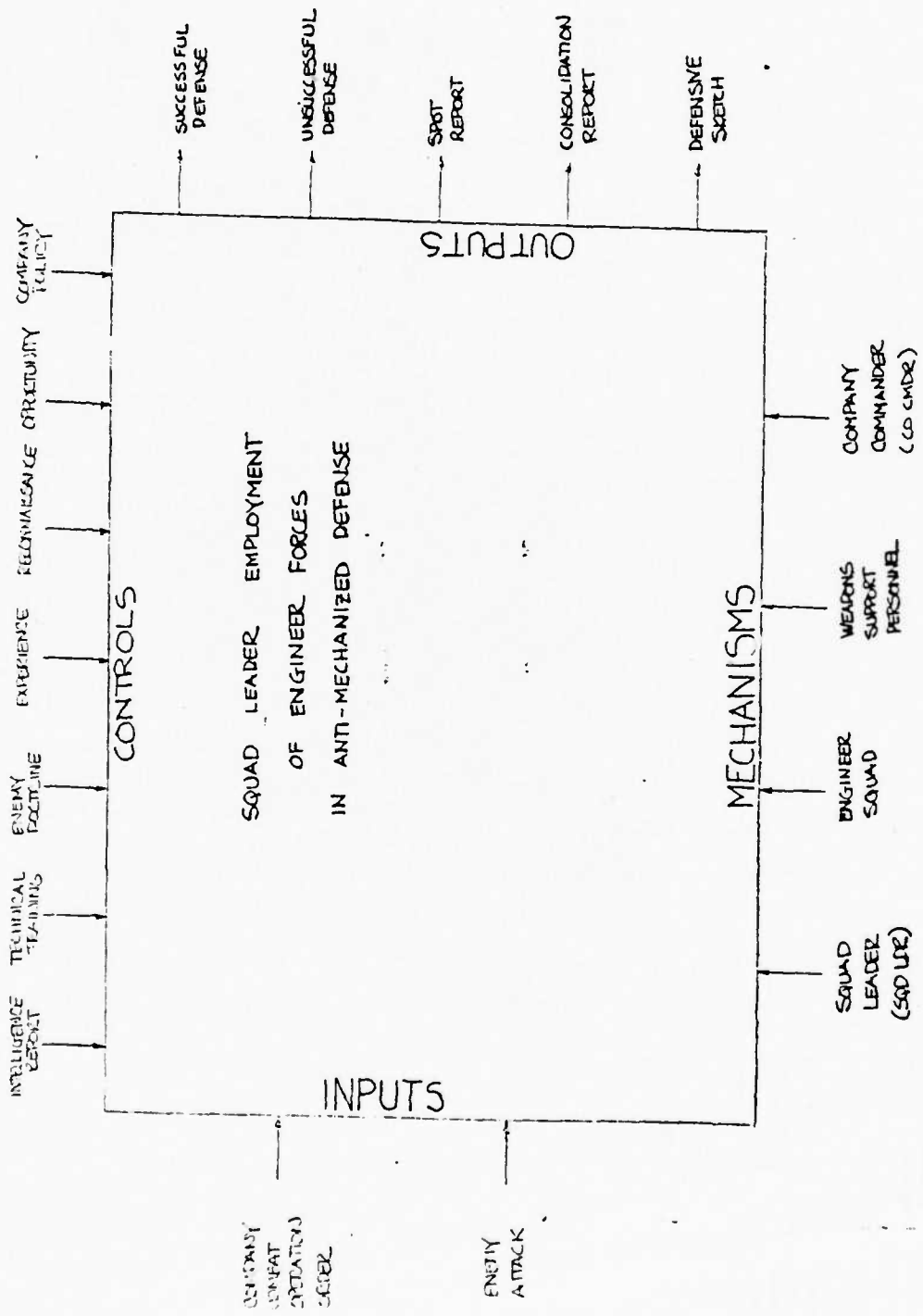
APPENDIX E
SQUAD LEADER'S DECISION PROCESS FLOWCHARTING



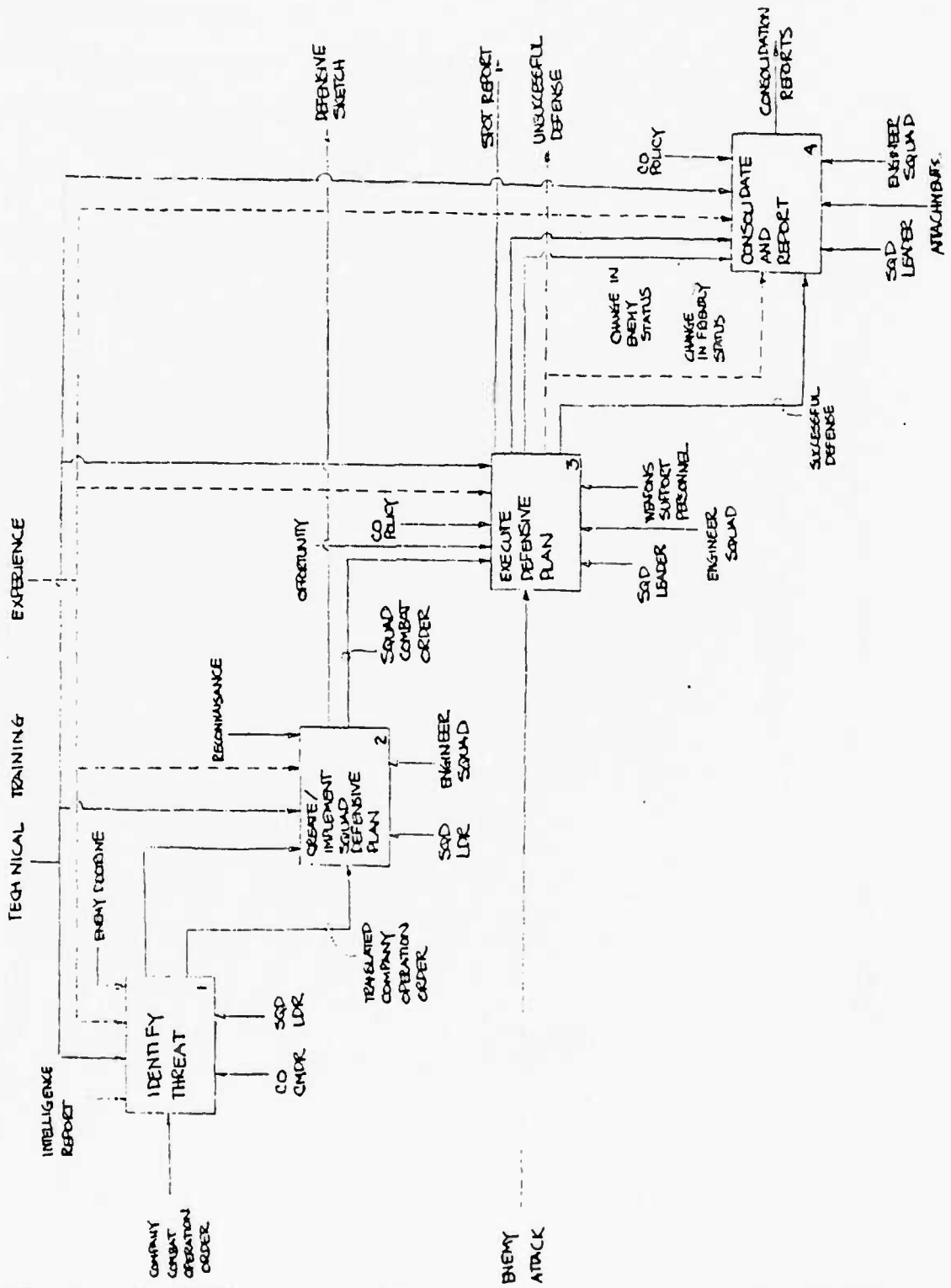




