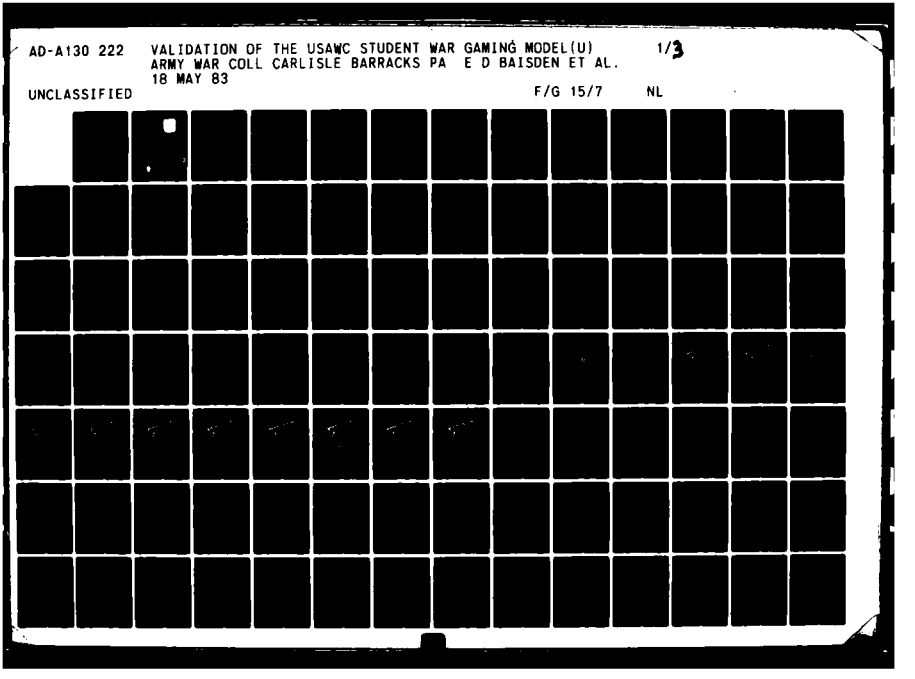
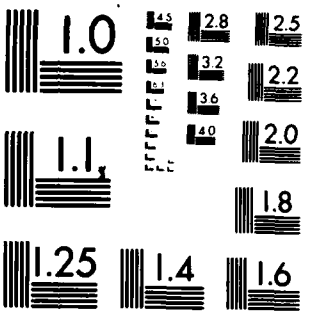
AD-A130 222 VALIDATION OF THE USAWC STUDENT WAR GAMING MODEL(U) 1/3
ARMY WAR COLL CARLISLE BARRACKS PA E D BAISDEN ET AL.
18 MAY 83

UNCLASSIFIED F/G 15/7 NL





STUDY PROJECT

VALIDATION OF THE USAWC STUDENT WAR GAMING MODEL

BY

LIEUTENANT COLONEL EDWARD D. BAISDEN, JR., MI
MR. WILLIAM R. BENDALL, GM14
COLONEL RICHARD A. FOSTER, DC
LIEUTENANT COLONEL ROBERT B. FRANKLIN JR., AR
DOCTOR MICHAEL L. GENTRY, GM14
LIEUTENANT COLONEL JAMES H. GRIFFIN, ORD
LIEUTENANT COLONEL IAN W. LARSON, IN
LIEUTENANT COLONEL LLOYD D. MASON, AR

COLONEL WALLACE P. FRANZ, IN
STUDY ADVISOR

18 MAY 1983

US ARMY WAR COLLEGE, CARLISLE BARRACKS, PA 17013

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. A130222	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) VALIDATION OF THE USAWC STUDENT WAR GAMING MODEL		5. TYPE OF REPORT & PERIOD COVERED Group Study Project
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) LTC Edward D. Baisden, Jr, Mr. William R. Bendall, COL Richard A. Foster, LTC Robert B. Franklin, Jr, Dr Michael L. Gentry, LTC James H. Griffin, LTC Ian Larson, LTC Lloyd D. Mason, Jr		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army War College Carlisle Barracks, PA 17013		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE 18 May 1983
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited.

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

18. SUPPLEMENTARY NOTES

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

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

This study evaluates the validity of the USAWC Student War Gaming Model relative to its ability to replicate historical events of war. The validation process simulated a historical battle and compared the model results with the actual historical events.

Selected battles of the 1973 Arab-Israeli War were used in the study. The battle period was 15-18 October during which time the Israelis moved to cross the Suez Canal into Egypt. The study included a review of a similar study

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Block 20

done in 1982, review of model changes by the USAWC War Gaming Department from 1982-83, comparison of the 1982 project's battle results with results of exactly the same computer input to the 1983 model, and exercising the 1983 model by conducting the battle with Egyptian and Israeli forces as known historically. Real world objectives and missions as known to the Egyptian and Israeli forces were used by the respective Egyptian and Israeli war game commanders, i.e., the Israeli forces were attacking with the known mission to cross the Suez Canal. The Egyptian forces were defending initially not knowing Israeli objectives. Results were evaluated relative to battle time involved, attrited unit strengths, variations in maneuver units involved and general location of maneuver units during and after the battle period. The study showed that the model did produce the same general historical results, i.e., the Israeli did cross the Suez Canal, but did not do so in the historical time frame or with comparable battle attrition.

This study and application of the model, in addition to its purpose of looking at the ability of the current model to replicate historical events, also provides a series of findings and recommendations on how to enhance the model's capabilities for future war gaming applications.

USAWC MILITARY STUDIES PROGRAM

VALIDATION OF THE USAWC STUDENT WAR GAMING MODEL

A GROUP STUDY PROJECT

by

Lieutenant Colonel Edward D. Baisden, Jr., MI
Mr. William R. Bendall, GM14
Colonel Richard A. Foster, DC
Lieutenant Colonel Robert B. Franklin, Jr., AR
Dr. Michael L. Gentry, GM14
Lieutenant Colonel James H. Griffin, ORD
Lieutenant Colonel Ian W. Larson, IN
Lieutenant Colonel Lloyd D. Mason, AR

Colonel Wallace P. Franz, IN
Study Advisor

US Army War College
Carlisle Barracks, Pennsylvania 17013
18 May 1983

ABSTRACT

AUTHORS: Edward D. Baisden, Jr., LTC, MI
William R. Bendall, MR, GM14
Richard A. Foster, COL, DC
Robert B. Franklin, Jr., LTC, AR
Michael L. Gentry, PH.D., GM14
James H. Griffin, LTC, ORD
Ian W. Larson, LTC, IN
Lloyd D. Mason, LTC, AR

STUDY ADVISOR: Wallace P. Franze, COL, IN

TITLE: Validation of the USAWC Student War Gaming Model

FORMAT: Group Study Project

DATE: 17 May 1983 PAGES: 103 (Plus Annexes A, B, D, E and Appendix 1)

CLASSIFICATION: Unclassified

This study evaluates the validity of the USAWC Student War Gaming Model relative to its ability to replicate historical events of war. The validation process simulated a historical battle and compared the model results with the actual historical events.

Selected battles of the 1973 Arab-Israeli War were used in the study. The battle period was 15-18 October during which time the Israelis moved to cross the Suez Canal into Egypt. The study included a review of a similar study done in 1982, review of model changes by the USAWC War Gaming Department from 1982-1983, comparison of the 1982 project's battle results with results of exactly the same computer input to the 1983 model, and exercising the 1983 model by conducting the battle with Egyptian and Israeli forces as known historically. Real world objectives and missions as known to the Egyptian and Israeli forces were used by the respective Egyptian and Israeli war game commanders, i.e., the Israeli forces were attacking with the known mission to cross the Suez Canal. The Egyptian forces were defending initially not knowing Israeli objectives. Results were evaluated relative to battle time involved, attrited unit strengths, variations in maneuver units involved and general location of maneuver units during and after the battle period. The study showed that the model did produce the same general historical results, i.e., the Israeli did cross the Suez Canal, but did not do so in the historical time frame or with comparable battle attrition.

This study and application of the model, in addition to its purpose of looking at the ability of the current model to replicate historical events, also provides a series of findings and recommendations on how to enhance the model's capabilities for future war gaming applications.

PREFACE

This group project, conducted under the auspices of the US Army War College War Gaming Department was the military studies project for the named student authors in the US Army War College Class of 1983. Authors of this study were trained and performed as war game controllers for the common curriculum at the USAWC. During the training period for war game controllers this group became aware that the War Gaming Department was seeking students to continue a study initiated by two members of the USAWC class of 1982. Further research was needed in determining the validity of the USAWC Student War Gaming Model relative to its ability to replicate historical events of war. The USAWC's military study program provided the vehicle for the group to fulfill an academic requirement and to participate in a meaningful research effort for the Department of War Gaming which would be beneficial to the US Army. Each member of the project group benefited as much was learned about war gaming, computer assisted war gaming models, computers, and computer operation. The study also enhanced members knowledge of the actual historical events studied. It was a useful and professionally rewarding experience.

The study group extends its thanks to the following individuals whose assistance made our project possible:

- Mr. John Roley of the Department of War Gaming for the technical support he provided each and every day of our project computer operation. Without his support the project would have gone nowhere or at least would have taken much longer to accomplish.

- Colonels Richard H. Martin and Gary R. Lord, USAWC Class of 1982 whose military study program project provided the basis for this project. Their personal assistance at the beginning of the research phase provided the fundamental basis to initiate the project. The study group is indebted to them for the basic information provided and for the support extended.

- Colonel Wallace P. Franz, Department of War Gaming, for his guidance and provision of space and resources to conduct the project.

- Captain S. A. Brannon, Automation Management Office/ Information Technology Division, for familiarization with the model and providing assistance as needed.

TABLE OF CONTENTS

*NOTE: Annexes A, B, D, and E submitted separately to War Gaming Department.

CHAPTER I

INTRODUCTION

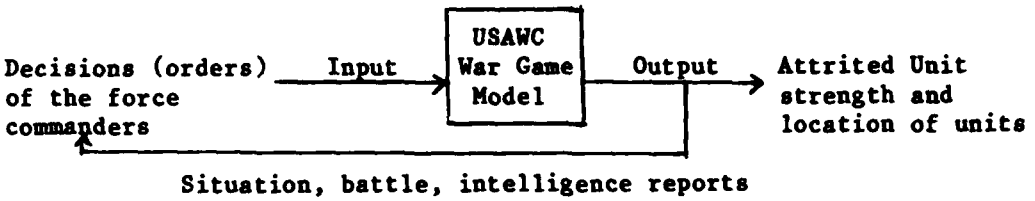
BACKGROUND

This project was accomplished as a group study project in the military studies program of the United States Army War College (USAWC), Carlisle Barracks, Pennsylvania. The project was initiated at the request of the Department of War Gaming at the college. The War Gaming Department sought a student group to continue research into the validity of the USAWC Student War Gaming Model, a microcomputer assisted variation of the McClintic Theater Model (MTM) with attendant players guide (Annex A), relative to its ability to reproduce the historical events of war. A preliminary project addressing the same subject was performed by Lord and Martin (Validation of the USAWC Student War Gaming Model) in 1982 (Appendix 1). This 1983 project continues and further expands upon their research. The objective of this study was to reach a supportable conclusion regarding the validity of the current version (January 1983 revised model) of the USAWC model to replcate the events of a historical battle. An additional objective of the research was to produce a series of findings and recommendations on how to enhance the model's capabilities for future war gaming applications.

STATEMENT OF THE PROBLEM

Intuitively, it is believed that the model produces output results (attrited unit strengths, battle times involved, variations in maneuver units involved, and general location of maneuver units during and after the

battle period) which reflect the decisions input in a fashion which simulates the real world equivalents. The model may be viewed as shown below:



The validation process used was to simulate a historical battle and compare the model results with actual historical data. The study used selected battles of the 1973 Arab-Israeli War. The battle period used was 15-18 October 1973 when the Israelis moved to cross the Suez Canal into Egypt.

INVESTIGATIVE PROCEDURES

1. The study done by Lord and Martin was thoroughly reviewed.

- The unit data file listing was reviewed and accepted as written after making minor variations in some unit withdrawal thresholds and substituting unit identification code numbers with proper names of units. (Annex B)

- The hex data file listing and terrain analysis were accepted as written. (Annex F of Appendix 1)

- Determination of unit Firepower Scores were accepted as written. (Annex J - classified - of Appendix 1)

2. The study group reviewed the applicable literature by Adan, Shazley, Dupuy, Allen, Herzog, Palit, and the London Sunday Times. This review more thoroughly familiarized study group members with the battle

period and provided the basis for preparation of the historical data base for comprison with the output produced by the current version of the model.

3. The USAWC Computer Model is under a continual process of improvement. For the purposes of this study, changes to the model software were frozen as of January 1983. The data base and software changes made from 1982 to January 1983 were reviewed. A number of the changes made were expected to have significant impact on the computer output.

4. After making numerous partial iterations to familiarize study group members with the game, a complete iteration of the game was played placing the same input orders into the model as were utilized by Lord and Martin. This was a group effort. A comparison of the computer output was then made to the 1982 computer data output. (See Chapter 3 and Annexes C and D)

5. The next step was to exercise the current model by conducting the battle with Egyptian and Israeli forces as known historically to see if the computer model output would replicate historical events. The research group divided into two teams; each with a commander, operations and intelligence personnel, a computer terminal operator, and a team recorder. Real world objectives and missions as known to the Egyptian and Israeli forces were used by the respective Egyptian and Israeli war game commanders. A comparison of the computer output was made to the historical data. (See Chapter 4 and Annex E)

It was noted that Lord and Martin (Annex H of Appendix 1) found it necessary to frequently enter the Director mode of computer entry. Minor adjustments to parameters and the updated model gave the study group confidence that this iteration of the game would proceed more successfully than the 1982 game. A firm decision was made by the 1983 study group not to revert to the Director mode for any moves or alterations in gam play as ~ ing to

the Director mode would add artificialities unacceptable to the research. The model was then exercised with the input based on command decisions. Situation reports via the Director mode were generated on an hourly basis. This was necessary to make timely comparisons with the historical data.

6. During the entire study, notes were made of findings and recommendations for enhancement of the model's capabilities for future war game applications.

7. Initially the intent was to run a sufficient number of complete iterations of the battle (as outlined in #5 above) to permit comparative analysis of multiple runs, however the amount of time required to conduct an iteration of the game was thirty-nine hours thus precluding multiple iterations. Sensitivity analysis of the model to various parameter changes initially planned was also precluded by length of run constraints. The number of runs accomplished, partial and complete, was sufficient to reach conclusions. The following chapters provide detailed discussion of the research and present conclusions and recommendations.

CHAPTER II

HISTORICAL REVIEW

GENERAL

This chapter provides both a general background and detailed synopsis of the historical events on which the study project was based. The chapter reviews the major factors and events of the 1973 war fought in the Sinai, then outlines in greater detail the period of the war (151700 OCT to 180500 OCT 73) that was played in the USAWC Computer Model. In as much detail as available sources permitted, the chronological sequence of battle events, the Israeli and Egyptian units involved, the locations where the events occurred, and results in manpower and equipment losses were compiled. The location of units at specific times during the period played and attrition figures for those units provided the data for comparison with results obtained on the USAWC Computer Model.

BACKGROUND--THE 1973 ARAB-ISRAELI WAR

The October 1973 war was conducted concurrently on two fronts--the Syrians attacking the Israelis in the Golan Heights area and Egyptians attacking across the Suez Canal into Israeli positions on the Sinai. This study dealt with operations conducted by the Egyptian and Israeli forces. Therefore, this review orients only on the Sinai front.

Egyptian President Anwar Sadat reached a firm decision to go to war with Israel in November 1972. His decision was based on several factors, including:

- The relatively strong state of readiness of the Egyptian armed forces.

- His dissatisfaction with the status quo with Israel as it existed since the 1967 war, and the defacto annexation of Arab territories occupied by Israel in that war.

- His belief that the only possibility of moving toward a Middle East settlement was to precipitate action that would force world focus on the "no peace, no war" situation in the Middle East.

- The sagging economy of Egypt, badly hurt by the closing of the Suez Canal and the heavy burden of Egypt's economic future, mortgaged to the Soviet Union for armament expenditures.

- A need to restore national pride and offset the wrong that they so fervently believed had been done to their fellow Arabs, the Palestinians, by Israel.

Sadat believed it better for the Egyptian people to fight and lose another war with Israel in an attempt to right a wrong than not to fight at all simply because defeat was likely. He also saw the 1973 war as a method of forcing the superpowers to turn their attention to and rekindle new initiatives in the Middle East. Sadat's decision to go to war was a political gamble designed to end a political stalemate.

The Commander-in-Chief of Egypt's Army and Supreme Commander of Arab Forces, General Ahmed Ismail Ali believed, as did Sadat, that limited military success was a definite possibility. He fully understood the relationship between war and politics and recognized that the superpowers would not allow a complete military victory by either side in the Middle East. His strategic concept took into full account Israel's two major elements of military superiority--airpower and excellence in tank warfare. His focus was placed on defensive combat and on inspiring his soldiers by

convincing them they could win through intense training, total discipline and thorough indoctrination. He was totally aware of Israeli sensitivity to casualties in combat and the Israeli inferiority in simple manpower strength. General Ismail knew that Israel feared a major two-front war and, in coordination with Syria, he set out to capitalize on this weak-point. Specific Egyptian tasks were to:

- Defeat Israeli forces in the western Sinai by a deliberate assault crossing of the Suez Canal.

- Seize five or more bridgeheads 10 to 15 kilometers deep on the eastern bank of the Canal.

- Repel Israeli counterattacks.

- Inflict maximum losses on the enemy.

- Prepare for further missions based on this initial assault and Syrian operations in the Golan Heights area.

The Egyptians' view of success was a cease fire with them controlling a substantial strip of territory on the east bank of the Suez Canal. To achieve this, President Sadat and his military leaders set three goals in Egyptian military performance: surprise, thoroughness of planning and tactical-technical efficiency. The strategic and tactical surprise which the Egyptians achieved through total secrecy, effective masking of intentions and surreptitious massing of forces in conjunction with a coordinated attack on a Jewish Sabbath (Saturday, October 6, 1973--the Yom Kippur holy day) was totally successful. The professional competence of Egyptian planning for the operation was exceptional. Total troop familiarization and proficiency on their equipment, favorable weather conditions, highly effective engineer bridging capabilities and total knowledge of the Israeli's Suez defense system were key in the Egyptians achieving a successful Suez crossing and seizure of territory on the east bank of the Suez.

While Egypt successfully dealt Israel its worst defeat in history during the period 6-8 October 1973, they made two major mistakes. They failed to aggressively exploit their initial successes by having a clearly defined second phase to their offensive (resulting in the stalemate which began 9 October 1973 and Israel's ability to reverse the tide on 14 October 1973) and they underestimated Isrsel's resolve to retaliate.

The Israeli commanders made some early blunders by failing to apply the classical military principle of force, along with underestimating the enemy, expecting the Egyptian forces to fold as easily as they did in the 1967 war.

Once realizing that the opposition was more formidable than expected, the Israelis began to adapt their strategy and tactics to cope with the Egyptian forces on the east bank of the Suez. As additional units were mobilized, the military balance began to favor the Israelis. Urged by Syria to mount an offensive in the Sinai in order to relieve some of the pressure in the Golan Heights, the Egyptians attacked eastward on 13-14 October and were soundly defeated. Israel now perceived the opportunity to seize the initiative by mounting a counteroffensive involving a crossing of the Suez toward the west.

By exploiting the undefended canal segment located on the east bank in the Deversoir area using a two division operation (Sharon and Adan's divisions), the Israelis successfully crossed the Suez on 18 October 1973. Factors contributing to the Israeli use of this particular location included:

- The left flank of the crossing force being protected by the Great Bitter Lake.

- The far bank offering good opportunity for manuever.

- The crossing site being a boundary juncture between two Egyptian armies and not covered by Egyptian troops on either side of the canal.

The crossing toward the west was by no means easy, and at times its success was in doubt, causing the Israeli high command to consider cancelling the operation. By dawn on 18 October 1973 Major General Adan's division had firmly secured a bridgehead on the west side of the Suez. This led to the control of the "green-belt" area by the Israelis on the west bank, and a major breakout by Adan's and Magen's divisions leading to the encirclement of the Egyptian Third Army. Involvement of the superpowers in reaching a settlement to the war influenced the establishment of a ceasefire at 1852 hours on 22 October 1973.

THE BATTLE PERIOD PLAYED IN THE USAWC COMPUTER MODEL

The period 151700 OCT 73 through 180500 OCT 73 was selected by Lord and Martin (Appendix 1) in their 1982 study, and was also used by this study group. The period is sufficiently detailed in the sources so as to provide data (especially concerning the Israeli forces) on major units involved, chronological sequence of actions, and gross losses suffered.

OPPOSING FORCE PLANS AND DISPOSITION (See Chart 1)

In the Sinai offensive of 13-14 October, the Egyptian forces were turned back by the Israeli defenders. In the north, in the area of the Egyptian Second Army, the 16th Infantry and 21st Armored Divisions, both having suffered significant losses, withdrew to the vicinity of the terrain feature called Missouri to reconsolidate. General Ismail had rejected, for

fear of causing panic, a recommendation that the mauled 21st Armored Division be withdrawn to the west bank of the Suez Canal to set up a second line of defense.[1] Now placed in a defensive posture, the Egyptian forces awaited the expected Israeli attack to the west. According to General Shazly, they had assumed that the Israelis would attempt to pierce the Egyptian bridgehead, and that one of the points where an attempt could be expected was Deversoir.[2] The Egyptian forces, consisting of the two divisions mentioned, held the Akavish and Tirtur roads between the Lexicon and Artillery roads; at least a brigade was deployed in and around the Chinese Farm; and the main forces of the two divisions were concentrated in the area of Missouri and between Missouri and the Chinese Farm.[3] There were no significant forces located on either bank of the Deversoir crossing site. Although Egyptian plans had called for counterattack on the west bank to destroy any Israeli attempt to establish a bridgehead, the forces to be used for the planned counterattacks had previously crossed to the east bank and were unavailable.[4]

The Israeli counteroffensive involving the westward crossing of the Suez Canal was a contingency planned for before the war. The crossing site selected was Deversoir. This selection was fortuitous in that the site was undefended by the Egyptians, probably because it was at the boundary between the Egyptian Second and Third Armies. The Israelis, however, were unaware of the strength of the Egyptian forces around Missouri and the Chinese Farm, and that these forces controlled the Tirtur and Akavish roads leading to the crossing site.

The Israeli plan was simple: Sharon's division was to open and widen a corridor to the crossing site, cross in the area of Deversoir, and establish a bridgehead on the west bank of the Suez Canal. Once the bridgehead was secure, Adan's division was to cross and sweep south.

Magen's division would relieve Sharon's, hold the crossing site, and keep the corridor open to the east. Sharon was then to cross after Adan, and follow Adan in the sweep south by staying to Adan's right rear to provide additional power to the sweep.

To accomplish his mission, Sharon's plan called for a diversionary attack in the north by Raviv's brigade (minus one battalion attached to Reshef) to draw Egyptian attention. One hour later, Reshef's brigade, reinforced to a strength of seven battalions, was to attack southwest along the Akavish road to the crossing site, secure the crossing site, then turn north and northeast to secure the Lexicon road, the Tirtur road, and the Chinese Farm. An attached paratroop brigade (led by Colonel Danny Matt), following Reshef's force in half-tracks, would conduct an assault crossing of the canal in rubber boats and establish the initial bridgehead. The third brigade of the division (Erez), following Matt, had the responsibility of escorting the bridging equipment (one a preconstructed roller bridge, the second a ponton bridge, and the third consisting of mobile rafts called GILOWAS) to the crossing site.

SUMMARY OF MAJOR EVENTS, 15-18 OCTOBER 1973 (SEE CHART 1)

The Israeli Suez crossing operation commenced at 1700 hours on 15 October with Raviv successfully drawing Egyptian attention by his diversionary attack in the north. One hour later, Reshef's brigade began its move along the Akavish road to the crossing site at Matzmed. Little resistance was encountered, and Reshef's forces reached the Matzmed site by 2100.

Leaving his reconnaissance battalion to secure the crossing site, Reshef turned north and northeast according to plan. Once across the Lexicon-Tirtur junction, his forces ran into the strength of the Egyptian

21st Armored Division as well as elements of the 16th Infantry Division. Surprised at first, the Egyptians reacted violently, pushing the Israelis south of the Lexicon-Tirtur junction. In fierce, close-range tank and infantry fighting throughout the night, both forces gave no quarter, Reshef attacking time and again to seize the Lexicon-Tirtur crossing and being repulsed. At dawn on the 16th he made one more attempt and was finally successful, but the price was high. His brigade had 27 tanks left; about two-thirds of his force has been damaged or destroyed during the night.[5]

Matt's paratroop brigade, which had been following Reshef down the Akavish road, reached Matzmed around midnight after having to leave the Akavish road on the advice of Reshef, who by now was embroiled in the fierce struggle in the vicinity of the Lexicon-Tirtur junction and the Chinese Farm. Crossing in rubber assault boats, Matt's brigade met no resistance on the west bank. By dawn on the 16th, the brigade was across and had established the bridgehead.

Erez, escorting the bridges, ran into difficulty with this mission. The preconstructed bridge broke down, and additionally, even after being repaired, could not move until the Tirtur road was clear, as it could only be towed on that specially constructed road. The ponton bridge was caught in the monumental traffic jam on Akavish road and had to be left. Proceeding with two battalions and the GILOWA rafts to the crossing site, he was ordered by the Division Commander (Sharon) to begin crossing, using the rafts. By midmorning on the 16th, major elements of Erez's two battalions had crossed the canal, and conducted a raid approximately 15km to the west encountering slight resistance and returned.

Major General Adan, anticipating that his division could cross early on the 16th, sent his lead battalion (from Amir's brigade) to the crossing site. The battalion broke through the Egyptian positions on the Akavish

road and met with Reshef's weary forces just south of the Lexicon-Tirtur junction around 0700 on the 16th. The fresh battalion was immediately attached to Reshef's brigade and given the mission of holding the Lexicon-Tirtur junction while Reshef withdrew his forces south to the vicinity of Lakekan to regroup and rest. For the next 24 hours, this battalion held the crossroads against repeated Egyptian attacks in brigade strength.

Sensing the gravity of the situation and the precarious situation that the bridgehead would be in if the Egyptian resistance could not be overcome, the Israeli high command on the 16th directed Major General Adan to clear the Akavish-Tirtur corridor. Attacking at noon with Amir and Baram's brigades, he failed to dislodge the defending Egyptians. Adan requested that his third brigade (Karen) be released to him from general reserve. The request was refused, but he was told that an Israeli paratroop battalion would be sent to reinforce him. The paratroop battalion, under Colonel Yairi, arrived at 2200 on the 16th. Moving out at midnight, the battalion was pinned down by intense fire from the vicinity of the Chinese Farm and was unable to maneuver. It was not until the following day that a battalion from Baram's brigade was able to extricate the paratroopers.

At dawn on the 17th, Adan, this time with Raviv's brigade (attached from Sharon's division) in addition to Amir's and Baram's, again attacked to clear the Akavish-Tirtur corridor. The attack was successful, and by noon on the 17th the Akavish and Tirtur roads were open. The ponton bridge was also in position, the bridge having been moved down the Akavish road during the night while the Egyptians were focused on Yairi's paratroops at the Chinese Farm.

The Egyptians were slow to react to the Israeli crossing. As late as 1700 on the 16th, twelve hours after Matt's brigade had crossed and Erez' two-battalion raid was completed, reports of no more than a company of

tanks on the west bank were received by the Egyptian high command. A counterattack plan was conceived, but its piecemeal execution caused it to fail. The plan called for simultaneous attacks at daybreak on the 17th from the west (by the 116th Infantry Brigade on the east bank), the north (by the 21st Armored Division) and the south (by the 25th Armored Brigade).[6] The attacks were not synchronized and each force, left to fight its own battle, was defeated. The 25th Armored Brigade, in particular, was destroyed on the afternoon of the 17th in a period of less than an hour, losing 86 of its 96 T-62 tanks.[7] The brigade, moving north along the Lexicon road from Botzer, was caught in a brilliant ambush set by Adan. Using Reshef to block the head of the Egyptian column; the Great Bitter Lake to block the unit's movement to the west; Baram striking from the north and east; and Karen (released from general reserve) striking from the east and the rear (south) of the column, the Egyptians had no chance of escape. Israeli losses were four tanks damaged by mines.[8]

Following the destruction of the Egyptian 25th Brigade on the afternoon of the 17th, Adan was directed to prepare his division to cross the Suez Canal. After refueling and rearming in the vicinity of Kishuf, the division's brigades (less Karen, who again reverted to general reserve) moved to the crossing site around 2300 on the 17th. By 0500 on the 18th, Adan's division had crossed and began preparations for the sweep to the south.

Losses by both sides were heavy in many units. During the fighting on the night of the 16th, Sharon's division suffered more than 300 men killed and 70 of 280 tanks destroyed;[9] most of these losses were in Reshef's brigade. During the same night about 150 Egyptian tanks were destroyed.[10] For the period 15-18 October, Israeli losses were estimated to be around 100 tanks, while Egyptian losses were around 350 tanks.

CHRONOLOGICAL LISTING OF ACTIONS, UNITS INVOLVED, AND RESULTS, 15-18 OCTOBER 1973 (SEE CHART 1)

The following listing was compiled from available sources. Dupuy was the prime source.[11] Other sources from which data was obtained were Shazly and Adan.[12,13] Immediately obvious is the difficulty in identifying Israeli units below brigade level; in the case of Egyptian forces, with few exceptions, the lowest level at which units were accurately identified was the division to which they belonged. Even more difficult is a statement of precise losses in men and materiel. Where an estimate has been made based on other corroborating data provided in the sources, it is so noted. Where no figures are shown, there simply was no data unearthed in the research.

DATE/TIME	UNITS AND ACTIVITY	RESULTS
151700 OCT 73	Israeli RAVIV brigade conducts two-battalion diversionary attack on Egyptian 16th Infantry Division elements at TALATA and TELEVISIA.	Attack halted. Losses insignificant.
1800	Israeli RESHEF brigade, reinforced by a battalion from RAVIV, a battalion from EREZ, and an independent Armored Infantry battalion, attacks west along Akavish road axis to Lakekan, then turns NW to Matzmed crossing site.	Sporadic, slight resistance; thought to be patrols of Egyptian 16th Infantry Division. Matzmed reached around 2100.
Around 2100	MATT paratroop brigade, supported by company of tanks from EREZ brigade, and SHARON division advance command post, follow RESHEF brigade along Akavish road to Matzmed.	Slow; Akavish road clogged with traffic; Egyptian artillery harassing; fired on from vic Chinese Farm. RESHEF recommends leaving Akavish and going cross-country.
		Arrives at Matzmed around midnight.

DATE/TIME	UNITS AND ACTIVITY	RESULTS
Around 2100	RESHEF brigade: Recon battalion holds crossing site; battalion from RAVIV brigade moves NE along Akavish road to link up with MATT'S paratroopers; armor battalion moves NE along Tirtur road to secure the road; two armor battalions, each followed by an infantry battalion, attack north from Matzmed on either side of Lexicon road. Elements of Egyptian 21st Armored and 16th Infantry Divisions hold Akavish and Tirtur roads, the Lexicon-Tirtur junction, and the Chinese Farm. At least a brigade is deployed in and around the Chinese Farm.	Israelis and Egyptians engage in bitter fighting throughout the night. Losses on both sides are heavy. RESHEF attacks repeatedly to seize the Lexicon-Tirtur junction and is unsuccessful. Makes a final, successful attempt at dawn. RESHEF is down to 27 tanks (loses 2/3 of his force). Egyptians lose 150 tanks.
2400	Israeli tank company attached to MATT's paratroop brigade attempts to seize Lexicon-Tirtur junction defended by Egyptian 16th Infantry and 21st Armored Division elements.	Tank company is destroyed, losing all 10 tanks. Company commander is killed.
160130 OCT 73	Israeli MATT paratroop brigade conducts assault crossing of Suez Canal.	Successful. West bank is undefended. Brigade closes on west bank by 0500.
Around 0200	Israeli bridging units begin movement to crossing site.	Roller bridge breaks down, is left at Akavish-Tirtur junction. Ponton bridge runs into traffic jam on Akavish road, is halted. GILOWAS move cross-country to crossing site, arrive at daybreak.
Around 0200	Israeli EREZ brigade (two battalions) moves to crossing site.	Successful. Arrives at Matzmed before daybreak.

DATE/TIME	UNITS AND ACTIVITY	RESULTS
0500	Israeli battalion from AMIR brigade, ADAN Division moves SW along Akavish road in anticipation of crossing as lead element of ADAN division.	Breaks through Egyptian positions on Akavish road. Links up with RESHEF brigade S of the Lexicon-Tirtur junction; because of losses in RESHEF brigade, is attached to that brigade.
0700	Israeli battalion from AMIR brigade defends Lexicon-Tirtur junction against Egyptian 21st Armored and 16th Infantry Division attacks in brigade strength.	Successful. Battalion holds crossroads until 171100 OCT, when ADAN'S division is successful in opening Akavish and Tirtur roads.
0700	Israeli RESHEF brigade withdraws S to Lakekan to rest and regroup.	
0800	Israeli EREZ brigade (two battalions) begins crossing Suez Canal using GILOWA rafts.	Closes on west bank, joining MATT's paratroop brigade by midmorning.
0800	Israeli ADAN division moves to vicinity SW of Kishuf.	
1130	Israeli ADAN division attacks with two brigades (AMIR and BARAM) to open Akavish and Tirtur roads by parallel drives from NE. Egyptian elements from 16th Infantry 21st Armored Divisions defend with tanks, AT missiles and AT guns, supported by artillery.	Israelis are repulsed. ADAN asks that his third brigade (KAREN) be released to him from General Reserve. Request is denied. Told that a paratroop unit (YAIRI) will join him instead.
Around 1200	Israeli 175mm Artillery Battalion crosses to west bank of Suez.	Fires on Egyptian SAM sites.
1200	Israeli EREZ brigade (two battalions) conducts raid	Successful raid. Three Egyptian SA 2

DATE/TIME	UNITS AND ACTIVITY	RESULTS
	W from the bridgehead.	positions destroyed, at least one SA 6 forced to displace. Several supply and maintenance installations are overrun.
Around 1600	Egyptian air and artillery attacks Israeli units at bridgehead.	Egyptians claim 14 Israeli planes downed; Israelis state 10 Egyptian MIG-17 aircraft destroyed.
2300	Israeli YAIRI paratroop battalion joins ADAN division and attacks SW to clear Akavish-Tirtur roads held by Egyptian 21st Armored and 16th Infantry Division elements.	Paratroops are pinned down at the Chinese Farm. Unable to move. Heavy losses incurred.
170200 OCT 73	Israeli tank battalion from AMIR brigade attached to YAIRI paratroop battalion to assist in clearing Akavish and Tirtur roads.	Tank battalion unable to link up with pinned down paratroops due to intense fire.
Around 0300	Recon company (ADAN division) moves SW along Akavish road to Matzmed.	Discovers that Akavish is open as Egyptians are preoccupied in their battle with YAIRI's paratroopers.
Around 0400	Israeli Ponton Bridge moves SW along Akavish road based on information that the road is open.	Closes on Matzmed around 0500. Engineers install the bridge, complete work by 1600 on 17th.
0600	Israeli ADAN division consisting of AMIR and BARAM brigades and attached RAVIV brigade attacks W to secure the Tirtur and Akavish roads against at least an estimated brigade each from the 16th Infantry and the 21st Armored Divisions.	Heavy contact until 1100. Israelis are successful. Egyptian elements withdraw N. BARAM brigade links up with and extricates the pinned-down YAIRI paratroop battalion.

