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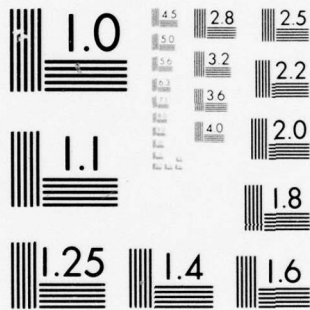
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**ANALYSIS OF THE DIVISION  
RESTRUCTURING STUDY  
PHASE I WAR GAMES**

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Technical Report TR 1-77

VOLUME 1

MAIN REPORT AND APPENDICES I-III

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COMBAT DEVELOPMENTS ACTIVITY

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Technical Report TR 1-77  
January 1977

Directorate of Combat Operations Analysis  
US Army Combined Arms Combat Developments Activity  
Fort Leavenworth, Kansas 66027

ANALYSIS OF THE DIVISION  
RESTRUCTURING STUDY PHASE I WAR GAMES

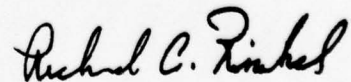
VOLUME 1

Main Report and Appendices I-III

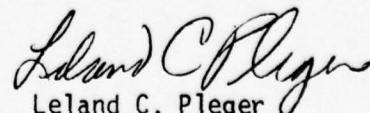
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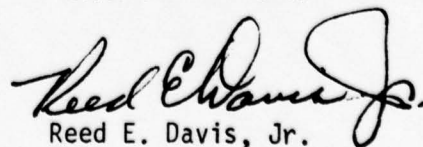
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FOREWORD

The Combined Arms Combat Development Activity (CACDA) was tasked by the US Army Training and Doctrine Command (TRADOC) to support their Division Restructuring Study Group by performing and analyzing a series of high resolution and division level war games. The Combat Operations Analysis Directorate (COAD) of CACDA had primary responsibility for this analysis with support in the form of the gaming staff being provided by the newly formed Scenario and War Gaming Directorate (SWGd).

The authors wish to express their appreciation to the entire gaming staff who participated in this study and especially to LTC Dave Hutcheson, Chief Controller, for his cooperation and support; Mr. Phil Kubler and CPT Neil Rapski for their documentation of running summaries for the war games; and Mr. Tim Bailey, CPT Terry Garrett and Mr. Gerry Martin for their assistance in preparation of the models and analysis of the results.

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### ABSTRACT

The Division Restructuring Study (DRS) war gaming effort was undertaken to evaluate the impact of the DRS organization on the effectiveness of an armored division and to develop recommendations for a tailored alternative to that organization. The phase I gaming was intended to make a first cut at determining the differences in combat effectiveness of both a tank heavy task force and the total armored division. Although there were many aspects of the reorganization for which the gaming was unable to measure a change in effectiveness, the analysis supported several recommendations concerning dedicated TOW companies, additional artillery batteries, and requirements for attack helicopter support. Another major result from the gaming was the identification of data voids and tactical limitations to be addressed in phase II.

## EXECUTIVE SUMMARY

1. PURPOSE. The Division Restructuring Study (DRS) war gaming effort was undertaken to evaluate the impact of the DRS organization on the effectiveness of an armored division and to develop recommendations for a tailored alternative to that organization. The phase I gaming was intended to make a first cut at determining the differences in combat effectiveness of both a tank heavy task force and the total armored division. A major result expected from this gaming was the identification of data voids and tactical limitations to be addressed in phase II.

## 2. METHODOLOGY.

a. General. The methodology for this study was designed to assess the differences in combat effectiveness resulting from the organizational changes defined for DRS. The organization was evaluated within a single scenario as described in paragraph 3. The evaluation of the proposed organization was accomplished by comparison with the current organization in a series of war games, as described in the following subparagraphs.

b. Manual War Game. The initial effort for the study was a high resolution manual war game, based on the Dunn-Kempf game developed at the US Army Command and General Staff College. This game plays individual weapon systems for a battalion size Blue unit against an appropriate threat. This game is a totally manual map game, with the assessment of the outcome of stochastic events being determined by selection of random numbers. The game was used to evaluate the management of the battalion under the alternative organization from the viewpoint of the battalion and company commanders, played by members of the Blue gaming team. The war games provided data and subjective evaluations used in answering the small unit essential elements of analysis (EEA).

c. Division Level War Game. Two division level games were then conducted using the CACDA Jiffy war gaming methodology. Jiffy is a computer assisted manual war game in which sophisticated assessment routines are used in conjunction with military gamer decisions to produce a realistic representation of a corps or division size battle. This evaluation was used to address EEA dealing with the combat power of the division and the contribution of division assets to the battle.

d. Parametric Analyses. Following the division level gaming, specific parametric analyses were performed using the Jiffy assessment routines to evaluate further the requirements for artillery, TOW, and attack helicopter support. These analyses measured the effects of changing mission allocations and numbers of supporting weapons on the outcomes of specific incidents within the scenario.

3. SCENARIO. The scenario for this study was derived from the SCORES Europe I Sequence 2A scenario as updated to a 1985 time frame.

a. The division level game assumed that the results of the battle would not change during the first few critical incidents of combat. The DRS scenario initiated activity as of 0330 D+1 and continued through 1130 D+2 when, in the base case, it would have been necessary to commit forces from the reserve division. The forces played for Blue were the organic elements of an armored division plus two squadrons from the armored cavalry regiment and three battalion task forces from the adjacent mechanized infantry division. Opposing this array, Red had two tank divisions forward with a tank division and a motorized rifle division in reserve. Red forces in the scenario were updated with the T-72 tank and were given a regiment of attack helicopters. All Blue force tanks, including the M60A2, were replaced with the XM1; and the MICV and ITV were utilized as appropriate instead of the M113. Additional capabilities portrayed for Blue were FASCAM, CLGP, and ICM-DP.

b. The high resolution game compared a tank heavy task force from the proposed division organization to an equivalent slice of the current organization in a battle against the same threat across the same frontage. This slice equates to two companies and the scout platoon from a similarly constructed task force. These forces were opposed by a Red force consisting of a tank regiment (+) with a second regiment (not played) following in echelon.

4. ESSENTIAL ELEMENTS OF ANALYSIS. The EEA are summarized below, with a brief description of the answers resulting from the analysis.

a. Battalion Level Management of Resources. Battalion level management of resources offered qualitative improvements to the organization, but the analysis did not quantify the effect.

b. Advantages/Disadvantages of Pure Companies. Organization by pure companies is generally advantageous, but it must be realized that situations will exist wherein combined arms company teams will need to be formed.

c. Effectiveness of a Dedicated TOW Organization. In the high resolution game, minefields, artillery, and TOW all provided an increased capability to the DRS organization, with the dedicated TOW organization providing the most significant increase in capability.

d. Effects of Three Versus Five Tanks in a Platoon. The high resolution game results established no differences in effectiveness between the two tank platoon organizations.

e. Impact on Combat Power of the Division. The clear alternative organization showed fairly consistent improvement in all measures of effectiveness. The primary contributor was the artillery system, where the additional tubes provided not only attrition on the enemy but also a suppressive effect, which allowed other systems to operate more effectively. The proliferation of TOW also provided a substantial increase in combat power.

f. Effect of Smaller Battalions. No major differences were apparent in the use of the battalions during the gaming of the division alternatives. The percent of units and total firepower committed were nearly identical functions over time for both divisions. The difference in final effectiveness of the division and its component battalions was almost entirely the result of the different replacement policies used in the two games. The resolution of the phase I gaming was not sufficiently detailed to observe the effects of the smaller, more agile battalions.

g. Consolidation of Aviation Assets. This EEA was not addressed by the phase I gaming. The only aviation assets played were the attack helicopters, and they were a corps asset attached to the division in the base case and a division asset in the alternative. Therefore, no differences were inherent in the way they were used.

h. Effectiveness/Role of Engineer Battalion. The only function of the engineer battalion examined in the games was the emplacement of minefields. The results indicated that the additional capability of the division resulted in a slower overall rate of advance for Red, which reduced the requirement for emplacement of minefields. This condition should free the engineer assets to perform other functions.

i. Levels of Artillery Capability. The analysis established that there was a significant difference between the current division artillery configuration (three batteries of six tubes each per battalion) and the proposed organization (four batteries of eight tubes each per battalion). The increase was almost proportional to the increase in tubes. No real difference in effectiveness between a six and an eight gun battery was observed.

j. Requirement for Attack Helicopter Support. The analysis revealed that the single most significant improvement to the division capability would be the addition of a second attack helicopter company in support of the division. A single attack helicopter company was not able to achieve a level of attrition and suppression of air defense sufficient to allow the AH to operate at acceptable loss rates in the air defense environment of the scenario.

## 5. FINDINGS.

a. The increase in both TOW and artillery significantly improved the combat capability of the division.

b. The increase in artillery available to a committed maneuver unit resulted in a more effective force primarily due to the additional CLGP rounds fired.

c. A FIST team with each company provided better CLGP coverage in the proposed organization, since at no time were all observers suppressed or moving.

d. Suppression had a significant impact on both the battalion and division games. Most notable were the suppression of air defenses by artillery and the use of a withdrawal tactic incorporating 81mm smoke to suppress the enemy and obscure his vision.

e. The employment of TOW in a dedicated antitank company significantly improved the effectiveness of that system.

f. There was no measurable difference in effectiveness due to the change in the tank platoon organization.

g. Similarly, the gaming provided no measure of the differences resulting from an organization of smaller maneuver battalions.

h. At division level the mine laying capability in the main battle area seemed to be adequate, and the requirement for emplacement of minefields decreased under the proposed organization. (It should be noted that the phase I gaming did not address covering force operations.)

i. The most significant improvement to either division organization would seem to be the provision of a second attack helicopter company.

j. The proposed DRS organization resulted in an overall increase in effectiveness of about 15 percent.

6. RECOMMENDATIONS. The purpose of the study indicated that the analysis of the proposed DRS organization should result in positive recommendations for a tailored alternative to that organization. Although there were many aspects of the reorganization for which the gaming was unable to measure a change in effectiveness, the analysis supported several recommendations, as follows:

a. The alternative division organization should definitely continue to consider dedicated TOW companies and additional artillery batteries and FIST teams.

b. The alternative organization should be reviewed to identify a means for satisfying the requirement for support from a second attack helicopter company.

c. The organization of engineer assets should be reevaluated in light of the decreasing requirement for minefield emplacement in the main battle area of the reorganized division.

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## CHAPTER 1

### ANALYSIS OF HIGH RESOLUTION MANUAL WAR GAMES

#### 1. INTRODUCTION.

a. Purpose. To conduct an evaluation of the clear alternative organization as compared to the current organization via high resolution manual wargames at battalion level.

b. Scope.

(1) Two war games were conducted within the context of the Europe I scenario. The first game (Base Case) played two of the three armor heavy company teams of an armored heavy task force defending against a Red tank regiment. The tank regiment consisted of three tank battalions and one motorized rifle battalion. The Blue maneuver units and supporting element were based on the current organization with the introduction of 1985 weapon systems.

(2) The second game (Clear Alternative) played a Blue tank battalion consisting of two tank companies, a mechanized infantry company and an antitank company (as organized under the DRS clear alternative) defending the same ground against the same threat. The number of major weapon systems for the Blue maneuver units played in the two games were essentially the same. However, increased artillery support and minefields were available in accordance with the structure of the clear alternative division.

(3) The wargames were played utilizing a 1:5000 scale terrain board with major weapon systems (tank, TOW, BMP, etc.) individually represented on the game board. The results of engagement events were determined by random draws from a 0-99 uniform distribution as compared to the associated probability for the event in question. One minute time steps were used in the play of the game.

(4) The evaluation conducted consisted of (1) a subjective evaluation of the advantages and disadvantages of the clear alternative by the Blue gamers, and (2) a comparative analysis of the effectiveness of the two organization structures based on the quantitative data generated from the games.

#### 2. GAME DESCRIPTION.

a. Terrain Board. The terrain board represents a four by eight kilometer area south and east of Fulda, Germany.<sup>1</sup> Elevations are built

<sup>1</sup>. This area coincides with the area for which detailed digitized terrain data is available for DYNTACS.

up using successive layers of 1:5000 map sheets and a styrofoam type material. A two to one vertical exaggeration is present. Changes of elevation appear as steps with each step representing a 10 meter change. Terrain features are easily discernible and map coordinates can be read with the aid of a template to 10 meter accuracy with ease.

b. Maneuver Elements. Individual elements associated with the maneuver units are uniquely represented on the board using color coded pins with a two digit number attached. For example, the threat pin Red-19 represents the first tank, third platoon, third company of the first battalion. Blue elements are XM-1, MICV, DRAGON team, ITV, CLGP FO and mortar platoon. Red elements are T72, BMP, BRDM with SAGGER and ACV (armored command vehicle).

c. Line of Sight Data. Situations where line of sight does not exist due to intervening major terrain features are readily discerned on the terrain board. However, quite frequently when units are near the crest of hills or in small depressions in the terrain it is difficult and in some cases impossible to determine the existence of line of sight visually or with the aid of a "straight edge." To enhance the game resolution with respect to line of sight, intervisibility patterns for Blue initial positions and points along their withdrawal routes were generated using a line of sight routine with the DYN TACS terrain data base. These intervisibility patterns were used by the gamers to determine existence or nonexistence of line of sight for each potential engagement when that determination was not obvious by visual inspection.

d. Play of Direct Fire. Table 1 lists the direct fire weapons simulated in the game. The missile systems are constrained to firing at most one round in any given bound (one minute). Tank commanders have a choice of firing one or two rounds in a bound and a choice as to which round to fire during a given engagement (HEP, HEAT or APDS for Blue and HEAT or APDS for Red). They may fire on the move or from a stationary position. Missile systems cannot fire on the move.

Table 1. Direct fire systems in high resolution games.

BLUE		RED	
System	Weapons	System	Weapons
XM-1 ITV MICV DRAGON team	105mm gun TOW Bushmaster DRAGON	T72 BRDM BMP ACV	115mm gun SAGGER SAGGER, 73mm gun

e. Play of Indirect Fire.

(1) All Red artillery missions, except for four 130mm field gun missions, are scheduled fires. Thirty percent of the ammunition load is ICM and 70 percent is HE. ICM and HE missions consist of five minute and 10 minute concentrations, respectively.

(2) All Blue artillery and mortar missions (except CLGP and FASCAM) are targets of opportunity with the accuracy based on observer adjusted fire. Fifty percent of the artillery missions are ICM.

(3) A CLGP forward observer is associated with each company team. The number of CLGP missions during the game are constrained based on the ammunition availability. Two rounds are fired during each mission.

f. Data Recorded. Data recorded during the game consists of (1) a running summary, (2) a list of Blue indirect fire mission, (3) the Red artillery schedule, and (4) detailed event data.

(1) The running summary provides a detailed chronological discussion of the game and highlights Blue command, control and communication problems and/or considerations. Appendices II and III are the running summaries for the Base Case and Clear Alternative games, respectively.

(2) The Blue indirect fire missions are listed in chronological order with data entries for time, system (155mm, 8in, 4.2in, 81mm), coordinates, type mission (ICM, HE, CLGP, FASCAM) and in the case of CLGP, target ID.

(3) The Red indirect fire missions are listed in chronological order for each system (122mm howitzer, 152mm howitzer, 130mm field gun, 120mm mortar, and 122mm MRL) with data entries consisting of (1) type ammunition (ICM or HE), (2) coordinates of concentration, and (3) time for removal of smoke for each concentration (one of six rounds are assumed to be smoke).

(4) Each direct fire and CLGP engagement event is defined by the following data entries; time, firer identifier, fire movement indicator, type round, target identifier, target status (move or stationary, open or defilade), range, abort indicator (applicable to missiles and CLGP), hit indicator, kill indicator, and coordinates of target if killed. Kills by mines and artillery are also recorded as they occur as well as the suppression of DRAGON teams and CLGP FOs by indirect fire.