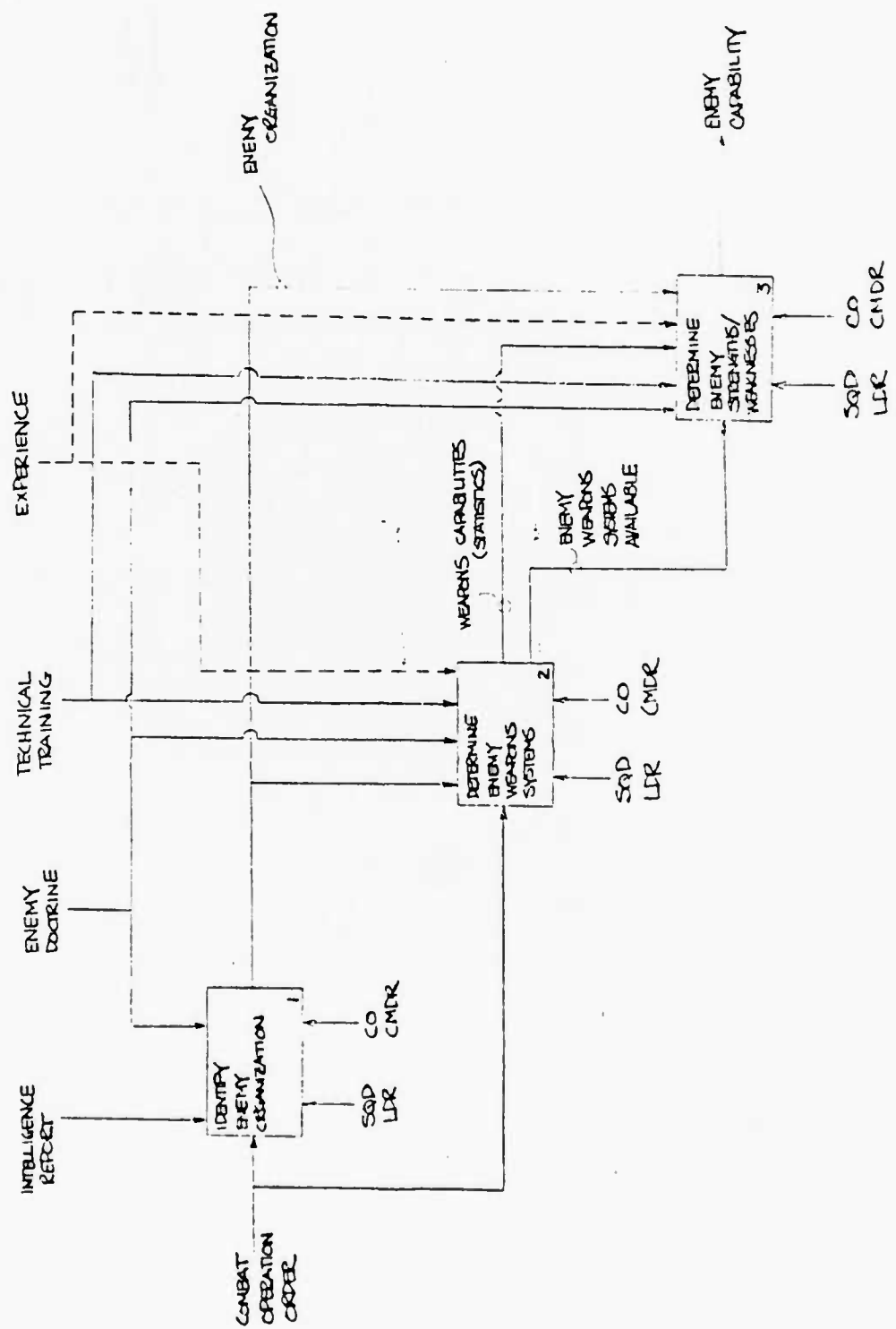
APPENDIX F
IDEF MODELING OF THE SQUAD LEADER'S DECISION PROCESS



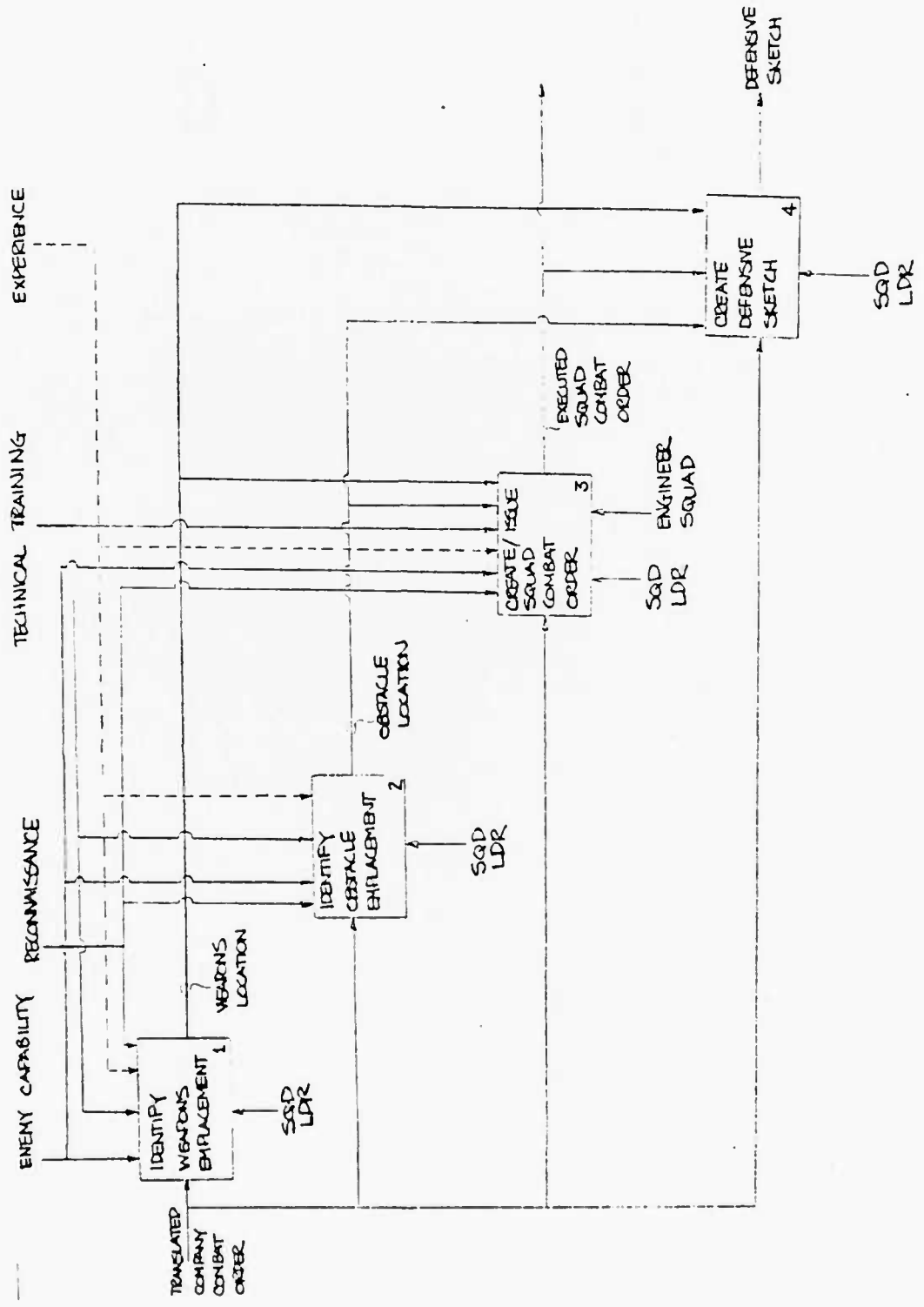