DATE/TIME	UNITS AND ACTIVITY	RESULTS
Around 1200	Israelis secure Tirtur road with AMIR, BARAM and RAVIV brigades along Tirtur road from SW to NE in that order.	
Around 1300	Egyptian 25th Armored Brigade moves N along Lexicon road from Botzer. Israelis establish ambush by placing RESHEF brigade to defend SE from Lakekan to block the head of the column; two battalions of BARAM brigade are pulled out from the Tirtur road defense to defend from a position E of Lakekan; the KAREN brigade is released back to the ADAN division from general reserve and moves to a position S and SE of the Egyptian column. The ambush is such that the Egyptian left (W) flank is blocked by the Great Bitter Lake.	Contact occurs at 1430. Egyptian brigade is virtually destroyed by 1515. Egyptians lose 86 of 96 T-62 tanks. The remaining 10 tanks are pursued to Botzer. Pursuit called off at 1600. Israeli losses are 4 tanks damaged by mines during the pursuit.
1600	Israeli ADAN division elements involved in ambush of Egyptian 25th Armored Brigade move to Kishuf to rearm and refuel.	Completed by 1900
1900	Israeli AMIR and BARAM brigade elements defending Tirtur road are relieved by SHARON division elements so they can rejoin ADAN division and prepare to cross the Suez Canal.	Completed by 2100
2100	Israeli KAREN brigade reverts to general reserve, moves to TASA.	
2300	Israeli AMIR Brigade, BARAM brigade and ADAN division headquarters begin crossing Suez Canal.	Completed by 0500 18 October.

CHAPTER III

COMPARISON OF 1982 GAME TO 1983 GAME WITH IDENTICAL COMPUTER COMMANDS

BACKGROUND

To provide a consistent base upon which to build an analysis of the McClintic Theater Model, the first requirement was to identify the impact of software changes made to the model in the period between generation of data used for the 1982 study and gathering of similar data for the 1983 validation run. It was believed that major changes would be made apparent by variances appearing in the specific comparative areas of location, movement rates, periods of combat, attrition, opposing units and status. Examination of the 1982 and 1983 computer runs would then provide a basis for further study.

It was believed that the results of all computer modeling should be compared against the historical events as every effort was made to replicate the actual movement of forces on the battlefield. This would provide the basis for determining the overall validity of the model when assessing its ability to reproduce history.

The USAWC Student War Gaming version of the McClintic Theater Model is dynamic in the sense that modifications are constantly implemented in an effort to enhance the model and its usefulness. A number of model changes were, in fact, made to the 1982 version used by Lord and Martin (Appendix 1) which resulted in the January, 1983 version upon which this group study project was performed. Although these changes were not fully documented,

discussion with the USAWC technical support staff identified their existence. It was necessary to identify model changes to accurately analyze and assess their impacts upon the 1983 model's results in comparison with the 1982 results. The known model changes are individually discussed below.

1. Combat Ratio Adjustment (CRA). The previous ground attrition formula was 1% unit loss per battle period multiplied by the combat power ratio of the opposing forces. Based upon earlier observation, this formula was modified to greatly increase the attrition when the combat ratio was high (combat involved disparate forces). Effectively, the new attrition losses are 1% multiplied by the square of the combat ratio. This was done by inserting the CRA factor into the ground attrition formula.

2. Terrain and Time-in-hex Parameters. The model multiplies the basic movement rate and/or combat power of affected units by parameters selected to reflect the types of terrain occupied and their defensive postures as a function of time-in-hex. The 1983 model incorporated three terrain factors for different size cities as opposed to the 1982 single city terrain factor. Also, the maximum time-in-hex parameter of 2.00 is now reached in 144 hours vice the previous criterion of 72 hours.

3. Withdrawal Thresholds. Upon attriting down to a specified percentage of unit strength, the model automatically withdraws units in combat or causes them to retreat. The act of withdrawal itself exacts losses on the units retreating. This withdrawal penalty was lowered from 10% of unit strength in 1982 to only 1% in the 1983 game. Further, the model automatically increases the withdrawal threshold of units in combat every 24 hours to reflect battle fatigue. This effect was increased slightly by raising the threshold a full 5% every 24 hours rather than 5% of current unit strength.

4. Combat power per hex. The 1983 version of the model limits the total combat power either side can place in a single hex to a maximum of 150 points including all appropriate multipliers for terrain, supporting artillery, etc. The 1982 version had no comparable limitation. It should be noted that unit size, hex size, battle periods, combat power and other factors are closely interrelated and have been adjusted or defined by trial and error.

5. Attrition Due to Administrative Movement. The attrition loss inflicted upon ground units for pure movement was decreased from 20% to only 0.8% per 32 kilometers of movement.

6. Unit Surrounded Factor. In addition to the tactical surprise effect, a new factor for surrounded combat units was added to the model. Here, a unit in combat attacked from the rear will have its strength reduced by 50%.

Although not documented as a change made to the model between the 1982 play and the 1983 play, one software constraint was noted which caused significant problems in the 1983 play. This constraint, termed the "too many units in a single battle problem" by the study group, showed itself whenever more than ten units from either side (usually the Blue side) became engaged in a single battle. It was never clear what exact actions were taken by the model when this occured, but units previously involved in the battle would suddenly cease to appear in the battle reports, although still appearing in SITREPS as in combat at the same location. Other units might appear in a battle report in their place and, in turn, drop out of subsequent reports. In any case, the problem showed itself on numerous occasions and should be rectified.

METHODOLOGY

Units for this analysis were selected from only those actually engaged in the heavy fighting and subequently required to move during the period of the battle. Three units from each side were chosen based on their relative positions and on a selection criterion that ensured geographic separation for at least two of the units on each side. Artillery units were not selected because of the artificialities inherent in their use (detailed in Chapter V, below). Special purpose forces were also excluded from consideration. The final selection resulted in the 1/460 AMIR TK BN, 1/14 AMRAM TK BN and 2/14 ALMOG TK BN representing the Israeli side while the 1/25 ARM BN, 2/18 MECH BN and 3/18 MECH BN represented the Egyptian side.

The 1983 validation run was made by issuing orders, insofar as possible, to the same units at the same times as those orders were issued in the 1982 iteration. By holding orders and times constant from 1982 to 1983, variations caused by software changes became apparent.

An entry-by-entry chronological listing for each unit was constructed detailing each SITREP, Order, Program Note and Report of Battle entry on the printout. This was done for both the 1982 and the 1983 validation run. From this, a brief narrative was constructed discussing the units' movements and actions as indicated on that specific computer run. In Annex C will be found a brief narrative of the units' actual historical actions, together with narratives and chronologies from the 1982 and 1983 runs, concluded by a comparison for each unit.

SUMMARY

Readers are advised to look at Annex C in two ways: first, a quick scan of the historical activities of a specific unit will provide a backdrop against which all else can be painted; second, an examination of the software-induced variations as highlighted in the table will allow the reader to make some value judgment as to his sensitivity to these fluctuations.

The historical/model comparison highlights what may be of benefit to a user of the model; there may be a variation in the overall outcome of repetitive games played using the same scenario. This would prevent users from becoming accustomed to rote answers. The software-caused variations could provide a changing milieu along the time line. Thus if a controller has been provided a tightly defined or structured scenario, the model may provide a changing situation. This would be of benefit if the model is to be exported and run by relatively unskilled controller personnel who would be more restricted in their choices of options to present to the players.

When viewed from a technical perspective, the model allows the input of a large variety of data that would facilitate tailoring it to a different terrain, climate and/or force structure. The model's approximation of a Combat Results Table appears to be responsive to varied inputs as evidenced by the increased Weapon Unit Values assigned to the Israeli side producing a higher casualty rate. It is not necessary to make a large input of data in order to make discrete and finite changes in the results, yet the results presented have sufficient granularity to satisfy the user.

There are some software changes that should be made to enhance the game. These are identified and discussed in Chapter V. Similarly, a series of recommended improvements is presented. These are suggestions

that were developed as a concensus of the members of the study group based on the total experience of conducting the study project.

In summary, the USAWC Student War Gaming version of the McClintic Theater Model, as viewed from the perspective of comparing results using similar commands with a year's worth of software changes in the middle, produces a useful tool. It appears to have a good balance between complexity and ease of operation.

CHAPTER IV

EXECUTION OF OPERATIONS ON THE USAWC COMPUTER MODEL

GENERAL

This chapter describes the use of the USAWC Computer Model in executing the operational intent of Israeli and Egyptian player commanders who, through commands to the model, attempted to be faithful to the plan of their 1973 historical counterparts. Brief descriptions of methodology, variances that were taken from normal computer model play, and the procedure followed precede comparisons of model and historical data.

METHODOLOGY

The use of the USAWC Computer model began with the following as given:

(1) The Israeli and Egyptian forces, and their initial strengths and locations, input into the model data base. The units available to each commander to maneuver were the following (exact unit listings are in the unit data base, Annex B):

Israeli

162nd Armored Division (ADAN Division)

217th Armored Brigade (KAREN Brigade)
1st, 2nd and 3rd Battalions

460th Armored Brigade (AMIR Brigade)
1st, 2nd, 3rd, 4th and 5th Battalions

600th Armored Brigade (BARAM Brigade)
1st, 2nd and 3rd Battalions

143rd Armored Division (SHARON Division)

14th Armored Brigade (RESHEF Brigade)

1st, 2nd and 4th Battalions, plus TF SHMULIK, TF SHAKED, plus 1st Battalion of RAVIV Brigade, plus 1st Battalion of MATT Brigade.

247th Armored Brigade (RAVIV Brigade)
2nd and 3rd Battalions (1st Battalion attached to RESHEF Brigade).

421st Armored Brigade (EREZ Brigade)
(1st, 2nd, and 3rd Battalions)

3 Engineer Bridge Forces (GILOWA, Roll Bridge, and Heavy Raft)

1-35 Paratroop Battalion (YAIRI Battalion)

243 Paratroop Brigade (MATT Brigade)
2nd, 3rd and 4th Battalions (1st Battalion attached to RESHEF Brigade)

Artillery

Air support

Egyptian

16th Infantry Division
16th Infantry Brigade
112th Infantry Brigade
3rd Mechanized Infantry Brigade

21st Armored Division
14th Armored Brigade
1st Armored Brigade
18th Mechanized Infantry Brigade

25th Independent Armored Brigade

Artillery

Air support

Plus forces on the west bank of the Suez Canal

(2) The opposing commanders' operational intent. These are depicted on Figure 1 and described in Chapter II, HISTORICAL REVIEW.

(3) The period of battle to be played, which would start at 151700 OCT 73, and would end when the model portrayed ADAN's division across the Suez Canal, prepared for a southward sweep. Historically, this was at 180500 OCT 73.

(4) A 1:50,000 scale topographical map was digitized and stored in the computer model data base. Map terrain areas were represented and stored in the computer as a set of hexagons, each hexagon having an alpha-numeric designator. For the 1:50,000 scale map, each overlay hexagon was 1.6 kilometers across. An overlay with the labeled hexagons was placed over the map. Major streams, roads, and terrain features such as hills were also digitized and stored in the computer. Movable magnetic pieces on the the map represented the Israeli and Egyptian units.

(5) A player organization consisting of two teams, each representing the opposing forces. Each team consisted of a commander, operations and intelligence personnel, computer terminal operator, and a team recorder.

(6) The USAWC Computer Model version dated January 1983, operating on the ALTOS Microcomputer, and consisting of a Visual Display Unit (VDU) with line printer for each team.

With the above as given, and unconstrained by the results of the actual historical events, the USAWC Computer Model was used to execute the operational intent of the opposing forces during the 15-18 October 1973 battle period. Each commander provided input commands to the computer model to move units, to provide artillery and air support, and took other actions within the capabilities of the model to carry out operations as intended by each side in 1973. These input commands resulted in outputs in terms of new unit locations, combat results, and other data which in turn generated further inputs as these outputs were assessed and acted upon by the respective commanders.

The ability of the model to reproduce historical events was analyzed by comparing model and historical data in two primary areas: (1) Unit movement, i.e. the location of specific units at specific times, and (2)

Unit attrition suffered at specific times during the battle period where known, as well as overall attrition suffered for the entire battle period.

VARIANCES FROM NORMAL COMPUTER MODEL PLAY

Decisions were made by the study group at the outset to forego the use of certain model capabilities, and to conduct game play at variance with normal play in the use of the situation map and in the frequency with which the SITREP was obtained. These decisions and the underlying reasons are listed below.

(1) Except for obtaining the SITREP, the Director mode of the model was not used. All interactions with the computer were in the Player mode. It was desired that no artificiality be used to determine the outcomes of player commands; the model was required to execute player commands without artificial intervention. Since the Director mode permits this artificiality (for example, a MOVE command for a unit in the Director mode is instantaneously accomplished) it was not used. Thus only those capabilities of the model that could be called on in the Player mode were used.

(2) A SITREP was called for hourly. (Normal SITREP frequency during game play is once every 12 hours.) Since the SITREP contained unit locations and strengths, it was necessary to call for this output so that the data would be available for later analysis and comparison with historical data. This was the only time the Director mode was used; it had no effect of the outcome of play--it simply provided us with an hourly record of the results of play.

(3) A common map was used by both commanders. (Normal game play has a separate map for each commander and a curtain separating the opposing force players). The objective of player commanders in the study was not to

try and outmaneuver the opposing commander, but to be faithful to the operational plans and intentions of their 1973 counterparts.

(4) The weather feature of the model was blocked so that weather had no effect on either side. Historically, weather was not a factor during 15-18 October 1973.

(5) The message denial feature (whereby a certain percentage of commands, though accepted by the model, would not be executed, to simulate the effect of electronic jamming) was blocked. It was important that every key command be received and executed to insure that the model's failure to execute key commands was not a reason for any results that varied significantly from history.

(6) Logistics play was not played in the model. The lack of logistics was not a factor and had no influence on the outcome of the historical 60-hour period played in the model.

PROCEDURE

An iterative procedure was used during USAWC computer model play, as described below.

(1) Speed of game play was set at zero (i.e. the game play clock was stopped). The SITREP as of 151700 OCT 73 was called for in the Director mode. Magnetic player unit pieces were posted at their game start locations on the map.

(2) Initial orders were input by both commanders.

(3) Game play time rate was set at 10 to 1 (60 minutes of play time equalled 6 minutes of real time); after 1 hour of game time, play was stopped by setting game time rate to zero.

(4) The SITREP was called for in the Director mode by each team.

(5) Each commander analyzed the output provided by the model during the previous 1-hour play period. Map posting was accomplished as necessary. Appropriate unit missions were determined and input as commands into the model.

(6) Steps 3 through 5 were repeated until the Israeli ADAN division was across the Suez Canal and prepared to sweep south from the bridgehead.

COMPARISON OF MODEL AND HISTORICAL DATA ON UNIT MOVEMENT AND LOCATION

"Snapshots" in the form of unit location charts of model data (obtained from the hourly SITREP generated during model play) for five specific times between 15 and 18 October 1973 were made. These charts were compared with corresponding historical data compiled from research to determine significant differences and similarities in the way the opposing commanders' operational intentions were executed by the model. Comments on the differences and similarities concerning the possible causes are provided.

Comparison of Egyptian model and historical data in most cases is possible only at the division level (an exception being the 25th Armored Brigade). While, as discussed earlier, the study group knew and was able to input the order of battle of the Egyptian units into the model, the same detailed information concerning unit identification and movement simply does not exist in historical accounts of the war. "Elements of the 21st Armored Division" or "tanks from the 16th Infantry Division" or "a brigade from the 18th Division" are examples of descriptions of unit identifications available. Nevertheless, the historical data available accurately portrays the "big picture" in sufficient detail as to provide useful comparison with corresponding model data.

The comments above relative to Egyptian unit identifications also apply to the Israeli units, except that the basis of comparison is at the brigade level (in a few cases, even battalion). Accounts of the war provide more specific information on individual Israeli units than they do the Egyptians. Comparisons and comments follow:

DATE/TIME: 160500 OCT 73 (Refer to Figures 3a and 3b)

MODEL DATA	HISTORICAL DATA
No Israeli units across canal. MATT paratroop brigade on Akavish road.	MATT paratroop brigade and EREZ battalion across.
Three bridges awaiting clearing of Akavish road before moving.	Preconstructed bridge broke down vicinity Akavish-Tirtur junction. Ponton bridge stopped by traffic jam, awaiting clearing of Akavish road. GILOWA rafts moved cross-country and are at crossing site.
RESHEF brigade in heavy contact.	Same.
RAVIV brigade draws Egyptian attention in north.	Same.

Comments: Historically, MATT's paratroop brigade was the first Israeli unit to cross the canal, doing so in rubber assault boats. The model provides each combat maneuver unit with an organic crossing capability, but causes a 12-hour wait from the time the unit arrives at the crossing site until it has successfully crossed the water obstacle.

In the model, the MATT paratroop brigade and the bridges came into contact with Egyptian units as they moved down the Akavish road. It was not the intention of the player Israeli commander to have these units come into enemy contact. However, in applying its algorithm for selecting a route to a location specified by the Israeli commander the model caused them to move to a map hex location adjacent to one containing Egyptian

units, thus initiating battle. This caused a movement delay of three hours, this being the time that the model maintains units in contact until results of the contact are provided.

Historically, the MATT paratroop brigade and the GILOWA rafts did come in contact with Egyptian forces as they moved SW along the Akavish road, but the contact was slight and they were able to bypass the Egyptians without becoming engaged. The computer model does not have a feature allowing a unit to bypass an opposing unit. Historically, the three bridges became separated en route to the crossing site--the GILOWA rafts arriving in time to let the Israeli EREZ brigade begin crossing; the ponton bridge was stalled in a traffic jam, then had to await clearing of enemy forces from the road; the preconstructed bridge broke down. The model moves units at predetermined rates and cannot, without the user intervening artificially, impose delays caused by events that Clausewitz calls the "friction" of war.

The model and historical data are similar concerning the situation in the RESHEF and RAVIV brigades. The RESHEF units in particular, both historically and in the model, are in heavy contact and have limited freedom of maneuver.

Date/Time: 161700 OCT 73 (Refer to Figures 4a and 4b)

MODEL DATA	HISTORICAL DATA
No Israeli units across canal.	EREZ brigade (2 battalions) joins MATT across, and has conducted a 15km raid to the west and returned.
Three bridges are at crossing site, arrived at 161100. Model requires 24 hours to install the bridges.	No change from 160500. GILOWA rafts are the only canal crossing capability at the crossing site.

DATA/TIME: 161700 OCT 73 CONT'D

MODEL DATA	HISTORICAL DATA
RESHEF brigade remains in heavy contact.	RESHEF brigade has withdrawn (at 160700) because of losses to rest and reconsolidate.
ADAN division remains on call to cross Suez Canal.	ADAN division is committed (at 161100) to assist in clearing the Akavish and Tirtur roads.
MATT brigade at crossing site; arrived at 161400. Model requires 12 hours to cross.	MATT brigade has now been across for 12 hours.

Comments: The major differences between the model and historical data at this comparison center on units and bridging equipment at the crossing site. Although the model now shows MATT's brigade at the crossing site, it will be 6 more hours before he will be across (12 hour delay imposed by the model for combat units crossing water obstacles, where there is no bridge installed at the crossing site). In the model, although all three bridges are at the crossing site, the model imposes a 24-hour period to complete bridge installation--thus it will be another 18 hours before the bridges are ready for use. (This points out an apparent inconsistency in the model concerning the times imposed in crossing of water obstacles. If a unit elected to wait for a bridge to be installed before crossing, it would be 24 hours before that unit could cross, whereas if the unit crossed using its organic bridging equipment, it would only take 12 hours). Historically, ADAN's division has now been attacking for 6 hours to clear the Akavish and Tirtur roads because of heavy attrition in SHARON's division, especially RESHEF's brigade, which has been withdrawn from contact. In the model, neither RESHEF's brigade nor any of the Israeli units in contact were anywhere near being attrited to a point where ADAN's division needed

to reinforce them. Specific comparisons concerning attrition in the model with historical battle losses are elsewhere in this chapter.

Date/Time: 170500 OCT 73 (Refer to Figures 5a and 5b)

MODEL DATA	HISTORICAL DATA
MATT's brigade across the canal at 170200.	MATT has been across since 160500.
Three bridges still being installed. Completion at 171100.	Ponton bridge arrived at 0500. Preconstructed bridge being repaired, but must await opening of Tirtur road before moving to crossing site.
RESHEF brigade and other Israeli elements continue to hold Akavish and Tirtur road open.	RESHEF brigade has been withdrawn out of contact since 170700.
ADAN division remains on call to cross Suez canal. RAVIV brigade continues diversion in the north.	ADAN division continues attack too open the Tirtur and Akavish roads, supported by RAVIV brigade.

Comments: The reasons for the differences in data at the crossing site have been discussed previously. In contrast with what happened historically, model play did not require reinforcement by ADAN's division as no Israeli units in contact were severely attrited. At this point in model play, ADAN's division was simply waiting for completion of the bridges being installed so crossing could begin.

Date/Time: 171700 OCT 73 (Refer to Figures 6a and 6b)

MODEL DATA	HISTORICAL DATA
Egyptian 25th Armored Brigade is surrounded. Initial contact with Israelis at 170900. Eliminated 9 hours later, at 171800.	Egyptian 25th Armored Brigade surrounded and eliminated in less than one hour of fighting, beginning at 171430.

Date/Time: 171700 OCT 73 CONT'D

MODEL DATA	HISTORICAL DATA
ADAN's division first joins Israeli elements in combat, in the ambush of the Egyptian 25th Armored Brigade. Elements of the division have surrounded the 25th Armored Brigade.	ADAN's division has been in combat for almost 30 hours, and is en route to rearm and refuel after having destroyed the 25th Armored Brigade.
KAREN brigade released from General Reserve to assist in ambush of 25th Armored Brigade. Moves from Tasm to ambush site (approx. 35km cross-country) in 8 hours.	Same. Covers identical distance in approximately 1 hour and 15 minutes.
MATT and EREZ brigades remain the only Israeli elements across the Suez Canal.	Same.
Egyptian forces attack MATT and EREZ brigades.	No contact.
Bridges are in position, ready to accept ADAN division crossing.	Preconstructed bridge still not at crossing site. Will not be in position ready for use until 181800.
Egyptian and Israeli forces remain locked in battle south of Missouri.	Egyptian 21st Armored Division withdraws North. Tirtur road is opened.

Comments: The ambush and destruction of the Egyptian 25th Armored Brigade occurred in the model, although it took three battle periods (9 hours) compared to less than an hour historically. A partial explanation for the difference is that the model's attrition rate is lower than that resulting from the high intensity of the historical battle--the same explanation for ADAN's division not being involved in combat in the model until the contact with the 25th Armored Brigade, i.e., he simply was not needed to influence the outcome of the battle. Another reason for the difference in the time

to destroy the 25th Armored Brigade lies in the battle period of three hours imposed by the model. The best the model could have done would have been to eliminate the Egyptian brigade in three hours. The movement of units in the ambush also merits discussion. The 25th Armored Brigade, moving at a rate of 12km per hour as specified in the model's unit data base, moved from Botzer to contact with Israeli forces, a distance of about 10km, in less than an hour. Historically, according to ADAN, "The advance of the Egyptian's 25th Independent Tank Brigade along the Lexicon axis was incredibly slow; they seemed to be doing more halting than moving."[14] Conversely, KAREN's brigade, rushing to get into position for the ambush, historically covered the 35km cross-country distance in about one-sixth the time it took in the model. The model does not have a feature to allow the user to speed up or slow down a unit's movement rate. Concerning the attack in the model by the Egyptians on the Israelis on the west bank, the Egyptian player commander was reacting to intelligence in the form of intercepted messages (a feature of the model) indicating to him the presence of enemy forces on the west bank of the canal.

Date/Time: 180500 OCT 73 (Refer to Figures 7a and 7b)

MODEL DATA	HISTORICAL DATA
ADAN's division is in the process of crossing the Suez; AMIR's brigade is across. Division crossing complete at 181000 (see Figure 8).	ADAN's division (minus KAREN brigade which reverted to General Reserve) completes crossing at 180500.
Egyptian attack on Israeli forces on west bank continues.	No contact.
Israeli and Egyptian contact continues south of Missouri, though at a diminished level.	Egyptian forces have withdrawn north.

Comments: The Egyptian attack on the west bank was discussed previously. The Israeli and Egyptian contact south of Missouri continued as unit strengths remained relatively high and neither side could wield overwhelming combat ratios. Historically, it took ADAN's division of two brigades about 5 to 6 hours to cross; this same force, moving one brigade at a time as was done historically, took 12 hours on the model.

Date/Time: 181000 OCT 73 (Refer to Figure 8)

MODEL DATA	HISTORICAL DATA
Crossing of Suez Canal of ADAN's Division is complete.	Crossing was completed at 180500.

Comments: Model play required an additional 5 hours for ADAN's Division to complete the canal crossing.

COMPARISON OF MODEL AND HISTORICAL ATTRITION DATA

Comparison of attrition data is meaningful only within certain parameters and given assumptions. Model data gives attrition in percent of combat strength remaining; this single percentage does not differentiate between personnel and materiel losses. What historical data is available generally gives numbers of things (e.g. tanks) destroyed and numbers of people killed. Further, the historical data often does not identify the specific units in which losses occurred--this is particularly true of Egyptian losses. Nevertheless, the historical details are such that one can piece together a reasonable estimate of the severity of losses and in which units they occurred so as to be able to make the comparison with model data.

In converting historical losses to a single percentage to compare with model data, certain assumptions were made. The first was that materiel and personnel losses corresponded (i.e., if it was estimated that a unit lost

15% of its tanks, it also lost 15% of its personnel--either killed or wounded so as to be put out of action). Secondly, for some units, the percent of attrition could be pinpointed to have occurred during a specific number of hours of intense combat; thirdly, for all units, an overall attrition percentage for the period 151700 to 180500 OCT 73 could be estimated. In estimating the percent of attrition, the study group applied its best professional judgement in those instances where actions were well-described concerning battle severity, but no specific loss figures were given; the same judgement was applied where the losses in the action were lumped into overall losses for the entire period. The final assumption was that unless specific battalions were identified, the percentage of attrition applied uniformly across a brigade (for Israeli units) or across a division (for Egyptian units).

Dupuy estimates Israeli losses during 15-16 October to be 80 tanks and 300 men killed, all from *SHARON's division.*[14] The study group estimates that another 15-25 tanks and 40-60 men were lost during the next two days, this estimate derived from piecing together the various accounts of the actions that occurred. The RESHEF brigade lost two-thirds of its 90 tanks in a 10-hour period on the night of 15-16 October; that same night, a tank battalion from the EREZ brigade, supporting MATT's paratroopers, lost an entire company in three hours; a battalion from the AMIR brigade held the Lexicon-Tirtur crossroads for 30 hours against repeated Egyptian attacks; and the YAIRI battalion attached to ADAN's division was pinned down at the Chinese Farm for 12 hours. The remaining Israeli elements, although in action at various times during 15-18 October, did not experience the same degree of combat intensity (and losses) as the units mentioned above.

On the Egyptian side, Dupuy shows the combined losses of the 16th Infantry and 21st Armored divisions to be 150 tanks during battle on the

night of 15-16 October, a 10-hour period.[16] The study group estimates that each division lost a third of its tanks during this period. It is further estimated that the two divisions lost a combined total of about 20-40 tanks in the next two days, again from a description of the battle events, the elements involved, and intensity of combat.

The following summarizes the estimated unit historical attrition rates and comparable model data:

	ATTRITION FOR INTENSE COMBAT DURING A PORTION OF THE BATTLE PERIOD		ATTRITION FOR THE OVERALL BATTLE PERIOD	
UNIT	HISTORICAL	MODEL	HISTORICAL	MODEL
ISRAELI				
RESHEF BDE	>50%/10 hrs	2%/10 hrs	>50%	11-28%
1st BN AMIR BDE	20-25%/30 hrs	13%/30 hrs	25-30%	19%
AMIR BDE	----------	----------	10-15%	5-10%
YAIRI PARA BN	20-25%/12 hrs	9%/12 hrs	20-25%	14%
2nd BN, EREZ BDE	20-25%/3 hrs	1%/3 hrs	20-25%	57%*
EREZ BDE (-)	----------	----------	10-15%	12-21%*
RAVIV BDE	----------	----------	10-15%	24%
BARAM BDE	----------	----------	10-15%	8-11%
KAREN BDE	----------	----------	1-5%	3%
1st BN, MATT PARA BDE	----------	----------	15-20%	19%
MATT BDE (-)	----------	----------	5-10%	8-100%*
EGYPTIAN				
16th INF DIV	25-30%/10 hrs	2%/10 hrs	35-40%	15-31%
BN 21st ARM DIV	25-30%/10 hrs	50%/10 hrs	35-40%	55%
21st ARM DIV (-)	25-30%/10 hrs	2%/10 hrs	35-40%	12-15%
2nd BN, 2nd TK BDE	----------	----------	0%	54%*
207 TK BN	----------	----------	0%	54%*
25th ARM BDE	90%/1 hr	75%/9 hrs	90%	75%*

* Involved in major Egyptian attack on Israeli bridgehead on west bank. This attack occurred in the model; it did not happen historically.

The historical attrition rates during the periods of intense combat, where very high losses occurred in relatively short periods of time, are not matched by the model. A lone exception to this observation is the battalion in the Egyptian 21st Armored Division. Examination of model SITREP data reveals however, that the high attrition in this unit was caused when the unit was attacked from the front and both flanks, the cause of similarly high attrition in units of the Israeli EREZ and MATT brigades; the Egyptian 207th Tank Battalion; the 2nd Battalion 2nd Tank Brigade; and the 25th Armored Brigade, which was destroyed historically and in the model. The model's increase of a unit's combat power ratio when that unit is able to achieve a tactical advantage (such as attacking an opposing unit from the rear or flanks) appears to be reasonable. Comparison of overall historical and model attrition data shows a somewhat closer match for those units that were not involved in the intense periods of conflict. This observation must exclude those units which, in the model, were involved in an Egyptian major attack on Israeli units on the west bank, an event that did not occur historically. The data from this study is insufficient to conclusively state whether the model's attrition rates are realistic for other tactical situations such as conventional war in Europe. What can be said is that the model, in attriting a unit at a steady rate over time, does not do so the way attrition occurs in combat, i.e., as a series of pulses (periods of relatively moderate to intensive conflict) separated by lulls (periods of negative to relatively low intensity).