### 3. SCENARIOS.

#### a. Threat Force.

(1) The threat force consisted of one tank regiment composed of three tank battalions and one motorized rifle battalion. Cross attachment and reinforcement of the BMP from the motorized rifle battalion resulted in three tank maneuver battalions being formed, each reinforced by 10 BMP. All three tank battalions were composed of four companies, including three tank heavy companies each with seven tanks and three BMP, and one company of nine tanks for a total of 12 companies in the regiment. Reconnaissance assets for the regiment included (1) one regimental reconnaissance company with three BMP, and (2) two battalion reconnaissance companies each with three BRDM/BRDM-2. The total number of weapon systems (excluding artillery) include 95 T72 tanks, 33 BMP w/SAGGER, 11 BRDM/BRDM-2 w/SAGGER, and 15 ACV/APC.

(2) Red indirect fire assets available were as follows.

- (a) One 122mm howitzer (TOWED) battalion (DS).
- (b) One 152mm howitzer (SP) battery (DS).
- (c) One 130mm howitzer battery (GS).
- (d) One 122mm MRL battery (GS).
- (e) Six 120mm Mortars (organic).

(3) The 2d tank battalion is to conduct the main attack on two axes with two companies in each axis along the avenue ARMENHOF-MARGRETEHAUN/REX/BOCKELS/WISSELS/DIRLOS/PILGERZELL to seize objectives B and D (figure 1). The 1st tank battalion is to conduct a supporting attack on two axes with two companies in each axis along the avenue HILL 385/DIPPERZ/WISSELSROD/HILL 427 to seize objectives A and C. The 3d tank battalion is to follow the 2d tank battalion and be prepared to assume the mission of the 2d tank battalion on order. After these intermediate objectives are secured, the regiment is to continue to advance to secure river crossing sites vicinity of 430-900. In conjunction with this, artillery fires will be phased as follows:

- (a) Phase 1 - ICM concentration to obtain maximum coverage and kill on enemy.
- (b) Phase 2 - HE concentration to obscure the vision of the enemy until the assault begins.

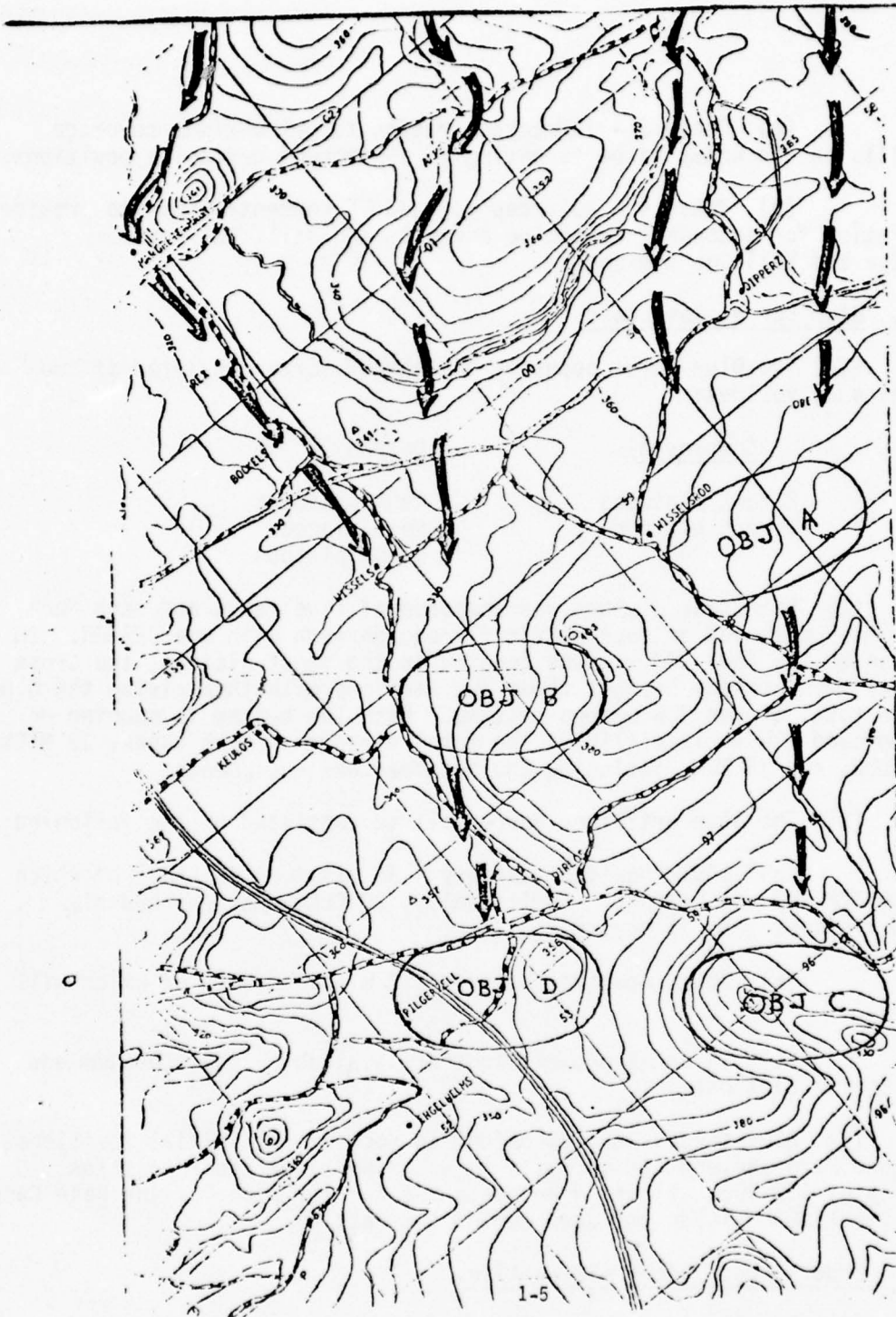


Figure 1. Red concept.

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(c) Phase 3 - ICM concentration to get maximum coverage and kills on the enemy as he is moving to subsequent defensive positions.

(d) Phase 4 - Balanced ICM and HE concentrations to provide obscuration for secondary objective assaults and still get maximum coverage and kills on the enemy.

b. Blue Force, Base Case.

(1) The Blue force opposing the threat force consisted of two companies as follows:

<u>Company A</u>	<u>Company B</u>
2 tank platoons	2 tank platoons
1 Mech platoon	1 Mech platoon
	1 Scout platoon

(2) Each tank platoon was composed of five tanks and each Mech platoon was composed of four MICV/rifle squads each with one DRAGON. In addition to the four TOW weapons located in the scout platoon, the cross attached Mech company brought three TOW sections with them giving the Blue force a total of ten TOW weapon systems. Each TOW system is mounted on the improved TOW vehicle (ITV). The total strength was 25 tanks, 13 MICV, 12 DRAGON, and 10 TOW, including the headquarters equipments.

(3) The Blue artillery forces played consisted of the following:

(a) 155mm howitzer battery - 30 missions one-half of which will be ICM and one-half HE. Additionally, 20 CLGP missions and six FASCAM missions were allocated.

(b) 203mm howitzer battery - 2 missions both of which will be ICM.

(c) In addition, missions are available from the 81mm and 107mm mortar platoons.

(4) Blue forces were to defend in sector with initial positions at figure 2 to prevent Red forces from securing river crossing sites vicinity of 430-900. Figure 3 presents the barrier plan for the Base Case (includes FASCAM fields emplaced during the battle).

c. Blue Force, Clear Alternative.

(1) The Blue force opposing the threat force consisted of four companies as follows.

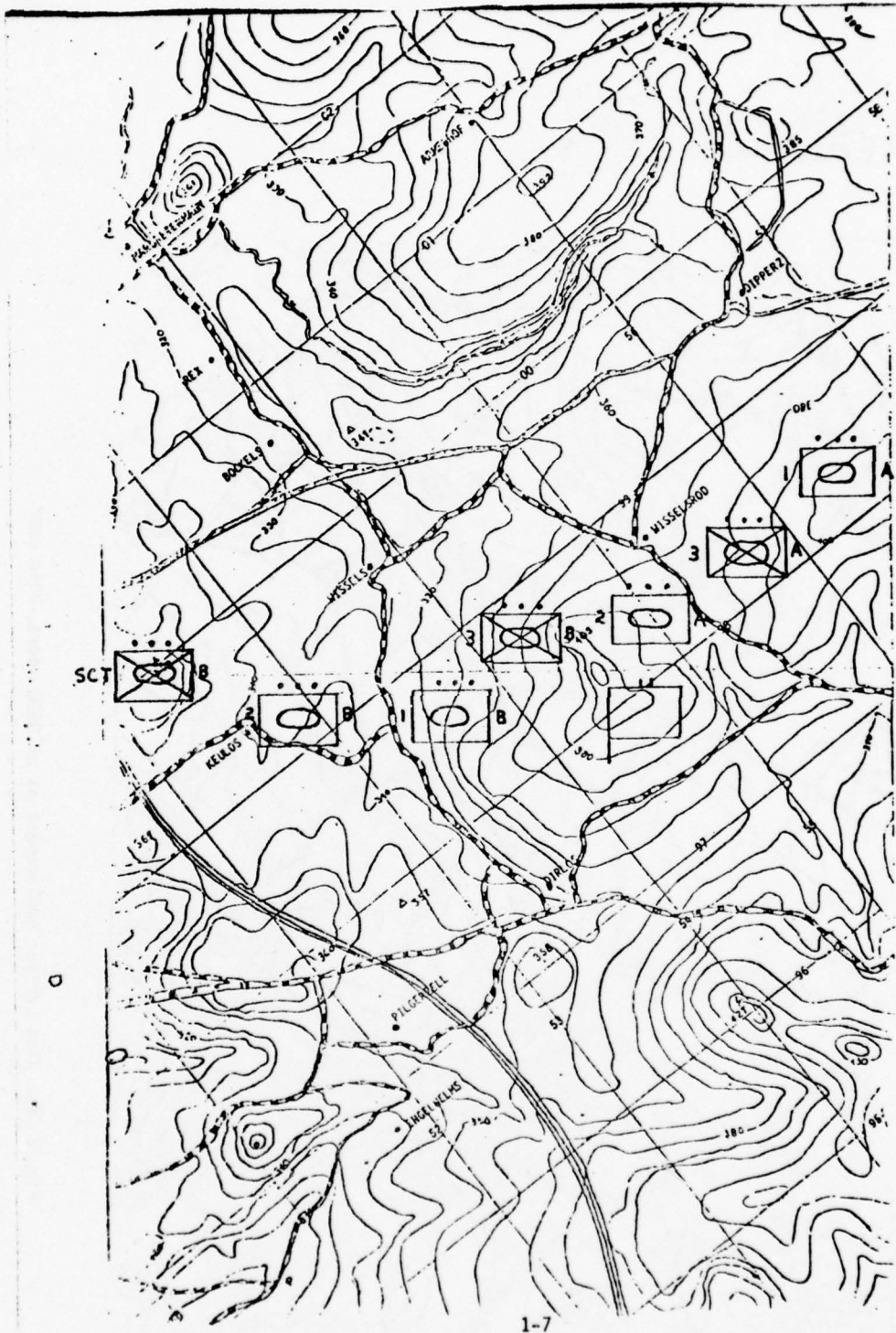


Figure 2. Blue initial disposition.

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Company A - 3 tank platoons  
Company B - 3 mech platoons  
Company C - 3 tank platoons  
AT Company - 3 AT platoons

(2) Each tank platoon contained three tanks and each mech platoon contained three MICV/rifle squads each with one DRAGON. The AT (TOW) platoon contained four TOW. The AT company was employed throughout the battalion task force sector. Each TOW system was mounted on an ITV. The total strength was 25 tanks, 10 MICV, 9 DRAGON, and 12 TOW, including the headquarters equipments.

(3) The artillery forces allocated to Blue forces played consisted of the following.

(a) 155mm howitzer battery - 40 missions one-half of which will be ICM and one-half HE. Additionally, 25 CLGP missions and seven FASCAM missions were allocated. The battery was composed of eight M109A1 howitzers.

(b) 203mm howitzer battery - 3 missions all of which will be ICM. The battery was composed of four M110A1 howitzers.

(c) In addition, missions were available from the battalion 81mm mortar platoon.

(4) Blue forces were to defend in sector to prevent Red forces from securing river crossing sites in the vicinity of 430-900. The initial positions of Blue units is at figure 4. Figure 5 presents the barrier plan for the Clear Alternative (includes FASCAM fields emplaced during the battle).

#### 4. GAME RESULTS AND ANALYSIS.

a. Results. Tables 2 and 3 present the killer victim tables for Blue firer-Red receiver and Red firer-Blue receiver respectively. Total kills by each force, total kills by a given type system, and total losses by system type are presented in addition to killer-victim frequencies. Figure 6 presents the survivor force ratio as a function of time into the battle. The loss exchange ratios at the end of the games are 2.05 and 3.56 for the base case and clear alternative, respectively. Although the effectiveness results appear to be strongly in favor of the clear alternative, an analysis of the two games, as discussed below, could not fully substantiate this first impression. The differences are probably due to gamer learning trends and the single replication (game) result of a stochastic game.

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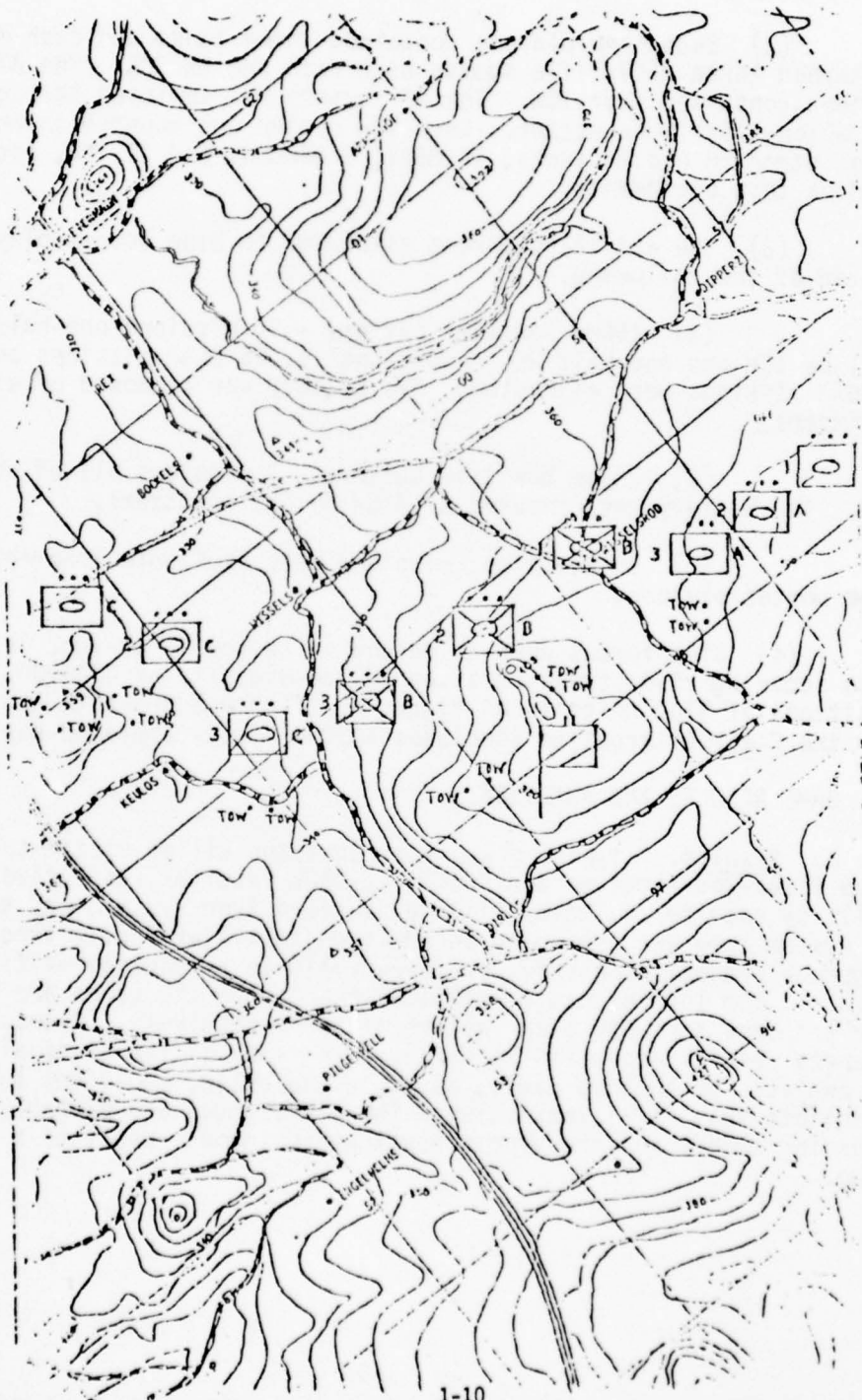


Figure 4. Blue initial unit dispositions, clear alternative.