NODE: A-Ø TITLE: SQUAD LEADER EMPLOYMENT OF ENGINEER FORCES



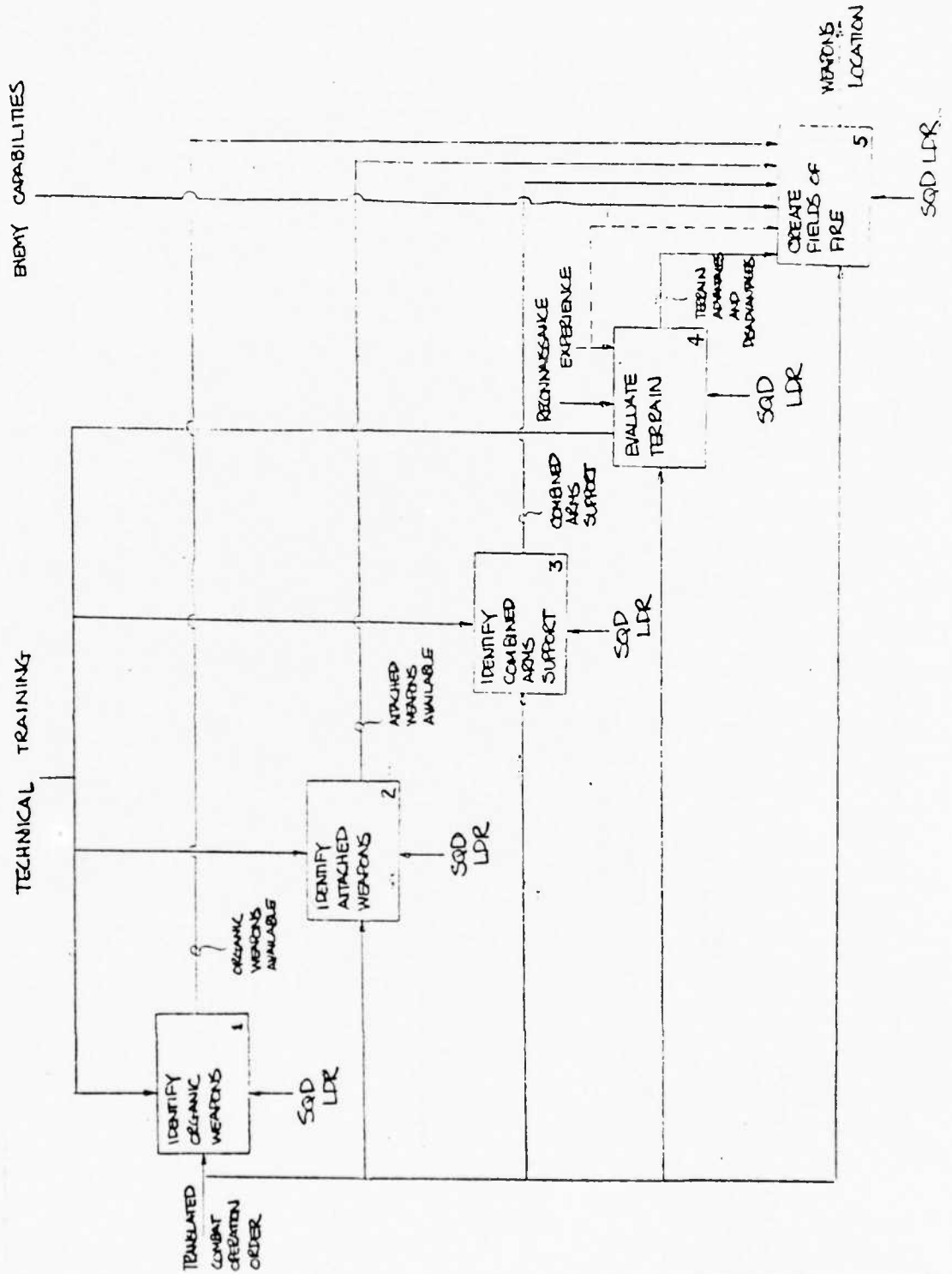
NODE : AØ TITLE : SQUAD LEADER'S DECISION PROCESS