CHARTS

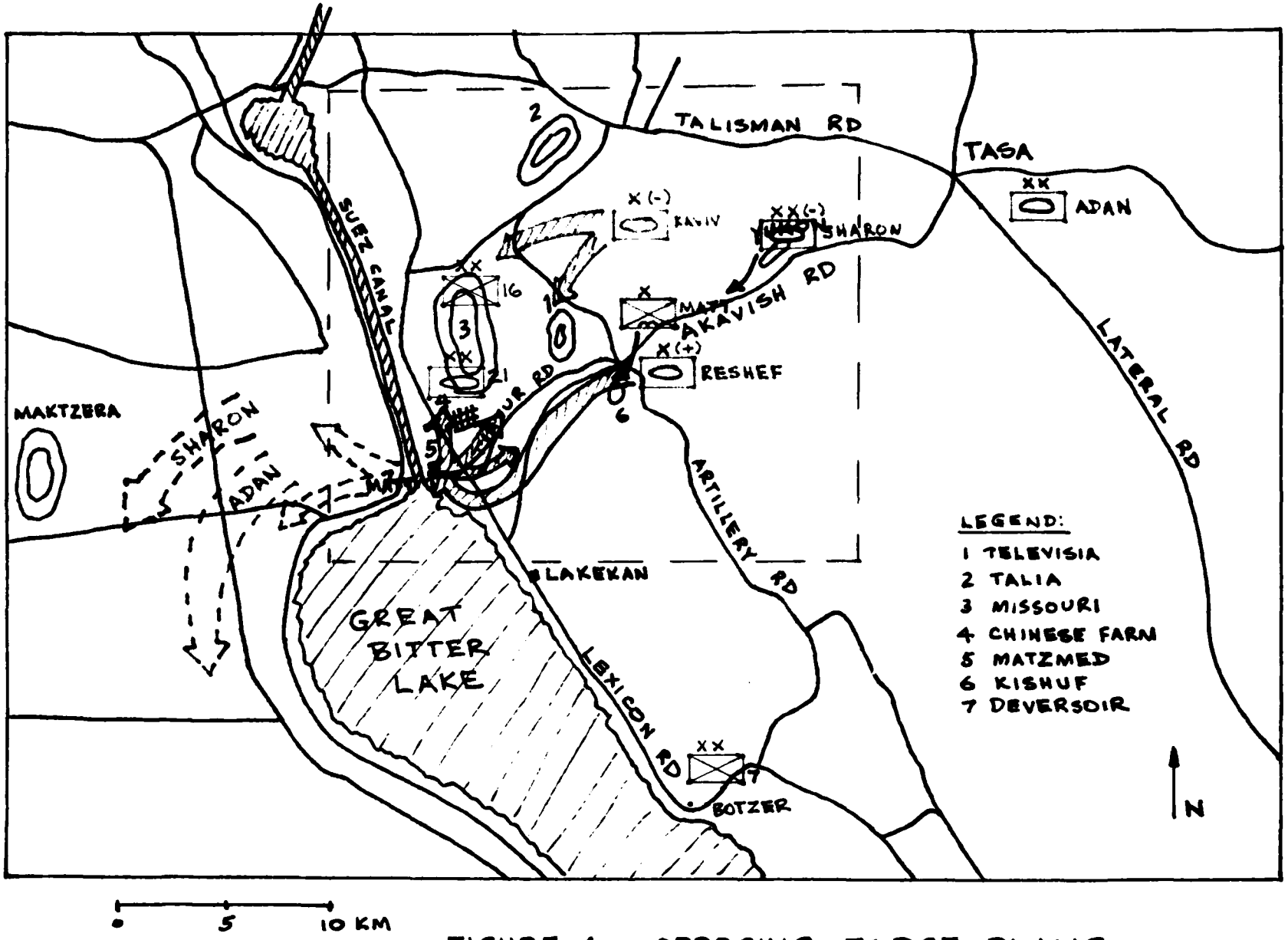


FIGURE 1. OPPOSING FORCE PLANS

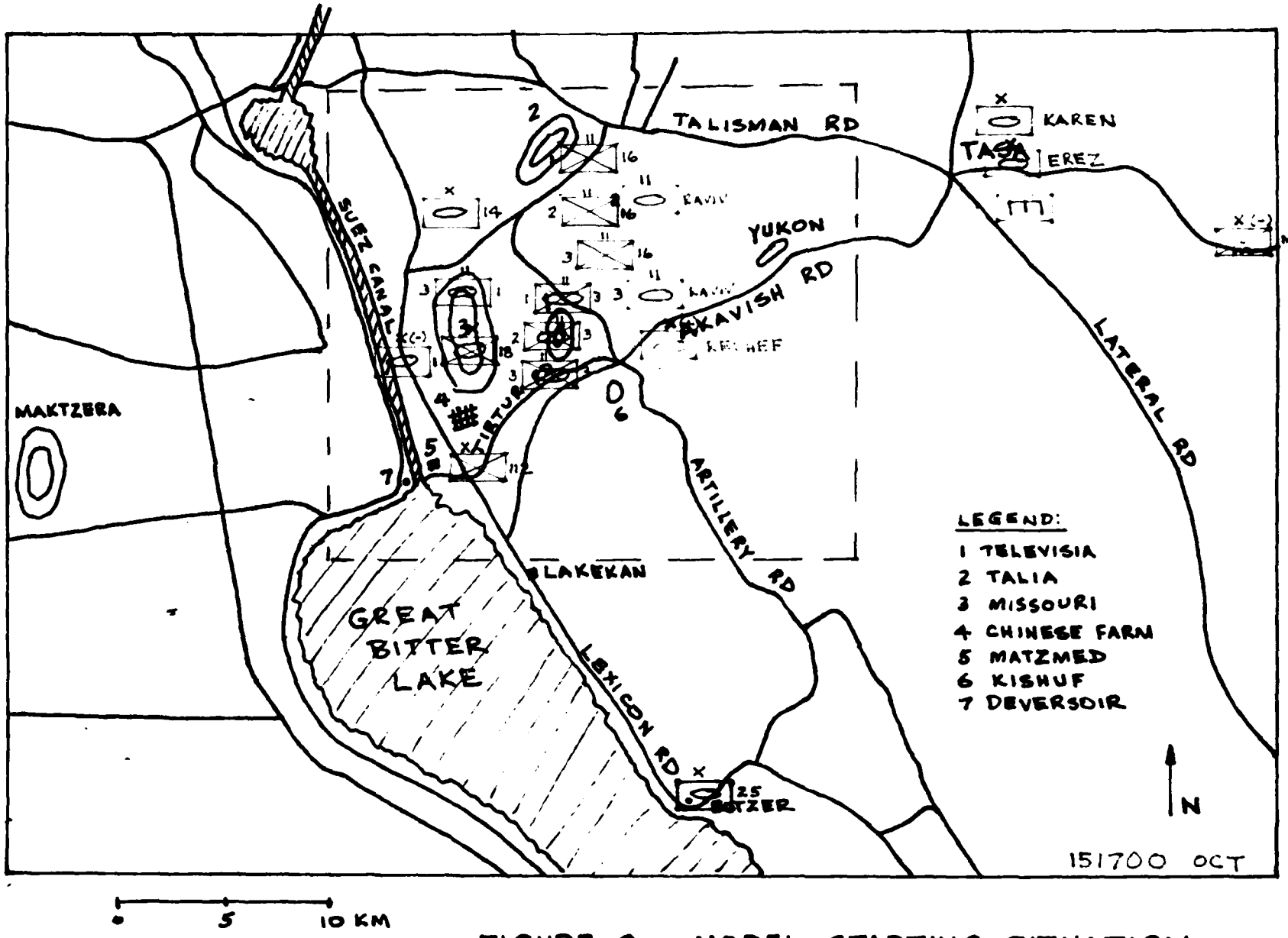


FIGURE 2. MODEL STARTING SITUATION

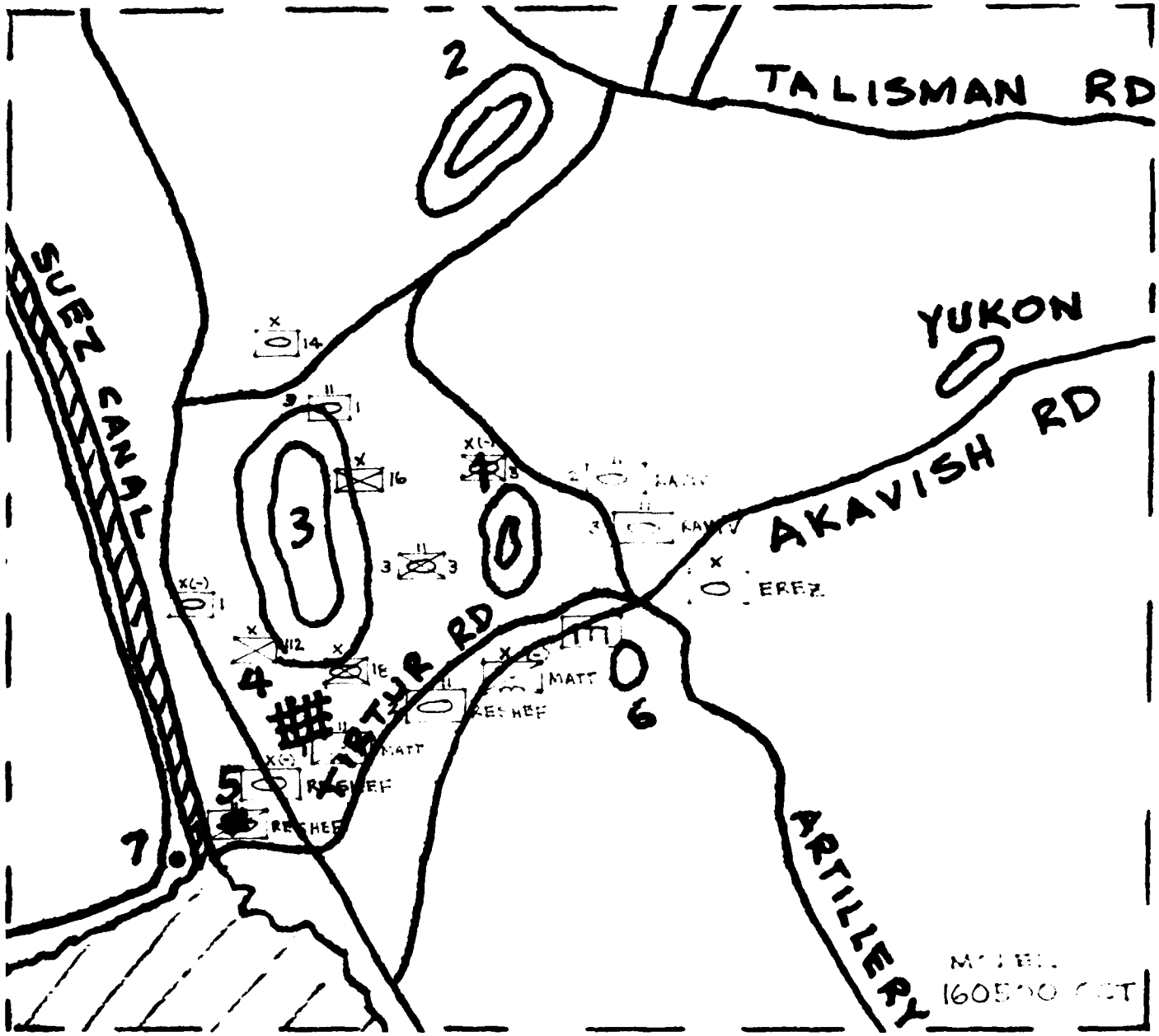


FIGURE 32. MODEL SITUATION, 160500 OCT 73

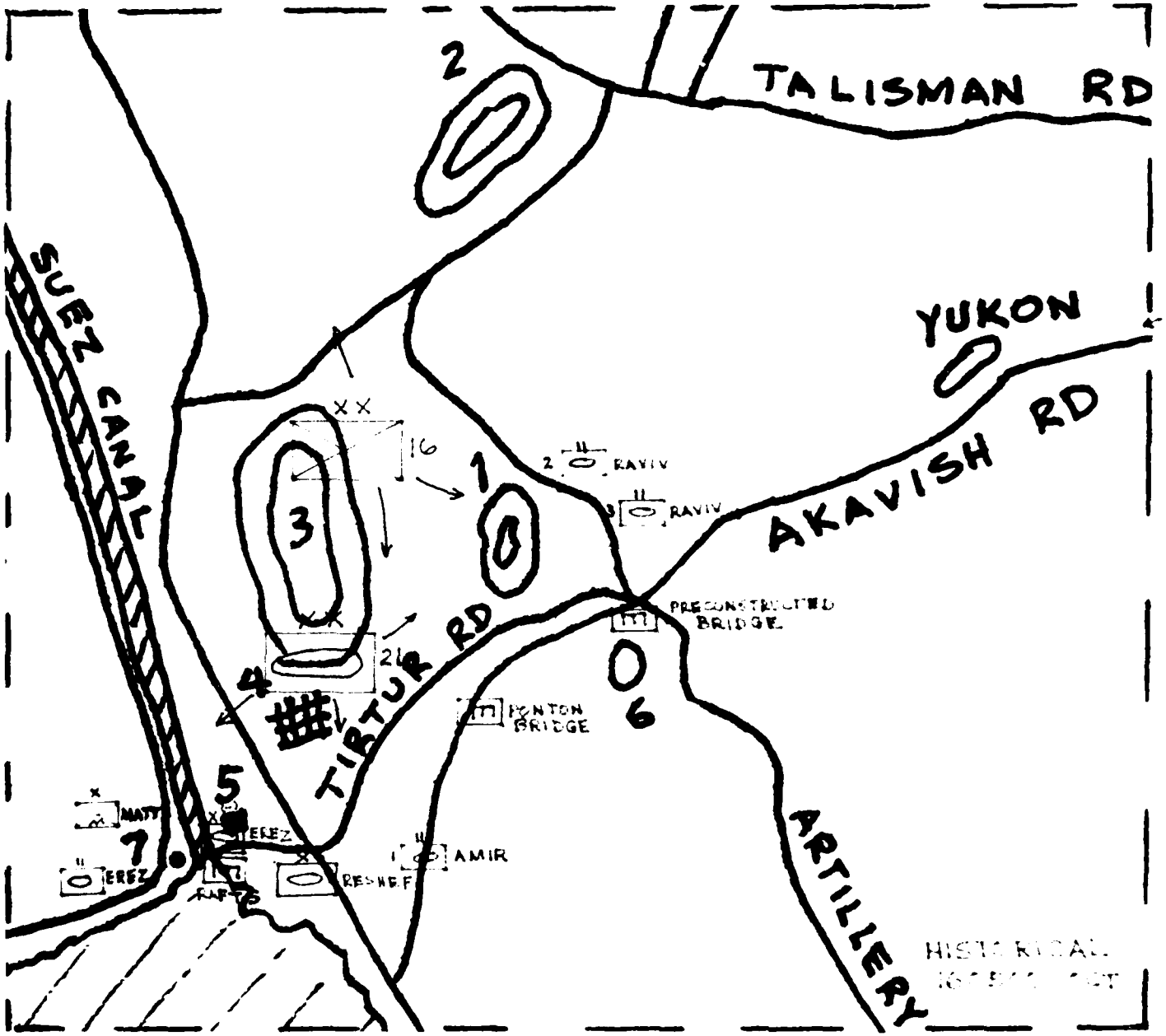


FIGURE 3b. HISTORICAL SITUATION, 160500 OCT 73

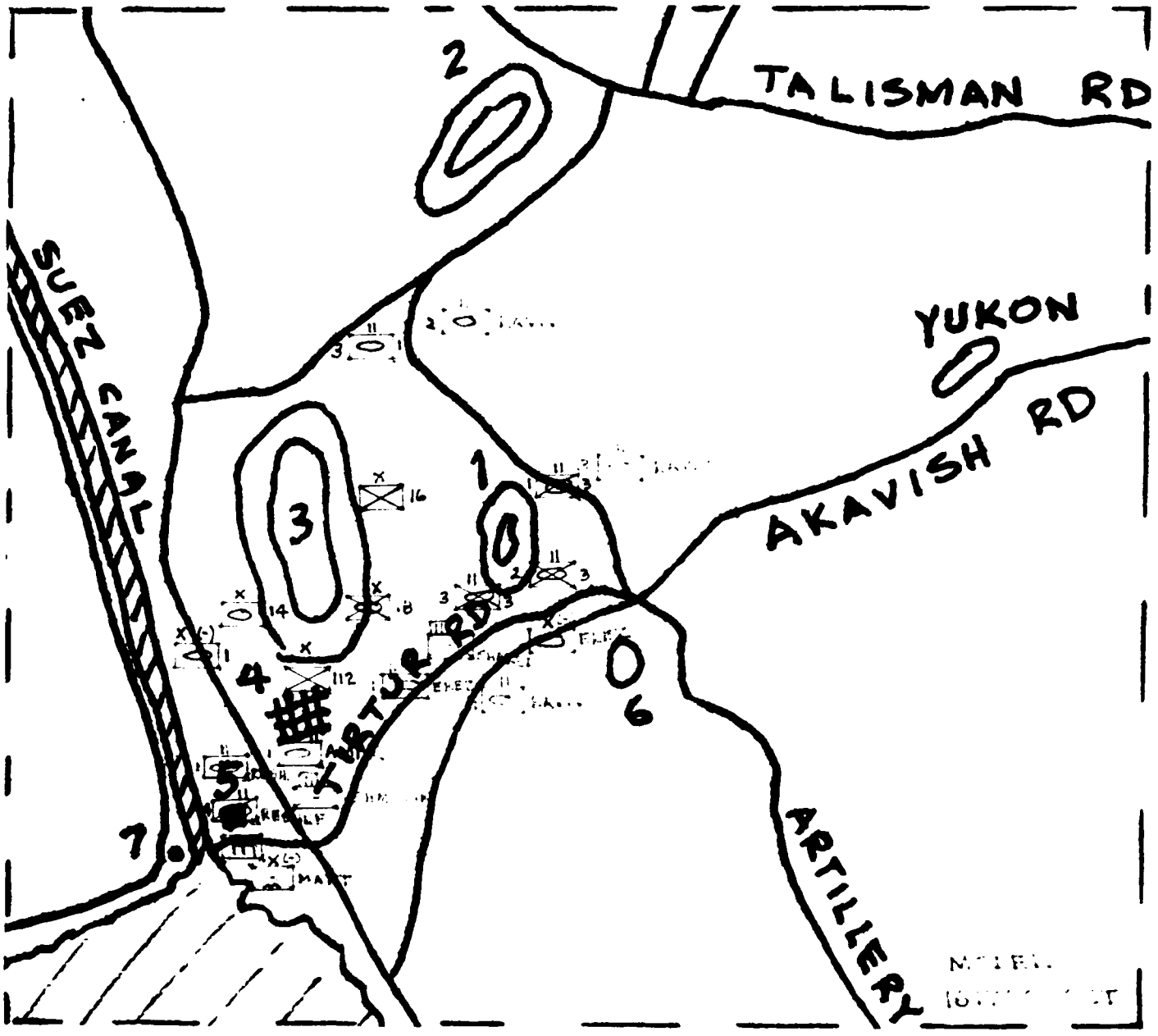
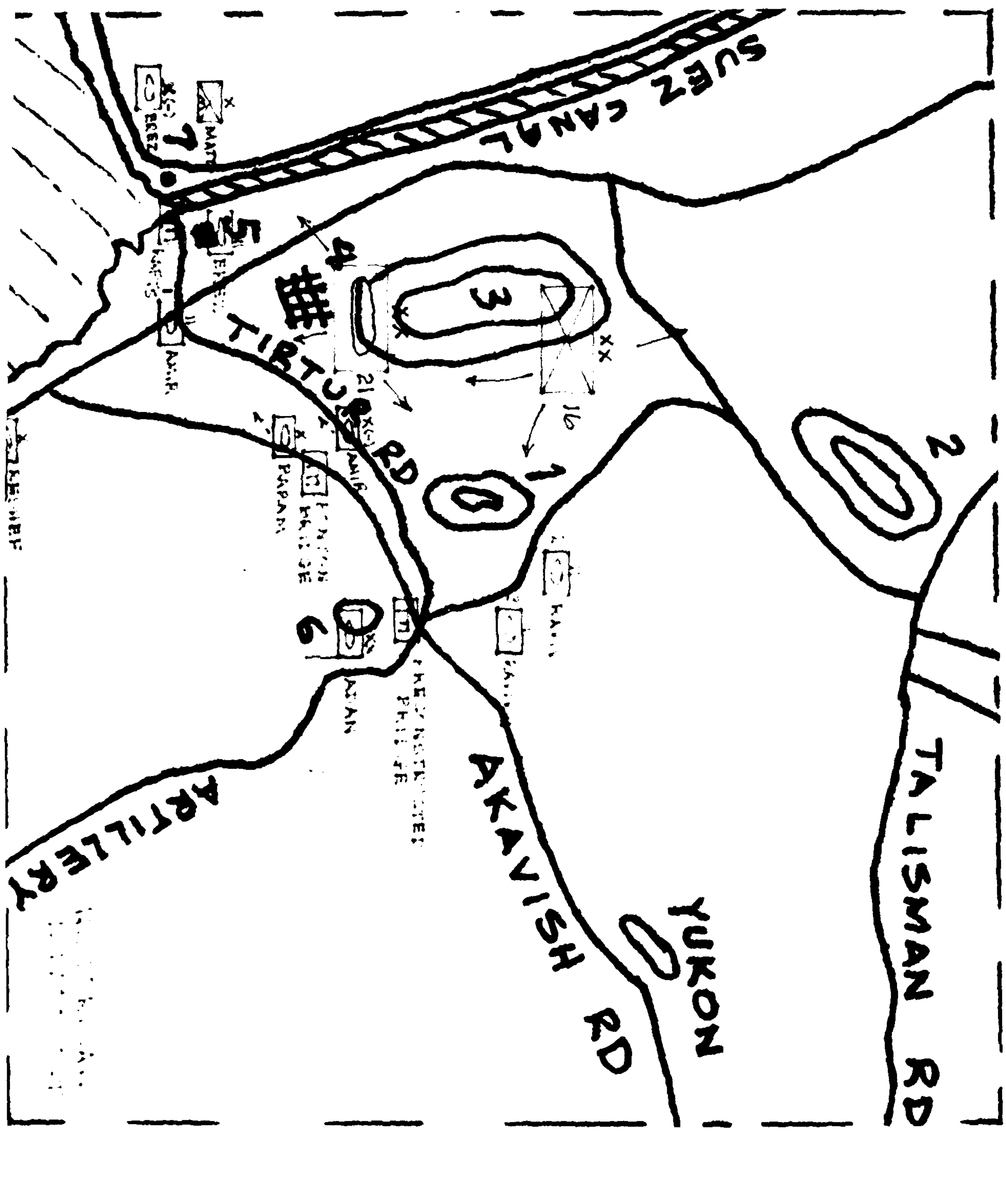