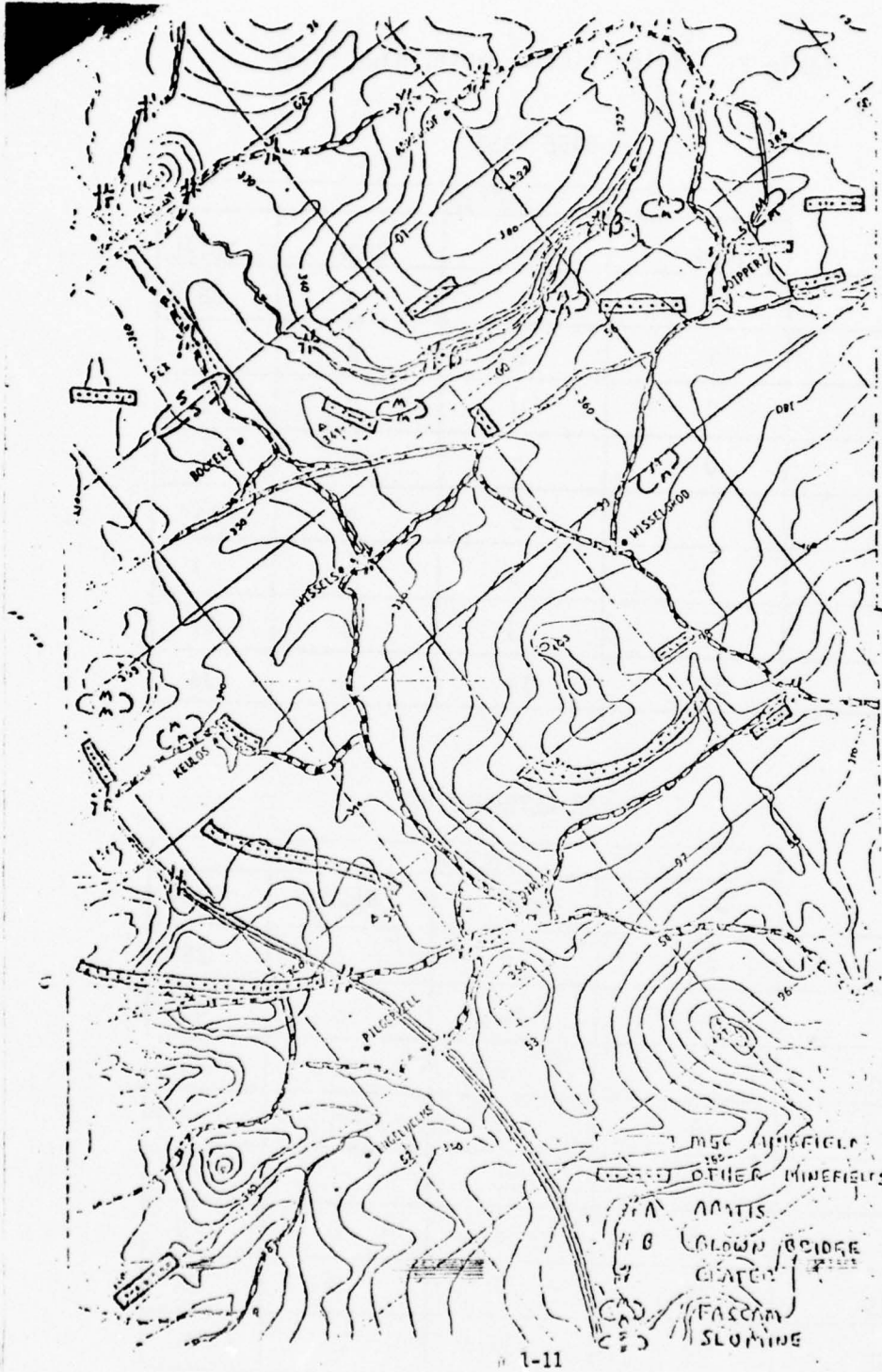


Figure 5. Blue barrier emplacement as of 0600 hours, clear alternative.

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Table 2. Killer victim table, Blue firer.

BASE CASE

	VICTIM			TOTAL
	T-72	BMP	BRDM	
XM-1	27	1	0	28
TOW	11	6	2	19
DRAGON	0	0	0	0
MICV	0	0	0	0
CLGP	6	5	0	11
ARTY	3	3	1	7
MINES	5	3	3	11
TOTAL	52	18	6	76

CLEAR ALTERNATIVE

	VICTIM			TOTAL
	T-72	BMP	BRDM	
XM-1	27	0	1	28
TOW	23	14	5	42
DRAGON	0	0	0	0
MICV	0	0	0	0
CLGP	5	11	1	17
ARTY	5	3	0	8
MINES	20	2	4	26
TOTAL	80	30	11	121

Table 3. Killer victim table, Red firer.

BASE CASE

	VICTIM				TOTAL
	XM-1	TOW	DRAGON	MICV	
T-72	6	0	0	0	6
BMP	3	6	0	1	10
BRDM	1	2	0	0	3
ARTY	8	2	4	4	18
TOTAL	18	10	4	5	37

CLEAR ALTERNATIVE

	VICTIM				TOTAL
	XM-1	TOW	DRAGON	MICV	
T-72	13	1	1	0	15
BMP	1	5	0	0	6
BRDM	0	3	0	0	3
ARTY	3	2	0	5	10
TOTAL	17	11	1	5	34

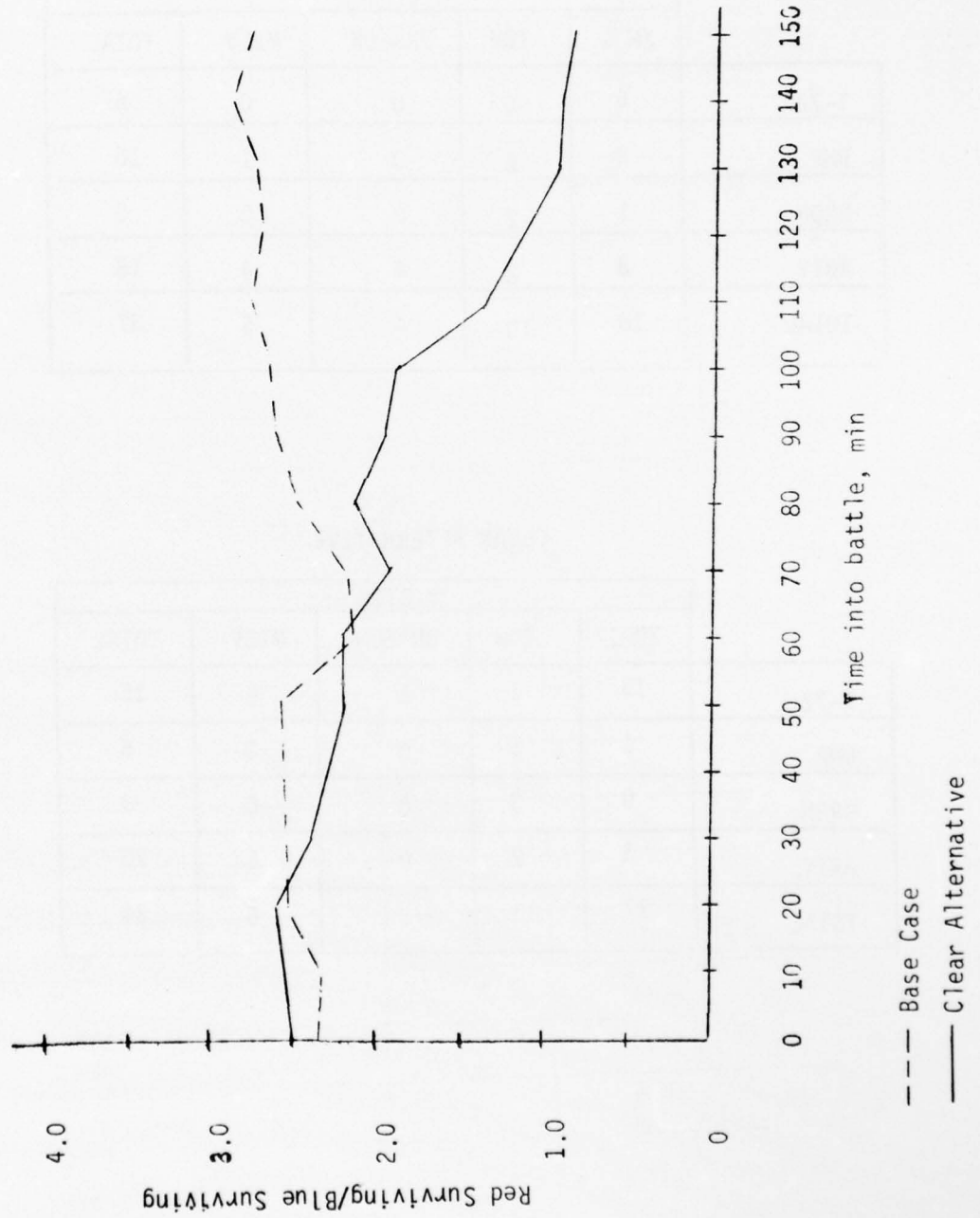


Figure 6. Survivor force ratio versus time for high resolution games

b. Discussion of Quantitative Results.

(1) General. The Blue losses in the two games were approximately the same (37 and 34 for the base case and clear alternative, respectively). However, there was a considerable increase in Red casualties going from the base case to the clear alternative (76 to 121). The following paragraphs discuss the activities and kills achieved by the various systems in an attempt to determine the cause of the considerably higher LER in the clear alternative. Detailed data presentations on game results are provided in appendix IV.

(2) XM-1.

(a) The XM-1 achieved the same number of kills in each game and as such did not contribute to the increment in LER.

(b) It is of interest to note that the number of engagements were essentially the same in both cases (125 to 120<sup>1</sup>). However, in the base case there was a tendency toward one round engagements (110 of 125) and in the clear alternative, there was a tendency toward two round engagements (78 of 120).

(c) The average kill range for the XM-1 was 1617 meters (std dev = 318m) and 1795 meter (std dev = 409m) for the Base Case and Clear Alternative, respectively.

(d) There were no multiple kills by the XM-1 in the Base Case. In the Clear Alternative, 12 Red targets were "killed" two or more times by the XM-1.

(3) TOW.

(a) The kills by TOW increased from 19 in the Base Case to 42 in the Clear Alternative. This increase was a major factor in the increment observed in the LER.

(b) An analysis of the TOW engagement events and resulting kills show that the increase in kills is due to greater number of engagements (40 to 123). The hits, kills given hit, etc., considering the target status (open/defilade and moving/stationary) seem reasonable (since only one replication was made, the variance is not known). The increased utilization of the TOW could be due to (1) gamer differences due to learning, (2) single point of control of TOW under the Clear Alternative, or (3) both of the preceding. The latter is suspected but not provable.

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<sup>1</sup>When comparison of this type is made, the first number refers to the first game (Base Case) and the second number refers to the second game (Clear Alternative).

(c) The average kill range for the TOW was 2509 meters (std dev = 327m) and 2237 meters (std dev = 578m) for the Base Case and Clear Alternative, respectively.

(d) There were no multiple kills by TOW in the Base Case. In the Clear Alternative, five Red targets were "killed" by two different TOW systems.

(4) DRAGON. For all practical purposes, DRAGON did not enter into the battle. In large part this resulted because the terrain on which the battles were simulated did not favor DRAGON employment. Three missiles were fired in the Base Case and six were fired in the Clear Alternative without achieving any kills.

(5) MICV. The MICV systems did not significantly enter into the battle, again due to the open nature of the terrain and the resultant defender tactics.

(6) CLGP. The number of CLGP missions were increased from 20 to 25 in going from the Base Case to the Clear Alternative with a resulting increase in kills of 11 to 17. Since more CLGP targets are generally available than are missions available, the added support under the Clear Alternative is a plus for that concept.

(7) Artillery. The number of artillery missions were increased from 32 to 43 in going from the Base Case to the Clear Alternative. Additionally, the number of tubes in the 155mm howitzer battery was increased from six to eight. The kills achieved by artillery increased from seven to eight. This increase is in the expected direction; however, with a single replication it could simply be due to chance.

(8) Mines.

(a) The number of FASCAM missions were increased from six to seven and the available GEMSS was doubled in going from the Base Case to the Clear Alternative. The kills due to mines increased from 11 to 26. There is no way of determining if this increase is primarily due to the increased number of mine fields or to the different placement of mine fields in the two games.

(b) Interaction between Red movements through some mine fields and around others were observed during the game. The mine fields were emplaced to channel and slow the Red advance in select key terrain areas that provided good fields of fire for the Blue direct fire weapons. Additionally, they were emplaced to slow Red units during Blue withdrawal. When Red became aware of a minefield, he would normally cross the field in a company line formation and at reduced speed. The effect was to decrease Red's firepower to the front against Blue and for Blue to concentrate his fire against current lead Red elements. Although the results of these interactions were not quantified, subjectively one can surmise that the presence of mine fields at key points lead to an increase in the effectiveness of the Blue direct fire weapons.

(9) Red systems.

(a) As mentioned earlier, the losses of Blue systems were essentially the same in the two games. However, there were distinct differences in the Red systems accounting for these losses. In the Base Case, 18 of 37 losses were due to artillery as contrasted in the Clear Alternative with 10 of 34 losses to artillery. In the Clear Alternative game, the direct fires accounted for additional kills such that the total losses in the two games were only different by three kills. These increases were due to the higher engagement rates in the Clear Alternative.

(b) All Red artillery fires, except for four 130mm missions are scheduled fires. This schedule was the same for both games. Therefore, the play of Red artillery was essentially a constant for the two games. The withdrawal of the Blue forces in the Clear Alternative game occurred sooner than in the Base Case. This early withdrawal generally placed the Blue forces outside of the artillery patterns. This was not the case in the Base Case game. Therefore, it can be assumed that the differences observed between the two games are due to (1) chance interaction between the Blue forces during the withdrawal and scheduled Red artillery fires, or (2) learning on the part of Blue gamers that resulted in avoiding Red concentrations by withdrawing ahead of the scheduled fires.

c. Subjective Evaluation by Gamers.

(1) General. This paragraph addresses gamer's subjective evaluations comparing the Base Case with the Clear Alternative force. It attempts to supplement measurable data, such as losses, with judgmental comments on the EEA as well as any other useful lessons.

(2) The three tank platoon (and eleven tank company).

(a) Advantages of more rapid movement are likely but were not clearly measurable in the game. Losses experienced in the gaming and the resultant command problems caused by frequent attachment of "1 tank" platoons to other "2 tank" platoons demonstrates some disadvantages.

(b) The advantage of "fitting" a three tank platoon to the terrain better because it need not hold any fixed geometric pattern could not be measured.

(c) The three tank platoon required external fire support to cover its withdrawal. The five tank platoon would move more independently in bounds, heavy section covering light section. The need of the three tank platoon for this external coordination and support could limit its flexibility.