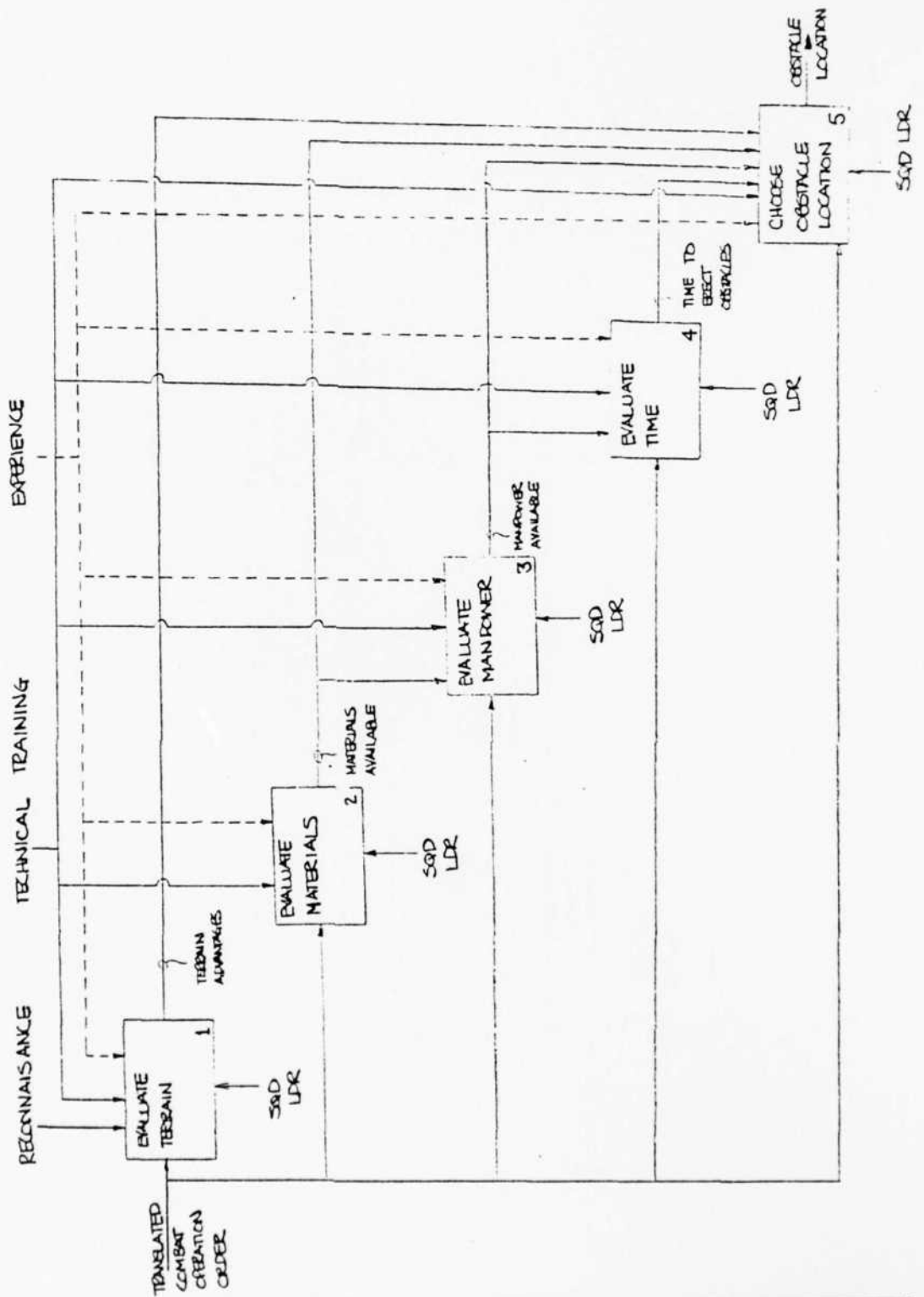
NODE : A1 TITLE : IDENTIFY THREAT



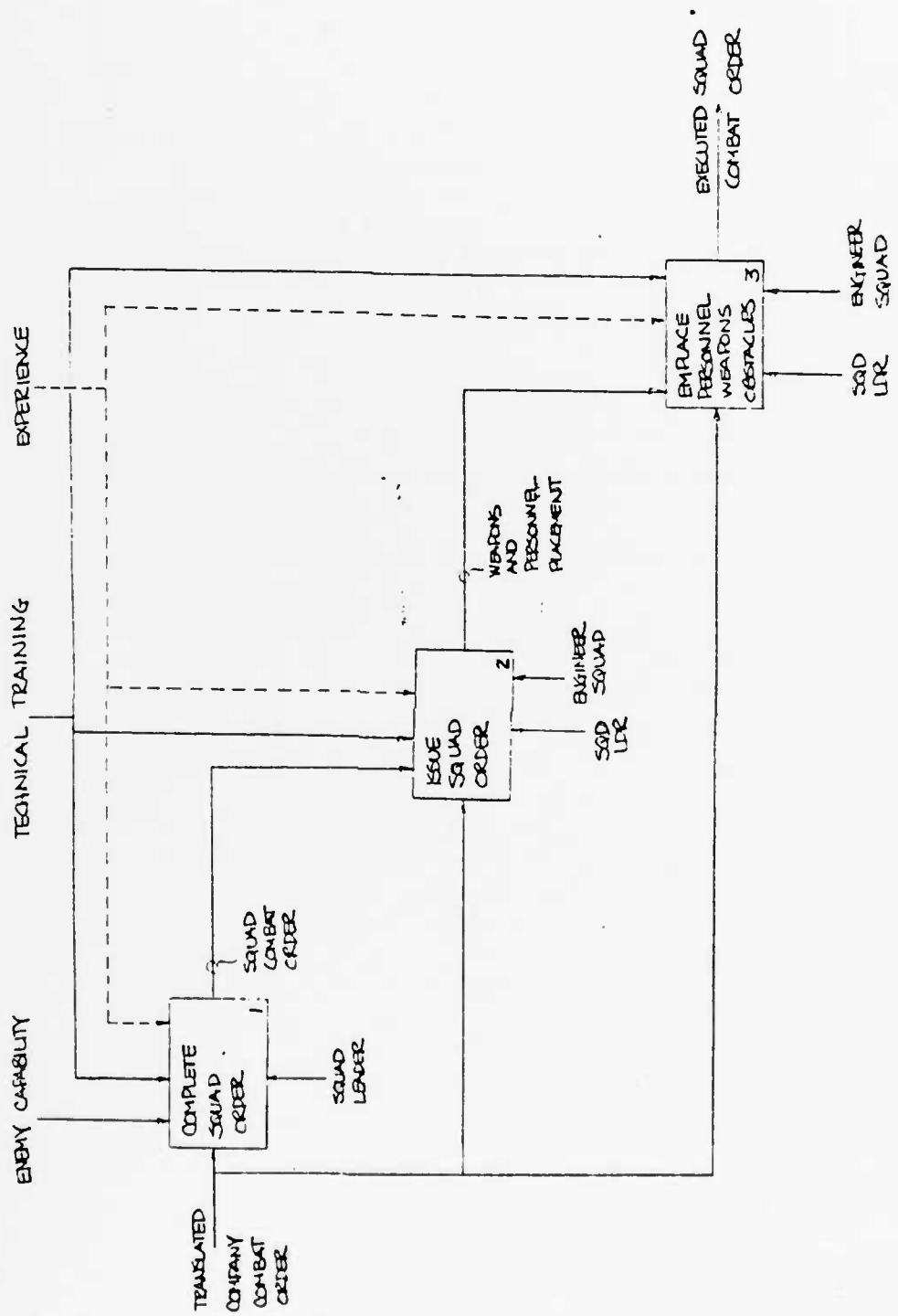