FIGURE 4a. MODEL SITUATION, 161700 OCT 73


SUEZ CANAL
TIRTUR RD
AKAVISH RD
TALISMAN RD
YUKON
ARTILLERY
1
2
3
4
5
6
7
16
21

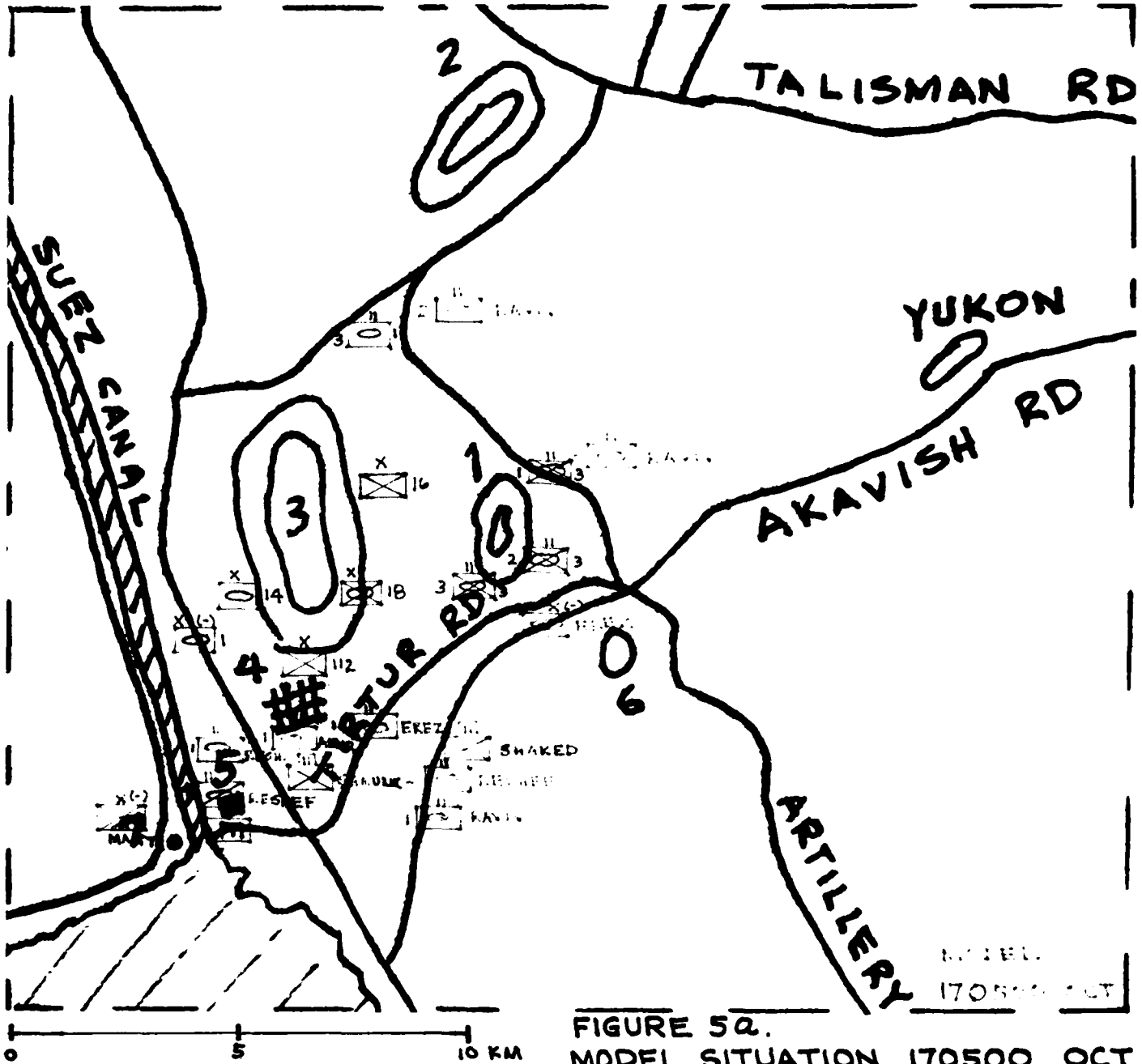


FIGURE 5a.
MODEL SITUATION, 170500 OCT 73

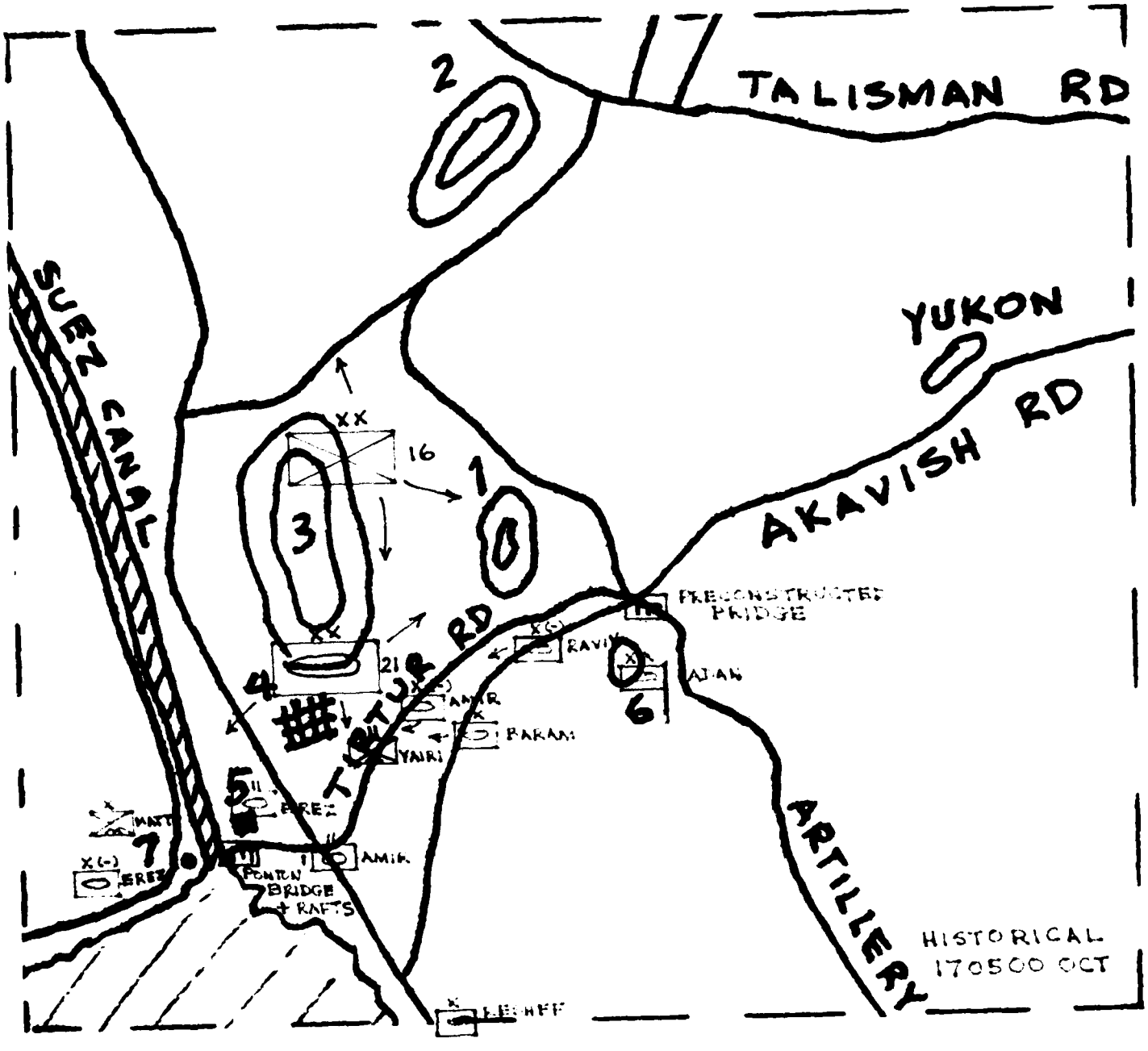


FIGURE 5b. HISTORICAL SITUATION, 170500 OCT 73

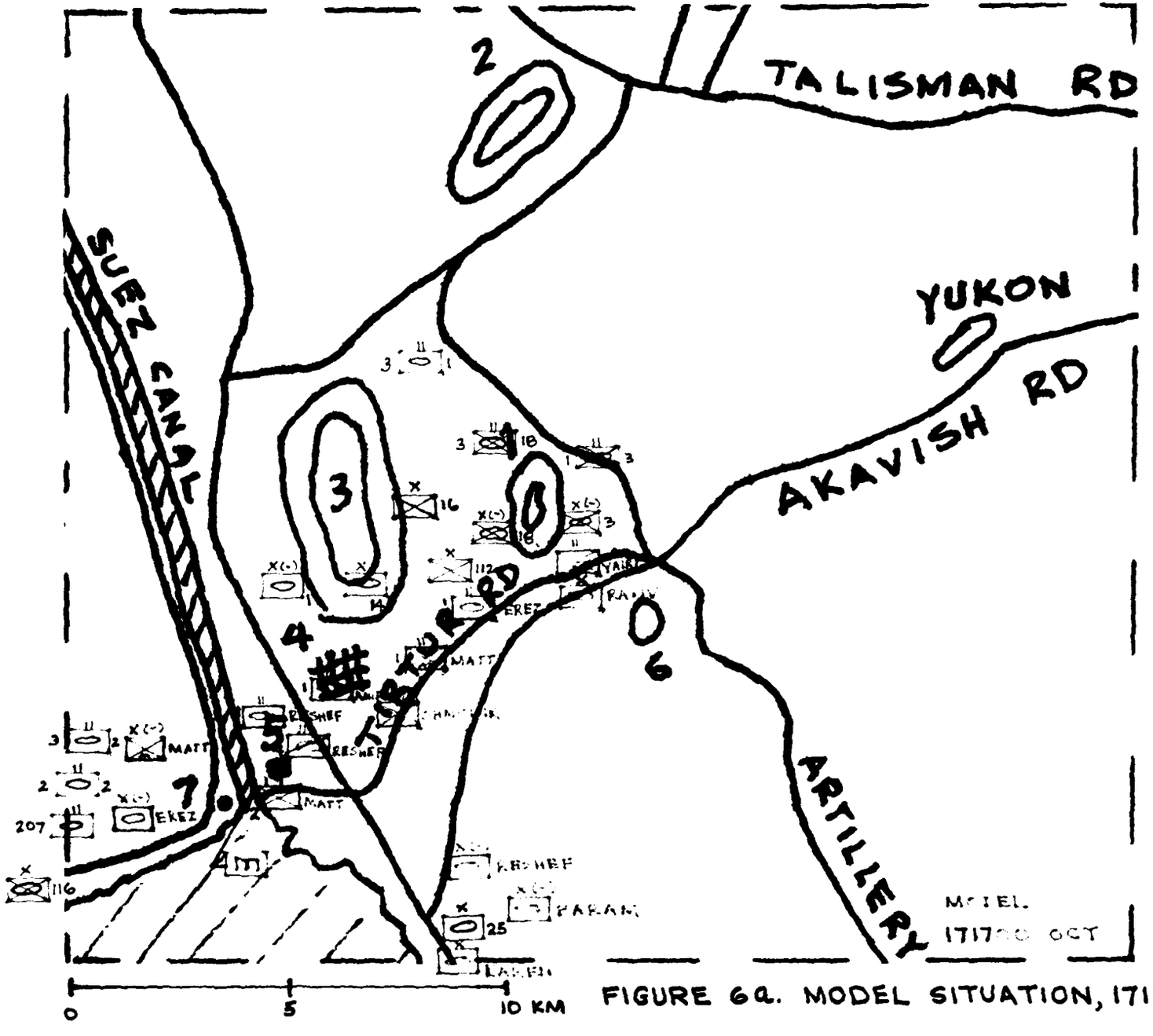


FIGURE 6a. MODEL SITUATION, 171700 OCT 73

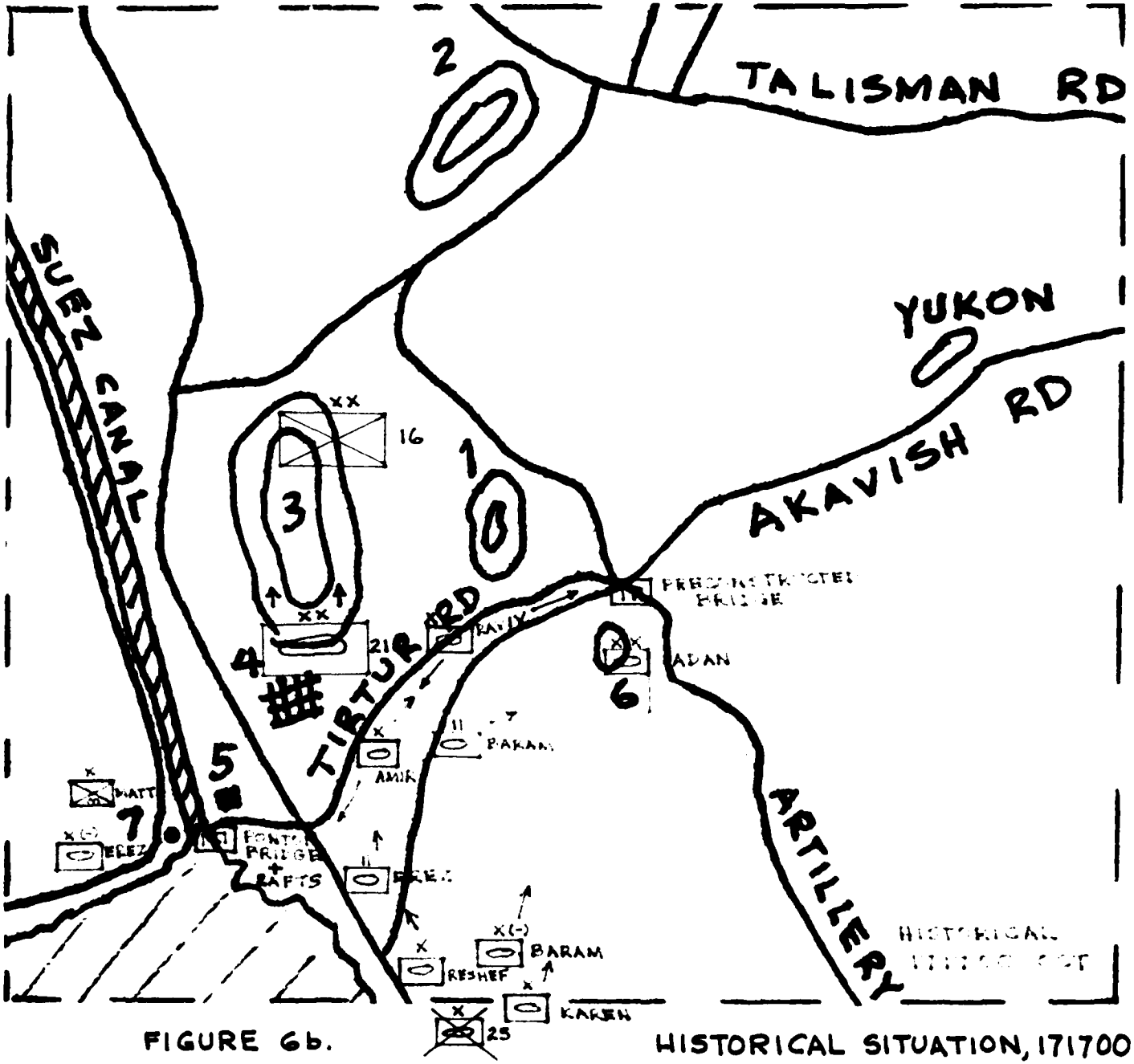


FIGURE 6b. HISTORICAL SITUATION, 171700 OCT 73

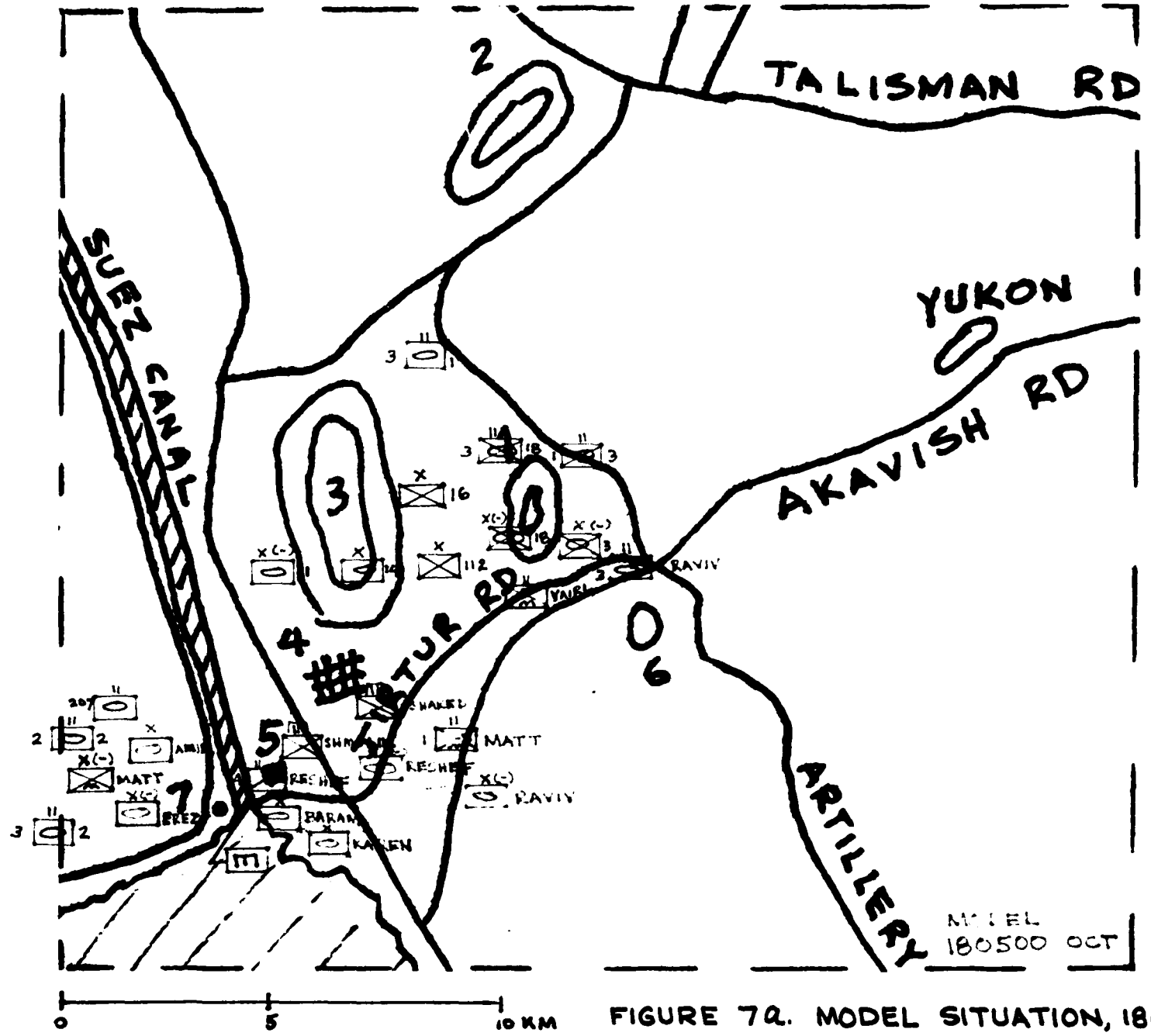


FIGURE 7a. MODEL SITUATION, 180500 OCT 73

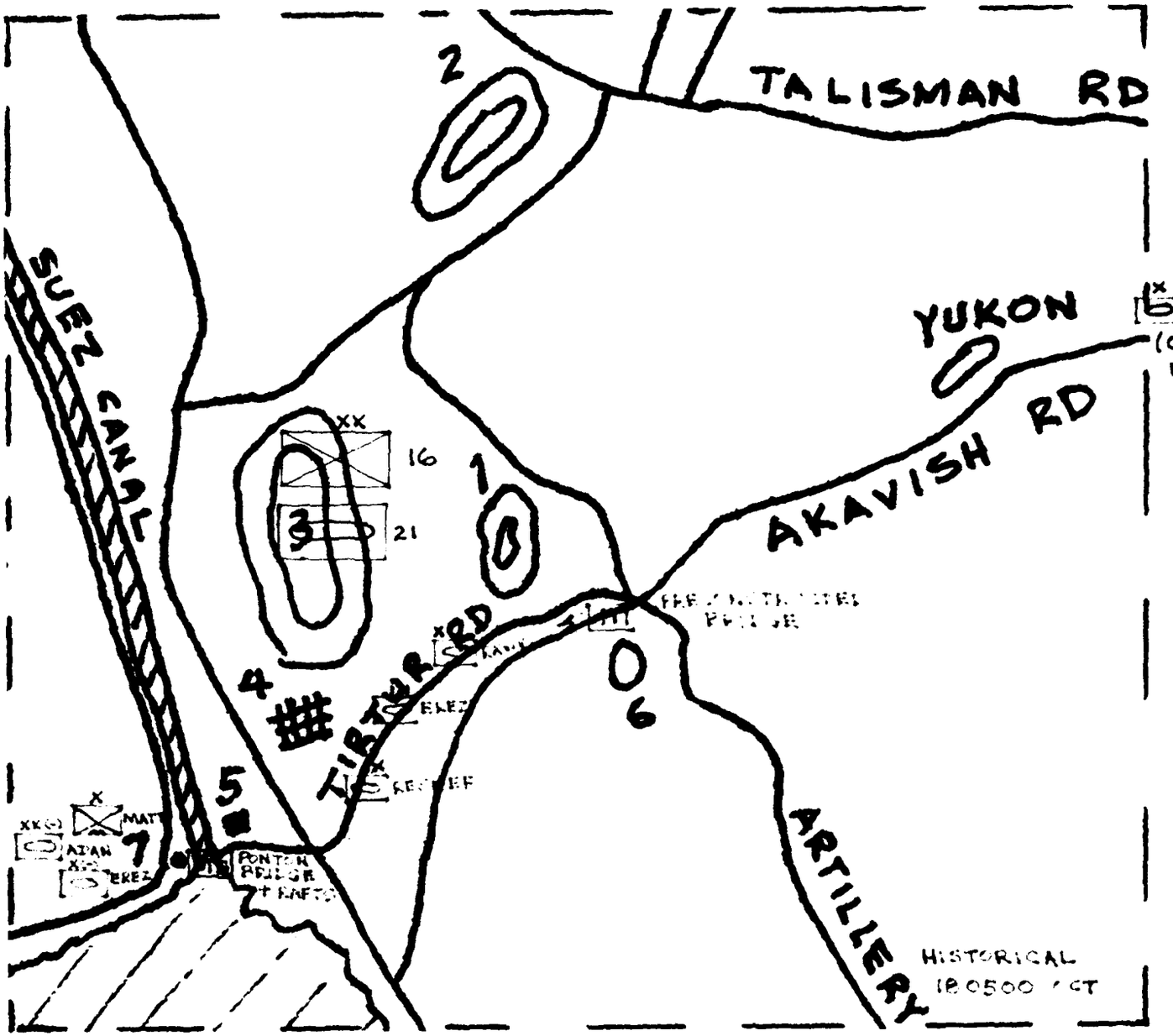


FIGURE 7b. HISTORICAL SITUATION, 180500 OCT 73

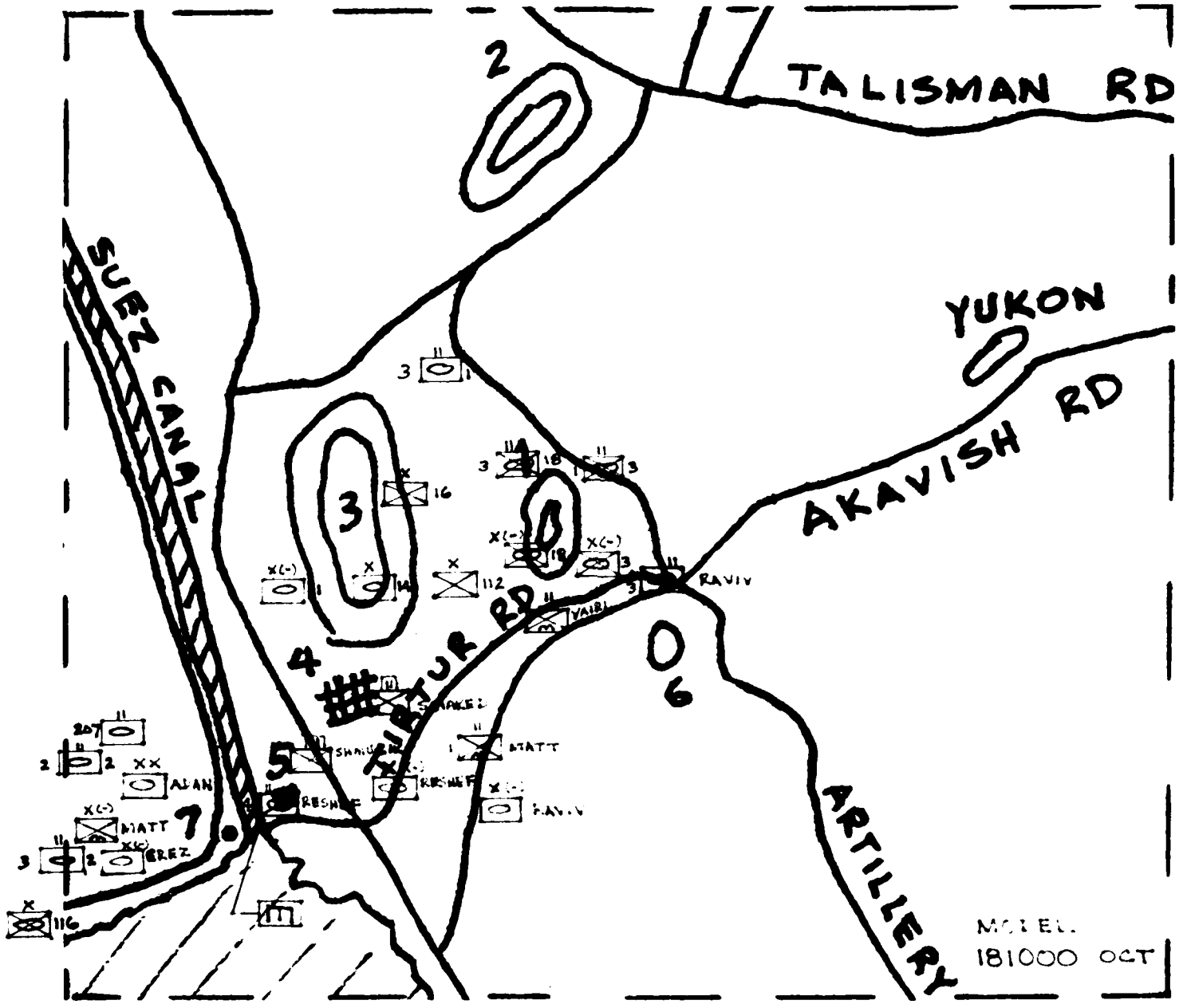


FIGURE 8. MODEL SITUATION, 181000 OCT 73

CHAPTER V

FINDINGS

This group's work with the USAWC War Game Model produced substantial findings which may be grouped into the following categories:

a) Specific Model Faults.

b) Suggestions for improvement.

c) General observations on model validity.

Each category will be addressed separately in the following sections.

SPECIFIC MODEL FAULTS

Problems identified under this category were observed in the January, 1983 version of the model as used in the General Overview Curriculum CORPS war game and by this study project team. If not already corrected, they are recommended for immediate correction prior to further classroom use of the model.

1. Move Algorithm. The move algorithm currently used by the model to determine the path or route to be followed by units assigned a player's mode move order is quite weak. The machine constructs a straight line between the center of the current hex and destination hex. A window is next examined which lies 60° either side of this direct "line-of-sight." This window will encompass a minimum of two and a maximum of three hexes adjacent to the current location hex. Considering terrain, roads, etc., the model then effects a move toward the adjacent hex within this window which can be reached in the least travel time by the maneuver unit. If two or more hexes can be reached in equal time, the algorithm selects the first

one encountered clockwise from north. After this move to an adjacent hex is completed, this process repeats iteratively until the destination is reached or movement blocked (e.g. engage enemy units). Although this approach offers relative simplicity, its shortcomings are many and obvious. By not exploring the ordered move beyond immediately adjacent hexes, the algorithm can entirely miss a road or other beneficial terrain feature which lies several hexes away. By resolving "ties" in the current fashion (first hex clockwise from north), the algorithm contains bias which tends to distort the move path: e.g. moves are biased to the east for an ordered move to the south. The algorithm fails to recognize ever present situations where a slight penalty in time now pays off handsomely later as movement continues.

An improved technique which considers the entire move path or route and selects the overall optimum path for use throughout the trip duration is recommended. This would increase the initial computational burden, but reduce the subsequent computational work the present method requires. More importantly, the selected route would more realistically simulate reality thereby enhancing model credibility.

2. Withdrawal Movement. Upon reaching the designated withdrawal threshold as a consequence of battle and/or movement attrition, the model automatically effects a withdrawal of the affected maneuver unit. The direction of movement taken by this unit is not controlled by the players. The model selects this move direction such that the weakened units often "retreated" in the general direction of the enemy lines vice the friendly side direction. The model is merely insuring that the weakened unit disengages from his immediate enemy contact. Recommend an improved technique be used which causes withdrawal in the general direction of friendly forces. The credibility of the model would be considerably enhanced.

3. Bridging Feature. Available documentation (Player Guides) on the model indicated that only engineer units could erect the necessary bridges for maneuver units to cross water (rivers or canals). A period of twenty-four hours was indicated to accomplish this task. Thus, in Suez game play, the Israeli side moved raft and bridge units to the canal first in order to commence construction. Combat maneuver units were then moved alongside the canal to cross when bridges were available. However, the model version played had been modified to provide combat maneuver units with organic bridging capability which was automatically engaged by the model. Worse, the construction time for organic bridge building was specified to be one-half that of engineer units. Thus, surprising and unrealistic canal crossings were experienced. This study concludes that the software modification adding organic bridging capability to all maneuver units should be removed. If it remains in, however, the documentation should be updated and construction delays adjusted such that engineering units can at least match maneuver units in bridging operations.

4. Number of units per battle. The model currently limits the number of units involved in a battle at ten per side. Apparently, the model module for battle simulation is table-driven and the table is restricted to ten units per side in order to conserve computer memory. In Suez game play, just as in history, a large front formed along an east-west line roughly parallel to the Akavish road with Egyptian units on the northern side and Israeli units opposite. The battle along this line was a major engagement of the war and involved many more than ten units per side. Consequently, numerous error messages were received in the printout warning that this overload condition existed. It was unclear what happens within the model when this condition exists. It is not catastrophic inasmuch as

play continues. However, all results are suspect once this occurs. Attrition would obviously be reduced for units not carried in the tables. Further, certain otherwise unexplainable unit movements, or lack thereof, were rationalized by attributing them to this model fault. If this table-size limitation cannot be altogether eliminated, then the maximum number of units per battle should as a minimum be raised to the 25-30 range. Incidently, this limitation is not documented in player guides. In general, it is recommended that players be buffered from artificial, machine-imposed limitations of this nature. The issue here involves more than model credibility, but the question of who serves whom, man or machine?

5. Artillery Play. This area is ripe with comment. To begin, the documentation currently stipulates two "modes" of artillery play in the model: (a) Direct fire missions whereby players input specific data; i.e. target, type of munition, number of volleys, etc.; (b) Support role to ground maneuver units where, artillery play is handled like close air support. The effective firepower of supported maneuver units is increased thereby shifting the attrition formula in their favor.

During this group's familiarization run described in Chapter IV above, it was found that the 1982 Suez work was done by playing artillery in a third mode. In the 1982 methodology, the Director mode was used to move artillery units into adjacent positions to enemy units whereby ground combat attrition simulated artillery damage. Later, the artillery units were removed, reconstituted in strength, and repositioned, all in Director mode. The 1983 study group rejected this mode in theory and practice as artificial and improper. Throughout the 1983 validation run, the Director mode was employed only for the purpose of obtaining hourly team situation reports needed for this report. Use of Director mode in any fashion which

affects model output results is specifically not recommended when the very validity of the model itself is at issue or realistic game play is desired.

In the model version played by the 1983 Suez group, it was necessary to specify in advance of play which artillery units would be played in each of the two legitimate modes described above. The model unit data base was then adjusted by technical support personnel such that units to receive "FIRE" missions were reflected as maneuver units and "SUPPORT" role units were shown with close air support units. Thereafter, artillery units were played exclusively in their designated mode. Not even "controllers" can modify the unit data base file and change artillery modes. Documentation on the model indicates either mode may be chosen for use by the players, which is not true once play begins. It is recommended that software modifications be implemented to permit player flexibility in artillery mode selection throughout the exercise as described in the player's guides.

Additionally, the attrition value for artillery in "FIRE" mode was chosen to be identical to the established value used in the classroom model play such as the CORPS game. The value is based upon data derived from actual battle as compiled by the Concepts Analysis Agency. In game play however, the effectiveness of artillery as used by the Egyptian side appears to be so low as to not be worth the time and effort to input repeatedly the mission data. History of this battle reinforces this belief. Perhaps this value is too low. Perhaps artillery is truly not that effective under these circumstances.

Finally, the requirement to use "DISPLACE" rather than "MOVE" orders to effect movement of <u>some</u> artillery units seems confusing and unnecessary. It is recommended that all units be controlled from a single move order format to improve the model man-machine interface.

6. Day/night move rate adjustment. A very simple flaw exists here. At sunrise or sunset, the model does not go through all units in move status and adjust their speed accordingly. At the time a unit commences movement, the rate of movement for the duration of the move is set based upon existence of daylight or darkness at that time. It is recommended that the model be upgraded to adjust move rates for all units in movement at sunrise and sunset.

7. Director Error Messages. Throughout all runs, sporadic printed messages were received indicating the software had encountered "invalid CASE statements." This appears to root back in the PASCAL source code and may have multiple origins. Its effect is unknown. In any case, it is a red flag condition which should be addressed and resolved.

8. False Destination Output. Once artillery units had completed fire missions, the activity column of the next SITREP reflected them as available, but the "destination" column showed their old target hex data. Since no move or fire order was currently active, this is a false output indication which should be corrected.

SUGGESTED IMPROVEMENTS

Items discussed under this category cannot be considered "faults" requiring correction. They are suggestions developed through extensive play by this study group and are considered worthy of adoption when hardware limitations permit. Some will improve model ergonomics and others its realism.

1. Time Display. In the current version of the model, to check on game time a request must be entered into the Visual Display Unit (VDU). At some uncontrollable future point, the time at which the request was received is printed on the output printer. Because of delays in clearing

printer buffers, the printout may lag actual game time considerably, especially when the time rate is set at a high value. It is recommended game time be displayed at all times on the VDU and be printed automatically at selected points as is currently done. This would have been valuable to study group and would be beneficial to all player groups. It is considered unrealistic to not be aware of exact time as the model is played.

2. Time Initialization. When a fresh game is initiated, the model automatically sets game time to 000000; i.e. day 00, hour 0000 (midnight). Not all scenarios begin at midnight. Although it is possible to set the time rate up and advance game time w/o unit movement in order to reach a desired start time, it is a little inefficient and error-prone. It is recommended that the initialization sequence be modified to allow players to input a desired start hour via VDU key-in. Incidently, humans prefer to refer to the first day of anything as day 1, not day 0. Again, recommend making the machine serve man rather than vice versa; initialize to day 1 vice day 0.

3. Move rates. In the current model version, the rate of movement for all units is strictly controlled by the computer based upon unit type, terrain, weather, darkness, etc. The players cannot specify, for example, a hurry-up move to be executed with some increased attrition in order to achieve a specific objective worth the increased losses. Recommend some flexibility in this regard be inserted into the model. Again, realisim would be somewhat enhanced.

4. SITREP Frequency. The model currently prints out a complete team situation report (SITREP) for both sides every twelve hours of game time. This was found to be a little too infrequent (although it may be very realistic). Too much can happen, or, more importantly, not happen in a twelve hour period. Because of demonstrated inconsistencies by the model

in certain movement activities, and absence of "artificial intelligence" imbued into individual maneuver units, a desire for more control or awareness than was possible with reports 12 hours apart was felt. Recommend team SITREP's be dumped every 6 hours automatically by the model. This would briefly compensate for model absence of tactical feedback about unit activity.

5. Order Queuing. The current model does not permit queuing multiple orders for a given unit each to be executed upon completion of the previous order. This study group encountered many situations in which this would have been useful. For example, the entire familiarization run could have been accomplished in dramatically shorter time by entering all of last year's orders into queues and then running at a high time rate. In actual classroom play, one often desires to control the move route of a selected unit by issuing a sequence of move orders to be executed in turn. To do this, the player must issue *each* order himself after awaiting and receiving notice of completion of the previous move order. It is recommended that queues be permitted into which order sequences can be specified.

6. Unit Stoppage. All ground units currently lose .25% of combat strength for every 10km they move. However, there exists no provision for unit stoppage due to mechanical breakdown. In the Suez battle modeled, the Israeli preconstructed bridge historically experienced a breakdown while moving to the canal along Akavish road. Until repaired, this bridge actually blocked this narrow road to all other traffic. This appears to be a fairly simple possibility to incorporate into the model with automatic repair effected after an appropriate delay.

7. Move without engagement. Currently, opposing side units will automatically engage in combat when in adjacent hexes. Once engaged, they are absorbed into the battle with all movement orders cancelled for engaged

units. Normally, this feature adequately suits the situation. However, there are times when a commander would like to order units to "move to location x and not to stop for battle engagement." Israeli units moving to the canal for the crossing operation (Adan's division) were under such orders. This could only be simulated by constantly withdrawing engaged units and issuing move orders along circuitous routes. It is recommended that another option be extended to commanders when issuing move orders to avoid battle.

8. Airstrike Targets. Upon issuing an airstrike mission order, the model currently inserts an appropriate delay (4 hours in our Suez play) for aircraft preparation (e.g. fueling, arming, etc.). Then, the aircraft take off and fly (with appropriate delay) to attack targets specified at the time the orders were issued. This, of course, means no use can be made of intelligence received during the preparation delay period. It is recommended that the model be modified in the airstrike module to request updated target information from players just as the aircraft takeoff on their mission. This seems more realistic and would enhance airstrike effectiveness.

9. Status of Artillery Units. In the current situation report format, there is no status or activity indication (i.e. combat, moving, or available) for artillery units being played in close air support fashion. It is recommended that this be added so that players can ascertain if displace (move) orders are in effect for these units.

10. Fire Mission Printouts. For every volley fired by every artillery unit, the model outputs an entry such as: "Your fire hit a unit! Damage was less than 1%. Location: AX 48" (See Annex E). With our intensive play of artillery on the RED side, this became a boring, wasteful, time-consuming message. It is recommended a single report for each

unit when its mission is completed be issued rather than a message with each volley.

GENERAL OBSERVATION ON MODEL VALIDITY

1. With the addition of a Combat Ratio Adjustment (CRA) factor in the ground combat attrition formula and "surrounded by enemy" factor, the model's ability to handle the annihilation of the Egyptian 25th brigade was significantly improved. With battalion sized maneuver units, the battle period was 3 hours. All three battalions of the 25th brigade were engaged by Blue forces at day 2, hour 0902 with 99% of combat strength. By the end of their first battle period, strengths were still high at 98% or 97%. By day 2, hour 1502, the end of the second battle period, strengths of the 25th brigade battalions were down to 55, 60, and 66% and falling rapidly. All three were automatically eliminated due to losses (less than 25% strength) at day 2, hour 1802, the end of battle period three. Thus, a total of nine (9) hours of battle was used to eliminate this brigade. Historically, only one (1) hour or so was required. The three hour battle period will never permit the model to duplicate history in this highly unusual battle experience. Notwithstanding the longer battle periods, the brigade was trapped, surrounded, and annihilated both historically and in the simulation.

2. Attrition rates observed were low in comparison to historical data. After the three days of battle simulation by computer, the percentages of attrition for units engaged in combat differed significantly from history. (See Chapter IV)

3. Generally, the commands to the model caused units to follow the pattern of movement as recorded by historians. However, in comparing model produced moves with historical moves the units did not move at the

same rates nor did they engage the identical units in combat. These observations were primarily attributed to the model's predetermined fixed rate of movement feature; the move alogorithm which prevented the units from arriving at given locations/hexes in the time frames as recorded by history. This produced observed instances where the attacker role was reversed and where units became engaged with units when in fact historically they did not make contact.

If model success is to be judged by how accurately history is replicated, then the ability of model players to place a given unit in a given location at a given time is important. Additionally, if the teaching of the effects of maneuver on battle outcome is a training objective, then the model should have variable speed move rates which can be set by the commander/player. The range of variable speeds should be consistent with logistics, personnel, equipment, terrain and climatic conditions. This feature would enable the players to place units in the right place at the right time in order to execute the battle plan in a more timely manner and would provide for more realistic game play.

CHAPTER VI

CONCLUSION

1. The attrition rates and operational times produced by the model generally lagged behind their historical counterparts. Low attrition can affect overall battle results by keeping units in action too long, keeping reserves uncommitted, or causing events to "stretch out" in time. The model attrition rate is a function of many factors; e.g. firepower scores (WUV elements determined by the US Army Concepts Analysis Agency), air or artillery support values, terrain adjustment factor, defensive time-in-hex, battle periods, etc. All of these values are empirically determined and subject to individual variations not reflected in the model. They reflect, at best, only reasonable aggregate values based on statistical data gathered on incomplete battle segments, professional experience and judgement, or extrapolated laboratory data. It is self-evident that the unit data base entries (firepower scores, movement rates, etc.) are critical determinants in the modeling process. The results observed in this project, however, are not considered conclusive in support of a change to any unit data or model formula. Further, the constant process of updating tactics, doctrine, weapons systems, etc. causes the "real world" situation to also remain in a state of flux. As data from the "real world" becomes available, however, the model data and formula must undergo perpetual review for correction as appropriate.

2. In a gross, overview sense, the model paralleled history with regard to the opposing operational plans and their execution. There were, nevertheless, large variations between model results and history in a more detailed

examination. There are first-order variables in the gigantic equation of war which are not captured in the modeling process; e.g. individual and small unit intelligence, the will/moral character/psychology of the combatants, the Clausewitzian elements of fog, friction, military genius as well as the enormous variation and indefinability of the circumstances of war, etc. Consequently, it would seem inapprorpriate to rely upon this model to predict the specific outcome of future battles. The model appears valid and useful as a classroom instructional tool and as a command and staff training tool upon correction of identified problems.

DISTRIBUTION

The US Army War College Department of War Gaming has primary interest in this project. Further distribution is left to their discretion. It is recommended that copies be provided to Colonel Richard H. Martin and Colonel Gary R. Lord, authors of the 1982 project on this same subject.

ENDNOTES

1. Lieutenant General Saad El Shazley, The Crossing of the Suez, p. 252.

2. Ibid., p. 253.

3. Colonel Trevor N. Dupuy (Ret), Elusive Victory, p. 498.

4. Ibid., p. 500.

5. Ibid.

6. Shazley, p. 259.

7. Dupuy, p. 511.

8. Ibid.

9. Ibid., p. 500.

10. Ibid.

11. Dupuy, pp. 492-516.

12. Shazley, pp. 248-260.

13. Avraham (Bren) Adan, On the Banks of the Suez, pp. 263-341.

14. Ibid., p. 294.

15. Dupuy, p. 500.

16. Ibid.

SELECTED BIBLIOGRAPHY

Adan, Avraham (Bren). On the Banks of the Suez. San Rafael: Presidio Press, 1980. (DS 128.17.A32).

Allen, Peter. The Yom Kipper War. New York: Scribners, 1982 (DS 128.1. A64).

Dupuy, Trevor N., Colonel (Ret). Elusive Victory. New York: Harper and Row, 1978. (DS 119.2.D86).

Dupuy, Trevor N., Colonel (Ret). Numbers, Predictions, and War. Indianapolis: Bobbs-Merrill, 1979. (U 104.D85).

Herzog, Chain. The War of Atonement. Boston: Little, Brown, 1975. DS 128. A1H4.

London Sunday Times. The Yom Kipper War. Garden City: Doubleday, 1974 (DS 128. A1Y6).

Lord, Gary R. Lieutenant Colonel(P), and Martin, Richard H. Colonel Validation of the USAWC Student War Gaming Model. Thesis. Carlisle Barracks: US Army War College, 4 June 1982 (unpublished--See Appendix 1)

Palit, D. K., Major General, VrCFRGS. Return to Sinai. Dehra Dun. New Delhi: Palit and Palit, 1974, (DS 128.1P34)

Shazly, Saad El Lieutenant General. The Crossing of the Suez. San Francisco: American Mideast Research, 1980. (DS 128.19.E3S53)

APPENDIX 1

UNPUBLISHED 1982 MILITARY STUDIES
PAPER BY LORD AND MARTIN
(ATTACHED TO ORIGINAL ONLY)

US ARMY WAR COLLEGE

MILITARY STUDIES PROGRAM PAPER

VALIDATION OF THE USAWC *STUDENT* WAR GAMING MODEL

A GROUP STUDY PROJECT

BY

COLONEL RICHARD H. MARTIN, MP
LIEUTENANT COLONEL (P) GARY R. LORD, EN

4 JUNE 1982

ABSTRACT

AUTHORS: Richard H. Martin, COL, MP
Gary R. Lord, LTC (P), EN
Wallace P. Franz, COL, INF (Study Advisor)

TITLE: Validation of the USAWC Student War Gaming Model

FORMAT: Group Study Project

DATE: 4 June 1982 Pages: 364 Classification: Unclassified

The USAWC Student War Gaming Model is a variation of the McClintic Theater Model (MTM). The MTM is the computer war gaming model developed by the US Army War College as a training tool for Senior defense officials. The USAWC Model has not been analyzed for validity from an historical perspective. The purpose of this study project is to evaluate the accuracy of the USAWC Model by correlating theoretical model results with historical results of selected battles in the 1973 Arab-Israeli War. The authors analyzed Egyptian and Israeli maneuver disposition casualties, and firepower rates at brigade and battalion level for combat units participating in the Battle of Deversoir (15-16 Oct 73) and the Battle of Chinese Farm II (16-17 Oct 73). The authors were assisted in their research efforts by USAWC International Fellows from Egypt and Israel, who either planned the military operations or participated in the Sinai campaign. Preliminary findings indicate acceptable correlation between the Model results and historical events of '73 War. Certain weaknesses exist within the Model (e.g. impart of surprise and shock, and selected maneuver conducted by the Isrealis) which can be further analyzed for possible correction. The Model has significant training utility for senior officials whose scope of strategic/tactical interest does not extend below division level. This study has resulted in the development of a data base for the USAWC which can assist in further design and refinement of a desert environment war game.

PREFACE

The McClintic Theater Model was developed at the US Army College and used by senior Army leadership for the past two years. Enhancements have been made to the model as users suggest improvements. Student use of the model (as modified for use on the ALTOS microcomputer) first occurred with the USAWC Class of 1982.

The authors of this study were part of a volunteer group of students who served as controllers during USAWC curriculum war game exercises. During the training period for the student controllers, we learned that the War Gaming Department was seeking assistance in conducting a study to determine the general validity of the USAWC Student War Gaming Model. The College's military study program provided the opportunity for us to fulfill an academic requirement and undertake a worthwhile study effort beneficial to the US Army.

The authors are particularly indebted to the following individuals whose unqualified assistance and encouragement made this project an interesting, rewarding, and professionally enhancing learning experience:

BG Mohamed Said, USAWC International Fellow from Egypt.

BG Sason Shilo, USAWC International Fellow from Israel.

Colonel (Retired) Trevor N. Dupuy, Military Historian and Professional Author.

Colonel Wallace P. Franz, Department of War Gaming, USAWC.

1st Lieutenant J. Eliot Moss, ADP Support Division, USAWC.

TABLE OF CONTENTS

Note: * Submitted separately to Department of War Gaming, USAWC

INTRODUCTION

The USAWC Student War Gaming Model is presently used for computer war game modeling by the US Army War College. The College believes the model is reliable;however, the model has not been analyzed from an historical perspective. The purpose of this study is to evaluate the accuracy of the USAWC Model by correlating model results with historical outcomes of battle in the 1973 Arab-Israeli War. A sub-objective of the study is to develop a data base for use in the design of a USAWC war game in a desert environment.

PROBLEM

The study group set out to analyze the historical and analytical results of the conflicts from 15-22 October to insure model consistency. Using the above analysis, we evaluated the reliability of the model. However, time did not permit modeling past early morning on the 18th. Hence, the findings are considered preliminary subject to further testing.

METHODOLOGY

Numerous references and discussions support the study (see bibliography at Annex A) but, Adan's book is the primary source for developing the detailed engagement narrative. An accurate account in minute detail is essential to fix the historical base against which model results can be evaluated. Adan's book is selected because he commanded one of the

principal units in the war and it contains the level of detail we were seeking.

The detailed narratives at Annexes C and D were developed and cross referenced with Shazly's and Dupuy's writings as well as reports prepared by the Historical Evaluation and Research Agency. When it became difficult to resolve differences in the various references, Dupuy's version was selected. The narratives represent our best judgment of the conduct of the engagements studied, and the movements listed in Annex H represent the effort to transition from the narratives into the model. Any change to freeplay of the model is annotated in Annex H.

We gathered factual data on specific units involved in the battles, specific data concerning unit capabilities and limitations, and detailed information concerning movements, casualties, distances, deployment schemes, etc. Discussions with BG Said, BG Shilo, and Colonel Dupuy were particularly helpful.

Comprehensive scripts, or scenarios, were developed for the engagements of 15-16 and 16-17 October 1973 and initial war game activities on the microcomputer were initiated. The "iterative process" was to become a way of life for use in the conduct of this study.

Conducting a battalion level war game on 1:50000 maps and using a theater oriented war game posed significant challenges. The challenge was further exacerbated by a lack of complete information concerning units and dispositions particularly on the Egyptian side.

The engagement of 15-16 October was processed on the computer approximately 18 times before achieving a level of confidence that all the "pieces" fit together, while ensuring the integrity of our effort. Iterative processing was required to gain an in-depth knowledge of the model (e.g. unit moves, terrain and trafficability features, engage-

ment rules, and the algorithms that compute these and other quantifiable factors).

We minimized artificalities (e.g. using the "Director" mode to move units or disengage them). When artificality was required (e.g. positioning and employment of artillery fires), we explained our rationale to Department of War Gaming, USAWC.

The engagement of 16-17 October was processed approximately 12 times. The significant challenge presented to us in this engagement involved the Egyptian 25th Independent Tank Brigade battle and the disparity between reality (e.g. the battle was initiated and completed in one hour) and the model (e.g. the battle was conducted - and achieved casualty rates similar to the historical record - in seventeen hours of game time). Details on this engagement are provided in Annexes G and I.

Periodic reviews were held with BG Said, BG Shilo, Colonel Dupuy, and Colonel Franz to discuss project status and difficulties. These sessions were valuable to us in soliciting further information, insight, and expertise from those who were actual participants in the war (Said and Shilo) or had discussed the events with participants (e.g. Dupuy's discussions with Adan).

ENGAGEMENTS

The engagements studied for the purpose of evaluating the McClintic Model were the Battle of Deversoir and the Battle of Chinese Farm II. Detailed information concerning participants, missions, movements, time, and results are furnished at Annexes C and D.

The Battle of Deversoir was conducted on 15-16 October. It was preceeded by the "great tank battle" on the 14th fought reluctantly by the Egyptians, in deference to their Syrian allies, and skillfully by

the Israelis. Deversoir, or Chinese Farm I, was the initial phase of an Israeli operation (called "Strongheart") conducted to secure crossings of the Suez Canal, establish a bridgehead and expand Israeli military operations into Egypt.

The actual battle involved a diversionary attack in the northern sector of operations (vicinity of Tassa) while maneuvering forces south to secure a crossing site (at Matzmed), install bridging equipment, and establish and secure a bridgehead on the west bank of the Suez Canal. The diversionary attack was launched at 1700 hours on 15 October. The scheduled main attack to the South proceeded with a mixture of timeliness, frustrating delay, uncommon luck, and ultimate success. Students of Clauswitz could observe numerous examples of the impact of chance, fog of war and friction during this engagement. The Israelis reached the canal at 2330 hours and began to cross. By 0600, 16 October the Israelis were deployed on the west bank.

Numerous bitter battles were fought during this engagement. Egyptian and Israeli armored, mechanized infantry, and light infantry units were committed. These battles afforded us an excellent opportunity to analyze and compare computer generated results with historical information.

The fighting was heavy and decisive. Israeli casualties included 350 personnel and approximately 56 tanks. Egyptian casualties included 500 personnel and about 62 tanks. Air support during this engagement was minimal. Significantly, the Israelis had launched an attack and secured their initial objective (crossing the Suez Canal). The Egyptians were acutely aware of the Israeli attack upon their forces deployed in the Sinai; however, they were ignorant of the Israeli suc-

cess in crossing the Suez Canal at Matzmed.

The Battle of Chinese Farm II was conducted on 16-17 October. The scope of the Israeli effort was oriented exclusively toward opening and maintaining lines of movement to the crossing site at Matzmed and exploiting tactical surprise achieved on the west bank. Thwarting any Egyptian attempt to sever or disrupt the crossing operation was imperative to Israeli operations.

The Egyptians were initially unaware of the Israeli presence on the west bank and consequently were intent upon protecting the Southern flank of their Second Army. Therefore, they sought to maneuver their forces to launch counterattacks, utilizing the 16th Infantry Division and 21st Armored Division from the north, and elements of the Third Egyptian Army from the south to crush the Israelis in a classic pincer operation.

At midday on the 17th the Egyptians learned of the crossing operation and reacted by deploying a few troop units and massive artillery fire to curtail or halt Israeli movement. The ensuing battle was intense and costly. Both sides sustained significant casualties and equipment losses. Ultimately the Israelis prevailed and the Egyptians were unsuccessful in preventing continued Israeli crossings to the west bank.

A significant battle occurred during the engagement that provided useful data in our study of the USAWC Model. The Egyptian 25th Independent Tank Brigade was ordered to deploy north from Botzer (vicinity of Little Bitter Lake) and assist the Egyptian Second Army in crushing the Israelis in the Chinese Farm/Lakekan area. The Israelis detected the movement of the 25th Brigade and ambushed it as it deployed in column movement on Lexicon Road between Botzer and Lakekan. The Israelis

virtually destroyed the 25th Brigade, which lost approximately 80-90 percent of its T-62 tanks.

Thus the "tide of battle" had turned in favor of the Israelis during the period 15-17 October 1973. Casualties were high. Mobility and surprise were key to success. Firepower effectiveness and efficiency were devastating on both sides. Many valuable lessons for students of warfare can be drawn from these engagements.

COMPUTER INPUT/OUTPUT

Detailed information concerning Israeli and Egyptian units involved in this study is contained at Annex E. Each unit is identified by a unique number and team code. Israeli units are identified in a block of numbers 1-100 and Egyptian units are identified in a block of numbers 101-201.

Other pertinent data available in the unit file includes:

1. Team (TM) = B (Blue - Israeli)
   R (Red - Egyptian)

2. Name and Size of the Unit (e.g. "4/460 Zeira TK BN" is the 4th Battalion, 460 Armored Brigade commanded by Zeira).

3. Speed or mobility factor, is coded as "SP". An "SP" of 80 is intrepreted by the model as an 8 kilometers/hour capability.