(d) Judgmentally, the gamers feel the platoon leader of the three tank platoon could more effectively control the distribution of fires; however, it was not possible to measure this directly. Line of sight charts used in the game often precluded the employment of all tanks in a platoon, indicating the larger the platoon the more tank fire will be "wasted". SOP which reduce the need for radio communications, simplify and clarify sectors of fire and trigger points are vital, and should be easier with the three tank platoon.

(e) It is also the gamer's judgment that there will be a clear general advantage of the smaller platoon in control and communications, offered by the platoon leaders ability to better lead by example.

(f) The eleven tank company assumes that the company commander and executive officer will be able to "fight" their tanks because they will not be encumbered with the command and control problems associated with the company team. Gaming clearly indicates that the command and control problem is alleviated somewhat. However, there is a strong indication that the company commander and executive officer are still not "free" enough to permit effective "fighting" capability. Casualties still have to be evacuated, platoons still have to be controlled and someone still must be busy with "thinking" about what is going on and what is to be done next.

(3) Pure companies.

(a) No disadvantages from the company commander's viewpoint were discerned from removing the mortars and TOW from his control. Subjectively, we feel there is a clear advantage in the commanders control of his organic weapons.

(b) Although pure companies will be the "norm" there will be times when the combined company team has to be formed and/or TOW is attached or in direct support to a company. In these cases they may be employed by an untrained commander unaccustomed to employment and re-supply of these "other" weapons.

(c) Selection of terrain for pure mechanized infantry companies posed a particular problem in the area gamed. The battalion commanders must employ them on obvious infantry approaches and areas where large armor formations are unlikely or impossible. This type area did not happen to be prevalent in this case. In other areas there could be more such terrain than there is infantry.

(d) Both mechanized infantry and armor companies must be closely and carefully supported by TOW fires.

(4) TOW companies.

(a) The consolidation of TOW within a single company provided a very clear improvement in the judgment of all gamers. This centralized command and control seemed to facilitate distribution of fires and movement. Smoother better balanced TOW support during moves was observed.

(b) Wide frontages and other special situations will periodically require TOW platoons/sections to be attached to or in DS of line companies. Coordination for positions, sectors of fire, and in some cases, fire support could not be measured but could be troublesome.

(5) Battalion level management of resources.

(a) It was not possible to measure the effects of the additional load on the battalion commander and his staff. It was concluded he will need a greater detailed working knowledge of weapons systems and their support. His span of control was judged to be about the same numbers of people, but shifted in favor of dealing more directly with those fighting the battle. The consolidation of intelligence/operations and administration/logistics under two experienced staff officers should permit more efficient employment and support of the weapon systems.

(b) Command, control and communications will benefit from a smaller battalion and a smaller sector.

(c) The removal of 81mm mortars to the battalion posed no significant problems. Six mortars in GS, normally employed in two 3 mortar sections, seemed quite adequate to support the force with suppression and obscuration fires.

(6) Artillery.

(a) An enlisted observer with each mechanized platoon and one with one of the tank platoons permitted much better conventional artillery coverage of the battlefield. Each company always had at least one observer who could call for and adjust fire, whereas in the Base Case the observers were frequently all suppressed.

(b) Enlisted observers with LWLD's never employed CLGP at all due to the short range of the LWLD.

(c) Having a FIST team with each company provided better CLGP coverage of the battalion sector. At no time during the game were all three GLLD observers suppressed or moving.

(7) Suppression.

(a) The gaming indicated that suppression of weapon systems, particularly the TOW, is a major problem. Continuous volumes of scheduled Red artillery obscures and effectively suppresses TOW systems for extended periods. Moreover, the vulnerability of TOWs to artillery accounted for several losses during the game. Suppression of forward observers, FIST teams, infantry and dragon gunners by artillery was also evident.

(b) During the withdrawal, the use of 81mm smoke to suppress and obscure enemy systems proved to be a necessary and effective tactic.

(c) Additionally, when the situation permitted, Blue units used the cover of Red artillery for withdrawal.

(8) Limitations.

(a) Resolution. Although the games were played to the resolution of the individual tank, TOW, dragon, etc., the staff was not large enough to play a different individual in each command or key staff position. Command, control and communications then were not measurable nor directly playable. Insights come from the gaming experiences of individual playing two or more roles sometimes guessing and sometimes overlooking problems or advantages that might occur in some important but unplayable event.

(b) Gamer learning. The clear alternative organization was the third game by Blue players on the same terrain against the same Red threat. (The Base Case was played twice, the second time with improved game rules.) Both sides benefited from learning but since there was a conscious attempt to hold the threat constant and to look for differences in Blue performance, Blue benefited far more than Red. With each succeeding game Blue systems survived longer and attrited Red more, and this can't be entirely attributed to the new organization. The learning process taught the gamers careful positioning of TOWs and tanks which was a factor in getting better LERs. The improved use of concealed routes of withdrawal and use of the terrain for reduced exposure during firing also helped. The increased effectiveness of mines in the Clear Alternative case partly due to an improved capability but also partly due to Blue increased familiarity with the terrain and with Red's options.

(c) CLGP observers were not allowed to be killed to avoid a chance random loss from removing CLGP from the play of the game. Instead these observers were suppressed for long periods if fired upon.

d. Field Experimentation.

(1) During the development, conduct, and analysis of the high resolution game, it was readily apparent that data gaps exist which can only be filled via field experiments. Additionally, field experiments can potentially provide basic information on the effectiveness of alternative firing doctrines, withdrawal procedures, interaction of minefields and direct fire weapons, etc. This type information and select quantitative data could be used in modifying the high resolution game rules and data base and as such enhance its utility in evaluating alternative organizations. Some of the type information and data desired from field experiments are discussed below.

(2) One of the anticipated advantages of the clear alternative over the current organization is an overall faster rate of movement due to better command and control with smaller units being more responsive to command. In the high resolution game, movement rates were the same for both organizations for lack of data on any "true" differences. Field exercises could be conducted during which data of this type are obtained.

(3) Alternative firing doctrines for the tank units and anti-tank companies should be developed and tested to determine their relative effectiveness in an operational environment. It is anticipated that the smaller tank platoons and pure antitank companies can be used to increase the efficiency of direct fires.

(4) The clear alternative provides an increased capability for emplacing mines. It has been subjectively determined that there is a considerable interaction between units breaching or going around minefields and direct fires. These interaction effects can be quantified by measuring Blue engagement and Red engagement opportunities in field exercises wherein the Red forces pass through selected terrain with and without emplaced minefields.

(5) The TOW engagement rate in the clear alternative high resolution game was approximately three times that of the base case. The reason for the increased rate could not be determined because of the gamer learning interaction with the different means of employing TOW in the two games. Field exercises to compare TOW operations/employment under the two organizations may shed some light on this finding.

5. FINDINGS.

a. The high resolution games indicate that the clear alternative maneuver battalion is at least as effective as the base case and is probably more effective. However, the increased effectiveness is not wholly quantifiable from the games played due to gamer learning and each

game being a single outcome of a stochastic process.

b. The increased artillery available to the maneuver unit under the clear alternative results in a more effective force. This increase is primarily due to the greater availability of CLGP missions.

c. The minefields emplaced under the clear alternative, with its increased artillery delivered FASCAM and increased GEMSS, were more effective than the minefields emplaced in the base case.

d. The antitank company appeared to be a strong contributor to the effectiveness of the clear alternative.

e. A high resolution manual wargame of the type played has serious limitations with respect to quantitative results since it utilizes a single replication of a stochastic process.

f. The high resolution manual wargames are an excellent tool for the analysis of alternative forces. However, they are slow and ways must be sought to speed up their application.

g. The high resolution manual wargames have considerable potential for use in deriving the detailed battle scenarios that are required for play in high resolution stochastic models such as DYNTACS and CARMONETTE.

## CHAPTER 2

### ANALYSIS OF DIVISION LEVEL WAR GAMES

#### 1. INTRODUCTION.

a. Purpose. To determine the effectiveness of the division restructuring study's clear alternative division organization as compared to the current organization, and to assess the specific contributions to total effectiveness resulting from organizational changes to maneuver, artillery, aviation and engineering units independently.

b. Scope.

(1) The scenario for this study was derived from the SCORES Europe I, Sequence 2A scenario as updated to a 1985 time frame. It was assumed that the result of the battle would not change dramatically during the first few critical incidents of combat. The DRS scenario initiated activity as of 0330 D+1 and continued through 1130 D+2 when, in the base case, it would have been necessary to commit the reserve division. The forces played for Blue were the organic elements of an armored division plus two squadrons from the armored cavalry regiment and three battalion task forces from the adjacent mechanized infantry division. Opposing this array, Red had two tank divisions forward with a tank division and a motorized rifle division in reserve. Red forces in the scenario were updated with the T-72 tank and were given a regiment of attack helicopters. All Blue force tanks, including the M60A2, were replaced with XM1; and the MICV and ITV were utilized as appropriate instead of the M113. Additional capabilities portrayed for Blue were FASCAM, CLGP and ICM-DP. A more detailed (and classified) description of the scenario is contained in both appendices V and VI.

(2) Within the context of this scenario, two war games were conducted. The first (base case) game played the current division structure as updated for the time frame. The second (clear alternative) game played the proposed restructured division. The major characteristics of the armored divisions gamed are shown in table 4. The substantial increase in artillery tubes results from division artillery organization, whose battalions are configured in 4 batteries of 8 tubes each. Another major change played but not reflected in the table was an increase in engineer assets proportional to the increase in maneuver battalions.

Table 4. Major characteristics of divisions gamed

	Pure Heavy Division Base	Alternative	DRS Scenario Base	Force Alternative
Battalions	6 Armor 5 Mech	9 Armor 6 Mech	14 BN TF 2 Sqdn ACR 1 Cav Sqdn	18 BN TF 2 Sqdn ACR 1 Cav Sqdn
Personnel	17,000(+)	20,000(+)	-	-
Weapon Systems				
Tank	324	324	370	391
TOW	134	180	187	229
MICV	210	216	310	300
155 How	54	96	130	178
AH-1S	0	21	30	30

(3) The assumptions made concerning the covering force action resulted in a DRS scenario force as shown in table 4. The unattrited scenario forces would have had nearly equivalent numbers of tanks and MICVs for the base case and clear alternative, and there would have been 64 additional TOW systems in the clear alternative. However, organization of the covering force resulted in more TOW and less tanks positioned forward for the clear alternative than for the base case. With the assumption that the losses in the covering force would reduce the task forces to nearly equivalent relative effectiveness with an identical number of total armored vehicle losses, the result as shown in the table was a slight increase for the alternative in the number tanks available at the start of the game, and not quite as many more TOWs as might be expected.

(4) The war games were played utilizing the CACDA Jiffy war gaming methodology. The Jiffy game is a computer assisted manual war game where the computer functions are limited to rate of advance determination, combat loss assessments and automated bookkeeping on the status of forces. All other functions, such as allocation of forces, maneuver, decisions to engage/break-off, resupply, etc., are performed by the gamers. The program operates interactively which allows for realistic tactical decisions to be incorporated into the battle results. Jiffy assesses the battle in terms of blocks of time called critical incidents and geographic areas referred to as sectors. A basic assumption to the game play is that the opposing forces do not significantly change within any sector during a critical incident.

c. Limitations.

(1) The time constraints imposed on the phase I gaming severely limited the amount of division level gaming which could be performed. As a result only the two basic games could be performed in total. In order to evaluate the contribution of specific subsystems of the re-organization, a series of parametric analyses were developed to investigate those contributions in selected battles. The parametric analyses can only generate indications of relative contribution, since the cumulative impact over time is not captured.

(2) The TACAIR contribution to the battle was not actually gamed. The results of the Europe I scenario in terms of losses to TACAIR was directly transferred to the DRS games. Because of this and the fact that it was not realized until just before the gaming started that Red would be utilizing attack helicopters, the Blue air defenses were not updated to a 1985 time frame. Although the changes to the air defense organization were incorporated into the force structure, the effects were not analyzed because of the limited and somewhat irrelevant data available.

(3) The only other major area of reorganization not evaluated in this analysis was the consolidation of aviation assets. The only assets gamed were the attack and scout helicopters, and the scouts were only gamed as targets for the air defense.

d. Model Output.

(1) Jiffy game provides two basic reports which are used by the gamers and analysts. The first is the interactive game audit file, which records the data transfers between the gamers and the computer program. The data provided by the gamers basically describes the scenario and controls the battle. The feedback from the computer provides updates on losses to assist the gamers in controlling the battle. These reports are essential to the parametric analysis in order to recreate the same battle.

(2) At the end of the gaming for every sector in each critical incident, the program automatically creates a second report file which is printed on the high speed printer at the computer site. This file has basically two separate reports on it. The unit status file gives a listing of all units which were located in the sector. For each unit, it gives the current unit effectiveness level, a list of weapons remaining and a list of weapons lost during this critical incident. The gamers use this data in planning for reinforcement, resupply, and movement of units.

(3) Also attached to this report is the battle statistics file, which contains primarily killer/victim (or loss by source of loss) tables. These tables are presented in both an aggregated and a very detailed format. This data is primarily for use by the analyst, and most of the aggregate tables for these games are reproduced in appendix IV of this report. The battle statistics file is also printed out at the end of each critical incident and contains the cumulative statistics for all of the sectors.

2. RESULTS AND ANALYSIS.

a. Gaming. From the same basic starting position at initiation of combat in the main battle area, 32 hours of combat were gamed with both the base case and clear alternative organizations. The games were played using seven critical incidents ranging in length from three to seven hours. Each critical incident was gamed with three brigade areas. The general results of the two games are summarized in table 5. It can be seen that the clear alternative division displays about a 10-15% improvement in both loss exchange ratio and territory lost. The margin of improvement was fairly consistent throughout the measures of effectiveness examined.

Table 5. Force effectiveness

	Base	Alternative
Initial force ratio	1.97	1.94
Loss exchange ratio	2.67	2.94
Final force ratio	.86	.63
Average Red advance Per Game (km)	9.3	8.1

b. Comparative Analysis.

(1) In comparing the results of the two games, the magnitude of the difference in the final force ratios as compared to other measures led to an investigation of the cause. It was found that the use of final force ratio as a measure is somewhat deceptive since it is strongly a function of replacement policy, as shown in table 6. This table shows a comparison of the base case, the clear alternative, and the base case modified to reflect a replacement policy similar to the alternative. Note that the number of losses is essentially the same in both the base case and clear alternative games, therefore the number of repairable vehicles should be about the same. Also, the number of vehicles arriving from sources external to the division is constant, so the total number available to be replaced should be about the same. The difference must be in the maintenance and resupply systems. So, if the assumption is made that an equal number of armored vehicles is replaced in the base case as was replaced in the alternative, then the final force ratio is reduced to a level which shows a comparable difference with the other measures examined. This means that the effect of having these additional replacements had not yet greatly impacted on the division battle when the gaming ceased.

(2) Although the analysis of the resupply and replacement policy was left to the logistics center and its associated schools, the effect was too important to be totally ignored in this analysis. It was discovered that the primary factor involved in creating this difference was the availability of replacement crew members. This is noted because the policy for replacing crew members should have no direct relationship to the restructuring of the division, and if the new policy is indeed this effective, it should be implemented regardless of the division structure.

(3) One of the hypothesized advantages of the new division structure was the greater mobility and lethality which would result from an organization composed of smaller maneuver battalions. Figures 7, 8, and 9 show several measures which were examined to determine the validity of the proposition.