NODE : A2 **TITLE : CREATE/IMPLEMENT SQUAD DEFENSIVE PLAN**



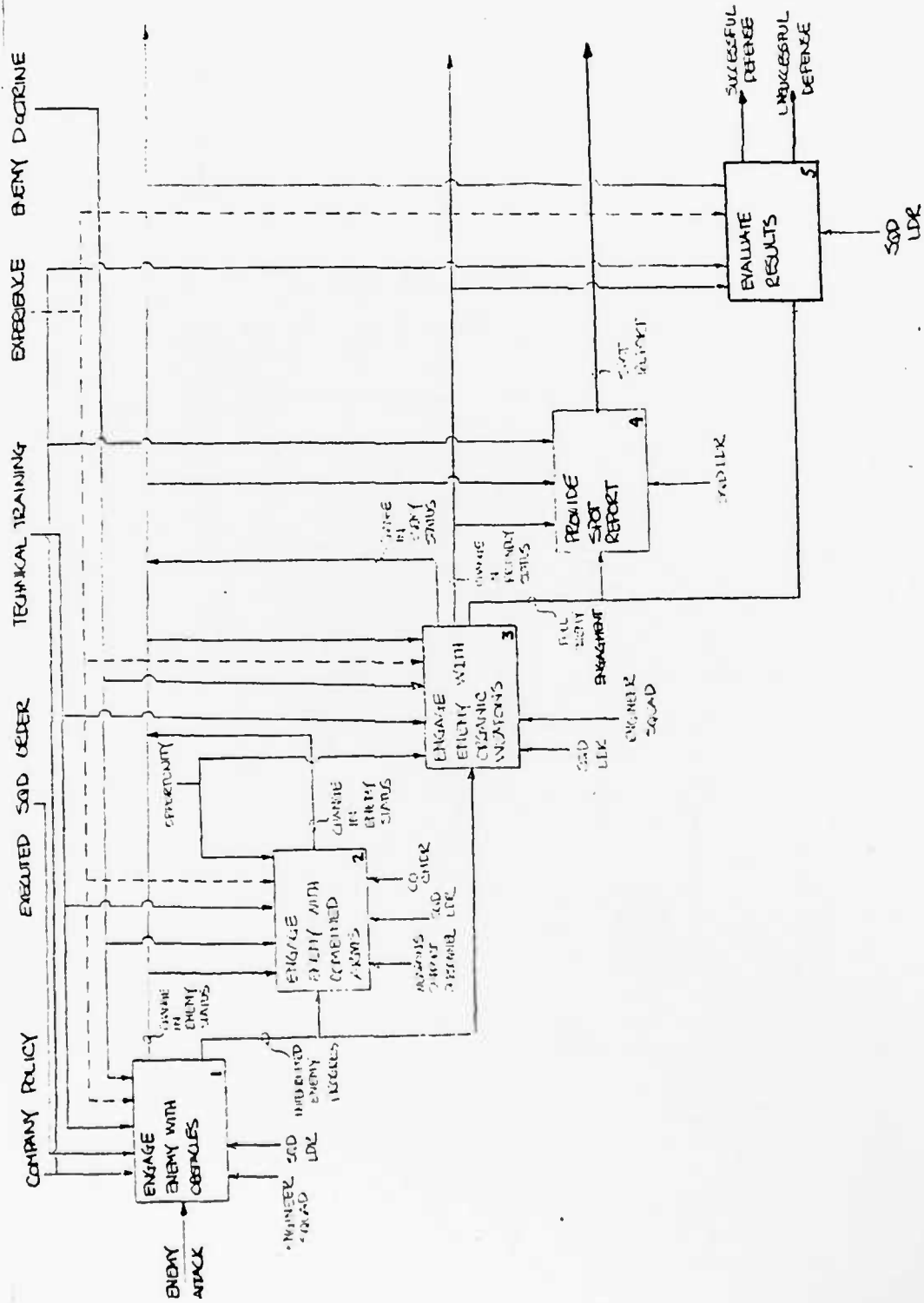
NODE: A21 TITLE: IDENTIFY WEAPONS EMPLACEMENT