4. The Firepower capability of the unit is coded as a three integer entry related to air, ground, and indirect fire respectively. Detailed explanation and mathematical computation methods in the calculation of ground firepower scores are provided at Annex I.

5. The activity of a unit (e.g. available, moving, combat, flying, escorting, etc.) is coded under the heading "AC".

6. "LO" is the hexagonal overlay code for the location of

the unit on the map.

7. "KI" is the code to identify kinds of unit (e.g. L=land, A=air).

8. "ST" is the code representing the strength of the unit (e.g. 10000 is intrepreted to mean 100%).

9. "TH" is the threshold value of a unit. The unit displaces when engaged in combat and the casualty rate degrades unit strength to that level (TH). A "TH" of 9500 will cause a unit to displace when its strength is degraded 5 percent to a level of 95 percent. Israeli sensitivity to the issue of personnel casualties caused us to establish "TH" codes at 75 percent in most cases. Conversely, lacking empirical data to the contrary from the Egyptian perspective, we established 50 percent thresholds for their units.

In summary, this study effort involved an analysis of the following committed units:

A. Egypt

1. 6 Infantry Battalions
2. 20 Artillery Battalions and 2 Regiments
3. 10 Tank Battalions
4. 6 Mechanized Battalions

B. Israel

1. 17 Tank Battalions
2. 1 Recon Unit (reinforced)
3. 5 Parachute Battalions
4. 4 Artillery Battalions

Maps utilized in the conduct of this study have been provided to the Department of War Gaming, USAWC. A detailed terrain analyses of these maps was conducted and the results coded for use with the USAWC Model. Attached at Annex F is the file listing of each unique hex ID code, primary terrain feature dominating that hex (e.g. marsh, des-

ert, water, urban, etc.) and data concerning trails, highways, bridges, barriers, etc. in the area of operations for Sharon's and Adan's Divisions during the period 15-22 October 1973.

There are many challenges facing researchers as they seek to determine facts pertinent to an historical event. Availability and accuracy of information and the objectivity of the sources of information are vital to a successful research venture. The availability of information for this research project covered the complete spectrum of possibilities — readily available for certain Israeli oriented information, meager for some Egyptian portions, and all manner of varibles between those extremes. Objectivity was a constant concern to insure the validity of our research. When objectivity was in doubt due to nationalistic origins, as mentioned previously, we chose to rely upon the battle accounts and reports of Colonel (Retired) Trevor N. Dupuy's book Elusive Victory as representing historical fact.

A detailed analyses was conducted of the military events of 15-17 October and documented in chronological order commencing at H+0 hour, (1700 hours 15 October) until H+60 hours, (0500 hours 18 October). Annexes G and H contain the initial and follow-on orders used to simulate historical events. Interspersed amongst the orders at Annex G are battle reports, Situation Reports (SITREP), intelligence data, and time checks. An analysis of this annex is conducted below and in supporting annexes. Annex H is a sanitized version of unit movement orders catalogued by time (H hour) and unit (1/460 Tank BN, 116th Egyptian Mech Infantry).

FINDINGS

A. Preliminary study and analysis indicates acceptable correlation between USAWC Model results and the historical record of the 1973 Arab-Israeli War for the engagements conducted during the period 15-17 October 1973.

B. Unit maneuver rates in the USAWC Model were realistic with the notable exception of the Aryeh Brigade move from Tassa to Hurva on 17 October.

C. Use of US Army Concepts Analysis Agency firepower scores (WUV values) appears satisfactory.

D. The USAWC Model was unable to portray the annihilation of the Egyptian 25th Independent Tank Brigade on 17 October within an acceptable time frame. The element of surprise and other human factors (e.g. shock, panic, rage) appear lacking in the Model. Such factors play a vital role in selective war engagements.

E. Close air support was not played sufficiently. Consequently, no meaningful findings can be made.

F. Artillery play in the Model requires clarification. The procedure used by the authors was simplistic, and required some artificialities.

G. A thorough analysis of terrain and man-made features and an accurate assessment of unit features (firepower scores, movement rates and capabilities) is critical to the modeling process.

H. The Model can be enhanced by utilizing "boiler plate" order formats which require only the "filling in of the blank spaces" and avoid the dull repetition of highly structured order formats. Multiple level movement orders (e.g. Move unit .2 to BC47, then BB46, etc) are also desirable.

I. The USAWC Model has significant training utility for senior level officials whose scope and level of strategic/tactical interest does not extend below division level.

J. The conduct of this study has resulted in the development of a data base for the USAWC which can assist in the further design and refinement of a desert environment war game.

K. Our experience in conducting this study reinforces a principle of war gaming. War game models are excellent training vehicles; however, their utility can never substitute for reality or predict certainty of future events or possibilities.

RECOMMENDATIONS

A. The USAWC Model should be adjusted to better adapt to surprise/and maneuver without decisive engagement.

B. The impact of artillery firepower needs to be studied. If the procedure used in this study is satisfactory, the technique is considerably easier than developing a subroutine requiring separate fire missions. Artillery firepower scores should be reduced during the hours of darkness.

C. The model should permit an override for units to move faster than the movement rate in the unit data base.

D. No conclusions should be drawn from this preliminary report without modeling engagements from 18-22 October for Sharon's and Adan's divisions. Consideration must be given for those engagements to the greater replacement capability of the Israeli forces. Further, continued gaming/analysis of the 18-22 October period will facilitate evaluation of the close air support module of the Model.

E. The Model needs to be modified to keep units from

wondering off roads when moving from point to point.

F. Unit withdrawals would be enhanced if a location could be specified.

G. T.N. Dupuy's Qualitative Judgment Model (QJM) should be reviewed for applicability to the USAWC Theater Model. The QJM allows for some quantification of human and behavioral factors in war and might suggest a means to introduce leadership, surprise, combat effectiveness and friction elements when appropriate.

DISTRIBUTION

A number of parties are interested in the results of this study. However, since the authors consider the study incomplete, distribution is reserved to the judgment of the Department of War Gaming, USAWC.

Recommend a copy be provided Colonel T.N. Dupuy.

ANNEX A — SELECTED BIBLIOGRAPHY

Adan, Avraham (Bren). On the Banks of the Suez. San Rafael, California, Presidio Press, 1980. (DS 128.17.A32)

Badri, MG Hassan El., Magdout, MG Taha El., and Zohdy, MG Mohammed Dia El Din. The Ramadan War, 1973. Dunn Loring, Virginia: T. N. Dupuy Associates, Inc., 1978. (DS 128.A1B3)

Concepts Analysis Agency. Classified report, Army Force Planning Data and Assumptions, FY 1979-1985(U). Bethesda, MD: 1978. (ØØ ARMY CAA SR-78-6)

Dupuy, Colonel (Ret) Trevor N. Elusive Victory. New York: Harper and Row, 1978. (DS 119.2D86.C.3)

Dupuy, Colonel (Ret) Trevor N. Numbers, Predictions, and War. New York: The Bobbs-Merrill Co, Inc., 1979. (U 104.D85)

Herzog, Chaim Major General. The War of Atonement, October, 1973. Boston: Little, Brown and Company, 1975. (DS 128, A1H4.C.8)

Historical Evaluation and Research Organization. Assessment of Arab and Israeli Combat Effectiveness, Part One: 1973 War Combat Performance, Dunn Loring, VA: 1977.

Historical Evaluation and Research Organization. Combat Data Subscription Service. Vol. 2, No. 2, Dunn Loring, VA: 1977. (U719, H56)

Historical Evaluation and Research Organization. The Middle East War of October 1973 in Historical Perspective. Dunn Loring, VA: 1976. (DS 128.A1H58)

Institute for Defense Analyses. IDAHEX Version 2: A Guide for Potential Users. Arlington, VA: May, 1979.

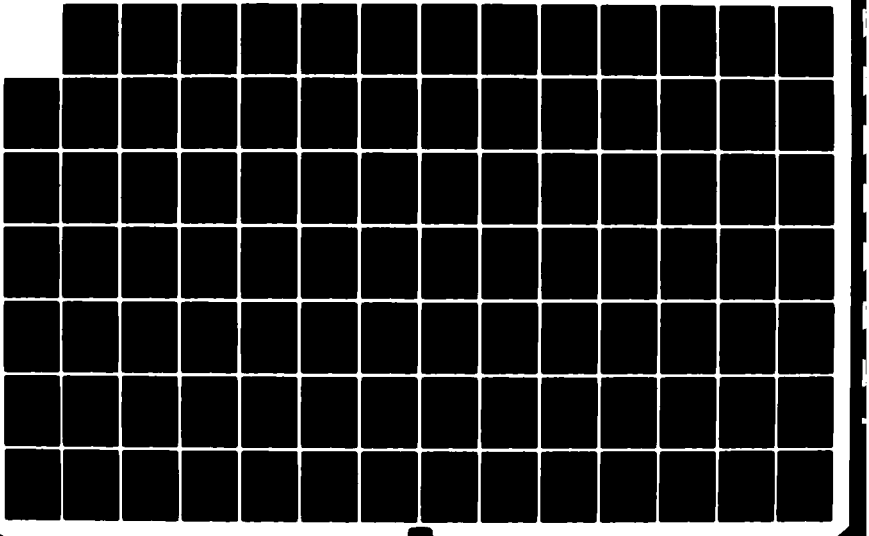
Kitchell, Tom. Classified working paper. WUV Scores for 1973 Arab-Israeli War. Bethesda, MD: Concepts Analysis Agency, 1982.

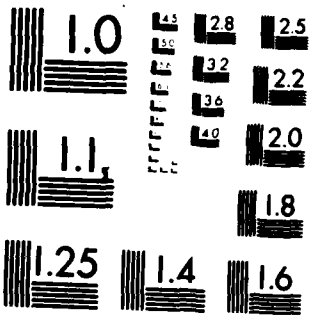
London Sunday Times. The Yom Kippur War. Garden City, NY: Doubleday and Company, 1974. (DS 128.A1Y6)

O'Ballance, Edgar. No Victor, No Vanquished. San Rafael, California: Presidio Press, 1978. (DS 128.1.Ø2)

AD-A130 222 VALIDATION OF THE USAWC STUDENT WAR GAMING MODEL(U) 2/3
ARMY WAR COLL CARLISLE BARRACKS PA E D BAISDEN ET AL.
18 MAY 83

UNCLASSIFIED F/G 15/7 NL





Schiff, Zeev. October Earthquake. Tel Aviv: University Publishing Projects Ltd, 1974. (DS 128.1.S34)

Shazly, LTG Saad El. The Crossing of the Suez. San Francisco, American Mideast Research, 1980. (DS 128.19.E3553)

United States Army Combined Arms Center. Classified report, 8 Vol., Analysis of Combat Data - 1973 Mideast War(U). Fort Leavenworth, KS: 1974.

ANNEX B — ORDER OF BATTLE

ISRAEL

162d Armored Division	MG Avrahan (Bren) Adan
600th Armored Bde	Col Natke Baram
Yaguri BN	
Nathan BN	
Gidra BN	
460th Armored Bde	Col Gabi Amir
Amir BN	
Ehud BN	
Lapidot BN	
Baruchi BN	
217th Armored Bde	Col Aryeh Karen
Artzi BN	
Nahum Zaken BN	
Elyashiv BN	
35th Paratroop Bde	Col Uzzi Ya'iri
Ytzik BN	
143d Armored DIV	MG Ariel (Arik) Sharon
14th Armored Bde	Col Amnon Reshef
Yoav Brom Recon Unit	
Amram BN	
Almog BN	
BN from Tuvia Bde	
TF Shmulik	
TF Shaked	
247th Armored Bde	Col Tuvia Raviv
Two Battalions	
(plus BN attached Amnon)	
421st Armored Bde	Col Haim Erez
Three Battalions	
243d Paratroop Bde	Col Danny Matt
Three Battalions	
(plus BN attached Amnon)	

Plus artillery, engineer, and Air Force units.

16TH Infantry Division	BG Abdel Rab Nabittafiz
16th Infantry Bde	
112th Infantry Bde	
3d Mechanized Bde	
21st Armored Division	Brig. Ibrahim Oraby
1st Armored Bde	
14th Armored Bde	
18th Mechanized Bde	
4th Armored Division	Brig. Abdel Ariz Qabil
2d Armored Bde	
3d Armored Bde	
6th Armored Bde	
35th Independent Armored Bde	
25th Independent Armored Bde	
182d Parachute Bde	Col Ismail Azmy
129th Commando Group	Col MohAbdel Kader Haikel
23d Mechanized Division	Brig. Ahmed Aboud el Zommor
116th Mechanized Bde	
6th Mechanized Division	Brig. Abou el Fath Moharram
113th Mechanized Bde	
3d Mechanized Div	Brig. Mohommed Nagaty Farahat
23 Armored Bde	

Plus Palestinian, Kuwaiti, artillery and Air Force units

ANNEX C — ENGAGEMENT 73-08, DEVERSOIR (CHINESE FARM I), OCTOBER 15-16

After the "great tank battle" on the 14th, Adan's Division was withdrawn from the line and consolidated in an assembly area south of Tassa as an economy of force measure to permit initiation of the Israeli plan, "Abirei-Lev", or operation "Strongheart." Sharon's Division, consisting of three tank brigades and an attached paratroop brigade, was to cross the Suez Canal at Matzmed, seize a bridgehead, and construct essential bridging. Additional forces would then cross to seize Egyptian bridges over the Ismailia Canal to isolate the zone of operations. Selection of the Matzmed zone was particularly fortutitous because it was not defended. Primary responsibility for the defense of this sector had been assigned to the 21st Armored Division which had crossed the canal on the 13th to participate in combat operations on the 14th. It remained on the east bank as Army reserve behind the 16th Infantry Division in the vicinity of Missouri. Meanwhile Sharon would simultaneously conduct diversionary attacks to the north and would hold a corridor north of Great Bitter Lake to screen the crossing effort and lull the Egyptians into believing the principal purpose of the attack was to roll up the right flank of the Second Egyptian Army.

After Sharon had secured the bridgehead Adan's Division would cross in a large turning movement to the west and south to take the Geneifa Hills, continue on to Mount Ataka and be prepared to capture Suez City. Once Adan had broken out of the bridgehead, Magen's Division would

assume responsibility for Sharon's defense of the bridge sites and the east bank. Sharon would follow to the rear of Adan to secure the zone of operations to the west and to insure adequate combat power in the drive south.[1]

The Egyptian Army, which reluctantly attacked on the 14th in deference to their Syrian allies to decrease pressures on the Golan Front, now reverted to their original concept of operations, i.e. to consolidate early military gains and sue for peace. The basic operational concept was to force Israel to fight a two front war with Egypt and Syria. The specific Egyptian tasks were:

> To defeat Israeli forces in the Western Sinai by a deliberate assault crossing of the Suez Canal; to seize five or more bridgeheads 10 to 15 kilometers deep on the eastern bank of the Canal; to repel Israeli counterattacks; to inflict maximum losses on the enemy; and to be prepared for further missions depending on the success of this initial assault and concurrent Syrian operations. They hoped the bridgeheads would include Mitla Pass, and if possible Giddi Pass, but a cease fire with firm Egyptian military control of a substantial strip of territory on the east bank of the Canal would be deemed a success.[2]

With this general background it is now possible to examine the conduct of battle during the period 15-17 October. The orientation of the Israeli forces was clearly one of attack, the Egyptian's one of defense. The Battle of Deversoir, 15-16 October, details the initial engagement of operation "Strongheart" pitting Sharon's Division against elements of the Egyptian 16th and 21st Divisions.[3]

The Egyptian 16th Infantry Division was deployed on the east bank opposite Ismailia southward to the Great Bitter Lake. Its left flank was anchored by the 16th Infantry Brigade, with the 3rd Mechanized Brigade in the center and the 112th Infantry Brigade on the right flank deployed in the vicinity of the "Chinese Farm." The 21st Armored Division backed up the 16th Division with the preponderance of its forces occupying a

hill mass known as Missouri ridge. See Figure 1.

After the tank battles on the 14th, Sharon's Division was deployed with Haim's Brigade on the right flank at Ziona, Tuvia in the center opposite Machshir and Amnon near Hamadia. On the 15th Amnon deployed to an assembly area on Caspi Road south of Rishuf and Matt's Paratroop Brigade was moved to an assembly area east of Tassa and attached to Sharon.

Tuvia's brigade, consisting of two battalions, was to conduct a diversionary attack to fix Egyptian forces and to secure Puton-Tirtur junction. Haim's brigade was directed to secure the zone of operations north of Akavish Road between Tassa and Yukon and to assist the movement of bridging equipment along Tirtur and Akavish Roads to the crossing site at Matzmed. Amnon's Brigade, comprising almost half of Sharon's Division, was ordered to move south of Akavish Road to secure the crossing site, expand the bridgehead on the east bank and hold the Tirtur-Akavish corridor. The actual crossing was assigned to Matt's brigade of two battalions reinforced by a tank company from Haim's brigade.

The diversionary attack was launched at 1700 hours, 15 October and was quickly repulsed by 2200. Matt's brigade was late in getting started due to delays in providing transport (half-tracks) to his location and almost inexplicable traffic congestion on Akavish Road. This same congestion would also delay considerably Haim and the engineer units in moving bridging equipment to the crossing site. Amnon, with a brigade of three tank battalions, three infantry task forces and a reinforced reconnaissance unit (battalion equivalent), was late in commencing movement but then moved with only minor contact to the Lexicon axis. Since the principle battles during the fight to gain the Akavish-Tirtur corridor were fought by Amnon's brigade, a clear definition of

AD-A130222

Page C-4 is not available per the originator.

DTIC-DDAC
19 aug 83

the missions of his major units will help in understanding this engagement and will also clarify the moves introduced in the modeling effort.

At 2100, Amnon's brigade was deployed in a column on and west of Lexicon Road stretching from Lakekan to an area norhtwest of the Chinese Farm. In accordance with the plan, the reconnaissance unit had turned west on three axes - Nahala, Tirtur and Shick roads - reaching the canal on a front 3 kilometers wide and securing the Matzmed crossing site. The scout unit was followed by Amram's battalion which was nearing Shick Road and was supposed to turn northwest to control the Egyptian bridging zone at Mifras and secure the bridgehead from the north. Almog's battalion was to turn east on Shick Road and strike toward Missouri. The third tank battalion (from Tuvia's Brigade) was tasked to open Akavish and Tirtur roads from west to east and presumably link up with Tuvia at Televisia. The follow on infantry task forces were assigned tasks of a defensive and mop-up nature. Shmulik's force was to follow Almog and mop up Amir and Missouri; Shaked was to mop up west of Lexicon Road; and Shumeri was to remain near Lakekan in general reserve and to secure the zone of operations to the south.[4] However, all did not go as planned. Enemy activity did not permit the proposed deployment of the infantry task forces and they were generally kept in reserve and used in a reinforcing role.[5]

Until 2120 everything progressed according to plan, but then intense fighting broke out along the Lexicon axis from Tirtur junction to the north of Shick Road. Amnon's column was cut in two. Amram's force became heavily engaged, withdrew to Shick Road, and established the northern boundary of the bridgehead. Almog suffered heavy losses at the Tirtur-Lexicon junction and withdrew along with Shmulik's task force. Part of Almog's battalion became separated and

joined Amram on Shick Road.

Meanwhile, a company from Amnon's third tank battalion (from Tuvia's brigade) was successful in traversing Akavish Road and assumed that axis to be clear of Egyptian troops. Without waiting to obtain a clear understanding of the Egyptian deployments, Sharon now (2330) ordered Matt to move forward and cross the canal. After initial success, Matt drew fire from Egyptian forces deployed along Tirtur Road and in the Chinese Farm. He then deployed south of Akavish Road and followed the route used by Amnon, reaching Matzmed around 0100 on the 16th. By 0300, he had completed the crossing without resistance and by 0600 was deployed 3 km north and 2 km west to the Sweetwater Canal.

At approximately midnight on the 15th, Amnon, realizing it was essential to open Tirtur Road to permit passage of the roller-bridge, attached one of Tuvia's tank companies to Shumeri's task force and directed Shumeri to attack Tirtur junction and strike east. Shumeri was unsuccessful and most of his tanks were destroyed. At 0300, Yoav Brom's scout unit was ordered to attack the junction, but he too was repulsed and withdrew westward.

At approximately 0400 Shumeri was again ordered to assault the junction. He made it through the junction but his force was badly mauled. At 0515, the company from Tuvia's brigade which had opened Akavish Road made one last unsuccessful attempt to open Tirtur Road. Amnon, having lost a significant part of his combat power, now advised Sharon that Tirtur Road could not be opened without additional force.

At 0700, Sharon attached two additional battalions to Amnon's command (one each from Haim's and Tuvia's brigades to the east) and ordered Amnon to make a two pronged attack east and west of Tirtur junction. After all Amnon had been through, this was probably too much

to ask. He committed his forces in a rather piecemeal, uncoordinated effort. Haim's battalion attacked first but was repulsed by missiles from the Chinese Farm. The Haim battalion tried again with the flanking cover of Tuvia's battalion and got 3 km further before being stopped again. At approximately 0800, Tuvia's battalion again attacked Tirtur Road from the north but was repulsed by a strong Egyptian armor counterattack. Simultaneously, Amnon assembled his remaining forces and attacked. Finally, at 0840 hours, he captured the junction which was abandoned by the Egyptians as they withdrew to the vicinity of Amir and south of Missouri. As Dupuy speculates, the ultimate capture of Tirtur junction was probably more attributable to a wearing down of the Egyptian defenders more than a result of Israeli firepower. Seeing more tanks coming from the west and armored infantry from the south was probably "the last straw for the defending Egyptians, whose strength and endurance had been gradually whittled away during the night."[6] However, when Amnon tried to continue northeast on Tirtur Road he was stopped by tank and missile fire from the slopes of Missouri and returned to the junction.

While Amnon was bitterly engaged throughout the night, Haim's brigade was equally unsuccessful in moving the bridging equipment forward to Matzmed. As mentioned previously, Akavish Road was jammed for 20 kilometers with vehicles and engineering equipment. At approximately 1700 Haim's Brigade, in support of three engineering task forces, began to move the crossing gear forward. One task force, consisting of tanks, engineers and an anti-aircraft unit towed the roller bridge toward Tirtur Road which had been specifically constructed to accommodate the wide, cumbersome roller bridge components. The second task force was moving the heavy mobile rafts, some delayed considerably

in arriving from Baluza, and the third task force was moving with the mobile assault bridging vehicles, called Gilowas.

It was obvious by midnight that severe problems were being experienced and that neither the bridge nor Haim's brigade would reach the crossing site on the 16th. After consultations at Southern Command Headquarters, Haim was directed to separate the Gilowas from the column and push them as fast as possible to the crossing site. The highly mobile Gilowas, led by a company of tanks, arrived at Matzmed by 0400. At 0630, tanks began to cross to support Matt's paratroopers.

At 0500, the roller bridge broke down as it was crossing the southern slopes of Hamadia, and Haim was ordered to move to the canal with one tank battalion and a paratroop battalion from Matt's brigade. As mentioned previously, Haim's other battalion was subsequently attached to Amnon to break through to Tirtur junction from the east. At 0900 as Haim was moving on Akavish Road, small arms and missile fire knocked out four of his tanks. He ordered the paratroopers to withdraw while he diverted south of Akavish toward Nahala Road. Upon reaching the canal Haim crossed with the mission of moving westward to knock out surface-to-air missile (SAM) sites. By 1000 he was moving toward Maktzera and Matt was pushing northward encountering light resistance. Before returning to the bridgehead at 1600, Haim had destroyed four missile sites and engaged an Egyptian tank battalion.[7]

One other significant event occurred during the morning of the 16th. Adan, expecting to be able to start crossing his forces shortly after dawn, had already sent Amir's battalion (from Gabi's brigade) down Akavish Road to the crossing site. Fighting through light Egyptian resistance, Amir reached Matzmed about 1130. Since no further crossings could be undertaken until a bridge was in place Amir was released to

Sharon to assist in holding the bridgehead. Amnon now deployed Amir and one infantry battalion to resist Egyptian interference from the north while he moved the rest of his brigade to regroup near Lakekan.

Phase I of Operation Strongheart and the Chinese Farm had concluded with Sharon losing approximately 350 men and 60 to 70 tanks. About 62 Egyptian tanks were knocked out.[8] The Israeli plan called for a secure bridgehead on both sides of the canal with two roads leading to two completed bridges. Instead, the bridgehead was tenuous at best. Sharon's forces on either side of the canal were linked only by three Gi`owa rafts, and the Tirtur-Akavish corridor was threatened by a strong Egyptian force to the north. The situation was ripe for an Egyptian counterattack. But the canal had been crossed, and bold action by either side could tip the balance.

ENDNOTES

1. Avraham (Bren) Adan, On the Banks of the Suez, p. 254. See also, Colonel (Ret) Trevor N. Dupuy, Elusive Victory, pp. 492-493.

2. Dupuy, pp. 388-390.

3. Note: Dupuy refers to this battle as engagement 73-08.

4. Adan, pp. 263-264.

5. Note: Adan's version of the composition and mission of Amnon's force differs slightly from Dupuy (pp. 497-498). However, after carful review of the order of battle and discusson with BG Shiloh of the Israeli Army and Colonel Dupuy, Adan's version appears to be more precise.

6. Dupuy, p. 499.

7. Adan, pp. 263-274.

8. Dupuy, p. 500.

ANNEX D — ENGAGEMENT 73-09, CHINESE FARM II, OCTOBER 16-17

Adan's Division, which was supposed to cross the canal as soon as Sharon had seized a bridgehead, moved from its assembly area south of Tassa early on the 16th and reached Caspi Road near Kishuf at approximately 0430 to await further orders.[1] It was late morning before Southern Command decided to abandon its original plan. Adan was ordered at 1200 hours to open the Akavish-Tirtur corridor while Sharon eliminated Egyptian resistance at the Chinese Farm.

Leaving Gabi's brigade in the vicinity of Kishuf, Adan ordered Natke to deploy his brigade to the Akavish-Tirtur junction and open the corridor from the west. At 1330 Natke moved in a two battalion column attack formation toward Chinese Farm and drew Sagger missile fire. However, his efforts to proceed toward Lexicon Road were thwarted by the presence of Egyptian armor formations trying to draw Natke within killing range of infantry troops deployed in the Chinese Farm. Adan advised Southern Command that no progress could be made until infantry forces could clear the Chinese Farm and a battalion from Uzzi's airborne brigade was released to conduct a night attack.

The situation evolved to a stalemate. Amnon was regrouping his forces near Lakekan, Natke was unable to attack and the airborne forces would take some time to arrive from A-Tur. The only bright spot was the movement of the heavy rafts which were finally freed from the congestion on Akavish Road and had reached Caspi.

Meanwhile, the Egyptians, still not grasping the significance of the Israeli attack were preparing to counterattack on the 17th to eliminate the threat to the right flank of the Second Army. The 21st Armored Division would attack from the north while the 25th Independent Tank Brigade would attack from the south in a pincer movement. Until the armored counterattack could be launched, the 16th Infantry Division was ordered to counterattack during the night. Palestinian forces and tank elements from the 2d Tank Brigade of the 4th Armored Division were also ordered north toward Deversoir. See Figure 2 for unit movements in this engagement.

During the evening, Adan repositioned his forces. Gabi was deployed on both sides of Akavish Road and Natke was withdrawn south of Kishuf along Caspi Road to secure the zone of operations against possible attacks from the south. The 16th would draw to a close with no significant action since early morning. Adan's efforts had been blocked and Sharon was unable to rejoin the battle.

The confusion of battle and the congestion on Akavish Road delayed movement of Uzzi's paratroopers and it was not until 2300 that the last elements of Itzik's battalion arrived by helicopter from Tassa. Time was short and Adan quickly briefed Itzik on the situation Itzik was ordered to "clean up the area along the Akavish-Tirtur junction as well as a few hundred meters north of Tirtur where [Adan] would position forces to isolate the Tirtur axis."[2] At 2400 the paratroopers moved out and easily reached the Akavish-Tirtur junction. They came under fire at 0245 along Tirtur Road and became decisively engaged.

Meanwhile, a company from Gabi's brigade reported Akavish Road was open and at 0400 Adan ordered the heavy rafts moved to the crossing area. They arrived at 0630. The convoy was secured by the deployment

of Natan's battalion moving north of Akavish Road.

At 0400, Gabi sent Ehud's battalion to try to link up with Itzik's paratroopers. Because of the intense fighting, Ehud was not able to distinguish the combatants and decided to wait until dawn before charging the Egyptian position. He was able to advance only 80 meters inside the Egyptian fighting positions before he encountered Sagger missiles and long range tank fire. Suffering heavy casualties, he was forced to withdraw.

At 0600, Natan's battalion had completed the screening movement for the raft convoy and was ready to join the battle. Gabi also moved Lapidot's battalion forward. At 0745, Tuvia's brigade was attached to Adan and deployed north from Puton Road to Televizia. By 0800 four battalions were moving in a wide arc toward Missouri and the Chinese Farm.

Between 0800 and 0830 Egyptian tanks from the 1st and 14th brigades were attacking towards Gabi and Tuvia while the 18th Mechanized Brigade attacked north of the Chinese Farm toward position Amir. At the same time tank elements from the Egyptian 25th Independent Tank Brigade were observed advancing very slowly on Lexicon Road north of strongpoint Botzer. Natke's two battalions moved off Caspi Road into the Edra Hills to prepare an ambush in anticipation of the Egyptian's continued advance. The plain at the foot of Grafit was selected as the kill zone.

Uzzi's paratroopers were evacuated at 1030 after suffering heavy casualties.

At 1100 hours Aryeh's brigade was released from Southern Command reserve. Leaving one battalion to secure Ziona he moved south along Mavdil Road and turned west on Pazum heading for the anticipated battle with the 25th Tank Brigade. He reached Hurva at 1500 hours.

While Adan was disposing his forces for two major encounters, Sharon was intensifying his efforts on the west bank and preparing to increase pressure on the Chinese Farm.

By now the Egyptians had pinpointed the Matzmed crossing site and were directing heavy artillery fire against it. While they had not yet massed armored forces west of the canal, they had contained the bridgehead with infantry, paratroopers and a few tanks and armored personnel carriers. These forces, in conjunction with artillery fire, were more than adequate to keep Haim from breaking out again to conduct raids similar to those on the 16th. The Egyptian concentration of artillery units around the crossing area and the corridor leading to it was impressive - 144 guns organized in 21 light batteries, 5 medium and 3 heavy.[3] The artillery firepower inflicted heavy casualties and delayed Israeli efforts to link the rafts into a single bridge.

At 0900 Amnon had completed the reorganization of his forces and moved to join Amir at the northern bridgehead. He left a small force at Lakekan to secure the southern zone of operations. However, Sharon diverted ten tanks to reinforce the west bank in violation of Southern Command orders.

At the same time Danny was ordered to send a reinforced paratroop unit northward. Movement in the greenbelt was difficult, but he advanced slowly against light resistance until he came under close fire, to include direct artillery fire from Orcha at the village of Serafeum. Intense fighting continued until 1700 hours when Danny's force was rescued by a relief force. Casualties were heavy on both sides.

The development of the ambush of the 25th Brigade was a classic example of tactical mobility and firepower of armored forces. Dupuy likened Adan's plan to Hannibal's famous victory at the Battle of Lake

Trasimene. The Egyptians, totally unaware of the impending threat, were deployed in a column stretching from Botzer 15 kilometers up Lexicon Road with some scout elements in the vicinity of Lakekan. Natke had one battalion deployed in the Grafit Hills and his other battalion 2 km east of Yachfan. Amnon's company was in a blocking position at Lakekan and Aryeh was rapidly moving to seal the trap from the rear. Concerned that the Egyptians might escape before Aryeh could get in position, Adan ordered him to rapidly position one battalion south of Yachfan and to turn the other battalion in a flanking movement southward. At the same time, Natan's battalion was withdrawn from the fight southeast of the Chinese Farm and ordered to attack south. At 1445 Natke charged forth from his concealed positions and by 1600 the 25th Brigade was virtually destroyed. Natke returned to Caspi Road to replenish and prepare for the crossing. Approximately ten Egyptian tanks, the brigade artillery and numerous supply vehicles did manage to retreat toward Botzer under artillery fire from Magen's Division (Israeli). Elyashiv's battalion followed in hot pursuit but Adan called him off as darkness approached. As the battle concluded, Aryeh was returned to Southern Command reserve.

Meanwhile the battle to the north raged on. Continued Egyptian armor and infantry thrusts were repelled during the day and Israeli forces slowly gained ground under heavy artillery fire. Sharon had been directed at noon to deploy Tuvia's brigade to permit relief of Gabi's forces, but this was not achieved until 2000. Therefore, when the bridge was finally completed at 1630, Adan had no forces ready to cross the canal and it was 2300 before he also arrived in "Africa."[4] It would be dawn before Gabi and Natke would join him after crossing under a heavy Egyptian artillery barrage.

As the 17th drew to a close Adan had avenged the defeat suffered on the 8th. The Egyptians lost approximately 2400 men and at least 200 tanks. Israeli losses were 40 tanks and less than 1000 personnel.[5] Adan was across the canal and looking forward to the breakout the next day. The Egyptians were beaten, but not defeated. The pincer-movement to destroy the Israeli "wedge" had failed. They had given ground at the Chinese Farm and yielded the Akavish-Tirtur Road corridor. During the next few hours the 16th Division would consolidate their defensive positions and the 21st Division would commence withdrawing across the canal to block further Israeli advances. The tide was turning in Israel's favor and Egypt's objectives could best be realized by a quick negotiated settlement.

ENDNOTES

1. Note: Lapidot's battalion (Gabi's brigade) was deployed North of Kishuf and Natan's battalion (Natke's brigade) was deployed south of Kishuf near Akauish Road. Amir's battalion (Gabi's brigade) was located near Shick Road securing the bridgehead.

2. Avarahan (Bren) Adan, On the Banks of the Suez, p. 287.

3. Adan, p. 296. See Also, HERO, Assessment of Arab and Israeli Combat Effectiveness, Part One: 1973 War Combat Performance, data for engagement 73-09. HERO identifies a greater number of artillery pieces.

4. Adan, pp. 275-313 (details for engagement 73-09, Chinese Farm II).

5. HERO, Assessment, data for engagement 73-09.

ANNEX E — UNIT DATA FILE LISTING

Submitted separately to Department of War Gaming, USAWC.

ANNEX F — HEX DATA FILE LISTING

Submitted separtely to Department of War Gaming, USAWC.