(a) Plotted on figure 7 is the percent of maneuver units which are considered to be effective units, where effective is defined as having at least 70% of its initial strength. The shaded portion of the curve indicates where these two curves are essentially identical. These curves begin to diverge in the fourth critical incident (CI). The reason for this divergence is the greater influx of replacements which occurs in the fourth CI and again in the sixth. It should be noted that most of the additional effective units in this end condition are located in brigade reserves. So, although these

Table 6. Effect of Blue replacements

	Base	Modified	Alternative
Blue Losses	783	783	780
Blue Replacements	356	537	537
% Replaced	46	69	69
Final Force	710	891	909
Final Force Ratio	0.86	0.69	0.63

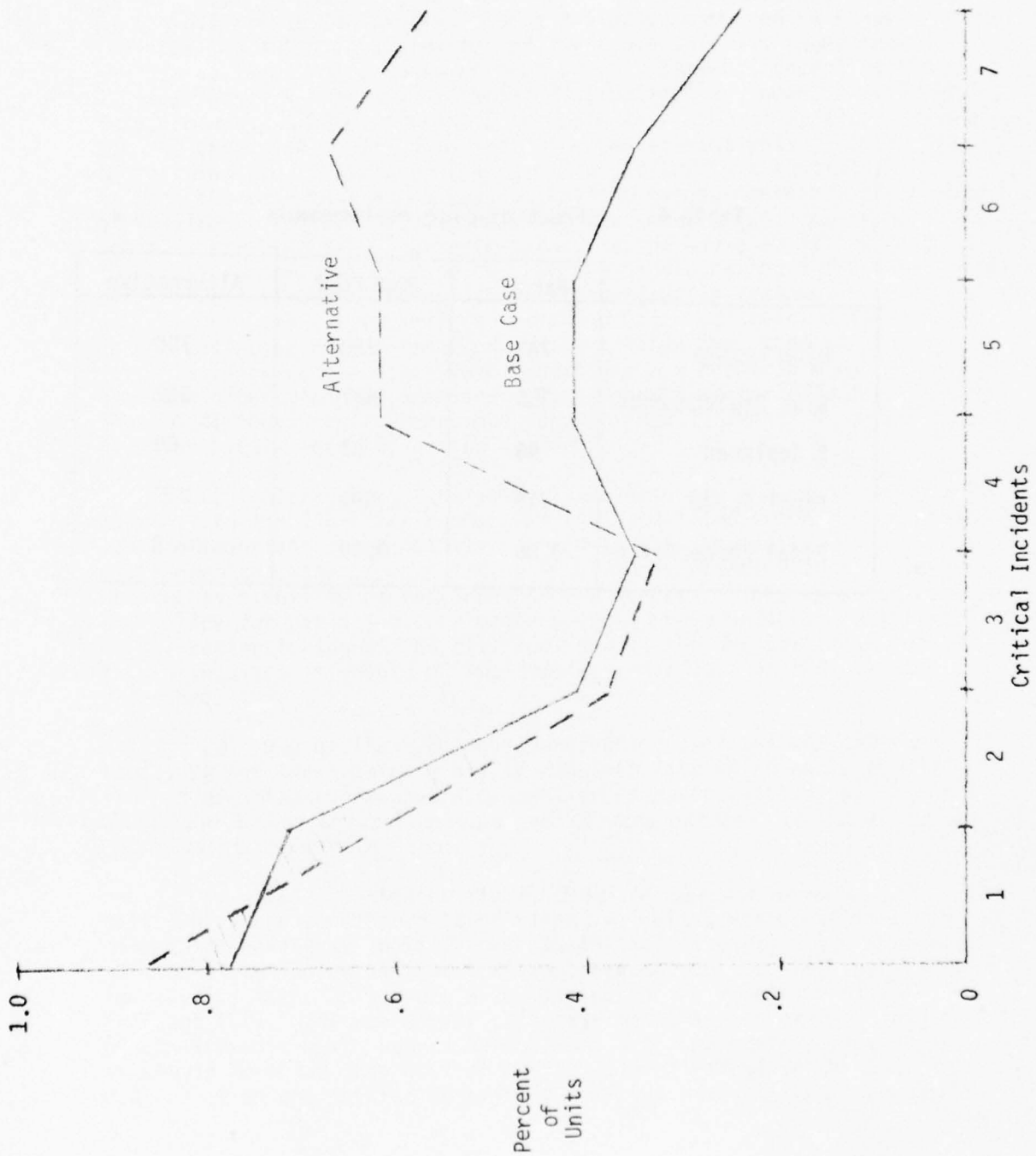


Figure 7. Effective Maneuver Units

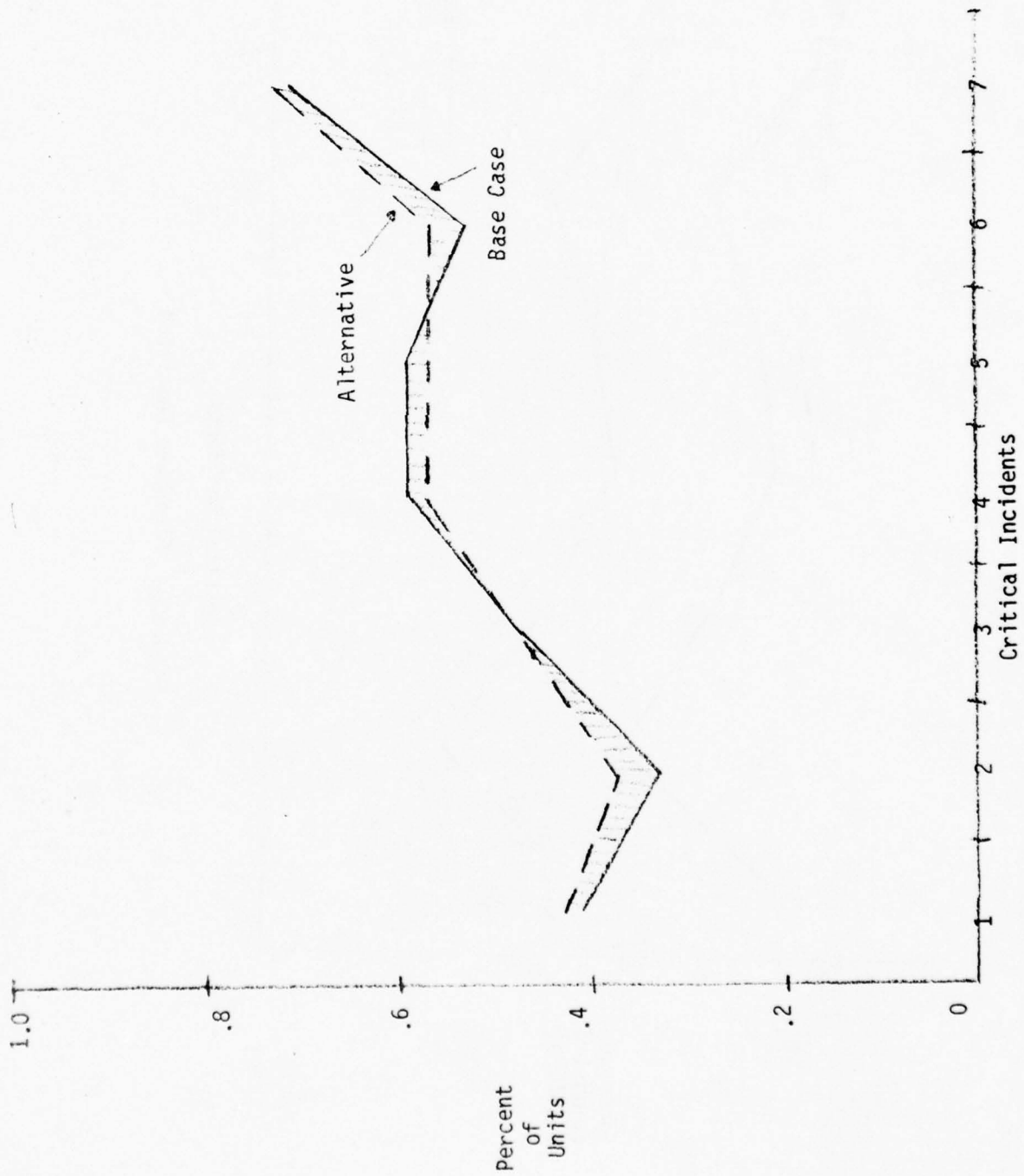


Figure 8. Committed Maneuver Units

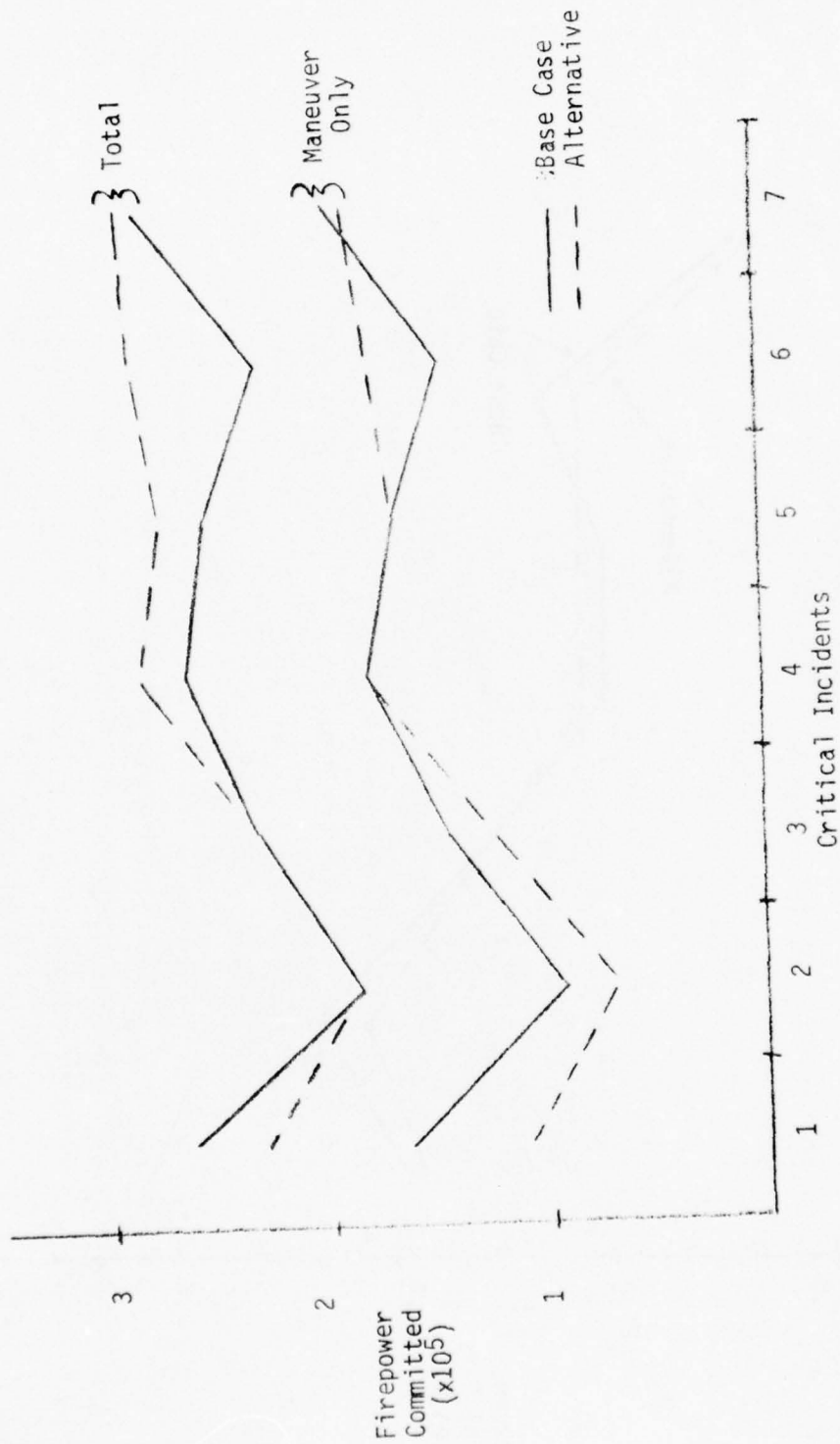


Figure 9. Firepower Committed

replacements had little effect on combat outcome by the end of the seventh CI, it is obvious from this end condition that the clear alternative has, at this point, a much better residual capability to maintain the defense.

(b) The set of curves on figure 8 is the percent over time of maneuver units on line and committed to the battle in their sector. As can be seen by the shading, the percent of force committed is essentially the same for both organizations. From figure 9, it can be seen that the actual maneuver unit firepower committed shows the same overlapping characteristics as this percent of force.

(c) These measures, which were examined to determine the effect of smaller battalions on the outcome of the battle, show no significant differences resulting from the size of the maneuver units. It appears that in order to get a measure of the "alacrity" of these units, it would be necessary to play the division level game with greater resolution than was done in Phase I of DRS. It would definitely be necessary to examine shorter CIs (like 1 hour) and probably somewhat smaller sectors than the brigade. This, of course, would require considerably more gaming time than was available for this study.

(4) In order to develop an understanding of the contribution of the major subsystems to the battle results, the total losses by source of loss, as shown in table 7, were examined.

(a) The large number of losses to Blue artillery in these games results primarily from the CLGP rounds. It is felt that the CLGP was considerably overplayed by the way in which it was modeled in Jiffy for this study, since it does not reflect the acquisition and engagement limitations of the GLLD operator. This capability was examined in the parametric analysis, and its effect will be discussed in the next section of this report. Although the losses to artillery are higher than would be expected, the relative changes due to organization should be consistent with the improvement shown. In any event, the artillery system generally showed the greatest improvement of the areas shown here. In addition, the improvement in AH kills is not a function of changes to the helicopter organization but rather is directly related to the additional suppression of air defenses by the artillery.

(b) The slight improvement in Red kills from direct fire is nearly equivalent to the amount of increase in Blue direct fire systems (approximately 6 percent). However, the loss exchange ratio, resulting from the direct fire battle, exhibits the same 10-15 percent increase that we have seen from other MOE. This, of course, means that the added direct fire systems (predominantly TOWs) must have contributed greatly to the battle in order to raise the overall LER by that amount.

Table 7. Armor Losses

Clear Alternative				
Source	Red		Blue	
	Number	Percent	Number	Percent
Arty	957	42	40	5
Direct fires	695	30	549	71
TACAIR	92	4	13	2
Mines	451	20	0	0
AH	92	4	178	23
Total	2287	100	780	100

Base Case				
Source	Red		Blue	
	Number	Percent	Number	Percent
Arty	718	34	38	5
Direct fires	662	32	602	78
TACAIR	92	4	15	2
Mines	545	26	0	0
AH	74	4	128	16
Total	2091	100	783	100

(c) Probably the most startling change is the decrease in kills in the clear alternative resulting from the employment of mines. Table 8 shows more detail of the mine employment. The minefield frontages displayed are actual minefields emplaced for the FASCAM systems and minefields encountered by the Red force for the pre-emplaced (conventional) mines. The reduction in minefield kills is related to the fact that fewer minefields were used in the clear alternative. This is because the overall rate-of-advance was slower due to the improvement in other Blue systems in the division. The increase in kills per kilometer of front for the base case results from the fact that most of the increase in minefield frontage came from the more lethal types of minefields (conventional and RAAMS).

c. Parametric Analyses. In addition to the actual division level gaming, some parametric (or sensitivity) analyses were performed on the results of those games. The areas of primary interest for these analyses were artillery force levels, TOW proliferation, and AH requirements. Three specific battles were selected for these analyses. They were base case, critical incident 1, sector 2; clear alternative, critical incident 1, sector 2; and clear alternative, critical incident 3, sector 1. The most relevant aspects of these analyses are discussed in the following paragraphs.

(1) Table 9 shows the results of the analysis of artillery force levels. The 3x6, 5x6, and 4x8 represent the battalion configurations examined, where 3x6 (for example) means the battalion contains three batteries of six tubes each. The implications of these results are that the majority of the difference in effectiveness between the base case and the clear alternative comes from the increase in artillery systems supporting the division. Although a clear difference in effectiveness was identified between the 3x6 configuration and the other two, it was not possible to establish a significant difference between the 5x6 and 4x8 systems. In fact, in some cases, the 5x6 even showed some improvement over the 4x8 in certain MOE. A survivability analysis of the 6 versus 8 gun battery was initiated, but when it became obvious that the analysis was duplicating, and the results paralleling a Field Artillery School study, that effort was terminated.