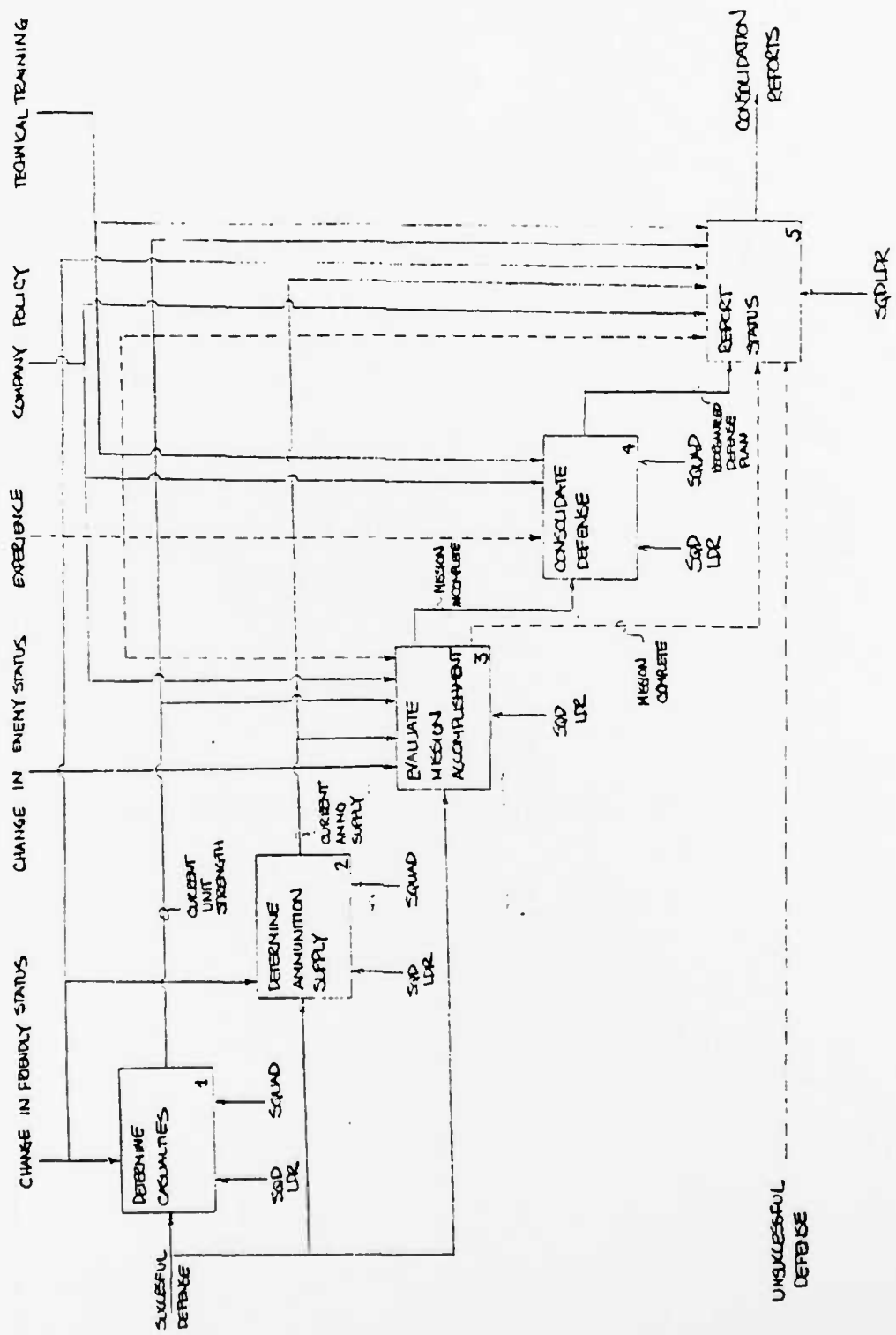
NODE : A22 TITLE : IDENTIFY OBSTACLE EMPLACEMENT



NODE: A23 TITLE: CREATE /ISSUE SQUAD COMBAT ORDER



NODE : A3 TITLE : EXECUTE DEFENSIVE PLAN



NODE: A4 TITLE : CONSOLIDATE AND REPORT

APPENDIX G
RESULTS FROM "S" DETERMINATION OF CHI-SQUARE STATISTIC

*****CHI-SQUARE GOODNESS OF FIT TEST*****

observed frequency

BY CLASS

1 2 3 4 5 6 7 8 9 10

1605 1604 1601 1596 1597 1597 1610 1591 1603 1596

theoretical frequency

BY CLASS

1 2 3 4 5 6 7 8 9 10

1600 1600 1600 1600 1600 1600 1600 1600 1600 1600

chi-square statistic = 0.17625

p-value = 0.999998

APPENDIX H
SAMPLE POST-GAME QUESTIONNAIRE

POST GAME QUESTIONNAIRE

The following questionnaire will be used to further refine the simulation war game you have just experienced. Please answer all questions and answer as honestly as possible. No names will be recorded. Your answers will not be graded and the results of your questionnaire will be used strictly by myself. Your cooperation is greatly appreciated.