ANNEX G - WAR GAME LISTINGS
(1700 hours, 15 October 1973
to 0500 hours, 18 October 1973)

Data Follows

ANNEX H — MOVEMENT ORDERS BY UNIT AND TIME

DATA LISTINGS

ORDERS FOR RED SIDE (EGYPT) BY UNIT

Unit 106 (1/16 Inf BN)

None

Unit 107 (2/16 Inf BN)

None

Unit 108 (3/16 Inf BN)

H+53, Move to BI45

Unit 110 (1/112 Inf BN)

H+24, Move to BC53
H+53, Move to BD52

Unit 111 (2/112 Inf BN)

H+19, Move to BB50
H+53, Move to BC51
H+54, Move to BD54

Unit 112 (3/112 Inf BN)

H+7, Move to BA51
H+19, Move to BB50
H+24, Move to BA51
H+53, Move to BD52

Unit 114 (1/14 Arm BN)

H+1, Move to BG45
H+19, Move to BE47
H+30, Move to BF48
H+37, Move to BC49
H+53, Move to BD50
H+54, Move to BE51
H+55, Move to BH52

Unit 115 (2/14 Arm BN)

H+4, Move to BJ48
H+8, Move to BK45

H+19, Move to BJ48
H+40, Move to BI43
H+53, Move to BH52

Unit 116 (3/14 Arm BN)

H+35, Move to BD52
H+37, Move to BC55
H+39, Withdraw at 80 percent

Unit 118 (1/35 Arm BN)

None

Unit 119 (2/35 Arm BN)

None

Unit 120 (3/35 Arm BN)

None

Unit 122 (1/1 Arm BN)

H+15, Move to BD56
H+37, Move to BG55
H+39, Move to BH48
H+41, Move to BG45
H+53, Move to BG55

Unit 123 (2/1 Arm Bn)

H+15, Move to BD54
H+24, Move to BC55
H+30, Withdraw at 72 percent
H+37, Move to BG55

Unit 124 (3/1 Arm BN)

H+8, Move to BF48
H+15, Move to BD48
H+30, Move to BF48
H+39, Move to BE49
H+53, Move to BG57

Unit 126 (1/18 Mcz BN)

H+14, Move to BD52
H+31, Move to BD54
H+41, Move to BC55
H+45, Withdraw at 85%
H+53, Move to BF50

Unit 127 (2/18 Mcz BN)

H+8, Move to BB52
H+21, Move to BC53
H+53, Move to BF50

Unit 128 (3/18 Mcz BN)

H+39 Move to BA51
H+53 Move to BF50

Unit 130 (1/116 Mcz BN)

H+18, Move to BA83
H+37, Move to BC63

Unit 131 (2/116 Mcz BN)

H+18, Move to BA83
H+37, Move to BA63

Unit 132 (3/116 Mcz BN)

H+18, Move to BA83
H+37, Move to BB68

Unit 135 (1/25 Arm BN)

H+39, Move to AW45 at 15 KPH

Unit 136 (2/25 Arm BN)

H+41, Move to AU43 at 15 KPH

Unit 137 (3/25 Arm BN)

H+43, Withdraw at 75 percent
H+43, Move to AS45 at 15 KPH
H+44, Cancel above move
H+45, Move to AS45 at 15 KPH
H+52, Move to AO39
H+52, Withdraw at 50 percent
H+63, Move to AO39

Unit 139 (3/2 Arm BN)

None

Unit 140 (207th Arm BN)

None

Unit 141 (2/2 Arm BN)

None

Unit 142 (113 Mcz Bde)

None

Unit 150 (1/182 Para BN)

None

Unit 151 (2/182 Para BN)

None

Unit 152 (3/182 Para BN)

None

Unit 153 (1st Commando BN)

H+37, Move to BE59
H+37, Withdraw at 90 percent
H+44, Withdraw at 99 percent

Unit 154 (2d Commando BN)

None

Unit 155 (3d Commando BN)

None

Unit 156 (4th Commando BN)

None

Unit 159 (1/23 Arm Bn)

None

Unit 160 (2/23 Arm BN)

None

Unit 161 (3/23 Arm Bn)

H+37, Move to BM57
H+44, Move to BP60

Unit 164 (6 Mcz Bde)

None

Unit 166 (1st Palestinian BN)

None

Unit 167 (2d Palestinian BN)

H+37, Move to AY61

Unit 168 (3rd Palestinian BN)

H+37, Move to AY63

Unit 169 (Kuwaiti Inf BN)

H+37, Move to AY61

Unit 171 (1 Arty BN)

None

Unit 172 (2 Arty BN)

H+53, Move to BI45

Unit 173 (3 Arty BN)

H+53, Move to BK51

Unit 174 (4 Arty BN)

H+18, Move to BD54
H+24, Move to BC55
H+37, Move to BJ52
H+53, Move to BD54

Unit 175 (5 Arty BN)

H+18, Move to BD56
H+37, Move to BJ52
H+53, Move to BD52

Unit 176 (6 Arty BN)

H+24, Move to BC53

Unit 178 (1/3 Mcz BN)

None

Unit 179 (2/3 Mcz BN)

H+53, Move to BF48

Unit 180 (3/3 Mcz BN)

H+30, Move to BD50
H+53, Move to BE51

Unit 181 (7 Arty BN)

H+37, Move to BK53
H+47, Move to BF60
H+54, Move to BK53

Unit 182 (8 Arty BN)

H+8, Move to BA51
H+19, Move to BK53

Unit 183 (9 Arty BN)

H+19, Move to BB50

Unit 184 (10 Arty Bn)

H+30, Move to BK53

Unit 185 (11 Arty BN)

H+13, Move to BB52
H+24, Move to BJ56
H+37, Move to BB50
H+53, Move to BJ56

Unit 186 (12 Arty BN)

H+18, Move to BD48
H+30, Move to BJ56
H+37, Move to BB50
H+53, Move to BJ56

Unit 187 (13 Arty BN)

H+6, Move to BH42
H+37, Move to BJ56

Unit 188 (14 Arty BN)

H+8, Move to BB52
H+24, Move to BJ56
H+37, Move to BB50
H+53, Move to BJ56

Unit 189 (15 Arty BN)

H+16, Move to BB52
H+24, Move to BJ56
H+39, Move to BC55
H+45, Move to BJ56

Unit 190 (16 Arty BN)

H+17, Move to BB52

H+24, Move to BI55
H+41, Move to BD50
H+53, Move to BE51

Unit 191 (17 Arty BN)

H+9, Move to BJ44
H+37, Move to BI55
H+41, Move to BE49
H+53, Move to BF48

Unit 192 (18 Arty BN)

None

Unit 193 (19 Arty BN)

None

Unit 194 (20 Arty BN)

H+37, Move to BF60

Unit 195 (5 Arty Regt)

H+39, Move to BC49
H+53, Move to BA53
H+54, Move to BG51

Unit 196 (6 Arty Regt)

H+24, Move to BE47
H+30, Move to BG51
H+53, Move to BA53
H+54, Move to BG53

Unit 198 (3 Arm Bde)

None

Unit 199 (CAS SU7)

H+21, Escort .180 21 sorties
H+21, Escort .124 20 sorties
H+35, Escort .116 30 sorties
H+37, Escort .124 0 sorties
H+37, Escort .180 0 sorties
H+37, Escort .112 11 sorties

Unit 200 (CAS M17)

H+21, Escort .114 20 sorties
H+21, Escort .123 21 sorties
H+37, Escort .123 0 sorties
H+37, Escort .111 21 sorties

CHRONOLOGICAL LISTING OF ORDERS FOR RED SIDE (EGYPT)

H-Hour (1700 hours, 15 Oct 73)

None

H+1

1. Move .114 to BG45

H+2

None

H+3

1. Move .181 to BJ44*

Note: Artillery units wer moved in the "director" mode to simulate indirect fire.

H+4

1. Move .115 to BJ48

H+5

None

H+6 (2300 hours, 15 Oct 73)

Move .187 to BH42*

H+7

1. Move .112 to BA51

H+8

1. Move .182 to BA51*
2. Move .127 to BB52
3. Move .188 to BB52*
4. Move .115 to BK45
5. Move .124 to BF48

H+9

1. Move .191 to BJ44*

Note: Orders marked with an asterisk (*) were input in the "director" mode.

H+10 - H+12

None

H+13 (0600 hours, 16 Oct 73)

1. Move .185 to BB52*

H+14

1. Move .126 to BD52

H+15

1. Move .122 to BD56
2. Move .123 to BD54
3. Move .124 to BD48

H+16

1. Move .189 to BB52*

H+17

1. Move .190 to BB52*

H+18 (1100 hours, 16 Oct 73)

1. Move .186 to BD48*
2. Move .175 to BD56*
3. Move .174 to BD54*
4. Move .130 to BA83*
5. Move .131 to BA83*
6. Move .132 to BA83*

Note: 130, 131 and 132 were positioned too far forward initially and were moved to preclude contact during Haim's raid.

H+19

1. Move .182 to BK53*
2. Move .183 to BB50*
3. Move .112 to BB50
4. Move .111 to BB50
5. Move .114 to BE47
6. Move .115 to BJ48

H+20

None

H+21

1. Move .127 to BC53

2. Escort .199, unit .180, 21 sorties
3. Escort .199, unit .124, 20 sorties
4. Escort .200, unit .114, 20 sorties
5. Escort .200, unit .123, 21 sorties

H+22 - H+23

None

H+24 (1700 hours, 16 Oct 73)

1. Move .196 to BE47*
2. Move .185 to BJ56*
3. Move .188 to BJ56*
4. Move .189 to BJ56*
5. Move .190 to BI55*
6. Move .176 to BC53*
7. "Set all artillery unit strengths at 100%"

Note: Artillery unit strengths were periodically restored to 100% to restore firepower artificially lost when in contact with the enemy.

8. Move .110 to BC53
9. Move .123 to BC55
10. Move .174 to BC55
11. Move .112 to BA51

H+25 - H+29

None

H+30 (2300 hours, 16 Oct 73)

1. Move .184 to BK53*
2. Move .186 to BJ56*
3. Move .114 to BF48
4. Move .124 to BF48
5. Move .180 to BD50
6. Move .196 to BG51*
7. Withdraw .123 at 72 percent

Note: This simulates considerable movement by Egyptian armor during the battle.

H+31

1. Move .126 to BD54

H+32 - H+34

None

H+35

1. Move .116 to BD52
2. Escort .199, unit .116, 30 sorties

H+36 (0500 hours, 17 Oct 73)

None

H+37

1. Move .114 to BC49*

Note: See order at H+30. Unit did not move on intended route. "Director" mode used to avoid unnecessary contact.

2. Move .185 to BB50*
3. Move .186 to BB50*
4. Move .188 to BB50*
5. Move .161 to BM57*
6. Move .174 to BJ52*
7. Move .175 to BJ52*
8. Move .187 to BJ56*
9. Move .191 to BI55*
10. Move .181 to BK53*
11. Move .194 to BF60*
12. Move .123 to BG55
13. Move .122 to BG55
14. Move .116 to BC55
15. Move .153 to BE59
16. Withdraw .153 at 90 percent
17. Move .169 to AY61
18. Move .167 to AY61
19. Move .130 to BC63
20. Move .131 to BA63
21. Move .132 to BB68
22. "Adjust CAS to 0 sorties for units 124, 123, 112
23. Escort .199, unit .112, 11 sorties
24. Escort .199, unit .111, 21 sorties
25. Escort .200, unit .114, 20 sorties

H+38

None

H+39

1. Move .189 to BC55*
2. Move .128 to BA51
3. Move .135 to AW45 at 15 KPH
4. Move .124 to BE49
5. Move .122 to BH48
6. Move .195 to BC49*
7. Withdraw .116 at 80 percent

H+40

1. Move .115 to BI43

H+41

1. Move .122 to BG45
2. Move .191 to BE49*
3. Move .190 to BD50*
4. Move .136 to AD43 at 15 KPH

Note: Speed reduced to portray indecisive movement by 25th Brigade.

5. Move .126 to BC55

H+42 (1100 hours, 17 Oct 73)

1. Set strength .196 at 100 percent*

H+43

1. Withdraw .137 at 75 percent

Note: Withdrawal used to portray fact that part of 25th Brigade was able to retreat.

2. Move .137 to AS45 at 15 KPH

H+44

1. Cancel .137
2. Withdraw .153 at 99 percent

Note: Commands unit was primarily a screening force and did not become decisively engaged.

3. Move .161 to BF60*

Note: Unit was supposed to have moved earlier. "Director" mode used to compensate for omission.

H+45

1. Move .137 to AS45 at 15 KPH
2. Withdraw .126 at 85 percent
3. Move .189 to BJ56*

H+46

None

H+47 (1600 hours, 17 Oct 73)

1. Move .181 to BF60*

H+48 - H+51

None

H+52

1. Move .137 to AO39

H+53

1. Withdraw .137 at 50 percent
2. Move .179 to BF48
3. Move .174 to BD54*
4. Move .180 to BE51
5. Move .122 to BG55
6. MOve .175 to BD52*
7. Move .108 to BI45
8. Move .190 to BE51*
9. Move .172 to BI45*
10. Move .191 to BF48*
11. Move .111 to BD54
12. Move .173 to BK51*
13. Move .115 to BH52
14. Move .126 to BF50
15. Move .110 to BD52
16. Move .188 to BJ56*
17. Move .112 to BD52
18. Move .186 to BJ56*
19. Move .127 to BF50
20. Move .185 to BJ56*
21. Move .128 to BF50
22. Move .195 to BG51*
23. Move .124 to BG57
24. Move .114 to BH52
25. Cancel .111
26. Move .111 to BC51
27. Cancel .114

Note: 111 and 114 were cancelled because they did not follow intended movement route. Subsequent commands moved units hex to hex.

28. Move .114 to BD50
29. Move .195 to BA53*
30. Move .196 to BA53*
31. "Set strengths for .195 and .196 at 100%"

H+54 (2300 hours, 17 Oct 73)

1. Move .181 to BK53*
2. Move .195 to BG51*
3. Move .196 to BG53*
4. Move .114 to BE51
5. Move .111 to BD54

H+55

1. Move .114 to BH52

H+56 - H+62

None

Note: H+60 is 0500 hours, 18 Oct 73

H+63

Move .137 to A039

ORDERS FOR BLUE SIDE (ISRAEL) BY UNIT

Unit 2 (1/460 Tank BN - Amir)

1. H+9, Move to BC41
2. H+13, Move to AY53
3. H+16, Move to BA55
4. H+21, Escort by .100 for unit .2, 50 sorties
5. H+21, Escort by .99 for unit .2, 50 sorties
6. H+23, Move to BB56

Unit 3 (2/460 Tank BN - Ehud)

1. H+9, Move to BC41
2. H+27, Move to BB46
3. H+36, Move to BB48
4. H+37, Withdraw .3 at 90 percent
5. H+55, Move to AY53
6. H+57, Move to BA55
7. H+58, Move to AZ58

Unit 4 (3/460 Tank BN - Lapidot)

1. H+9, Move to BD42
2. H+27, Move to BD44
3. H+39, Move to BD48
4. H+44, Withdraw at 80 percent
5. H+53, Move to BC45
6. H+56, Move to BA55
7. H+57, Move to AZ58

Unit 5 (4/460 Tank BN - Zeira)

1. H+9, Move to BC41
2. H+27, Move to BD42
3. H+53, Move to BC45
4. H+56, Move to BA55
5. H+57, Move to AZ56

Note: This unit should have been deleted.

Unit 6 (Baruchi Arm/Inf BN)

None

Unit 8 (1/14 Tank BN - Amram)

1. H+1, Move to AY53
2. H+4, Move to BB56
3. H+5, Move to BD54
4. H+16, Move to AZ54, then AY53, then AY51, and then AX50
5. H+56, Move to BB52

Unit 9 (2/14 Tank BN - Almog)

1. H+1, Move to AY53
2. H+4, Move to BB54
3. H+16, Move to AZ54, then AY53, then AY51, and then AX50
4. H+40, Move to BA51
5. H+44, Move to AZ50
6. H+56, Move to BB52

Unit 11 (4/14 Recon Unit)

1. H+1, Move to AY53
2. H+4, Move to BB56
3. H+13, Move to BB54
4. H+16, Move to AZ54, then AY53, then AY51, and then AX50
5. H+44, Move to AZ50
6. H+56, Move to BB52

Unit 17 (1/217 Tank BN - Artzi)

1. H+42, Move to AT32
2. H+44, Move to AT34
3. H+46, Move to AS39
4. H+47, Move to AR42
5. H+64, Move to AT38
6. H+66, Move to AU37
7. H+69, Move to AY37
8. H+71, Move to BC39

Unit 18 (2/217 Tank BN - Zaken)

1. H+42, Move to AT32
2. H+44, Move to AT34
3. H+46, Move to AQ39
4. H+63, Move to AT38
5. H+69, Move to AY37
6. H+71, Move to BC39

Unit 19 (3/217 Tank BN - Shimshi)

1. H+42, Move to BL32

Unit 21 (1/600 Tank BN - Yaguri)

1. H+9, Move to BC43
2. H+21, Escort .99 unit .21, 33 sorties
3. H+21, Move to BE43

4. H+21, Withdraw at 90 percent
5. H+23, Move to BE45
6. H+27, Move to BA39
7. H+40, Move to AY37
8. H+42, Move to AW43
9. H+44, Withdraw at 75 percent
10. H+65, Move to BA45
11. H+70, Move to BC59

Unit 22 (2/600 BN - Nathan)

1. H+9, Move to BC43
2. H+14, Move to BB46
3. H+27, Move to BA47
4. H+33, Move to BB46
5. H+33, then to BC45 (after arrival at BB46)
6. H+35, Move to AY49 at 50 KPH
7. H+37, Move to AZ48
8. H+38, Move to BA49
9. H+43, Withdraw at 90 percent
10. H+44, Withdraw at 95 percent
11. H+45, Move to AX46
12. H+45, Withdraw at 75 percent
13. H+66, Move to BA45
14. H+67, Move to BC59
15. H+70, Move to BC59

Unit 23 (3/600 BN - Gidra)

1. H+9, Move to BC43
2. H+21, Move to BE43
3. H+27, Move to BA39
4. H+40, Move to AY37
5. H+42, Move to AU41
6. H+64, Move to BA45
7. H+70, Move to BC57

Unit 25 (1/247 Tank BN)

1. H+2, Move to AY51
2. H+7, Move to BB54
3. H+19, Move to AX48
4. H+40, Move to AX52, then BA55
5. H+42, Move to BB56
6. H+45, Move to BB58

Unit 26 (2/247 Tank BN)

1. H+0, Move to BJ40, then BJ42
2. H+9, Move to BK43
3. H+9, Withdraw at 85 percent
4. H+17, Move to BJ38
5. H+39, Move to BJ42

Unit 27 (3/247 Tank BN)

1. H+0, Move to BG43
2. H+15, Move to BH38, then BG39
3. H+16, Move to BD46
4. H+22, Move to BH38
5. H+39, Move to BG41, then BG43
6. H+59, Move to BE45

Unit 29 (1/35 Parachute BN - Ytzik)

1. H+30, Move to BD42
2. H+31, Move to BC45, then BB48
3. H+42, Withdraw at 90 percent
4. H+56, Move to BE41

Unit 31 (1/421 Tank BN)

1. H+1, Move to BJ30

Unit 32 (2/421 Tank BN)

1. H+0, Move to BI25 at 20 KPH
2. H+1, Move to BH34 at 20 KPH
3. H+4, Move to BE41 at 20 KPH
4. H+14, Move to BD48
5. H+26, Move to BE41
6. H+41, Move to BC45, then AY53
7. H+43, Move to BA55

Unit 33 (3/421 Tank BN)

1. H+0, Move to BI25 at 20 KPH
2. H+1, Move to BH34 at 20 KPH
3. H+5, Move to BE41 at 20 KPh
4. H+9, Cancel .33
5. H+14, Move to BC45, then AY53
6. H+16, Move to BA55, then BA57, then BA59
7. H+17, Move to BA61, then BA75
8. H+22, Move to BB60, then BB58

Unit 34 (TF Engr Roll Bridge)

1. H+0, Move to BI25
2. H+1, Move to BH34
3. H+5, Move to BE41

Unit 35 (TF Engr Heavy Raft)

1. H+0, Move to BI25
2. H+1, Move to BH34
3. H+5, Move to BE41
4. H+7, Cancel 35
5. H+22, Move to BE41
6. H+33, Move to BC45

Unit 36 (TF Engr Gilowa)

1. H+0, Move to BI25 at 20 KPH
2. H+1, Move to BH34 at 20 KPH
3. H+5, Move to BE41 at 20 KPH
4. H+7, Cancel .36
5. H+7, Move to BC45
6. H+8, Move to AY49
7. H+10, Move to AY53
8. H+13, Move to BA55

Unit 38 (1/243 Para BN - Shumer)

1. H+2, Move to AY49
2. H+7, Move to BB52
3. H+19, Move to AX48
4. H+40, Move to BA51
5. H+44, Move to AZ50
6. H+56, Move to BB50

Unit 39 (2/243 Para BN)

1. H+0, Move to BK21
2. H+2, Move to BH34 at 40 KPH
3. H+6, Move to BC45
4. H+8, Move to AY53
5. H+10, Move to BA55
6. H+11, Move to BA57

Unit 40 (3/243 Para BN)

1. H+0, Move to BK21
2. H+2, Move to BH34 at 40 KPH
3. H+6, Move to BC45
4. H+8, Move to AY53
5. H+10, Move to BA55
6. H+12, Move to BA57
7. H+42, Move to BC59, then BF60
8. H+47, Move to BE59
9. H+55, Move to BA59

Unit 42 (175 MM Arty BN)

1. H+21, Move to BA57

Unit 44 (TF Shmulik)

1. H+2, Move to AY51
2. H+5, Move to BB54
3. H+16, Move to AZ54, then AY53, then AY51, then AX 50
4. H+40, Move to BA51
5. H+44, Move to AZ50
6. H+56, Move to BB40

Unit 45 (TF Shaked)

1. H+2, Move to AY53
2. H+5, Move to BB56
3. H+13, Move to BC55
4. H+21, Escort .99, unit 45, 50 sorties
5. H+21, Escort .100, unit 45, 50 sorties
6. H+23, Move to BA55

Unit 46 (1st Arty BN)

1. H+18, Move to BD46
2. H+23, Move to BI35
3. H+46, Move to AO39
4. H+63, Move to BI35

Unit 47 (2nd Arty BN)

1. H+9, Move to BK43
2. H+17, Move to BI35
3. H+35, Move to BB48
4. H+46, Move to AO39
5. H+46, Set strength at 10000
6. H+63, Move to BI35

Unit 48 (3rd Arty BN)

1. H+35, Move to BB48
2. H+46, Move to AO39
3. H+46, Set strength at 10000
4. H+64, Move to BI35

Unit 50 (4/243 Para BN)

1. H+0, Move to BK21
2. H+2, Move to BH34 at 40 KPH
3. H+9, Move to BE41
4. H+14, Move to BC45
5. H+14, Move to BA47
6. H+16, Move to BA45
7. H+16, Move to BC43
8. H+17, Move to BE41
9. H+43, Move to BC45
10. H+45, Move to BA55
11. H+46, Move to BA59

CHRONOLOGICAL LISTING OF ORDERS FOR BLUE SIDE (ISRAEL)

H-Hour (1700 hours, 15 Oct 73)
Note:
Units 26 and 27 had initial threshold values of 95% to permit light contact as a diversionary attack force. Unit 25 had an initial threshold of 90% to portray fact that only a company assisted Shumeri in his counterattack. Unit 32 was set at 90% to permit light contact during move to crossing site.

1. Move .26 to BJ40
2. Move .27 to BG43
3. Move .39 to BK21
4. Move .40 to BK21
5. Move .50 to BK21
6. Move .32 to BI25 at 20 KPH

Note: Israeli movement on Akavish Road south of Tassa was particularly slow because of traffic congestion.

7. Move .33 to BI25 at 20 KPH
8. Move .34 to BI25
9. Move .35 to BI25
10. Move .36 to BI25 at 20 KPH
11. Move .26 to BJ42 (after arrival at BJ40)

H+1

1. Move .11 to AY53
2. Move .8 to AY53
3. Move .9 to AY53
4. Move .31 to BJ30
5. Move .32 to BH34 at 20 KPH
6. Move .33 to BH34 at 20 KPH
7. Move .34 to BH34
8. Move .35 to BH34
9. Move .36 to BH34 at 20 KPH

H+2

1. Move .39 to BH34 at 40 KPH
2. Move .40 to BH34 at 40 KPH
3. Move .50 to BH34 at 40 KPH
4. Move .25 at AY51
5. Move .44 to AY51
6. Move .45 to AY53
7. Move .38 to AY49

H+3

None

H+4

1. Move .11 to BB56

Note: Orders marked with an asterisk (*) were input in the "director" mode.

2. Move .8 to BB56
3. Move .9 to BB54
4. Move .32 to BE41 at 20 KPH

H+5

1. Move .8 to BD54
2. Move .44 to BB54
3. Move .45 to BB56
4. Move .33 to BE41 at 20 KPH
5. Move .34 to BE41
6. Move .35 to BE41
7. Move .36 to BE41 at 20 KPH

H+6 (2300 hours, 15 Oct 73)

1. Move .39 to BC45
2. Move .40 to BC45

H+7

1. Move .25 to BB54
2. Move .38 to BB52
3. Cancel .35
4. Cancel .36

Note: Heavy rafto (35) bogged down. Gilowas (36) were moved separately to the crossing site.

5. Move .36 to BC45

H+8

1. Move .39 to AY53
2. Move .40 to AY53
3. Move .36 to AY49 (after arrival at BC45)

H+9

1. Move .26 to BK43
2. Withdraw .26 at 85 percent
3. Move .50 to BE41
4. Move .4 to BD42
5. Move .3 to BC41
6. Move .5 to BC41
7. Move .22 to BC43
8. Move .21 to BC43

9. Move .23 to BC43
10. Cancel .33
11. Move .2 to BC41
12. Move .47 to BK43*

H+10

1. Move .39 to BA55
2. Move .40 to BA55
3. Move .36 to AY53

H+11

1. Move .39 to BA57*

Note: "Director" mode was used to move units across the canal once crossing capability was available to facilitate play of the game.

H+12 (0500 hours, 16 Oct 73)

1. Move .40 to BA57*

H+13

1. Move .11 to BB54
2. Move .45 to BC55
3. Move .36 to BA55
4. Move .2 to AY53

H+14

1. Move .50 to BC45
2. Move .32 to BD48
3. Move .33 to BC45
4. Move .22 to BB46
5. Move .50 to BA47 (after arrival at BC45)
6. Move .33 to AY53 (after arrival at BC45)

H+15

1. Move .27 to BH38
2. Move .27 to BG39 (after arrival at BH38)
3. Move .27 to BD46 (after arrival at BG39)

H+16

1. Move .50 to BA45
2. Move .33 to BA55
3. Move .2 to BA55
4. Upon arrival at BA55, Move .11, .8, .9, and .44 to AZ54, then AY53, then AY51, and then AX50
5. Move .50 to BC43 (after arrival at BA45)
6. Move .33 to BA57 (after arrival at BA55)*
7. Move .33 to BA59

H+17

1. Move .26 to BJ38
2. Move .47 to BI35*
3. Move .50 to BE41
4. Move .33 to BA61
5. Move .33 to BA75

H+18 (1100 hours, 16 Oct 73)

1. Move .46 to BD46*

H+19

1. Move .25 to AX48
2. Move .38 to AX48

H+20

None

H+21

1. Escort .99, unit .2, 50 sorties
2. Escort .99, unit .45, 50 sorties
3. Escort .99, unit .21, 33 sorties
4. Escort .100, unit .45, 20 sorties
5. Escort .100, unit .2, 50 sorties
6. Move .21 to BE43
7. Withdraw .21 at 90 percent
8. Move .23 to BE43
9. Move .42 to BA57*

H+22

1. Move .27 to BH38
2. Move .35 to BE41
3. Move .33 to BB60
4. Move .33 to BB58 (after arrival at BB60)*

H+23

1. Move .21 to BE45
2. Move .46 to BI35
3. Move .45 to BA55
4. Move .2 to BB56

H+24 (1700 hours, 16 Oct 73)

None

H+25

None

H+26

1. Move .32 to BE41

H+27

1. Move .21 to BA39
2. Move .23 to BA39
3. Move .4 to BD44
4. Move .5 to BD42
5. Move .3 to BB46
6. Move .22 to BA47

H+28

None

H+29

None

H+30 (2300 hours, 16 Oct 73)

1. Move .29 to BD42*

Note: "Director" mode used to move airborne unit to Adan's command post area.

H+31

1. Move .29 to BC45
2. Move .29 to BB48 (after arrival at BC45)

H+32

None

H+33

1. Move .22 to BB46
2. Move .35 to BC45
3. Move .22 to BC45 (after arrival at BB46)

H+34

None

H+35

1. Move .22 to AY49 at 50 KPH
2. Move .47 to BB48*
3. Move .48 to BB48*

H+36 (0500, 17 Oct 73)

1. Move .3 to BB48

2. Withdraw .3 at 90 percent

Note: Ehud's battalion did not become decisively engaged.

H+37

1. Move .22 to AZ48
2. Move .20 to BE5*

Note: 20 was incorrectly positioned on the board and should be deleted from game play.

H+38

1. Move .22 to BA49

H+39

1. Move .4 to BD48
2. Move .27 to BG41
3. Move .26 to BJ42
4. Move .27 to BG43 (after arrival at BG41)
5. Move .35 to BA55*

H+40

1. Move .9 to BA51
2. Move .38 to BA51
3. Move .44 to BA51
4. Move .25 to AX52
5. Move .21 to AY37
6. Move .23 to AY37
7. Move .25 to BA55 (after arrival at AX52)

H+41

1. Move .32 to BC45
2. Move .32 to AY53 (after arrival at BC45)

H+42 (1100 hours, 17 Oct 73)

1. Move .25 to BB56
2. Move .21 to AW43
3. Move .23 to AU41
4. Move .19 to BL32
5. Move .17 to AT32*
6. Move .18 to AT32*

Note: Aryeh Brigade movement not possible in specified time. See Annex I.

7. Move .40 to BC59
8. Withdraw .29 at 90 percent

Note: Paratroopers were able to withdraw at this time (Adan).

9. Move .40 to BF60 (after arrival at BC59)

H+43

1. Move .32 to BA55
2. Move .50 to BC45

3. Withdraw .22 at 90 percent

Note: Natan battalion was withdrawn to permit participation in ambush of Egyptian 25th Brigade.

4. Move .50 to AY53 (after arrival at BC45)

H+44

1. Move .9 to AZ50
2. Move .11 to AZ50
3. Move .38 to AZ50
4. Move .44 to AZ50
5. Withdraw .22 at 95 percent
6. Move .17 to AT34*
7. Move .18 to AT34*
8. Withdraw .21 at 75 percent
9. Withdraw .4 at 80 percent

H+45

1. Move .22 to AX46
2. Move .50 to BA55
3. Withdraw .22 at 75 percent
4. Move .25 to BB58*

H+46

1. Move .17 to AS39
2. Move .18 to AQ39
3. Move .46 to AO39*
4. Move .47 to AO39*
5. Move .48 to AO39*
6. Set .47 strength at 10000.*
7. Set .48 strength at 10000.*
8. Move .50 to BA59

H+47

1. Move .17 to AR42
2. Move .40 to BE59

H+48 (1700 hours, 17 Oct 73)

None

H+49

None

H+50

None

H+51

None

H+52

None

H+53

1. Move .4 to BC45
2. Move .5 to BC45

H+54 (2300 hours, 17 Oct 73)

None

H+55

1. Move .3 to AY53
2. Move .40 to BA59

H+56

1. Move .29 to BE41
2. Move .4 to BA55
3. Move .5 to BA55
4. Move .8 to BB52
5. Move .9 to BB52
6. Move .11 to BB52
7. Move .44 to BB40
8. Move .38 to BB50

H+57

1. Move .4 to AZ58
2. Move .3 to BA55
3. Move .5 to AZ56

H+58

1. Move .3 to AZ58

H+59

1. Move .27 to BE45

H+60 (0500 hours, 18 Oct 73)

H+61, H+62

None

H+63

1. Move .18 to AT38
2. Move .46 to BI35
3. Move .47 to BI35

H+64

1. Move .48 to BI35
2. Move .17 to AT38
3. Move .23 to BA45

H+65

1. Move .21 to BA45

H+66

1. Move .22 to BA45
2. Move .17 to AU37

H+67

1. Move .22 to BC59

H+68

None

H+69

1. Move .17 to AY37
2. Move .18 to AY37

H+70

1. Move .21 to BC59*
2. Move .22 to BC59*
3. Move .23 to BC57*

H+71

1. Move .17 to BC39
2. Move .18 to BC39

ANNEX I

ANALYSIS OF MANEUVER AND LOSS DATA

MANUEVER DATA

The battle of 17 October 1973 between the Israelis and the 25th Egyptian Independent Tank Brigade represents the only major problem we experienced during the course of this study. The variation between war game results and historical fact were significant. Coincidentally, this battle is better documented — particularly as it concerns Egyptian forces, movements, casualties, and so forth — than any other battle analyzed for this study project. One other minor deviation occurred. The manuever rate (8 KPH) assigned Israeli units was satisfactory with the exception of the Aryeh brigade move from Tassa to Hurva on 17 October, a distance of approximately 52 kilometers. Adan said the move was made in a little over three hours. Our rate would take over five hours with a trail factor of 1.25 (10 KPH). However, if Lateral Road (a distance of 30 kilometers in this situation) were a better surface than indicated, the road factor would be 2.5 or 20 KPH. The total time would have been about 3 hours and 45 minutes — an acceptable correlation.

Initial war game processing resulted in the 25th Brigade battle being waged in excess of thirty hours. In fact, with allowance for mop up of defeated and retreating forces, the battle was waged and decisively terminated in little more than an hour!

Our processing of initial move orders for both sides was conducted to portray both forces moving — the Egyptians in column movement, north on Lexicon Road and the Israelis conducting a flanking attack to strike,

encircle, and destroy the Egyptian force. The McClintic Model portrayed this engagement as two forces on "even ground" (e.g. no prepared defensive positions, no surprise, etc) and produced strength degradation figures almost identical for both sides. In summary, the Model perceived no significant deviences between opposing forces and thus "judged" the situation a stalemate. After a few iterations we were in fact able to get the surprise aspect of the model to work properly for unit 137, the southernmost battalion of the 25th Brigade. (When a unit is hit on the flank while moving, it automatically suffers a 25 percent loss before engaging the battle attrition formula). On one other occassion the surprise factor also worked with unit 136. In our opinion, we eventually would have gotten the surprise factor to impact all three battalions of the 25th Brigade, but time did not permit us to pursue the matter. In any event, the surprise factor needs to be simplified from the aspect of user input.

Subsequent iterations of the game portrayed a significant variation in the placement of Israeli forces. Specifically, the Israeli units were moved into hex locations prior to the arrival of Egyptian forces, and thus afforded the "game advantage" of occupying a piece of terrain. Subsequently, Egyptian units (25th Bde) were moved into the occupied hex locations and combat ensued. Numerous iterations were processed until we had "fine tuned" the scenario to the degree that Egyptian casualty rates matched historical fact. We were able to reduce the time difference of the battle from 30 to 17 hours. Consequently, efforts to terminate our analysis at H+60 hours (0500 hours, 18 October 73) were unattainable and we terminated at H+72 hours (1700 hours, 18 October 73) solely as a result of the McClintic Model processing of this battle. However, we want to emphasize that the historical versus model maneuver

relationships were compatible in all situations other than the two incidents described. These two incidents had no impact on the resulting unit strengths before or after "scheduled" battles took place.

In summary, the H+72 data is consistent with what should have occurred at H+60 and in fact, would have occurred except for the deviations discussed above. Experience with the McClintic Model throughout this study project, until the 25th Brigade battle, had caused us to acquire a healthy "respect" for its capabilities and predictability. This was particularly true as we analyzed the model's manuever functions and the complex movement activities of both forces in previous battles.

The 25th Brigade experience is a lesson in the need to appreciate the sensitivity of the human dimension in war that models — however sophisticated — have difficulty in computing. This battle represents a classic example of one side seizing an opportunity presented to it by reliable intelligence, decisive maneuver of its forces, and violent execution of a surprise attack culminating in the destruction of an opposing force. Conversely, the opposing force was indecisive in its movement, vulnerable to attack since it lacked flank security, and may well have been influenced by the uncertainty of conflicting reports of Israeli excursions across the canal. Apprehension, fear, anxiety, surprise, panic, disgust, revenge, national fervor, fatique, and so forth are human factors present in any conflict. However, their individual and collective consequences may be significantly different when assessed in a battle such as experienced by the 25th Tank Brigade. Some changes can be made to the Model to enhance its capabilities and accommodate a surprise attack. However, our experience with this

particular battle articulates in clearest terms the caveat all users of war games and models must be sensitive to at all times — never overlook the human dimension in war.

LOSS DATA

1. While it is difficult to statistically analyze the loss data, the model generated results of the battle correspond very closely with historical accounts.

a. Ammon's brigade suffers heavy losses on the 15th and 16th.

b. The Israelis repeatedly have difficulty capturing the Tirtur-Lexicon junction.

c. The preponderance of Egyptian artillery significantly influences battle outcomes.

d. Tuvia's diversionary attack on the 15th and 16th is repulsed.

e. The Chinese Farm is a formidable defensive position.

f. Egyptian tank battalions suffer heavy losses and the 25th Independent Tank Brigade is virtually annihilated on the 17th.