(2) As was mentioned earlier, it was felt that the capability of CLGP may have been greatly overplayed, so it was examined parametrically as shown in table 10. Three levels of CLGP support were evaluated; the one used in the gaming which was approximately 1 round per tube per hour, one which had no CLGP, and one which approximated 1/3 of a round per tube per hour. This latter level of CLGP was chosen because it gave the GLLD operator about the same engagement rate as an average TOW gunner. Note that the percent of artillery kills is cut in half for the latter case. This means that in terms of the 32 hour

Table 8. Minefield frontage (km)

Clear Alternative

	CI1	CI2	CI3	CI4	CI5	CI6	CI7	Total
Conventional	1.0	2.5	5.2	0	0	2.0	1.3	12.0
FASCAM 1	8.45	6.5	16.5	0	0	10.1	9.3	50.85
FASCAM 2	7.93	5.6	13.5	0	0	11.1	14.3	49.43
FASCAM 3	5.95	3.0	9.0	0	0	4.25	5.25	27.45
Total	23.33	17.6	44.2	0	0	27.45	27.15	139.73

Base Case

	CI1	CI2	CI3	CI4	CI5	CI6	CI7	Total
Conventional	1.2	7.5	5.3	0	0	3.0	4.5	21.5
FASCAM 1	15.0	11.75	9.0	0	0	10.0	10.5	56.25
FASCAM 2	1.0	10.0	8.5	0	0	7.0	11.0	37.5
FASCAM 3	4.5	9.25	4.5	0	0	6.75	8.25	33.25
Total	21.7	38.5	27.3	0	0	26.75	34.25	148.5

kills/km of front (base) = 3.67

kills/km of front (CA) = 3.25

Table 9. Parametric analysis

Artillery Force Level

	Armor LER	Kills/Tube
<b>Sector 2 CI 1</b>		
Base Case (3x6)	3.64	0.86
Base Case (5x6)	4.13	0.98
Clear Alternative (4x8)	4.37	0.95
Clear Alternative (5x6)	4.32	0.95
Clear Alternative (3x6)	3.58	0.83
<b>Sector 1 CI 3</b>		
Clear Alternative (4x8)	3.00	0.76
Clear Alternative (5x6)	2.82	0.78
Clear Alternative (3x6)	2.05	0.76

Table 10. Parametric analysis

CLGP Sensitivity

Sector 2, CI 1	Artillery Kills	Percent of Total Kills
Clear Alternative	92.5	36
Alternative, No CLGP	9.8	5
Alternative, CLGP reduced to 1/3	38.8	18

battle, the average percent of kills would be about 20-22 percent, which is comparable to what was seen in the high resolution game.

(3) Next the effect of proliferating TOW in the division was examined. The analysis considered two cases for the base case, first changing from a 4-man to a 3-man TOW crew (as is the case in the clear alternative), and second, by adding TBAT to the MICV. For the clear alternative, only TBAT was considered. The results in table 11 show fairly consistent improvement as more TOW systems are added, with an apparent saturation being achieved when both increases are combined for the base case.

(4) The increase in TOW for the division was from 134 to 180, or approximately 34 percent. The change to a 3-man crew then approximates the proliferation of TOW for the CA. This result indicates that on a launcher for launcher basis, this increase in capability is not as dramatic as it is for the artillery. However, this comparison is very sensitive to the availability and survivability of the GLLD operators, and a comparison of the costs involved would probably show the TOW proliferation to be more cost effective, since it does not involve the addition of personnel to the division.

(5) Finally, the effectiveness of two levels of attack helicopter support was examined. In both the base case and clear alternative, there was only one AH company available to support the division. In the case where twice that capability was available, the results as shown in table 12 were rather surprising. The helicopters had not been performing as well as anticipated in either game, but when the additional capability was added the number of kills they achieved increased better than fourfold. The attack helicopter LER more than doubled, and for the base case, the increase in armor LER indicated an increase in the division capability of about the same margin as achieved by the clear alternative.

(6) This result is explained by the density functions of the helicopters and air defense systems. In the small unit battle, the first platoons into the area take heavy losses from the AD systems, but also destroy and suppress many of them. With the additional AHs available, follow-on platoons can take advantage of the more favorable air defense environment to achieve greater kills. Additionally, if this were examined over an extended period of time, this effect could possibly change the force ratio of air defenses to attack helicopters from a situation of getting progressively worse for the AHs to one of getting progressively more favorable.

### 3. FINDINGS.

a. Combat Capability. The increase in both TOW and artillery improved the capability of the division. The primary ways in which the added artillery improved the division were through employment of

Table 11. Parametric analysis

TOW Proliferation\*

	Armor LER	TOW Kills
Base Case 44 TOW	3.64	20
Base Case (3 man crew) 59 TOW	3.72	27
Base Case (MICV/TBAT) 100 TOW	4.10	48
Base Case (MICV/TBAT + 3 man crew) 115 TOW	4.10	55
Clear Alternative 36 TOW	4.37	16
CA (MICV/TBAT) 88 TOW	4.58	40

\* Results based on battle in Sector 2 CI 1

Table 12. Parametric analysis

Attack Helicopters\*

	AH LER	% Kills	Armor LER
Base Case	3.12	5	3.64
Base + 1 AH Co	7.26	19	4.25
Clear Alternative	3.44**	4	4.37
CA + 1 AH Co	7.28	15	4.93

\* Results based on battle in Sector 2 CI 1

\*\* Difference in LER from Base Case a function of suppression provided by additional artillery

more CLGP rounds on the forward maneuver elements, and through the increased suppression of Red weapons, especially the air defenses. The increase in TOW did not provide as significant an increase in the overall effectiveness of the division as did the artillery, but by the same token the increase in cost would be nowhere near as great.

b. Smaller Maneuver Battalions. The gaming provided no measurable differences resulting from an organization composed of smaller maneuver battalions. What differences there were in unit effectiveness and utilization could be accounted for in terms of the differing replacement policies.

c. Engineer Battalion. The DRS scenario played only the main battle area and not the covering force, where the requirement for mine laying capability may be much greater. But, in this scenario, with the proposed FASCAM systems employed, the mine laying capability was adequate for the base case, and the requirement for employment of mines actually decreased for the clear alternative. Since mine employment was the only engineer function gamed, the results here can indicate nothing conclusive about the engineer battalion organization; however, that organization may need to be reconsidered in light of the decreasing requirement for minefields with the proposed division.

d. Attack Helicopter Requirement. The most significant improvement to either division organization was the addition of a second attack helicopter company. The way the games were played, the AH company in the base case was a corps asset operating in support of the division, and in the clear alternative, it was a division asset. Without doing a much more encompassing attack helicopter force analysis, it is impossible to say what the source of the second company might be. But if there would be only one company at corps to support the division, then this certainly argues strongly for an organic company at division to satisfy the total requirement.

e. Relative Effectiveness. The clear alternative division demonstrated an improvement in effectiveness of about 10 to 15 percent. This relative improvement was seen in most measures of effectiveness including total loss exchange ratio (LER), kills per artillery tube, direct fire LER, territory lost, and attack helicopter LER.

f. Model Adequacy. The Jiffy game was a useful tool for a first cut approach to evaluating the differences in effectiveness of the two division organization. The limitation on time did not allow the gaming to examine the issues in as much detail as would be desired. For phase II a much more detailed investigation should be planned. In order to accomplish this, it would be necessary to use Jiffy in a higher degree of resolution than was done in phase I or else use a more detailed war game such as DIVWAG.

## APPENDIX I

### DATA FROM MANUAL WAR GAMES

1. GENERAL. A considerable amount of quantitative data was acquired during the high resolution gaming. Most data pertinent to the comparative analysis of the two organizations were included in the main report. This appendix presents additional data on loss rates, detailed results of TOW and XM-1 firings, engagement ranges, kill ranges, and Blue losses to Red artillery.

#### 2. DATA PRESENTATIONS.

a. Table I-1 presents the cumulative battle results at the end of each ten minute time interval. The cumulative loss exchange ratio (LER) is fairly unstable as expected (single outcome of stochastic process and large effect of a small increment of losses at any given time). The survivor force ratio (SFR) is a more stable measure than the LER and a plot of this measure versus time is presented in figure 6 of the main report.

b. Table I-2 presents the results of TOW firings. Figures I-1 and I-2 present the cumulative distribution of TOW engagement ranges and TOW kill ranges respectively.

c. Table I-3 presents the results of XM-1 firings. Figures I-3 and I-4 present the cumulative distribution of XM-1 engagement ranges and XM-1 kill ranges respectively.

d. Blue lost 18 and 10 elements to Red artillery in the base case and clear alternative games respectively. It had been concluded, as discussed in the main report, that the differences observed were due to (1) chance interaction between Blue elements during the withdrawal and scheduled Red artillery fire (schedule same in both games), or (2) learning on the part of Blue gamers that resulted in avoiding Red concentrations by withdrawing ahead of the scheduled fires. Table I-4 presents the Blue losses to Red artillery for each ten minute time interval.

Table I-1. Cumulative battle results versus time.

Time Interval, min	Base Case				Clear Alternative			
	Losses		LER <sup>1/</sup>	SFR <sup>2/</sup>	Losses		LER <sup>1/</sup>	SFR <sup>3/</sup>
	Red	Blue			Red	Blue		
0-10	1	1	1.00	2.34	0	1	0	2.53
11-20	1	5	.20	2.51	2	3	.67	2.58
21-30	6	7	.86	2.51	13	3	4.33	2.38
31-40	11	10	1.10	2.56	30	8	3.75	2.27
41-50	22	11	2.00	2.59	41	11	3.73	2.18
51-60	39	13	3.00	2.13	52	16	3.25	2.18
61-70	47	18	2.61	2.19	70	20	3.50	1.92
71-80	51	24	2.13	2.44	75	26	2.88	2.13
81-90	58	29	2.00	2.61	84	28	3.00	1.96
91-100	63	31	2.03	2.62	87	28	3.11	1.86
101-110	64	33	1.94	2.78	101	28	3.61	1.36
111-120	67	33	2.03	2.67	107	28	3.82	1.14
121-130	71	35	2.03	2.72	113	28	4.04	.93
131-140	73	37	1.97	2.87	115	31	3.71	.96
141-150	76	37	2.05	2.74	121	34	3.56	.82

1/ Loss Exchange Ratio.

2/ Survivor Force Ratio, 60 Blue and 139 Red at time zero.

3/ 56 Blue and 139 Red at time zero.

Table I-2. Results of TOW firings.

	Base Case	Clear Alternative
Missile Fired (Open/Defilade)	40(40/0)	123(97/26)
Missile Aborts	10	9
Missile Hits (Open/Defilade)	26(26/0)	80(73/7)
Missile Kills (Open/Defilade)	19(19/0)	47(43/4)
Targets Engaged (Open/Defilade)	40(40/0)	101(78/23)
Targets Killed (Open/Defilade)	19(19/0)	42(38/4)
Multiple Kills (Open/Defilade)	0	5(5/0)

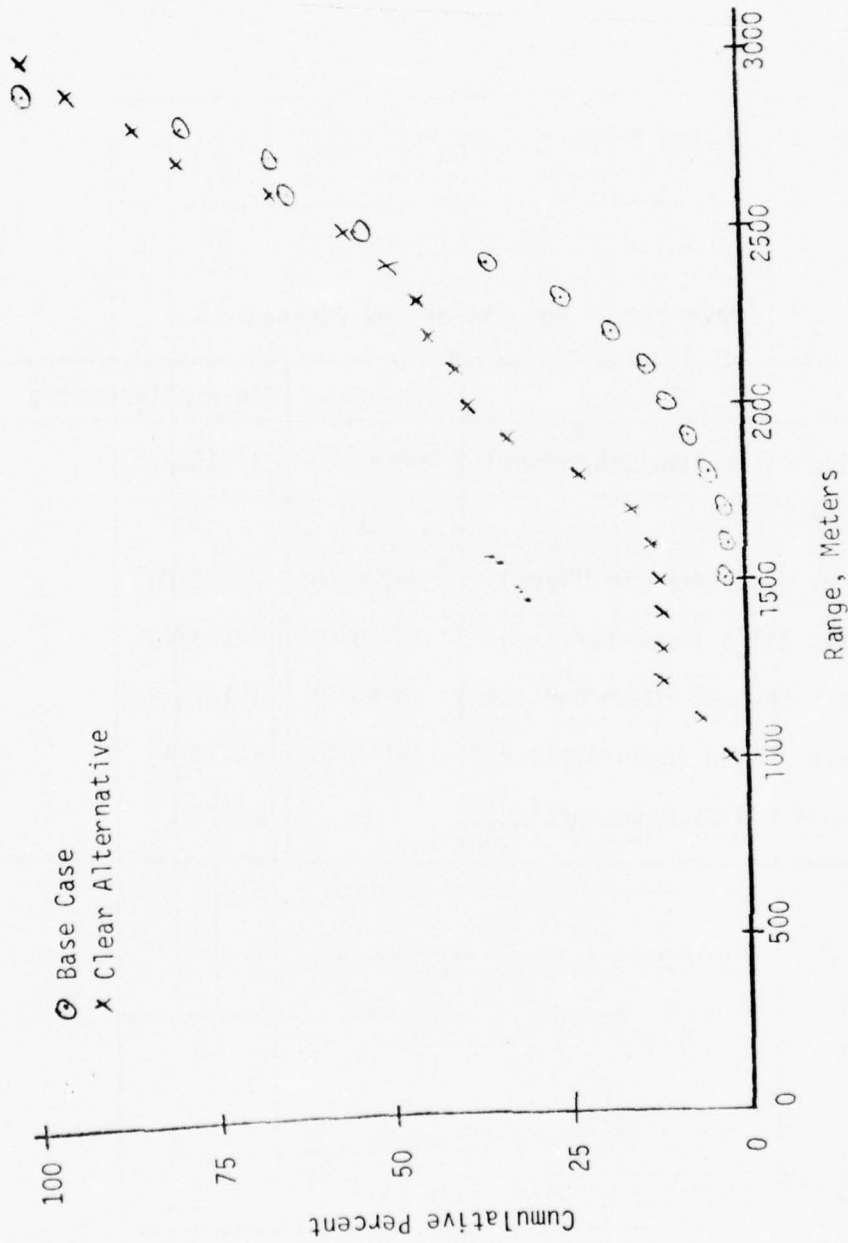


Figure I-1. Cumulative distribution of TOW engagement ranges.