SEMPER FIDELIS

JOHN E. WISSLER

CAPTAIN, USMC

_____ What is your present age?
a. 18 to 24 years
b. 25 to 27 years
c. 28 to 32 years
d. over 32 years

_____ What is your present rank?
a. Lance Corporal or below
b. Corporal
c. Sergeant
d. Other

_____ How long have you been in the Marine Corps?
a. 0 to 4 years
b. 5 to 6 years
c. 7 to 9 years
d. Over 9 years

_____ Have you ever been a squad leader?
a. Yes
b. No

_____ What is your occupational specialty?

- a. Combat (Infantry, Tanks, Aviation)
- b. Combat Support (Engineers, Artillery, AAV's)
- c. Combat Service Support (Supply, Motor Transport, Maintenance)
- d. Other

+ + + + +
SA A N D SD

Answer the following questions according to the above scale. The letters correspond to the following responses:

- SA - Strongly Agree
- A - Agree
- N - Neutral
- D - Disagree
- SD - Strongly Disagree

- _____ 1. Playing this game is enjoyable.
- _____ 2. Playing this game has given me a better appreciation for U.S. and Soviet weapons systems.
- _____ 3. Repeated use of this game would be effective in training engineer squad leaders.
- _____ 4. This game has little value as a teaching tool.
- _____ 5. Classroom training on the various weapons characteristics is essential in using this game as a teaching tool.
- _____ 6. This game requires realistic decisions which would be necessary in the combat environment.
- _____ 7. This requires effective use of artillery support for successful completion.
- _____ 8. I would never play this game unless required to do so by my platoon/company commander.
- _____ 9. The map provided was sufficient for gaming needs.
- _____ 10. Playing this game has given me an appreciation for the time and support effort required to emplace engineer obstacles.

- _____ 11. The game is too complicated to use on the squad level.
- _____ 12. This game would be effective for shipboard training.
- _____ 13. The scenario involved is unrealistic and detracts from the usefulness of the game.
- _____ 14. The number of choices available in playing the game are too limited.
- _____ 15. This game shows the effectiveness of obstacles in anti-mechanized defense.
- _____ 16. This game reinforces Marine Corps practices used in ground defense.

What changes would you make to the game to make it more enjoyable and more effective as a teaching tool?

SELECTED BIBLIOGRAPHY

A. REFERENCES CITED

1. Avalon Hill Game Company, The Arab Israeli Wars. 4517 Harford Road, Baltimore MD. 1977.
2. Avalon Hill Game Company, The Squad Leader. 2nd Edition. 4517 Harford Road, Baltimore MD. 1977.
3. Boseman, G.F., and R.E. Schellenberger. "Business Gaming : an Empirical Appraisal," Simulation and Games , December, 1974, pp.383-402.
4. Butler, R.J. Thomas F. Pray, and Daniel R. Strong. "An Extension of Wolfe's study on Simulation Game Complexity," Decision Sciences , December 1979, pp. 481-486.
5. Catalanello, Ralph F., and Daniel C. Berenstuhel. "An Investigation of Innovative Teaching Methodologies," pp. 18-23 in Proceedings of the Thirty Eighth Annual Meeting of the Academy of Management, August, 1978.
6. Cooper, Doug, and Michael Clancy. Oh! Pascal! New York NY: W.W. Norton and Company, Inc., 1982.
7. Dill, W.R. and N. Doppelt. "The Acquisition of Experience in a Complex Management Game," Management Science , October, 1963, pp. 30-46.
8. Dittrich, John E. "Realism in Business Games : A Three Game Comparison," Simulation and Games , June, 1977, pp.201-210.
9. Greenlaw, Paul S., and F. Paul Wyman. "The Teaching Effectiveness of Games in Collegiate Business Courses," Simulation and Games , September, 1973, pp.259-294.
10. Hauser, Mike. Telephone Interview. Model Developer, Marine Corps Combat Analysis Model. Navy Coastal Systems Laboratory, Panama City FL, December 2, 1982.
11. Headquarters, United States Marine Corps. Engineer Field Data, FM 5-34, Washington: Government Printing Office, 1979.
12. Marine Corps Combat Readiness Evaluation System; Volume II, Infantry , MCBul 3501.3 of 12

December 1977, Washington: Government Printing Office, December 1977.

13. _____ . Marine Corps Combat Readiness Evaluation System; Volume V, Combat Support Elements, MCBul 3501.6 of 14 December 1977. Washington: Government Printing Office, December 1977.
14. _____ . Marine Rifle Company/Platoon, FMFM 6-4. Washington: Government Printing Office, February, 1976.
15. _____ . Marine Rifle Squad, FMFM 6-5. Washington: Government Printing Office, December, 1974.
16. Isby, David C., Weapons and Tactics of the Soviet Army. London, England: Jane's Publishing Company, Limited, 1981.
17. Keen, Peter G.W., and Michael S.Scott Morton, Decision Support Systems: An Organizational Perspective. Reading MA: Addison-Wesley Publishing Company, Inc., 1982.
18. Lewin, Arie Y., and W.L. Weber. "Management Game Teams in Education and Organization Research : An Experiment in Risk Taking," Academy of Management Journal , March 1969, pp. 49-58.
19. Marine Corps Amphibious Warfare Extension School. Tactical Fundamentals. Education Center, Marine Corps Development and Education Center, Quantico VA, 1976.
20. Marine Corps Education Center, Artillery Reference Handbook. Supporting Arms Division, Education Center, Marine Corps Development and education Command, Quantico VA, 1979.
21. Marine Corps Education Center, Direct Fire Anti-mechanized Weapons. Education Center, Marine Corps Development and Education Command , Quantico VA, 1978.
22. Marine Corps Institute. The United States Marine...Essential Subjects. MCIO P1550.14C, Marine Barracks Box 1775, Washington DC 20013, 1 December 1979.
23. McKenny, J.L. "An Evaluation of a Business Game in an MBA Curriculum," Journal of Business , July, 1962, pp.278-286.