2. The firepower scores of those units engaged in battle during the period 1700 hours, 15 October to 0500 hours 18 October total 1135 points for the Egyptians and 1432 points for the Israelis (not including points assigned for artillery and close air support). Since artillery was played by moving a unit in the director mode to its point of impact on the battle without permitting accumulation of loss in strength to the artillery units, it is difficult to assess the point value of artillery during the battle. However, Egyptian artillery had a point value of 300 compared with 45 for the Israeli's, or a ratio of 6.7:1 which is consis-

tent with Trevor Dupuy's analysis.[1] Close air support was played, but it is not possible to compare firepower scores as addressed above. Air unit firepower scores are identified in the unit data tables (see Annex E). Thus the combat power ratio is 1135:1432 or .73 which compares favorably with Dupuy's Quantatative Judgment Method value of .73 -.88 for a refined P/P ratio.[2] After the battle concluded on the 17th (equivalent to analyzing the H+72 sitrep) the Egyptian's strength value was 816, and the Israeli's value was 1050 (see appendix 1).[3] This represents a loss of 29 percent for the Egyptians and 27 percent for the Israelis. If this corresponds to an effective PR/PR of .78 (816/1050), the results disagree with Dupuy's assessment of the outcome with an effective PR/PR range of .47 to .55.[4] Whether this is significant really depends on the results one would achieve by pursuing engagements 73-10, 73-11, and 73-12 for the period 18-22 October.[5]

A review of tank losses provides another way to assess the outcome. However, it is difficult to identify total tanks in the battle as well as actual losses. Dupuy and Adan provide the following data:[6]

Table 1

	Tanks Available	Tanks Lost	% Lost
Egypt	415/240	284/**	60-68
Israel	560/400*	96/110-120	17-30

Note: The number above the diagonal (/) represents Dupuy's analysis; the number below is based on Adan's book.

* Numbers have been reduced from 600 and 440 to account for two battalions, one from Aryeh's Brigade and one from Haim's Brigade, which remained in the rear area during engagements 73-08 and 73-09. Forty tanks have been alloted these battalions even though TOE strengths would be 30 each.

** Adan says that only 50-60 tanks of the 25th Brigade were destroyed and approximately 10 escaped. Dupuy says 86 were destroyed. This would cause Dupuy's numbers to be adjusted as low as 248.

The average strength at H+60 (H+72) of those units with tanks as an element of firepower is 67.7% for the Egyptians and 71.1% for the Israelis. (Note: Includes mechanized battalions. Strength of ten tank battalions is 57.4%). Assuming a 100% correlation between unit firepower strength and tanks available, a 28.9% loss is within the range of Israeli tank losses presented above. There appears to be no correlation of Egyptian unit losses with tank losses. However, in reviewing Dupuy's calculations for proving ground operational lethality indexes (weapons effects firepower) we find that the value for armor lethality represents 57% of the Egyptian combat power (w) for engagement 73-08 compared with 84% for the Israelis.[7] It represents 44% of the Egyptian combat power for 73-09 if one disregards the impact of airpower and 34% considering airpower. Thus the Egyptian armored lethality averages 45 to 50% during the modeling period. If this relationship is true, then the Egyptian 32.3% strength loss shown in Appendix 1 should be doubled (1/.45-.50) to assess tank losses of approximately 65-71%. A loss of 65% does indeed fall within the 60-68% range shown in Table 1.

For comparison, applying the same logic to Israeli tank losses, armor lethality represents 84% of W for 73-08 and varies due to air power considerations between 48% and 83% for 73-09. Thus the armored lethality varies between 71% and 83% for the modeling period. Similar to the Egyptian analysis, this necessitates a loss adjustment factor of 1.2 - 1.4. Adjusting the loss data in Table 1 results in tank losses in the range of 33-38%. Outside the table, yes, but since Adan's figures represent the 30% value in Table 1, the error may not be as great as it

first appears. Finally, Israeli units 11, 44 and 45 were included as part of the forces in determining an analysis of armor lethality. This may not be correct since these units were reinforced with tanks organic to other tank units within Adan's and Sharon's divisions. If including these units was incorrect, the average strength for tank units at H+60 is 75.4% or a tank loss of 24.6%. When adjusted, this value ranges between 29.5% and 34%.

This rather lengthy statistical approach was undertaken to relate the results of this study with other statistical and analytical approaches. We do not rest on the accuracy of the effort and time did not permit review by a mathematician. If accurate, the results do tend to indicate some validity to the USAWC Theater Model's attrition formula and use of Concepts Analysis Agency WUV scores. However, running additional engagements through the model should be done before drawing any statistical conclusions. Nevertheless, the model does seem to portray the historical results of engagements 73-08 and 73-09 within what appears to be acceptable variances and tolerances. Intuitively, one senses that the model is a valuable tool in predicting outcomes of future battles between forces of varying strength and composition.

ENDNOTES

1. Historical Evaluation and Research Organization (HERO), Assessment of Arab and Israeli Combat Effectiveness 1967 and 1973 Wars, Calculations for Engagements 73-08 and 73-09. (See Appendix 2)

2. T. N. Dupuy, Numbers, Predictions and War, p. 134.

3. Note: The attrition formula used in the model has a random factor of ± 2% when calculating strengths. While the H+72 sitrep is considered to represent average values, they could vary by the 2% limits of the random factor.

4. T. N. Dupuy, Numbers, p. 134.

5. Note: This is the technique used by T. N. Dupuy and the HERO organization to identify specific engagements in the 1973 Arab-Israeli War.

6. Multiple sources. HERO, see data for engagements 73-08 and 73-09. T. N. Dupuy, Elusive Victory, pp. 485-512. Avraham Adan, On the Banks of the Suez, pp. 245-308, (of particular note, p. 253, p. 255, p. 303).

7. HERO, calculations for 73-08 and 73-09. (See Appendix 2) Note: This appears to be valid for Tom Kitchell's figures also, particularly Egyptian armored forces.

APPENDIX 1 (ANNEX I) — UNIT FIREPOWER VALUES

o = units with tanks

Average strength (at H+72) of Egyptian units with tanks is 67.7%.

Average strength (at H+72) of Israeli units with tanks is 71.1%.

H+72 is equivalent to H+60. See pp. I-1 to I-4 for explanation.

APPENDIX 2 (ANNEX I) — EXTRACT OF HERO REPORT CALCULATION SHEETS

T.N. Dupuy's QJM Input Requirements

$W_{s,\ mg}$ - small arms and machine gun effectiveness

W_{hw} - heavy weapons

W_{gi} - anti-tank

W_g - artillery

W_{gy} - air defense

W_i - armor lethality

W_y - air support lethality

S = force strength = $(W_s + W_{mg} + W_{hw})\ (r_m) + (W_{gi})(r_n) +$

$(W_g + W_{gy})(r_{wg} \times h_{wg} \times z_{wg} \times W_{yg}) + (w_i \times r_{wi} \times h_{wi})$

$+ (W_y \times r_{wy} \times h_{wy} \times z_{wy} \times w_{yy})$

P = Combat Potential = S modified by operational variables

$P = (S)(m)(l_e)(t)(o)(b)(u_s)(r_u)(h_u)(z_u)(v)$

Note: See Dupuy, Numbers, Prediction and War, for discussion of QJM theory.

For Engagement 73-08:

Egyptians

$W = 372,356$

$$\frac{Wi}{W} = \frac{213,466}{372,356} = 57\%$$

Israelis

$W = 259,503$

$$\frac{Wi}{W} = \frac{217,808}{259,503} = 84\%$$

For Engagement 73-09:

Egyptians

$W = 704,312$

$\frac{Wi}{W} = \frac{242,205}{704,312} = 34\%$

$\frac{Wi}{W-Wy} = \frac{242,205}{704,312 - 149,814} = 44\%$

Israelis

$W = 582,713$

$\frac{Wi}{W} = \frac{284,676}{582,713} = 48\%$

$\frac{Wi}{W-Wy} = \frac{284,676}{582,713 - 238,380} = 83\%$

ANNEX J — DETERMINATION OF UNIT FIREPOWER SCORES

Classified annex submitted separately to Department of War Gaming, USAWC.

Subject: Index of Save Points for ALTOS SUEZ Game (Arab-Israeli 1973 War)

SAV2 - Initial Unit Locations and Initial Orders

SAV7 - H+0 to H+18

SAV11 - H+18 to H+25

SAV12 - H+25 to H+37

SAV13 - H+37 to H+39

SAV14 - H+39 to H+42

SAV15 - H+42 to H+44

SAV16 - H+44 to H+47

SAV17 - H+47 to H+53

SAV18 - H+53 Orders

SAV19 - H+53 to H+58

SAV23 - H+58 to H+75

ANNEX A

McCLINTIC THEATER MODEL DOCUMENTS
AND PLAYERS GUIDE
(ATTACHED TO ORIGINAL ONLY)

ANNEX B

UNIT DATA FILE LISTING
(ATTACHED TO ORIGINAL ONLY)

ANNEX C

COMPARATIVE INFORMATION ON 1982 AND 1983 COMPUTER GAMES
WITH IDENTICAL COMPUTER COMMANDS

ANNEX C

COMPARATIVE INFORMATION ON 1982 AND 1983 COMPUTER GAME WITH IDENTICAL COMPUTER COMMANDS

This annex contains detailed information on the comparison of the 1982 game to the 1983 game with identical computer commands. It should be read in conjunction with Chapter III. The annex contains the same information for each of the six units selected for comparison, i.e., Historical Narrative, 1982 Narrative, 1983 Narrative, 1982 Chronology, 1983 Chronology and a table outlining differences noted between the 1982 and 1983 runs. The chronologies list, in sequence, every entry noted in the printouts for each selected unit. The "report" column indicates which of the four types of entries is being considered: SITREP, order, battle report or program note (any entry not clearly identifiable as one of the other three--these usually noted unit arrivals, but occasionally denoted the end of a battle). The "time" column indicates the effective time of an event, e.g., the time for a SITREP will indicate effective time, not time of receipt, which is always later.

NOTE: All times listed in the 1982/1983 Narratives and Chronologies are in game time 000001 being the start of the first day.

1/460th AMIR TK BN HISTORICAL NARRATIVE

The battalion was organic to the 460th Armored Bde commanded by Colonel Gabi AMIR and part of the 162nd Armored Division commanded by Major General Bren ADAN. The battalion, at the start of the battle period covered by this study, had approximately 30 tanks.

At 1700 hours on 15 October the battalion was located with the rest of the 460th Bde at an assembly area east of the Akavish-Artillery road crossing (VIC BD 26), preparing to conduct a crossing of the Suez Canal after elements of Major General SHARON's division secured a crossing site. Anticipating that he could begin crossing by dawn on 16 October, Major General ADAN directed the 460th Bde commander to move his lead element to the crossing site. Thus the 1/460th moved at about 0500 on the 16th along the Akavish road toward Lakekan (AZ 50), arriving sometime around 0700, and encountering little resistance en route.

At approximately 0730, the battalion linked up with elements of the Israeli 14th Armored Brigade south of the Lexicon-Tirtur crossroads (VIC BA 51). The crossing site was by no means secure; the 14th Armored Bde had been in heavy contact with Egyptian armored, anti-tank, and infantry elements, suffering heavy losses (approximately 60 tanks and 200-250 KIA). Major General SHARON, learning of the arrival of the fresh 1/460th Bn, requested and received approval for attachment of the battalion to his division, and specifically to the battered 14th Bde.

Now attached to the 14th Armored Bde, the 1/460th received the mission to defend the Lexicon-Tirtur crossroads (BB 52) against Egyptian forces to the north and northeast. The battalion successfully held the crossing through the day and night, until about 1100 on 17 October. Throughout the 16th, the battalion defended against a determined attack by two Egyptian

tank brigades, one from the 21st Armored Division and one from the 23rd Mechanized Division. The Egyptians were unable to dislodge the Israeli battalion. On the morning of the 17th, the Egyptian 14th Armored Bde (21st Mechanized Division) made one more attempt to seize the crossroads; this attempt by mid-morning was repulsed by the battalion, and the Egyptian forces withdrew northward. The battalion was reinforced at approximately noon by the arrival of Colonel BARAM's 600th Armored Bde, which had succeeded in opening the Tirtur road from the east. Shortly thereafter, the remainder of the 460th Bde arrived in the area.

From noon to approximately 2100 on the 17th, the battalion anchored the defense of the Tirtur road by the Israelis. The battalion remained at the Lexicon-Tirtur junction (BB 52) while the rest of the 460th Bde and the 600th Armored Bde and the 247th Armored Bde extended to the east along the Tirtur road. Contact with Egyptian forces during this period was light.

The 460th Bde was relieved by a brigade from Major General SHARON's division at around 2100 on the 17th in order to prepare to cross the Suez. The battalion moved with the brigade to position Kishuf (BD 44) to refuel, and from there to the crossing site (BA 55). Crossing operations commenced around midnight; the crossing was complete (two brigades of Major General ADAN's division--the 460th and the 600th) by 0500 on 18 October.

Total losses suffered by the battalion are not recorded. However, based on the estimated 80-90 tanks lost by all Israeli forces in the Tirtur-Lexicon-Akavish area during the period 15 2100- 17 1200 October, and considering the central role of the battalion during the 16th, a reasonable estimate of the battalion's losses would be 10-15 tanks (1/3 to 1/2 of the force).

1/460th AMIR TK BN 1982 NARRATIVE

The unit began the play of the problem approximately 10K's south of Akavish road and 15K west of Lateral road (BD 26) with 100% strength and moving to an attack position near the intersection of Casma and Akavish roads (BC 41) arriving there after 010600. It was then given an order to move toward a pre-crossing location (AY 53). It arrived there at 010800. At 010900 the unit was further ordered to move to the bridge crossing site (BA 55) arriving there within the same hour. The unit was allocated close air support at 011400. At 011600 the unit was ordered to move to a position just north of the bridge site (BB 56) arriving there an hour later. The SITREP at 011700 shows the unit at BB 56, not in contact and with a strength figure of 98%. At 011800 the unit is attacked by the 2/1st Armor Battalion (strength 73%) reinforced by a DS artillery battalion, the 3rd Artillery Battalion (Egyptian) (strength 83%). Unit strength as of this report is 94%. A report of battle at 020100 shows the unit still in combat with the same units. Its strength is down to 93% with the Egyptian units down to 60% and 69% respectively. The 020500 SITREP shows the unit still in combat at the same location with a unit strength of 93%. The printout shows this battle ending before 020600 but the 020800 SITREP shows the unit still to be in combat, however, there has been no decrement in its unit strength. At 021000 the unit is involved in a new battle at the same location with the 3/14th Armored Battalion (strength 88%). The 1/460th's strength is shown at 91%. A SITREP at 021300 shows the unit still in combat with a strength of 91%. At 021400 the unit is shown to be still engaged (strength 89%) but it has now been joined by the 1/247th Tank Battalion (strength 75%). Opposing units now include the 3/14th Armored Battalion (strength 77%) and the 1/18th Mechanized Battalion (strength 82%)

with support provided by the 15th Artillery Battalion (Egyptian), strength 76%.

The 021700 SITREP shows the unit at 90% strength, still in combat at the same location. The battle ends at 021800 when the last opposing unit, the 1/18th Mechanized Battalion, withdraws because its unit strength (66%) exceeds the withdrawal criteria. The 1/460th unit strength is now shown at 87%. The unit remains stationary and out of contact for the remainder of the period with the 031700 SITREP showing its strength at 88%.

1/460 AMIR TK BN: 1983 Narrative

This unit began play approximately 10km south of Akavish road and 15km west of Lateral road (BD 26) with 100% strength. At 010200 it was ordered to move to an attack position north of the intersection of Casma road and Akavish road (BC41), arriving there between 010304 and 010400. At 010600 it was ordered to a pre-crossing location (AY 53), arriving there before 010700. At 010900 the unit was further ordered to the crossing site (BA 55) and arrived there shortly thereafter with a unit strength of 98%. At 011400 close air support was allocated to the unit and two hours later it was ordered to move to a position just north of the bridge site (BB 56). At 011708 the 1/460th AMIR TK BN arrived at BB 56 and contacted the 2/1 ARM BN. A battle report as of 011817 shows the unit with 97% strength involved in a major battle, allied with the 4/14 Recon Unit (94%), TF SHAKED (92%), 1/247 TK BN (94%), 2/14 ALMOG TK BN (93%) and 1/14 AMRAM TK BN (95%). Egyptian forces involved include the 2/1 ARM BN (98%), 6 ARTY BN, 1/112 INF BN (89%), 2/112 INF BN (89%), 3/112 INF BN (88%), and 2/18 MECH BN (91%).

The composition of forces involved in the battle changed throughout the course of play for both sides. This is thought to be due primarily to a software problem which precluded more than ten units per side fighting in

the same battle. The battle, for example, as determined from an 021217 battle report showed the composition of the battle as follows:

BLUE	RED
1/460 AMIR TK BN (93%)	6 ARTY BN
TF SHMULIK (93%)	3/1 ARM BN (85%)
2/600 NATHAN TK BN (97%)	3/3 MECH BN (83%)
1/35 YTZIK PARA BN (97%)	5 ARTY BDE
1/243 SHUMER PARA BN (82%)	1/14 ARM BN (81%)
4/243 PARA BN (96%)	3/18 MECH BN (92%)
3/460 LAPIDOT TK BN (93%)	14 ARTY BN
3 ARTY BN	12 ARTY BN
2 ARTY BN	11 ARTY BN
2/460 EHUD TK BN (96%)	9 ARTY BN

Three hours later (021517) the two Blue artillery battalions were replaced in the troop list by the 4/14 RECON UNIT and TF SHAKED. Through all the apparent changes in forces, the 1/460th AMIR TK BN remained in combat in the same location (BB 56). Its unit strength was gradually attrited and it ended play (final SITREP) at 031700 with a strength of 89%.

1/460th AMIR TK BN: 1982 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001700	BD26	AVAIL	100%
SITREP	010100	BD26	AVAIL	100%
ORDER	010200	MOVE TO BC41		
SITREP	010500	BC33--MOVING TO BC41		99%
NOTE	010600	ARRIVED AT BC41		
ORDER	010600	MOVE TO AY53		
NOTE	010800	ARRIVED AT AY53		
ORDER	010900	MOVE TO BA55		
NOTE	010900	ARRIVED AT BA55		
SITREP	011100	BA55	AVAIL	98%
ORDER	011400	ASSIGNED CLOSE AIR SUPPORT		
ORDER	011600	MOVE TO BA56		
NOTE	011600	ARRIVED AT BA56		
SITREP	011700	BB56	AVAIL	98%
BATTLE REP	012100	BB56	COMBAT	94%
BATTLE REP	020100	BB56	COMBAT	93%
SITREP	020500	BB56	COMBAT	93%
SITREP	020800	BB56	COMBAT	93%
BATTLE REP	021000	BB56	COMBAT	91%
SITREP	021300	BB56	COMBAT	91%
BATTLE REP	021400	BB56	COMBAT	89%
SITREP	021700	BB56	COMBAT	90%
SITREP	021800	BB56	BATTLE REP	87%
SITREP	030500	BB56	AVAIL	88%
SITREP	031700	BB56	AVAIL	88%

1/460th AMIR TK BN: 1983 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001200	BD26	AVAIL	100%
SITREP	010000	BD26	AVAIL	100%
ORDER	010200	MOVE TO BC 41		
NOTE	010304 TO 010400	ARRIVED AT BC41		
ORDER	010600	MOVE TO AY53		
NOTE	010600 TO 010700	ARRIVED AT AY53		
ORDER	010900	MOVE TO BA55		
NOTE	010907 TO 010909	ARRIVED AT BA55		
SITREP	011000	BA55	AVAIL	98%
SITREP	011200	BA55	AVAIL	98%
ORDER	011400	ASSIGNED CLOSE AIR SUPPORT		
ORDER	011600	MOVE TO BB56		
NOTE	011700	ARRIVED AT BB56 AND CONTACTED ENEMY		
BATTLE REP	011817	BB56	COMBAT	97%
BATTLE REP	012117	BB56	COMBAT	96%
SITREP	020000	BB56	COMBAT	96%
BATTLE REP	020217	BB56	COMBAT	95%
BATTLE REP	020317	BB56	COMBAT	94%
BATTLE REP	020617	BB56	COMBAT	94%
SITREP	021000	BB56	COMBAT	94%
SITREP	021200	BB56	COMBAT	94%
BATTLE REP	021217	BB56	COMBAT	93%
BATTLE REP	021517	BB56	COMBAT	92%
BATTLE REP	021817	BB56	COMBAT	92%
BATTLE REP	022117	BB56	COMBAT	91%
SITREP	030000	BB56	COMBAT	92%
BATTLE REP	030017	BB56	COMBAT	91%
BATTLE REP	030317	BB56	COMBAT	90%
BATTLE REP	030617	BB56	COMBAT	90%
BATTLE REP	030917	BB56	COMBAT	89%
SITREP	031200	BB56	COMBAT	90%
BATTLE REP	031217	BB56	COMBAT	89%

1/460th AMIR TK BN: COMPARISON

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
1	Arrival at BC 41 @ 010600	Arrival at BC 41 between 010304-010400	Arrival Time	Same move order issued both runs @ 010200 difference due to move algorithm and/or move rates.
2	Arrival at AY 53 @ 01800	Arrival at AY 53 between 010600-010700	Arrival Time	Same move order issued both runs @ 010600 difference due to move algorithm and/or move rates.
3	Arrival at BB 56 @ 011600	Arrival at BB 56 @ 011708 (contact)	Arrival Time	Same move order issued both runs @ 011600 difference due to move algorithm and/or move rates.
4	Contact @ 012100 Strength-94%	Contact @011708 Strength-96%	Start-Time of Battle	Difference due to move algorithm and/or move rates.
5	Battle-012100 units engaged: Blue 1/460 AMIR TK BN Red 2/1 ARM BN 4ARTY BN	Battle-012117 units engaged: Blue 1/460 AMIR TK BN 4/14 RECON UNIT TF SHAKED 1/247 TK BN 2/14 ALMOG TK BN 1/14 AMRAM TK BN	Composition of units engaged in battle	All these difference are possibly due to move algorithm and/or move rates. The software will not allow a unit to bypass an enemy occupied hex, rather it intitiates a contact and, as units are engaged on each side and their movement stopped, thus causes a piling on.

1/460th AMIR TK BN: COMPARISON (CONT'D)

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
		Red 2/1 ARM BN 6 ARTY BN 1/112 INF BN 2/112 INF BN 3/112 INF BN 2/18 MECH BN		
	Red Attacking	Blue Attacking	Attacking Force	Probably caused by change in movement rates. The first unit to a hex always defends.
	Damage: Blue-2% Red-15%	Damage: Blue-<1% Red-1%	Battle Losses	Change in software.
6	Battle- 021000 Units engaged:	Battle- 021217 Units engaged:		
	Blue 1/460 AMIR TK BN	Blue 1/460 AMIR TK BN TF SHMULIK 2/600 NATHAN TK BN 1/35 YTZIK PARA BN	Composition of units engaged in battle	
	Red 3/14 ARM BN 15 ARTY BN	1/243 SHUMER PARA BN 4/243 PARA BN 3/460 LAPIDOT TK BN 2 ARTY BN 3 ARTY BN 2/460 EHUD TK BN		All these differences are possibly due to move algorithm and/or move rates See Remark #5.
		Red 6 ARTY BDE 3/1 ARM BN 3/3 MECH BN 5 ARTY BDE 1/14 ARM BN 3/18 MECH BN 9 ARTY BN 11 ARTY BN		

1/460TH AMIR TK BN: COMPARISON (CONT'D)

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
		12 ARTY BN 14 ARTY BN		
	Red Attacking	Blue Attacking	Attacking Force	
	Damage: Blue-3% Red-13%	Damage: Blue-<1% Red-3%	Battle Losses	
7	Battle Ends-021800	Combat continues	Battle termination	1982 battle ended due to Red unit (1/18 MECH BN) strength attriting to 66%, causing its withdrawal. This unit does not appear in 1983 troop list for battle at this location.

1/14th AMRAM TK BN
>HISTORICAL NARRATIVE
2/14th ALMOG TK BN

These two battalions operated essentially identically, under brigade control. Hence, a single historical narrative is provided for both units. The battalions were organic to the 14th Armored Bde commanded by Colonel Amnon RESHEF, and part of the 143d Armored Division commanded by Major General Arik SHARON. The battalions, at the start of the battle period covered by the study, had approximately 30 tanks each.

The battalions moved shortly after 1800 on 15 October from an assembly area south of the Akavish-Artillery road junction (VIC BC 41) as part of the 14th Bde (reinforced to 7 battalions). The Bde mission was to attack SW along the Akavish road. Resistance was light, and the battalions reached Lakekan (AZ 50) around 2100. Turning northwest, the battalions were the lead elements of the brigade attack north along the Lexicon road, the 1/14 on the left of the road, the 2/14 on the right.

Unaware of the strong Egyptian armored and anti-tank elements north of the Lexicon-Tirtur junction (BB 52), the battalions crossed the Lexicon-Tirtur junction shortly after 2100 and were immediately engaged by major elements of the Egyptian 16th Infantry and 21st Armored Divisions. They remained in heavy contact throughout the night in a fierce struggle to secure the Lexicon-Tirtur junction, which they were unable to do because of the tenacity of the Egyptian defenders. At dawn on the 16th, the Brigade made one more attempt to seize the junction, using elements of another battalion in the brigade. The attack was successful, and the Lexicon-Tirtur junction was secured, but by now the two battalions and the remainder of the 14th Brigade were severely battered, having lost approximately 2/3 of their tanks during the night (27 tanks remained in the

brigade). A battalion (1/460) from the 460th Armored Bde, of Major General ADAN's division, linked up with the 14th Bde at 0700 on 16 October. The 1/460th, the lead element of Major General ADAN's division which was prepared to cross the Suez, was immediately attached to the 14th Bde and directed to hold the Lexicon-Tirtur crossroads while the 14th Bde moved south to reconsolidate.

Thus at 0700 on 16 October, the 1/14 and 2/14 joined the remainder of the brigade in moving to Lakekan (AZ 50) for rest and reconsolidation. Around 1300, elements of the 14th Brigade, busy repairing damaged tanks, observed a column of dust from what appeared to be a large Egyptian Armored column approaching along the Lexicon road from the south. Calling the division commander for assistance, Colonel RESHEF positioned the remaining tanks of the brigade (about 30) to defend to the south, while Major General ADAN maneuvered other elements of the division to counter the Egyptian threat. The 1/14th and 2/14th participated in the ambush and annihilation of what was later identified as the Egyptian 25th Independent Tank Brigade, which lost 90 of its 100 T-62 tanks in the encounter with the 14th Bde, the 600th Armored Bde and the 217th Armored Bde of Major General ADAN's division. By 1500, the engagement was over.

At 1900 on the 17th, the two battalions (again as part of the 14th Bde) began to relieve elements of Major General ADAN's division along the Tirtur road (vic BC 49, BD 48) to free ADAN's elements to cross the Suez. The relief operation was completed by 2100. This ended involvement of the units in the battle period covered by this study.

Virtually all of the losses of the two battalions were suffered during the night of 16 October, when each battalion lost at least 20 of its 30 tanks.

1/14th AMRAM TK BN-1982 NARRATIVE

The unit begins the problem near the Akavish-Artillery road junction (CB 41) moving to a pre-crossing location (AY 53). Unit strength is 100%. The unit arrives at (AY 53) at 002100 and is further ordered to move to a position just north of the bridge site (BB 56). The unit arrives at (BB 56) at 002200 (strength 99%) and receives orders to move to a position just north of Shrick road (BD 54). The unit arrives at (BD 54) at 002300 and contacts an enemy force consisting of the 1/1st Armored Battalion (strength 97%), 2/1st Armored Battalion (strength 94%) supported by the 4th and 5th Egyptian Artillery Battalions (strength 98% each). The 1/14th strength is shown as 89% as of 010300. A SITREP at 010500 shows the unit still in combat at BD 54 but the unit strength has increased to 90%. The battle ends at 010700 when the unit withdraws under fire to the SW about 6kms (BC 55) with a unit strength of 75%. The units on the Egyptian side now include the 1/1st Armored Battalion (strength 95%), 2/1st Armored Battalion (strength 94%), and the 1/18th Mechanized Battalion (strength 97%) still supported by the 4th and 5th Egyptian Artillery Battalions (strength 95% each). The unit strength for the 1/14th remains at 75% through the 011100 SITREP. At 011200 the unit, now down to 70%, is joined by TF SHAKED (strength 91%). Opposing units are the 1st and 2nd of the 1st Armored Battalion (strength 93% and 88%) with support still provided by the 4th and 5th Egyptian Artillery Battalions (strength 92% and 89%). This battle causes the unit to again withdraw under fire further south toward the Tirtur road (BB 54). At 011400 the unit is forced to further withdraw in conjunction with the 4/14th RECON (strength 62%) as its strength is down to 51%. Opposing units now include the 1/112th Infantry Battalion (strength 86%), and the 2/18th Mechanized Battalion (strength 90%) supported by the

6th, 11th, 14th, 15th, and 19th Egyptian Artillery Battalions with strengths of 85%, 91%, 88%, 92%, and 94%. The unit is given an order to move to a pre-crossing staging site (AZ 54). It arrives within the hour. At 011500 the unit is again, ordered to a closer pre-crossing site (AY 53) and again arrives within the hour then being ordered to Lakekan along the Lexicon road (AY 51) then to move further south along the road (AY 50) and completes this series of moves by 011600. The 011700 SITREP shows the unit at 52% at AY 50 not in contact. This situation holds constant throughout the 020500, 020800, 021300, and the 021700 SITREP periods. At 030100 the unit is ordered to the intersection of the Lexicon and Tirtur roads (BB 52). The unit arrives at 030300. The 030500 SITREP shows the unit still out of contact with a unit strength of 51%. The 031700 repeats this data.

1/14th ARAM TK BN: 1983 NARRATIVE

The 1/14th AMRAM TK BN began play 4km south of the intersection of the Akavish road and Artillery road (BC 41) with 100% strength. At 001806 the unit was ordered to move to a pre-crossing location at AY 53, arriving there shortly before 001900. At 002100 it was ordered to move to the crossing site (BB 56), arriving there shortly after 002200. It remained there until 010909 when it was ordered to withdraw to a location south of the crossing site (AZ 54). At 010957 the unit arrived at BB 54 and joined battle at 99% strength. The composition of the battle at 011257 was:

BLUE	RED
1/14 AMRA TK BN (97%)	3/112 INF BN (90%)
4/14 RECON UNIT (96%)	2/112 INF BN (91%)
TF SHAKED (94%)	1/112 INF BN (91%)
1/247 TK BN (95%)	2/18 MECH BN (93%)
2/14 ALMOG TK BN (95%)	16 ARTY BN
	15 ARTY BN
	14 ARTY BN
	11 ARTY BN
	6 ARTY BN

The 1/14th AMRAM TK BN remained in combat at the same location until 030100 with its strength gradually declining to 93%. At 030100 it was ordered to move to BB 52. At 030917 it arrived at BB 50 and joined battle, although it does not appear in troop lists of subsequent battle reports for combat at that location. Between 031100 and 031117 it was shown to be at BB 54, en route to BB 52. It finally arrived at BB 52 at 031217, joining the battle in progress. The unit was also noted as arriving at BA 53 at 031413, joining battle. It is not clear how or why the unit moved from BB 52 to BA 53. In any case, it ended play, in combat, at 92% strength at BA 53.

1/14th AMRAM TK BN: 1982 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001700	BC41	AVAIL	100%
NOTE	001800	BC41	MOVING	
NOTE	002100	ARRIVED AT AY53		
ORDER	002100	MOVE TO BB56		
NOTE	002100	AY53	MOVING TO BB56	
SITREP	002200	BA55	MOVING TO BB56	99%
NOTE	002200	ARRIVED AT BB56		
ORDER	002200	MOVE TO BD54		
SITREP	002300	BC55	MOVING TO BD54	99%
NOTE	002300	BD54	COMBAT	
BATTLE REP	010300	BD54	COMBAT	89%
SITREP	010500	BD54	COMBAT	90%
NOTE	010700	BC55	ARRIVED	
BATTLE REP	010700	BD54	COMBAT	75%
SITREP	011100	BC55	COMBAT	75%
NOTE	011200	BB54	ARRIVED	
BATTLE REP	011200	BC55	COMBAT	70%
NOTE	011400	BA55	ARRIVED	
BATTLE REP	011400	BB54	COMBAT	51%
ORDER	011400	MOVE TO AZ54		
NOTE	011400	ARRIVED AT AZ54		
ORDER	011500	MOVE TO AY53		
NOTE	011500	ARRIVED AT AY53		
ORDER	011500	MOVE TO AY51		
NOTE	011500	ARRIVED AT AY53		
ORDER	011600	MOVE TO AX50		
NOTE	011600	ARRIVED AT AX50		
SITREP	011700	AX50	AVAIL	52%
SITREP	020500	AX50	AVAIL	52%
SITREP	020800	AX50	AVAIL	52%
SITREP	021300	AX50	AVAIL	52%
SITREP	021700	AX50	AVAIL	52%
ORDER	030100	MOVE TO BB52		
NOTE	030300	ARRIVED AT BB52		
SITREP	030500	BB52	AVAIL	51%
SITREP	031700	BB52	AVAIL	51%

1/14th AMRAM TK BN: 1983 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001200	BC41	AVAIL	100%
ORDER	001806	MOVE TO AY53		
NOTE	001841 TO 001900	ARRIVED AT AY53		
ORDER	002100	MOVE TO BB56		
NOTE	002206 TO 002211	ARRIVED AT BB56		
SITREP	010000	BB56	AVAIL	
ORDER	010909	MOVE TO AZ54		
NOTE	010957	ARRIVED AT BB54 AND JOINED BATTLE		
SITREP	011000	BB54	COMBAT	99%
SITREP	011200	BB54	COMBAT	99%
BATTLE REP	011217	BB54	COMBAT	97%
BATTLE REP	011517	BB54	COMBAT	96%
BATTLE REP	011817	BB54	COMBAT	95%
BATTLE REP	012117	BB54	COMBAT	95%
SITREP	020000	BB54	COMBAT	95%
BATTLE REP	020017	BB54	COMBAT	94%
BATTLE REP	020317	BB54	COMBAT	93%
BATTLE REP	020617	BB54	COMBAT	92%
	(NOTE: Unit did not appear in battle reports after 020617)			
SITREP	021000	BB54	COMBAT	93%
SITREP	021200	BB54	COMBAT	93%
SITREP	030000	BB54	COMBAT	93%
ORDER	030100	MOVE TO B52		
NOTE	030917	ARRIVED AT BB50 AND JOINED BATTLE		
NOTE	031100 TO 031117	AT BB54 MOVING TO BB52		
NOTE	031217	ARRIVED AT BB52 AND JOINED BATTLE		
SITREP	031200	BB54	COMBAT-DESTINATION BB52	93%
NOTE	031413	ARRIVED AT BA53 AND JOINED BATTLE		
SITREP	031700	BA53	COMBAT	92%

1/14th AMRAM TK BN: COMPARISON

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
1	Arrived at AY 53 @ 002100	Arrived at AY 53 @ 001841-001900	Arrival Time	Difference due to move algorithm and/or move rates.
2	Combat began at BD 54 @ 002300	No combat-arrived at BB 56 @002206-002211	Battle engagement	Difference due to move algorithm and/or move rates.
3	Battle Report-011200 Units engaged:	Battle Report-011217 Units engaged:		All these differences are probably due to move algorithm and/or move rates.
	Blue 1/14 AMRAM TK BN TF SHAKED	Blue 1/14 AMRAM TK BN 4/14 RECON UNIT TF SHAKED	Composition of units engaged in battle	May also be caused by "10 units in a battle rule" applied against adjacent battle, thus causing additional units to be allocated to this battle in 1983 and to the adjacent battle in 1982.
	Red 1/1 ARM BN 2/1 ARM BN 4 ARTY BN 5 ARTY BN	1/247 TK BN 2/14 ALMOG TK BN Red 3/112 INF BN 2/112 INF BN 16 ARTY BN 15 ARTY BN 14 ARTY BN 11 ARTY BN 6 ARTY BN		
	Red Attacking	Blue Attacking	Attacking Force	
	Damage: Blue-7% Red-5%	Damage: Blue-1% Red-1%	Battle Losses	Note: It appears that the algorithm allocates losses almost as an inverse of the size of the battle. This is probably the result of changes addressed by item #1 in the software changes section of Chapter III.