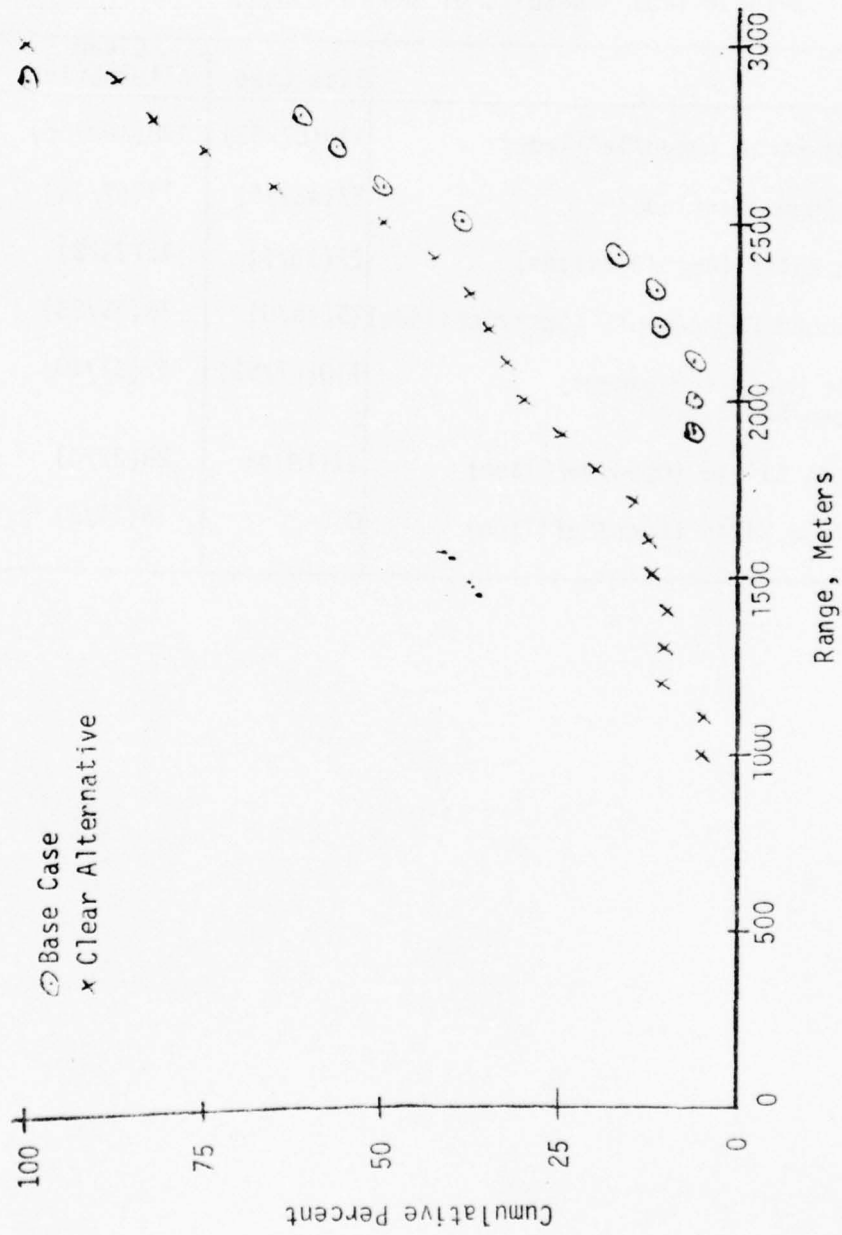


Figure I-2. Cumulative distribution of TOW kills.

Table I-3. Results of XM-1 firings.

	Base Case	Clear Alternative
Rounds Fired (Open/Defilade)	140(87/53)	198(142/56)
Hits (Open/Defilade)	57(42/15)	71(57/14)
Round Kills (Open/Defilade)	27(18/9)	42(33/9)
Two Round Engagements (Open/Defilade)	15(15/0)	78(55/23)
Single Round Engagements (Open/Defilade)	110(57/53)	42(32/10)
Targets Killed (Open/Defilade)	27(18/9)	28(22/6)
Multiple Kills (Open/Defilade)	0	14(11/3)

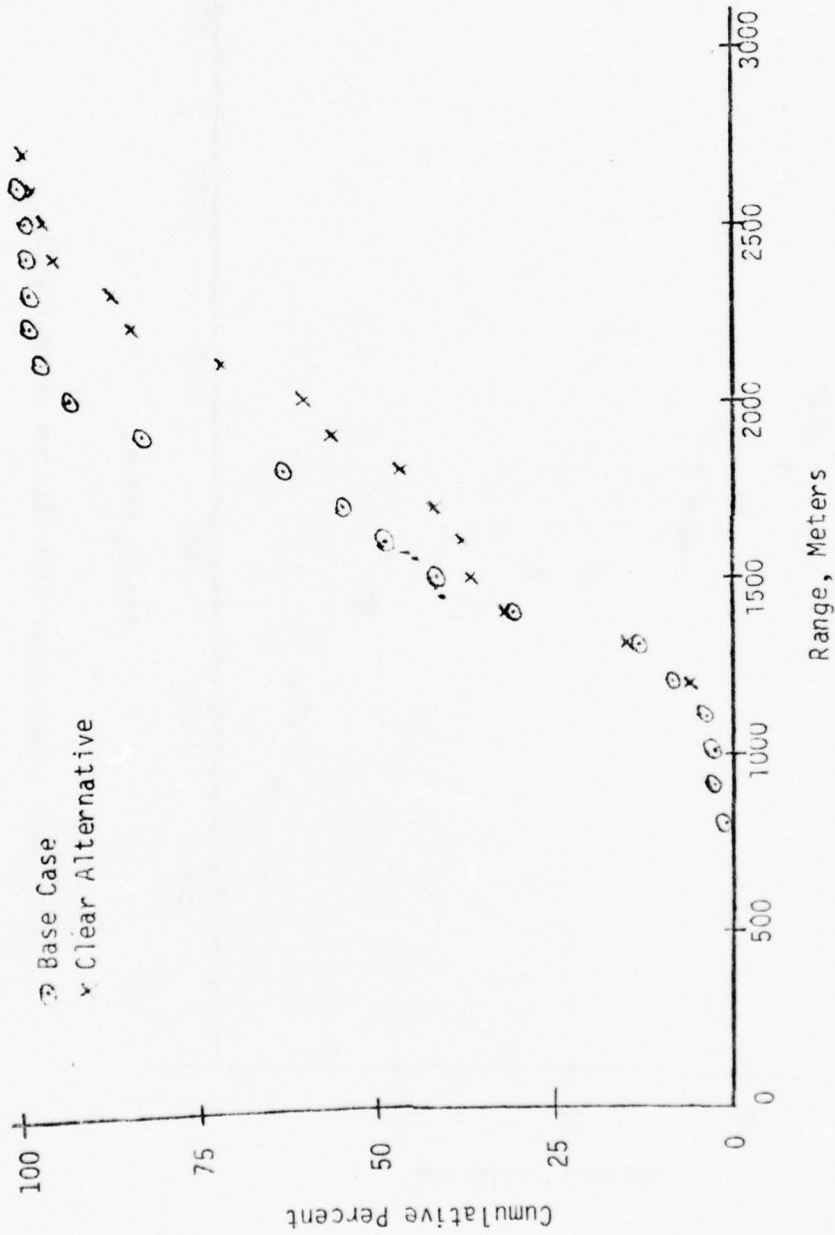


Figure I-3. Cumulative distribution of XM-1 engagements.

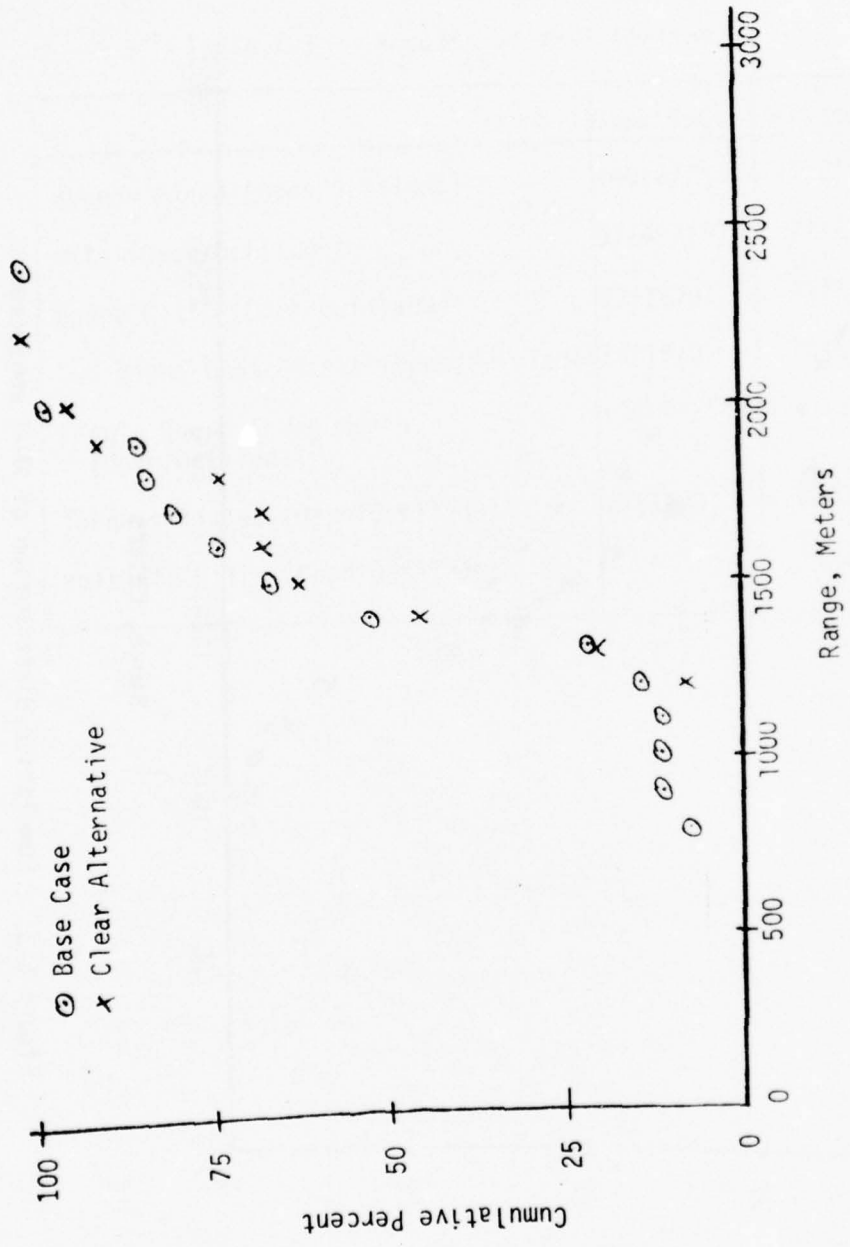


Figure I-4. Cumulative distribution of XM-1 kills.

Table I-4. Cumulative Blue losses to artillery.

Time Interval	Base Case	Clear Alternative
0-10	1	1
11-20	5	3
21-30	6	3
31-40	7	6
41-50	7	6
51-60	7	6
61-70	7	8
71-80	11	8
81-90	13	8
91-100	14	8
101-110	14	8
111-120	14	8
121-130	16	8
131-140	18	8
141-150	18	10

APPENDIX II  
RUNNING SUMMARY  
BASE CASE

Red Force

1. Force Structure. The threat force consisted of one tank regiment composed of three tank battalions and one motorized rifle battalion with the following total number of weapon systems employed (excluding artillery):

- a. 95 T-72 tanks
- b. 33 BMP w/Sagger
- c. 11 BRDM/BRDM-2 w/Sagger

2. Maneuver Units. Cross attachment and reinforcement of the BMP from the motorized rifle battalion resulted in three tank maneuver battalions being formed each reinforced by 10 BMP. All three tank battalions were composed of four companies, including three tank heavy companies each with seven tanks and three BMP, and one company of nine tanks for a total of twelve companies in the regiment. Reconnaissance assets for the regiment included:

- a. One regimental reconnaissance company with three BMP.
- b. Two battalion reconnaissance companies (troops) each with three BRDM/BRDM-2.

3. Field Artillery/Mortars. Artillery/Mortar assets available consisted of the following:

- a. One 122-mm howitzer (towed) battalion (DS)
- b. One 152-mm howitzer (SP) battery (DS)
- c. One 130-mm howitzer battery (GS)
- d. One 122-mm MRL battery (GS)
- e. Six 120-mm Mortars (organic)

4. Red Concept of Operation. The 2nd tank battalion is to conduct the main attack on two axes with two companies in each axis along the avenue

ARMENHOF-MARGRETHENHAUN/REX/BOCKELS/WISSELS/DIRLOS/PILGERZELL to seize objectives B and D. (Figure 1). The 1st tank battalion is to conduct a supporting attack on two axis with two companies in each axis along the avenue HILL 385 DIPPERZ/WISSELSROD/HILL 427 to seize objectives A and C. The 3rd tank battalion is to follow the 2nd tank battalion and be prepared to assume the mission of the 2nd tank battalion on order. After these intermediate objectives are secured, the regiment is to continue to advance to secure river crossing sites vicinity of 430-900. In conjunction with this, artillery fires will be phased as follows:

- a. Phase 1 - ICM concentration to obtain maximum coverage and kill on enemy.
- b. Phase 2 - HE concentration to obscure the vision of the enemy until the assault begins.
- c. Phase 3 - ICM concentration to get maximum coverage and kills on the enemy as he is moving to subsequent defensive positions.
- d. Phase 4 - Balanced ICM and HE concentrations to provide obscuration for secondary objective assaults and still get maximum coverage and kills on the enemy.

#### Blue Force

1. Force Structure. The Blue force opposing the threat force consisted of two companies composed as follows:

Company A	Company B
2 tank platoons	2 tank platoons
1 Mech platoon	1 Mech platoon
	1 Scout platoon

- a. Each tank platoon was composed of five tanks and each Mech platoon was composed of four MICV/Rifle squads each with one Dragon. The tank battalion headquarters, plus one tank company headquarters and one Mech company headquarters, were also employed in the area.
- b. In addition to the four TOW weapons located in the scout platoon, the cross attached Mech company brought three TOW sections with them giving the two companies a total of ten TOW weapon system. Each TOW system is mounted on the improved TOW vehicle (ITV).
- c. The total number of Blue weapon systems employed is as follows:
  - (1) 25 tanks

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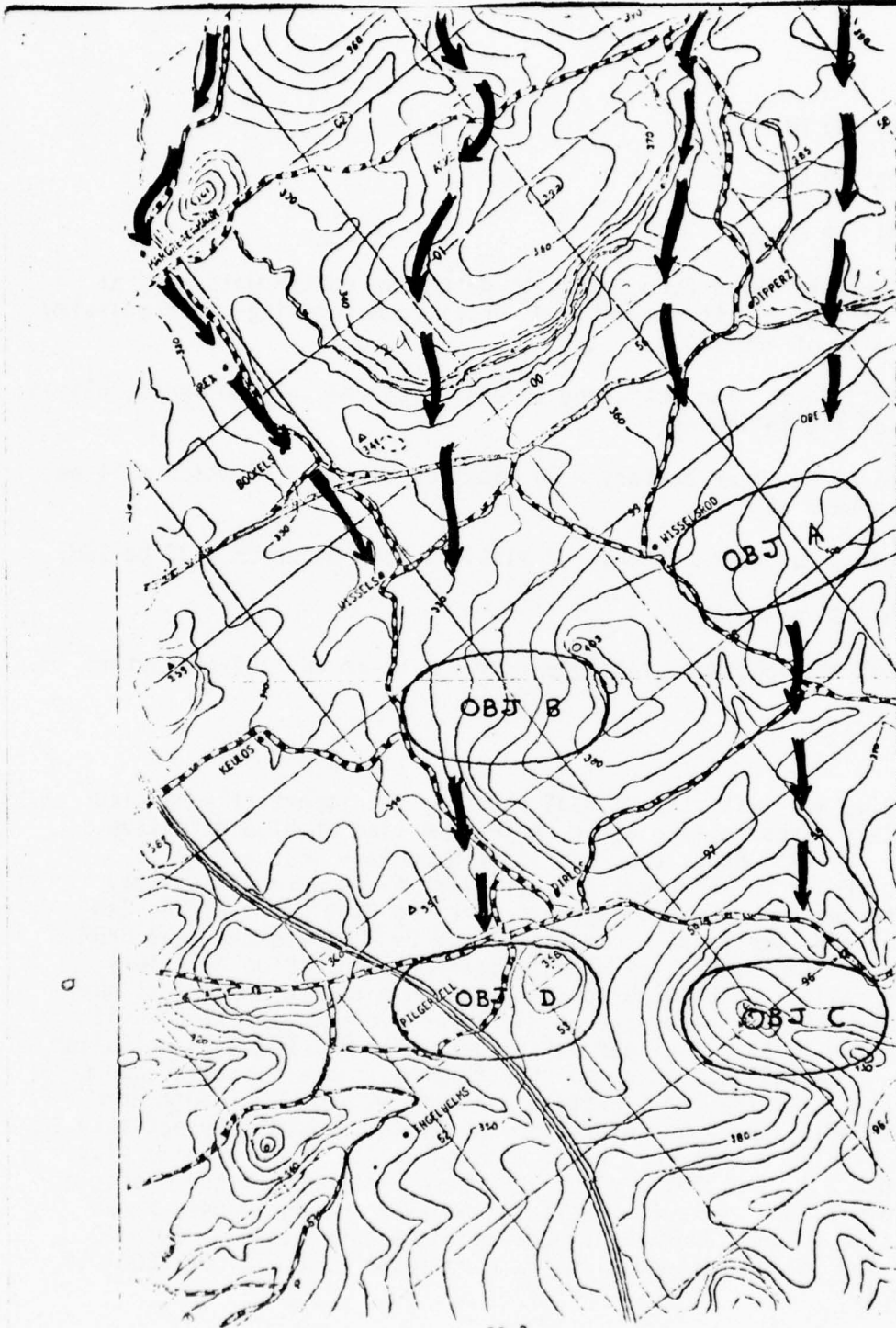


Figure 1. Red concept.