24. Mintzberg, H. The Nature of Managerial Work ,New York NY : Harper and Row, 1973.
25. Morra, Lieutenant Colonel R.J., USMC. Telephone Interview, Head, War Gaming Section, Marine Corps Development Center, Quantico VA, 2 December 1982.
26. Murawski, Captain Robert J., USMC. "First to Fight : A Battle Simulation at the Squad and Fireteam Level," Unpublished Master's Thesis. LSSR 65-81, AFIT/LS, Wright Patterson AFB, OH, September, 1981.
27. Neuhauser, John J. "Business Games Have Failed," Academy of Management Review , October, 1976, pp.124-128.
28. Norris, Dwight R., and Charles A. Snyder. "External Validation of Simulation Games," Simulation and Games , March 1982, pp. 73-85.
29. Partridge, S.E., and D. Sculli. "Management Skills and Business Games," Simulation and Games , June, 1982, pp. 165-177.
30. Raia, Anthony P. "A Study of the Educational Value of Management Games," Journal of Business , July, 1966, pp. 339-352.
31. Rowland, K.M., and D.M. Gardner. " The Uses of Business Gaming in Education and Laboratory Research," Decision Sciences , April, 1973 pp. 268-283.
32. Schechter, George, James C. Richards, and Henry A. Romberg, Jr. "Improved Tactical Deterrent Effects Model (ITDEM)," U.S. Army Armament Research and Development Command Large Caliber Weapons Systems Lab, Dover NJ, 1980.
33. Shannon, Robert E. Systems Simulation : The Art and Science. Englewood Cliffs NJ, Prentice Hall, Inc., 1975.
34. Schoderbek, Peter P., Asterios G. Kefalas, and Charles G. Schoderbek. Management Systems : Conceptual Considerations. Dallas TX, Business Publications, Inc, 1975.
35. Shubik, Martin. The Uses and Methods of Gaming. New York, NY: Elsevier Scientific Publishing Company, 1975.
36. Shriver, Edgar L., Glenn R. Griffin, David L. Hannamon,

- and Donald R. Jones. Small Combat Arms Unit Leader Training Techniques Rules of Play for Two/Multiplayer Infantry Mapboard Games. Kinton, Inc. Alexandria VA, 1979.
37. Sims, Henry P., and Herbert H. Hand. "Simulation Gaming : The Confluence of Qualitative and Quantitative Theory," Academy of Management Review , July, 1976, pp. 109-112.
 38. Simulation Publications, Inc. Cityfight, Modern Combat in the Urban Environment; Rules for Play. New York NY, 10010, 1979.
 39. _____ . Firefight, Modern US and Soviet Small Unit Tactics; Rules for Play. New York NY, 10010, 1976.
 40. _____ . Patrol : Man to Man Combat in the 20th Century; Rules for Play. New York NY, 10010, 1977.
 41. _____ . Raid; Commando Operations in the 20th Century; Rules for Play. New York NY, 10010, 1977.
 42. _____ . Sniper. House-to -House Fighting in WWI; Rules for Play. New York NY, 10010, 1973.
 43. Slattery, Captain Patrick J., US Army "A Structure for the Development of an Engineer Model," Unpublished Master's Thesis. Naval Postgraduate School. Monterey CA, December 1980.
 44. Strother, G.B., A.C. Johnson, and H.E. Thompson. Educational Applications of Management Games U.S. Department of Health, Education, and Welfare, 1966, pp. 133- 169.
 45. Task Force Games. Operation Pegasus; Task Force Game #8. 405 South Crockett Amarillo TX, 79106, 1980.
 46. U.S. Army. Pegasus Rules. Combined Arms Center; Training Develop- ments Activity, Fort Leavenworth KS 1971.
 47. U.S. Army. Dunn Kempf; Battle Guide to Simulation. Combined Arms Center, Training Developments Activity, Fort Leavenworth KS, 1975.
 48. Vance, S.C., and C.F. Gray. "Use of Performance Evaluation Model for Research in Business," Academy of Management Journal , March, 1967, pp. 27-37.

49. Vora, Jay A. "Simulated Management Game : Any Utility for Management Education ?," Proceedings of the Thirty Third Annual Meeting of the Academy of Management, August, 1973 pp. 298-302.
50. Walther, Lieutenant Colonel H.J. US Army Catalogue of War Gaming and Military Simulation Models 6th Edition, Studies Analysis and Gaming Agency Organization of the Joint Chiefs of Staff. Washington DC, June, 1975.
51. Wolfe, Joseph. "Effective Performance Behaviors in a Simulated Policy and Decision Making Environment," Management Science , April 1975, pp. 872-882.
52. _____ . "A Comparative Evaluation of the Experiential Approach as a Business Policy Learning Environment," Academy of Management Journal , September, 1975, pp. 442-452.
53. _____ . "The Case Approach Versus Gaming in the Teaching of Business Policy Knowledge," Journal of Business , October, 1975, pp. 349-364.
54. _____ . "The Effects and Effectiveness of Simulations in Business Policy Applications," Academy of Management Review , April 1976, pp. 47-56.
55. _____ . "Correlates and Measures of the External Validity of Computer-based Business Policy Decision Making Environments," Simulation and Games , December, 1976, pp. 411-438.
56. _____ . "The Effects of Game Complexity on the Acquisition of Business Policy Knowledge," Decision Sciences , January, 1978, pp. 143-155.
57. Yaquinto Publications, Inc. Beachhead; A Game of Island Invasions in the South Pacific 1942-1944. Box 24767. Dallas TX, 1980.
58. Yeoman, Major Richard C., USMC. Telephone Interview Project Officer Marine Corps Combat Analysis Model, Plans and Analysis Division, Marine Corps Development Center, Quantico VA, 2 December 1982.
59. Young Un Lee, Lieutenant Colonel, Republic of Korea Army. "Probabalistic Model and Analysis of Conventional Preinstalled Minefield Defense". Unpublished Master's Thesis. Naval Postgraduate School, Monterey CA, September 1980.

B. RELATED SOURCES

Harnett, Donald L., Statistical Methods. Reading MA:
Addison-Wesley Publishing Company, Inc., 1982.

Emory, William C., Business Research Methods. Homewood IL:
Richard D. Irwin, Inc., 1980.

**DAT
FILM**