1/14 AMRAM TKBN: COMPARISON CONT'D

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
4	Battle over at 011400	Battle Continues	Battle Termination	Loss rate in 1982 caused unit to reach withdrawal criteria.
5	In 1982 run, unit was able to withdraw through successive positions, being given a subsequent move order each time. Unit terminated play at 51% strength.	In 1983 run, unit arrived at initial withdrawal location three hours earlier than in 1982 and had not engaged in combat. Unit then remained in combat for duration of play without further withdrawals. It ended play at 92% strength.	Withdrawal criteria Battle Losses Final Strength	

2/14th ALMOG TK BN-HISTORICAL NARRATIVE

(See historical narrative for 1/14th AMRAM TK BN, Above)

2/14th ALMOG TK BN-1982 NARRATIVE

The unit begins the play of the problem near the Akavish-Artillery road junction (BC 41) moving toward a pre-crossing location (AY 53). The unit is at 100% strength. The unit arrives at AY 53 at 002100 at which time it is ordered to move to a position (BB 54) near the crossing site. The unit arrives at 002200 and goes into combat with the 1/112th Infantry Battalion (strength 94%) which is supported by the 6th and 18th Artillery Battalions (strength 93% and 94%). The unit strength is shown as 90%. The other Israeli unit, TF SHMULIK, is at 89%. The 010500 SITREP shows the unit strength as 91%. At 010600 the unit strength is down to 83%. An additional Israeli unit, the 4/14th RECON has joined TF SHMULIK in the battle. Their strengths are listed as 88% and 80%. The opposing forces now consist of the 1/112th Infantry Battalion (strength 90%) and the 2/18th Mechanized Battalion (strength 94%). They are being supported by the 6th, 11th, and 14th Artillery Battalions with strengths of 90%, 98%, and 92%. At 011000 the unit is forced to withdraw to Matzmed (BA 55) as its strength is now down to 74%. The other Israeli units, the 4/14th RECON attrites to 77% while TF SHMULIK's strength drops to 69% and causing its withdrawal. The Egyptian force now consists of the 1/112th Infantry Battalion (87%) and the 2/18th Mechanized Battalion (92%) supported by the 6th (85%), 11th (95%), 14th (89%), 15th (95%), and 16th (95%) Artillery Battalions.

At 011000 the unit is ordered to move to the SE to a position SW of the Nahaza road. (AZ 54) and completes the move at 011100. It then receives an order to move to further SE toward Lakekan (AY 53). This move

is completed before 011200. Ordered to move to Lakekan (AY 51) it arrives before 011200. The unit then begins a move to join in the ambush preparation at AX 50, a move also completed within the hour. The 011700 SITREP shows the unit at AX 50 out of contact with a unit strength of 67%. This condition remains constant through the 020500 and 020800 SITREPS. At 020900 the unit was ordered to move to the Chinese Farm (BA 51). While en route at Lakekan (AZ 50) the unit comes into contact as part of a large Israeli force consisting of the 3/460th (83%), the 4/14th RECON (59%), 2/600th Tank Battalion (91%), 1/35th RECON (83%), 1/243rd Para (69%), and TF SHMULIK (60%) all supported by the 3rd Israeli Artillery Battalion (88%). The opposing Egyptian forces consist of the 2/122th Infantry Battalion (76%), 3/112th Infantry Battalion (78%), 1/14th Artillery Battalion (73%), 3/18 Mechanized Battalion (91%), supported by the 9th (91%), 11th (92%), 12th (83%), 14th (89%), 17th (94%), Egyptian Artillery Battalions and the 5th Egyptian Artillery Brigade (92%). As a result of this fight the 2/14 strength drops to 62% which forces it to withdraw to the SE (AY 49).

At 021300 the unit is ordered to again move to Lakekan (AZ 50). Shortly after arrival at that location the unit contacts the enemy. The 021300 SITREP shows the unit in combat at Lakekan (AZ 50) with a unit strength of 56%. At 021400 the 2/14th is forced to again withdraw to the SE along the Lexicon road (AY 49) as a result of this contact which drives its unit strength down to 51%. Other Israeli units involved in the fight include the 3/460th Tank Battalion (78%), 4/14th RECON (49%), 1/35th Para (77%), 1/243rd Para (57%), and TF SHMULIK (51%), all supported by the 3rd Israeli Artillery Battalion (83%). The opposing force consisted of the 2/112th Infantry Battalion (71%), 3/112th Infantry Battalion (74%), 1/14th

Armored Battalion (68%), and the 3/18th Mechanized Battalion (87%). Artillery support consisted of the 9th (85%), 11th (87%), 12th (79%), 14th (86%), 16th (90%), Egyptian Artillery Battalions and the 5th Artillery Brigade (85%).

The 021700 SITREP shows the unit out of contact at AY 49 with a unit strength of 47%.

At 030100 the unit is ordered to Lexicon-Tirtur road junction (BB 52). It arrives there at 030300. The 030500 SITREP shows the unit out of contact at (BB52) with a unit strength of 46%. This is the same condition as reported on the 031700 SITREP.

2/14th ALMOG TK BN: 1983 NARRATIVE

The 2/14th ALMOG TK BN started play 5km south of the intersection of Akavish road and Cassard road (BC 41) at 100% strength. At 001806 it was ordered to move to a pre-crossing location (AY 53), arriving there shortly before 001900. At 002100 it was ordered to the crossing site (BB 54). It is not clear when the 2/14th ALMOG TK BN arrived there, but a garbled 010200 SITREP shows the unit, at 99% strength, in combat at an undetermined location. Subsequent battle reports and SITREPS show the unit in continuous combat. At 010909 the unit was ordered to move to AZ 54, but was unable to break contact. It remained in contact at BB 54, gradually attriting to 90% strength, until 020900. At that time it was ordered to move to BA 51. AT 020948 it was noted arriving BI 43 and joining battle. This is thought to be a result of the "too many units in single battle" software problem as subsequent SITREP show the unit in combat at BB 54 at a constant strength of 91%. The unit does not appear in any battle reports after 020617 and "ignores" move orders at 021319 and 030100. It ended play at 031700 in combat at BB 54 at 91% strength.

2/14th ALMOG TK BN: 1982 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001700	BC41	MOVING	100%
NOTE	002100	ARRIVED AT AY53		
ORDER	002100	MOVE TO BB54		
NOTE	002200	ARRIVED AT BB54 AND HAS CONTACT		
BATTLE REP	010200	BB54	COMBAT	90%
SITREP	010500	BB54	COMBAT	91%
BATTLE REP	010600	BB54	COMBAT	83%
NOTE	011000	UNIT ARRIVED AT BA55		
BATTLE REP	011000	BB54	COMBAT	74%
ORDER	011000	MOVE TO AZ54		
NOTE	011000	ARRIVED AT AZ54		
ORDER	011100	MOVE TO AY53		
SITREP	011100	AZ54	MOVING	67%
ORDER	011100	MOVE TO AY51		
NOTE	011100	ARRIVED AT AY51		
ORDER	011100	MOVE TO AX50		
NOTE	011100	ARRIVED AT AX50		
SITREP	011700	AX50	AVAIL	67%
SITREP	020500	AX50	AVAIL	67%
SITREP	020800	AX50	AVAIL	67%
ORDER	020900	MOVE TO BA51		
NOTE	020900	ARRIVED AT AZ50 AND HAS CONTACT		
NOTE	021000	ARRIVED AT AY49		
BATTLE REP	021000	AZ50	COMBAT	62%
ORDER	021300	MOVE TO AZ50		
NOTE	021300	ARRIVED AT AZ50 AND HAS CONTACT		
SITREP	021300	AZ50	COMBAT	56%
NOTE	021400	ARRIVED AT AY49		
BATTLE REP	021400	AZ50	COMBAT	51%
SITREP	021700	AY49	AVAIL	47%
ORDER	030100	MOVE TO BB52		
NOTE	030300	ARRIVED AT BB52		
SITREP	030500	BB52	AVAIL	46%
SITREP	031700	BB52	AVAIL	46%

2/14th ALMOG TK BN: 1983 CHRONOLOGY

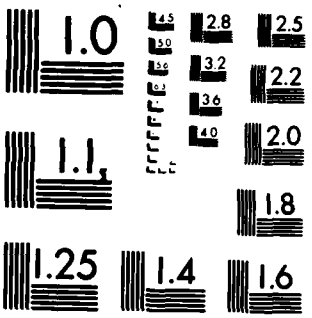
REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001200	BC41	AVAIL	100%
ORDER	001806	MOVE TO AY53		
NOTE	001841 TO 001900	ARRIVED AT AY53		
ORDER	002100	MOVE TO BB54		
NOTE	002117	ARRIVED AT BB54 AND CONTACTED ENEMY		
SITREP	010200	B@005 (SIC)	COMBAT	99%
BATTLE REP	010317	BB54	COMBAT	97%
BATTLE REP	010617	BB54	COMBAT	97%
ORDER	010909	MOVE TO AZ54		
SITREP	011000	BB54	COMBAT (DESTINATION AZ54)	96%
BATTLE REP	010917	BB54	COMBAT	96%
SITREP	011200	BB54	COMBAT (DESTINATION AZ54)	96%
BATTLE REP	011217	BB54	COMBAT	95%
BATTLE REP	011517	BB54	COMBAT	94%
BATTLE REP	011817	BB54	COMBAT	93%
BATTLE REP	012117	BB54	COMBAT	92%
SITREP	020000	BB54	COMBAT	93%
BATTLE REP	020017	BB54	COMBAT	92%
BATTLE REP	020317	BB54	COMBAT	91%
BATTLE REP	020617	BB54	COMBAT	90%
ORDER	020900	MOVE TO BA51		
NOTE	020948	ARRIVED AT BI43 AND JOINED BATTLE		
SITREP	021000	BB54	COMBAT	91%
ORDER	021319	MOVE TO AZ50		
SITREP	021200	BB54	COMBAT	91%
SITREP	030000	BB54	COMBAT	91%
ORDER	030100	MOVE TO BB52		
SITREP	030200	BB54	COMBAT	91%
SITREP	031200	BB54	COMBAT	91%
SITREP	031700	BB54	COMBAT	91%

2/14th ALMOG TK BN: COMPARISON

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
1	Battle report: 010200 Units engaged: Blue 2/14 ALMOG TK BN TF SHMULIK Red 1/112 INF BN 6 ARTY BN 14 ARTY BN	Battle report: 010317 Units engaged: Blue 2/14 ALMOG TK BN TF SHAKED TF SHMULIK 1/247 TK BN Red 1/112 INF BN 2/112 INF BN 3/112 INF BN 2/18 MECH BN 6 ARTY BN 8 ARTY BN 9 ARTY BN 14 ARTY BN	omposition of units engaged in in battle	All these differences are possibly due to move algorithm and/or move rates.
	Blue Attacking Damage: Blue-7% Red-5%	Blue Attacking Damage: Blue<1% Red-2%	Battle Losses	Algorithm causes higher losses in small battles.
2	020900-ordered to BA 51 020900-joined battle at AZ 50	020900-ordered to BA 51 020948-joined battle at BI 43	Battle engagement	Difference due to move algorithm.
3	021000-fell back to AY 49 021300-ordered back to AZ 50 021400-fell back to AY 49 030100-ordered to move to BB 52 030300-arrived at BB 52	All subsequent reports show unit in combat at BB 54 unit "ignored" orders at 021319 to move to AZ 50 and at 030100 to move to BB 52.	Conduct of battle	Reason for 1983 order refusal undeterminable.

AD-A130 222 VALIDATION OF THE USAWC STUDENT WAR GAMING MODEL(U) 3/3
ARMY WAR COLL CARLISLE BARRACKS PA E D BAISDEN ET AL.
18 MAY 83

UNCLASSIFIED F/G 15/7 NL



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

2/14th ALMOG TK BN: COMPARISON CONT'D

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
4	Unit ended play at 46% strength at BB 52	Unit ended play at 91% strength at BB 54	Final strength and location	- Location variance addressed above. - Strength variance due to algorithm treatment of small battles.

1/25th ARM BN--HISTORICAL NARRATIVE

The 1/25th ARM BN was part of the 25th Independent Armored Brigade. This brigade, attached to the 7th Infantry Division, Third Field Army, was comprised of 96 T-62 tanks. On 16 October 1973, this battalion was located approximately 25km south of the Chinese Farm on Lexicon road, bounded on its left by the Great Bitter Lake. At 1200 hours on 16 October the 25th Brigade was ordered to move north up Lexicon road to the Chinese Farm area (Lakekan) and assist in repelling an Israeli canal crossing in the Denesoir area. Major General ADAN, the Israeli armored division commander, placed one of his brigades in position due east of the head of the approaching column and another brigade element southeast of the 25th. ADAN sent a battalion south-eastward to get behind the Egyptians to ambush them from the rear. At 1430 the Israelis opened fire simultaneously. Of the 96 tanks in the 25th Armored Brigade, 86 were destroyed within one hour. Ten others escaped. Four Israeli tanks were lost (all i. a minefield in pursuit of the Egyptians). This battle was a modern counterpart of Hannibal's famous victory at the battle of Lake Trasimene, in April, 217 B. C.

1/25th ARM BN--1982 NARRATIVE

The unit beings the play of the problem on the shore of Great Bitter Lake approximately 2km S of Lexicon road (AO 39) available for orders with a strength of 100%. The unit remains in that location until 020800 when it is ordered to move 12km north along Lexicon road (AW 45) with a speed of 15kph. The unit is shown to be moving until 021500 at which time it arrives at (AW 45) and makes contact with the Israeli 1/600th YAGURI Tank Battalion and the 2/600th NATHAN Tank Battalion. The 021700 SITREP shows the unit still in contact with a strength of 99%. A report of battle at

021900 shows the unit down to 78% strength while its two opponents the 1st and 2nd of the 600th are down to 79% and 88% respectively.

Another report of battle at 022300 shows the unit down to 57% while its opponents maintain strengths of 79% and 85% for the Israelis. Four hour later the unit is down to 37% as opposed to 78% and 85% for the Israels. The 030500 SITREP proves to be slightly behind in reporting as the unit is shown at 38%. At 030700 the unit is eliminated from the game because its strength is down to 19%. The opposing Israeli units have only been degraded to 77% and 85%. During the battle the unit lost 80% of its strength while the opposing forces were degraded 5% and 6%.

1/25th ARM BN--1983 NARRATIVE

The 1/25th ARM BN started play approximately 2km south of Lexicon road, on the shore of Little Bitter Lake (AO 39) at 100% strength. At 020801 it was ordered to move to a position 12km north along Lexicon road to AW 45, arriving there shortly after 020900. It was attacked by the 1/600 YAGURI TK BN at 021144. The 1/25th was at 99% strength and the 1/600th at 93% strength. These two units remained in combat for essentially the full run of play, gradually attriting. The battle ended between 031417 and 031517 with the 1/25th ARM BN at 90% strength and 1/600 YAGURI TK BN at 85% strength.

NOTE: This is an obvious large deviation from historical events.

1/25th ARM BN 1982 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001700	A039	AVAIL	100%
SITREP	010500	A039	AVAIL	100%
SITREP	011100	A039	AVAIL	100%
SITREP	011700	A039	AVAIL	100%
SITREP	020500	A039	AVAIL	100%
SITREP	020800	A039	AVAIL	100%
ORDER	020800	MOVE TO AW45 AT 15KPH		
UNIT SITREP	021200	AS45	MOVING TO AW45	100%
UNIT SITREP	021300	AT44	MOVING TO AW45	99%
SITREP	021300	AT44	MOVING TO AW45	99%
UNIT SITREP	021500	AV46	MOVING TO AW45	99%
NOTE	021500	ARRIVED AT AW45 AND MADE CONTACT		
SITREP	021700	AW45	COMBAT	99%
BATTLE REP	021900	AW45	COMBAT	78%
BATTLE REP	022300	AW45	COMBAT	57%
BATTLE REP	030300	AW45	COMBAT	37%
SITREP	030500	AW45	COMBAT	38%
NOTE	030700	UNIT ELIMINATED BECAUSE OF LOSSES		
BATTLE REP	030700	AW45	ELIMINATED	19%
SITREP	031700	NO ENTRY FOR UNIT		

1/25th ARM BN: 1983 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001200	A039	AVAIL	100%
SITREP	010000	A039	AVAIL	100%
SITREP	011200	A039	AVAIL	100%
SITREP	020000	A039	AVAIL	100%
ORDER	020801	MOVE TO AW45		
NOTE	020900 TO			
	020907	ARRIVED AT AW45		
SITREP	021000	AW45	AVAIL	
SITREP	021200	AW45	COMBAT	99%
	(CONTACT WITH 1/600 YAGURI TK AT 021144)			
BATTLE REP	021444	AW45	COMBAT	98%
BATTLE REP	021744	AW45	COMBAT	96%
BATTLE REP	022044	AW45	COMBAT	95%
BATTLE REP	022344	AW45	COMBAT	94%
SITREP	030000	AW45	COMBAT	95%
BATTLE REP	030244	AW45	COMBAT	93%
BATTLE REP	030544	AW45	COMBAT	92%
BATTLE REP	030844	AW45	COMBAT	90%
BATTLE REP	031144	AW45	COMBAT	89%
SITREP	031200	AW45	COMBAT	90%
NOTE	031417 TO			
	031517	BATTLE OVER		
SITREP	031700	AW45	AVIAL	90%

1/25th ARM BN: COMPARISON

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
1	021500- Arrived at AW 45 and made contact	020900- Arrived at AW 45. No contact until 021144	Arrival time. Initiation of combat	Difference due to move algorithm and/or move rates.
2	Battle report: 021900 Units engaged Blue 1/600 YAGURI TK BN (79%) 2/600 NATHAN TK BN (88%) Red 1/25 ARM BN (78%)	Battle report: 021744 Units engaged Blue 1/600 YAGURI TK BN (90%) Red 1/25 ARM BN (96%)	Initiation of combat Composition of units engaged in battle	All of these differences are possibly due to move algorithm and/or move rates.
	Red attacking Damage: Blue-2% Red-20%	Blue attacking Damage: Blue-<1% Red-1%	Attacking force Battle Losses	- Arrival at hex variance changed designation of defender. - Red as attacking force in 1982 does not benefit from time in hex multiplier.
3	Remains at AW 45 until eliminated because of losses at 030700. Final Strength: 19%	Remains at AW 45 until 031417-031517 when battle ends. Ended play at AW 45 at 90% strength.	Outcome of battle Battle losses	- Red force attacking in 1982 did not respond to withdrawal criteria for unit strength.

2/18th MECH BN--HISTORICAL NARRATIVE

Both the 2/18th MECH BN and the 3/18th MECH BN were part of the 3rd Mechanized Infantry Brigade, which was part of the 21st Armored Division. Both of the units were part of a brigade force which drove from the 2nd Infantry Division in an easterly direction parallel to the road from Ismailia toward Tasa and the Khamtia Pass. They were halted by Major General SHARON's right hand brigade. These two battalions lost approximately 30 tanks and were halted.

2/18th MECH BN--1982 NARRATIVE

The unit begins the play of the problem at the west end of Televizia road (BF 50) en route to a location just south of Chinese Farm (BB 52) and is at full (100%) strength. AT 010200 the unit arrives at BB 52 and makes contact with the 1/14th ALMOG Tank Battalion, 4/14th RECON and TF SHMULIK. The other Egyptian line unit in the battle is the 1/112th Infantry Battalion with the 6th, 11th and 14th Artillery Battalions in support. On the 010500 SITREP the Egyptian strengths are listed as follows: 1/112th Infantry Battalion (89%), 2/18th MCZ Battalion (100%), and the 14th Artillery Battalion (95%). A report of battle at 010600 shows the unit down to 94% with its other units down to 90% for the 1/112th and 90%, 98%, and 92% for the three artillery battalions. The Israeli strengths are 83% for the 2/14th ALMOG Tank Battalion, 88% for the 4/14th RECON and 80% for TF SHMULIK. At 011000 another report of battle shows the unit at 92% with the 1/112th Infantry now at 87%. The original artillery support has now been expanded to the following: 6th Artillery Battalion (85%), 11th Artillery Battalion (95%), 14th Artillery Battalion (89%), 15th Artillery Battalion (95%), and the 16th Artillery Battalion (95%). The Israeli force consists

of the 2/14th ALMOG Tank Battalion, 4/14th RECON, and TF SHMULIK with strengths of 74%, 77%, and 69%. A SITREP at 011100 confirms this strength. A report of battle at 011400 shows the unit at 90% strength with the 1/112th at 86%. The artillery units are as follows: 6th Artillery Battalion (85%), 11th Artillery Battalion (91%), 14th Artillery Battalion (88%), 15th Artillery Battalion (92%), and the 16th Artillery Battalion (94%). The Israeli force has changed to now include the 1/14th AMRAM Tank Battalion (51%) and the 4/14th RECON at 62%. At 011400 the unit is ordered to move to a position along the Lexicon road (BC 53) just north of the intersection with the Tirtur road. It moves and arrives within the hour making contact in a skirmish with TF SHAKED (65%). Other Egyptian units in this battle are the 1/1st Armored Battalion (92%) and the 2/1st Armored Battalion (87%) with support being provided by the 4th Artillery Battalion (90%) and the 5th Artillery Battalion (87%). The 2/18th's strength is shown as 87% as of this report of battle. This skirmish ends prior to 011700 and the unit remains in place at 87% strength until 022200 when it is ordered to move back to the west end of Televizia road (BF 50). It arrives there at 022300 and remains there at 87% strength for the duration of the game.

2/18th MECH BN--1983 NARRATIVE

The 2/18th MECH BN started play 2km south of the west end of Televizia road (BF 50) at 100% strength. At 010100 it was ordered to a location just south of Chinese Farm (BB 52). It arrived there at 99% strength at 010139 and joined battle. The Blue forces in this battle consisted of the 2/14th ALMOG TK BN (97%), TF SHAKED (97%), TF SHMULIK (97%) and the 1/247th TK BN (98%). Along with the 2/18th MECH BN, Red forces included the 3/112th INF BN (96%), 2/112th INF BN (97%), 1/112th INF BN (97%), as well as the Egyptian 6th, 8th, 9th and 14th Artillery Battalions.

By 010617, the Red forces had been joined by the 11 ARTY BN, while Blue forces remained the same. By 010917, Red forces were further augmented by 15 ARTY BN and Blue forces were joined by the 4/14 RECON UNIT. The 2/18th MECH BN was at 94% strength at this point. At 011217, a battle report indicates that the 1/14th AMRAM TK BN (97%) has joined the Blue force and TF SHMULIK is no longer involved. Red forces have been augmented by the 16 ARTY BN and the 2/18th MECH BN is at 93% strength.

The composition of units involved in the battle continues to change over time. The 2/18th MECH BN remained in combat in this battle, located at BB 52, until the end of play, finishing with 85% strength. It should be noted that the unit does not appear in battle reports after 020617, although SITREPs continue to show the unit in combat at the same location. The unit also "ignored" move orders at 011400, 011450 and 022200.

2/18th MECH BN: 1982 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001700	BF50	MOVING TO BB52	100%
NOTE	100000	BF50	MOVING TO BB52	
NOTE	010200	ARRIVED AT BB52 AND MADE CONTACT		
SITREP	010500	BB52	COMBAT	100%
BATTLE REP	010600	BB52	COMBAT	94%
BATTLE REP	011000	BB52	COMBAT	92%
SITREP	011100	BB52	COMBAT	93%
BATTLE REP	011400	BB52	COMBAT	90%
ORDER	011400	MOVE TO BC53		
NOTE	011400	ARRIVED AT BC53 AND MADE CONTACT		
BATTLE REP	011600	BC53	COMBAT (ENDED)	87%
SITREP	011700	BC53	AVAIL	87%
SITREP	020500	BC53	AVAIL	87%
SITREP	020800	BC53	AVAIL	87%
SITREP	021300	BC53	AVAIL	87%
SITREP	021700	BC53	AVAIL	87%
ORDER	022200	MOVE TO BF50		
NOTE	022300	ARRIVED AT BF50		
SITREP	030500	BF50	AVAIL	87%
SITREP	031700	BF50	AVAIL	87%

2/18th MECH BN: 1983 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001200	BF50	AVAIL	100%
SITREP	010000	BF50	AVAIL	100%
ORDER	010100	MOVE TO BB52		
NOTE	010139	ARRIVED AT BB52 AND JOINED BATTLE		
BATTLE REP	010317	BB52	COMBAT	97%
BATTLE REP	010617	BB52	COMBAT	95%
BATTLE REP	010917	BB52	COMBAT	94%
SITREP	011200	BB52	COMBAT	95%
BATTLE REP	011217	BB52	COMBAT	93%
ORDER	011400	MOVE TO BC53		
ORDER	011450	MOVE TO BC53		
BATTLE REP	011517	BB52	COMBAT	92%
BATTLE REP	011817	BB52	COMBAT	91%
BATTLE REP	012117	BB52	COMBAT	90%
SITREP	020000	BB52	COMBAT	91%
BATTLE REP	020017	BB52	COMBAT	89%
BATTLE REP	020317	BB52	COMBAT	88%
BATTLE REP	020617	BB52	COMBAT	87%
SITREP	021000	BB52	COMBAT	87%
SITREP	021200	BB52	COMBAT	87%
ORDER	022200	MOVE TO BF50		
SITREP	030000	BB52	COMBAT	87%
SITREP	031200	BB52	COMBAT	87%
SITREP	031700	BB52	COMBAT	85%

2/18th MECH BN: COMPARISON

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
1	Battle report: 010600 Units engaged: Blue 2/14 ALMOG TK BN (83%) 4/14 RECON UNIT (88%) TF SHMULIK (80%) Red 1/112 INF BN (90%) 2/18 MECH BN (94%) 6 ARTY BN (90%) 11 ARTY BN (98%) 14 ARTY BN (92%)	Battle report: 010617 Units engaged: Blue 2/14 ALMOG TK BN (97%) TF SHMULIK (97%) TF SHAKED (96%) 1/247 TK BN (97%) Red 1/112 INF BN (93%) 2/112 INF BN (95%) 3/112 INF BN (92%) 2/18 MECH BN (95%) 6 ARTY BN 9 ARTY BN 11 ARTY BN 14 ARTY BN	Composition of units engaged in battle	All these differences are possibly due to move algorithm and/or move rates. Differences in artillery units are due to artillery play.
	Blue attacking Damage: Blue-9% Red-4%	Blue attacking Damage: Blue-<1% Red-2%	Battle losses	Algorithm small battle effects caused variance.
2	011400- combat ends 011400- unit moved to BC 53, arrives and makes contact which lasts until 011600. Unit is then shown as available for duration of play.	Unit continues in combat at BB 52 until end of play. Last five SITREPs show the unit in combat but no battle report are given after 011600 which show unit in the troop list.	Conduct of battle Termination of combat	1982 combat attrition causes Blue to withdraw. 1983 attrition does not reach withdrawal criteria. Same as above.
	Final strength: 87%	Final strength: 85%		

3/18th MECH BN--HISTORICAL NARRATIVE

(See historical narrative for the 2/18th MECH BN, above)

3/18th MECH BN--1982 NARRATIVE

The unit begins the problem 2km south of the west end of Televizia road (BG 50) at full strength and available for movement. At 021000 the unit is ordered to move to a position just south of Chinese Farm (BA 51). It arrives there at 021000 and joins in a major battle with the 3/460th LAPIDOT TK BN (93%), 2/14th ALMOG TK BN (62%), 4/14th RECON (59%), 2/600th NATHAN TK BN (91%), 1/35th YITZIK Para BN (83%), 1/243 SHUMER PARA BN (88%). Other Egyptian units in this battle are the 2/112th Infantry Battalion (76%), 3/112th Infantry Battalion (78%), and the 1/14th Armor Battalion (73%) with support provided by the 9th, 11th, 12th, 14th, 17th Artillery Battalions and the 5th Artillery Brigade with strengths of 91%, 92%, 83%, 89%, 94%, and 92%.

At 021400 the unit is still engaged and now has a strength of 87%. The other Egyptian units' strength are as follows: 2/112th Infantry Battalion (71%), 3/112th Infantry Battalion (74%), and the 1/14th Armor Battalion (68%) while the fire support units are: 9th Artillery Battalion (85%), 11th Artillery Battalion (87%) 12th Artillery Battalion (79%), 14th Artillery Battalion (86%), 17th Artillery Battalion (90%) and the 5th Artillery Brigade (85%). The Israeli unit strengths have now been attrited to: 3/460th LAPIDOT Tank Battalion (78%), 2/14th ALMOG Tank Battalion (51%), 4/14th RECON (49%), 1/35th YITZIK Para (77%), the 1/243 SHUMER Para (57%), TF SHMULIK (51%), and the 3rd Artillery Battalion (83%). At 021700 the SITREP still shows the unit in combat with a strength of 87%. At 022200 the unit is given an order to move back to its original location (BF

50). It arrives within the hour and remains at that location at 87% strength for the duration of the problem.

3/18th MECH-BN--1983 NARRATIVE

The 3/18th MECH BN started play 2km south of the west end of Televizia road (BF 50) at 100% strength. It remained in that location until 020801, when it was ordered to move to a position just south of Chinese Farm (BA 51). At 020844 it arrived at BB 50 at 99% strength and joined battle. The battle at that point included:

Red forces	Blue forces
3/1 ARM BN (92%)	1/460 AMIR TK BN (93%)
3/3 MECH BN (90%)	TF SHMULIK (94%)
1/14 ARM BN (88%)	2/600 NATHAN TK BN (97%)
3/18 MECH BN (99%)	1/35 YTZIK PARA BN (97%)
6 ARTY BDE	1/243 SHUMER PARA BN (83%)
5 ARTY BDE	3/460 LAPIDOT TK BN (93%)
9 ARTY BNG	2/460 EHUD TK BN (97%)
11 ARTY BN	1/247 TK BN (92%)
12 ARTY BN	2 ARTY BN
14 ARTY BN	3 ARTY BN

A battle report of 021517 shows the same Red forces involved in the battle. On the Blue side, however, the 4/243 PARA BN (95%), the 4/14 RECON UNIT (90%) and TF SHAKED (88%) have joined the battle, while the 2 ARTY BN, 3 ARTY BN and 1/247 TK BN have dropped out.

The 030017 battle report shows forces arrayed as follows:

Red forces	Blue forces
3/1 ARM BN (69%)	1/460 AMIR TK BN (91%)
3/3 MECH BN (68%)	2/460 EHUD TK BN (95%)
1/14 ARM BN (66%)	4/243 PARA BN (93%)
3/18 MECH BN (76%)	TF SHMULIK (92%)
1/18 MECH BN (96%)	2/600 NATHAN TK BN (95%)
3/14 ARM BN (97%)	1/35 YTZIK PARA BN (95%)
2/1 ARM BN (90%)	1/243 SHUMER PARA BN (78%)
3/112 INF BN (81%)	3/460 LAPIDOT TK BN (91%)
9 ARTY BN	4/14 RECON UNIT (89%)
6 ARTY BN	TF SHAKED (87%)

The composition of forces involved continued to change over time. The 3/18 MECH BN remained in combat in this battle at BB 50, gradually losing strength, until play terminated with the unit at 67% strength. The 3/18 MECH BN was given an order to move at 022200, but was unable to break contact.

3/18th MECH BN: 1982 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001700	BF50	AVAIL (DEST BC51)	100%
SITREP	010500	BF50	AVAIL (DEST BC51)	100%
SITREP	011100	BF50	AVAIL (DEST BC51)	100%
SITREP	011700	BF50	AVAIL (DEST BC51	100%
SITREP	020500	BF50	AVAIL (DEST BC51	100%
ORDER	020800	MOVE TO BA51		
SITREP	020800	BF50	MOVING	100%
BATTLE REP	021000	BE49	COMBAT	91%
SITREP	021300	BE49	COMBAT	91%
BATTLE REP	021400	BE49	COMBAT	87%
SITREP	021700	BE49	COMBAT	87%
ORDER	022200	MOVE TO BF50		
NOTE	022200	ARRIVED AT BF50		
SITREP	030500	BF50	AVAIL	87%
SITREP	031700	BF50	AVAIL	87%

3/18th MECH BN: 1983 CHRONOLOGY

REPORT	TIME	LOCATION	ACTIVITY	STRENGTH
SITREP	001200	BF50	AVAIL	100%
SITREP	010000	BF50	AVAIL	100%
SITREP	011200	BF50	AVAIL	100%
SITREP	020000	BF50	AVAIL	100%
ORDER	020801	MOVE TO BA51		
NOTE	020844	ARRIVED AT BB50 AND JOINED BATTLE		
SITREP	021000	BB50	COMBAT	96%
BATTLE	020917	BB50	COMBAT	95%
SITREP	021200	BB50	COMBAT	96%
BATTLE REP	021217	BB50	COMBAT	92%
BATTLE REP	021517	BB50	COMBAT	88%
BATTLE REP	021817	BB50	COMBAT	83%
ORDER	022200	MOVE TO BF50		
BATTLE REP	022117	BB50	COMBAT	78%
SITREP	030000	BB50	COMBAT	79%
BATTLE REP	030017	BB50	COMBAT	76%
BATTLE REP	030317	BB50	COMBAT	74%
BATTLE REP	030617	BB50	COMBAT	72%
BATTLE REP	030917	BB50	COMBAT	71%
SITREP	031200	BB50	COMBAT	71%
BATTLE REP	031217	BB50	COMBAT	68%
SITREP	031700	BB50	COMBAT	67%

3/18th MECH BN: COMPARISON

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
1	021000- arrived at BE 49 and joined battle	020844- arrived at BB 50 and joined battle	Arrival time initiation of combat	Caused by movement rate variation.
	Units engaged:	Units engaged:	Location of combat	See above.
	Blue 3/460 LAPIDOT TK BN (93%) 1/243 SHUMER PARA BN (69%) TF SHMULIK (60%) 4/14 RECON UNIT (59%) 2/14 ALMOG TK BN (62%) 3 ARTY BN (88%) 1/35 YTZIK PARA BN (83%) 2/600 NATHAN TK BN (91%)	Blue 1/460 AMIR TK BN (93%) TF SHMULIK (94%) 2/600 NATHAN TK BN (97%) 1/35 YTZIK PARA BN (97%) 1/243 SHUMER PARA BN (69%) 3/460 LAPIDOT TK BN (93%) 3 ARTY BN 2 ARTY BN 2/460 EHUD TK BN (97%) 1/247 TK BN (92%)	Composition of units engaged in battle	Caused by movement rate variation and probably by 10 unit in a battle role.
	Red 2/112 INF BN (76%) 3/112 INF BN (78%) 1/14 ARM BN (73%) 3/18 MECH BN (91%) 9 ARTY BN (91%) 11 ARTY BN (92%) 12 ARTY BN (83%) 14 ARTY BN (89%) 17 ARTY BN (94%) 5 ARTY BDE (%)	Red 3/1 ARM BN (88%) 3/3 MECH BN (86%) 1/14 ARM BN (84%) 3/18 MECH BN (95%) 6 ARTY BN 9 ARTY BN 11 ARTY BN 12 ARTY BN 14 ARTY BN 5 ARTY BDE		
	Blue attacking Damage: Blue-5% Red-7%	Blue attacking Damage: Blue<1% Red-4%	Battle losses	Caused by software change in unit loss rates.

3/18th MECH BN: COMPARISON CONT'D

	1982 EVENT	1983 EVENT	SIGNIFICANT DIFFERENCE	REMARKS
2	022200-ordered to BF 50. Remained at BF 50 for duration of play.	Remained in combat at BB 50 for duration of play. Unit "ignored" order to move to BF 50 at 022200.	Conduct of battle	Cause of failure to move undeterminable as the normal "5% orders not received" function was removed. All units received orders.
	Final strength 87%	Final strength 67%	Battle losses	

ANNEX D

COMPUTER PRINTOUT: 1982/1983 COMPARISON (CHAPTER III)
(ATTACHED TO ORIGINAL ONLY)

ANNEX E

COMPUTE PRINTOUT: 1983 OPERATIONS (CHAPTER IV)
(ATTACHED TO ORIGINAL ONLY)

END

DATE
FILMED

8 — 83

DTIC