- (2) 13 MICV
- (3) 10 TOW
- (4) 12 Dragon

2. Blue Concept. Blue forces were to defend in sector with initial positions at figure 2 to prevent Red forces from securing river crossing sites vicinity of 430-900.

3. Blue Artillery. The artillery forces allocated to Blue forces played consisted of the following:

- a. 155-mm howitzer battery - 30 missions one-half of which will be ICM and one-half HE.
- b. 203-mm howitzer battery - 2 missions both of which will be ICM.
- c. 20 CLGP missions.

In addition, missions are available from the 81-mm and 107-mm mortar platoons.

#### Game Play

1. Game Play was initiated at 0330 hours by the impact of scheduled Red artillery fires falling along the entire line of Blue defensive positions. By 0355 hours the 2nd Plt of B company lost a tank to artillery. Prior to the time, the artillery fires were effectively suppressing one to two weapon systems in every Blue platoon. As Red forces advanced, the first element observed by Blue was the lead BRDM of the 1st Red tank battalion reconnaissance troop. Blue artillery fires were called and by 0340 hours the reconnaissance troop lost one of its three BRDM. The advance of all three Red reconnaissance units was slowed due to Blue engineer activities. The 1st Red tank battalion, 2nd Red tank battalion, and regimental reconnaissance elements encountered an abatis at the road junction vicinity 573-012, a road crater vicinity 562-015, and a blown bridge vicinity of 545-025 respectively. (The Blue barrier emplacement as it existed at the start of game play is at figure 3.) The abatis and crater were bypassed but the obstacle of the blown bridge was not expected to be overcome until 0410 hours at which time a tank launched bridge was to be operational. By 0340 hours the Red reconnaissance elements were located at 572-008, 560-014, and 546-024.

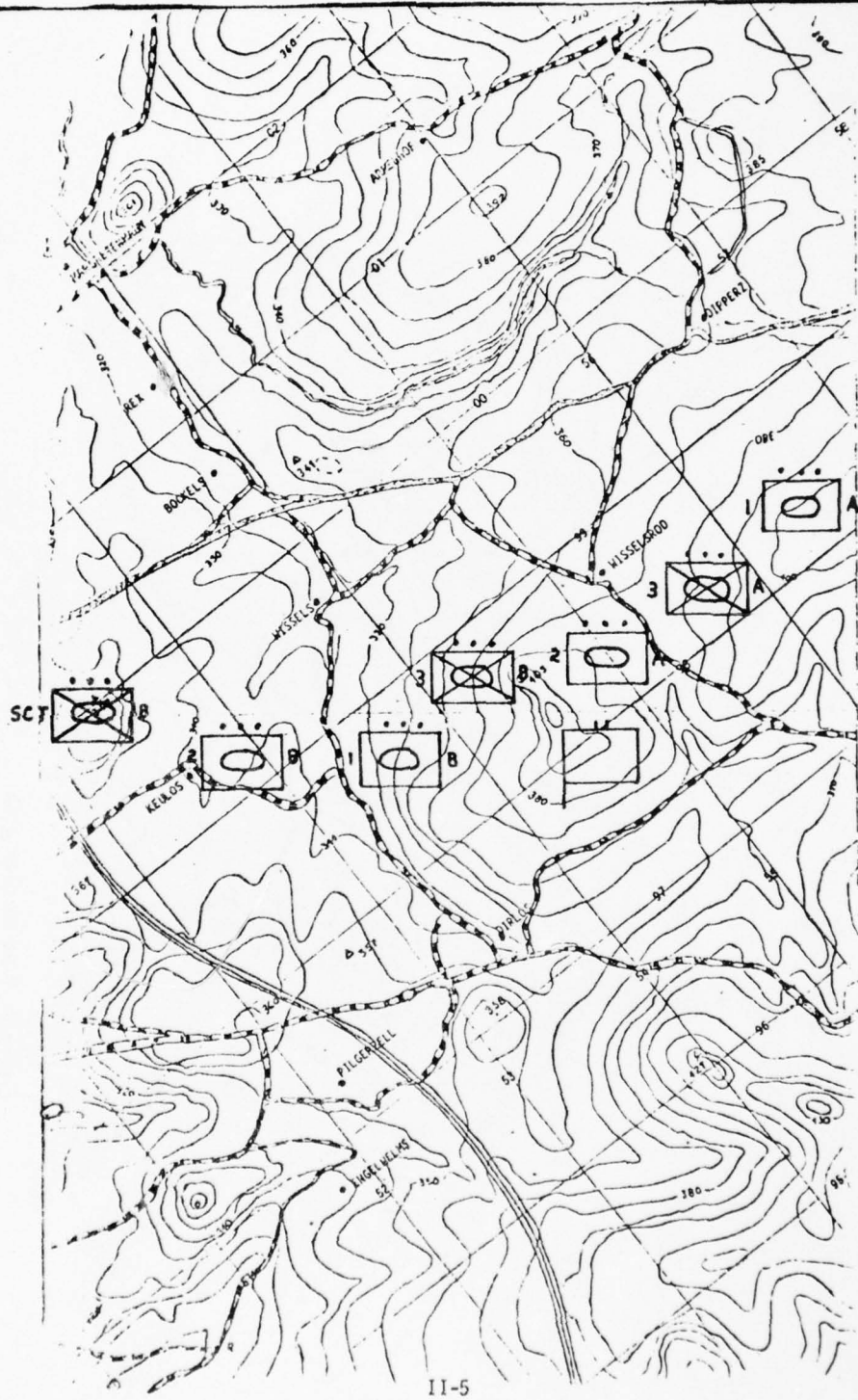


Figure 2. Blue initial disposition.

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Figure 3. Blue barrier plan.

2. At 0341 hours Red artillery fires were shifted slightly but still fell along the entire line of Blue defensive positions. However, the majority of artillery fires were received by B company. Artillery fires received from 0340 to 0344 hours resulted in the loss of two tanks, one MICV, and one Dragon all of which were from B company except one tank. The advance of the 2nd Red tank battalion was effectively masked by hills 392 and 361. Because of this, the majority of Blue artillery fires were directed against the lead columns of the 1st Red tank battalion. All Red direct fire weapon systems remained out of range of Blue direct fire weapon systems.

3. Red artillery fire again shifted at 0351 hours. Smoke suppressed two MICV from the 3rd platoon of A company, a TOW and a Dragon located forward of hill 359 north of KEULOS, and destroyed one Dragon east of hill 359. Blue artillery fired a FASCAM minefield vicinity of 572-008 to disrupt the advance of the right column of the 1st Red tank battalion. The advance of the right column of the 2nd Red tank battalion was slowed because of the blown bridge vicinity 545-025 and the necessity to ford the river. By 0356 Blue was able to engage TOW systems located in the vicinity of hill 359 against the 2nd Red battalion reconnaissance BRDM troop at 548-008. Fires were exchanged and by 0400 hours two of the three BRDMs were destroyed by TOW fires and the third was destroyed when it hit a minefield at 564-003. A BRDM was successful in killing one TOW system vicinity of hill 359. The 1st Red tank battalion left column was observed by the CLGP forward observer of A company. One tank was engaged and destroyed.

4. The shift in scheduled Red artillery fires from 0401 to 0411 hours resulted in one MICV from the 3rd platoon of A company being suppressed. In B company, the 3rd platoon lost one MICV and had one suppressed along with one of its Dragons. The Scout platoon also had one MICV and one Dragon suppressed. As directed by the Blue battalion commander, only TOW weapon systems were to engage Red targets at this time because of range considerations and also to disclose as few Blue positions as possible. Because A company only controlled two TOW systems of the ten in the battalion, the 1st platoon of A company on the right flank was also directed to fire tanks on targets of opportunity. By 0403 hours, the lead elements of the left column of the 2nd Red tank battalion observed a bridge out at 544-009. This slowed their advance as they now were also required to ford the river. The 1st platoon of A company was able to engage the left column of the 1st Red tank battalion with direct fires by 0404 hours. The primary targets of their fires were the BMP vehicles since they posed the greatest threat at this time. In addition, A company CLGP forward observer directed CLGP fires and conventional artillery from the 155 battery on the left column of the 1st

Red tank battalion. A CLGP round killed one BMP and the conventional artillery fires kill one tank. The 1st platoon was not successful in killing any Red weapon systems as of 0411 hours but did lose one of its own tanks as return fires from the Red forces on the 1st platoon were very heavy. At 0408 hours the 3rd platoon (mech) of A company was directed to withdraw to secondary positions since very few Red targets would be within their range by the time the rest of A company started their planned withdraws. To fill their gap, the forward observer and company commander's tanks were brought forward. For B company, very few Red targets presented themselves. Both columns of the 2nd Red tank battalion were slowed to ford rivers and the left column was effectively utilizing terrain to prevent observation of its tanks and BMP vehicles until all elements of the lead company had crossed the river. Two Blue tanks located 100 meters west of hill 403 started to withdraw to positions just north of KEULOS to cover the anticipated withdraw of the remaining weapon systems from hill 403. In conjunction, the mech platoon of B company also started to withdraw to positions just east of DIRLOS.

5. The shift in Red artillery fires at 0411 hours resulted in only one tank from A company being suppressed. The advance of the right column of the 1st Red tank battalion was to the point where they were now also able to fire their lead weapons on the 1st platoon of A company. The TOW section of A company was now also able to fire on the left column of the 1st Red tank battalion. By 0415 hours, the exchange of fires resulted in the 1st platoon tanks destroying two Red tanks and the TOW section also destroying a tank. The CLGP forward observer of A company with the 1st platoon also engaged and destroyed one tank. Other artillery fires produced no kills. Because of this threat, another FASCAM minefield was emplaced at 573-992 to disrupt the advance of the left column of the 1st Red tank battalion. The 2nd Red tank battalion lead columns still remained out of range or masked by terrain. A summary of Red and Blue losses as of 0415 hours is at table 1. The advance of Red forces and their location as of 0415 hours is at figure 4. The advance of the left column of the 2nd Red tank battalion was again slowed at 0416 hours as its lead tanks crossed the river and struck a minefield vicinity 544-009. Two tanks were lost and a plow had to be utilized to clear a safe lane. The right column of the 1st Red tank battalion continued to deploy west of DIPPERZ to secure objectives vicinity of WISSELSROD. However, their advance was blunted as they struck a minefield and received artillery and direct fires from the forward observer and company commander's tanks of A company. From 0415 to 0420 hours, the assaulting Red forces of the right column of the 1st Red tank battalion lost three tanks and was still clearing the minefield. At 0417 hours, the Blue battalion commander directed the S3 and forward

Table 1

A summary of both Blue and Red force losses by cause as of 0415 hours is as follows:

		<u>Red Losses</u>			
		Tank	BMP	BRDM	
<u>Blue Killer</u>					
Tank		3	--	--	
TOW		1	--	2	
Arty		1	--	1	
CLGP		3	3	--	
Mine		--	1	2	
<hr/>					
Total		8	4	5	
Total Remaining		87	29	6	
		<u>Blue Losses</u>			
		Tank	TOW	MICV	Dragon
<u>Red Killer</u>					
Tank		2	--	--	--
BMP		1	--	--	--
BRDM		--	1	--	--
Arty		3	--	2	2
<hr/>					
Total		6	1	2	2
Total Remaining		19	9	11	10

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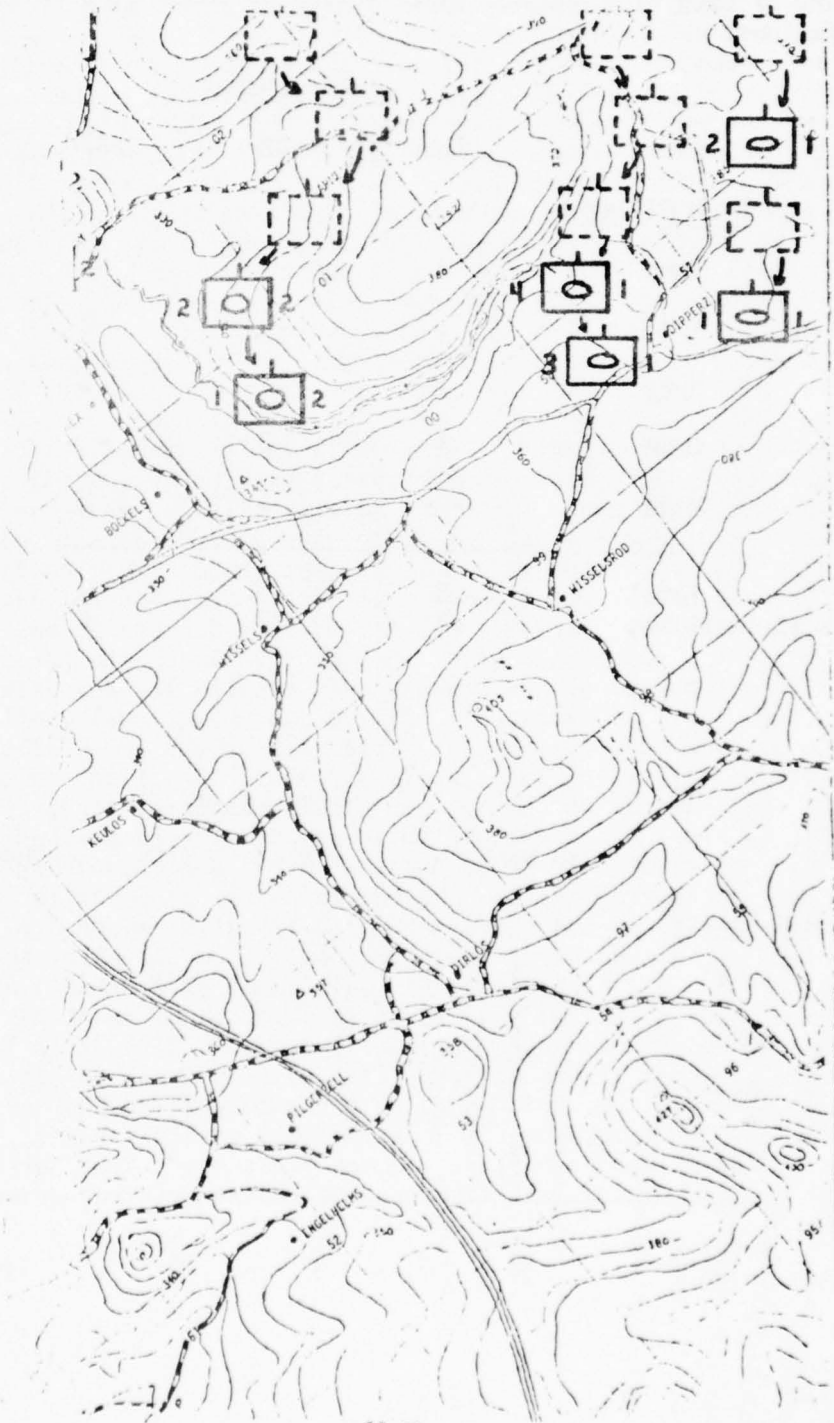


Figure 4. Red advance and location as of 0415 hours.

air controller tanks to withdraw to locations on the forward slope of hill 427. As the two withdrawing 1st platoon tanks of B company passed through the remaining elements of the 1st platoon at 542-978, the 1st platoon started to withdraw as a unit. The Mech platoon of B company also continued to withdraw. The remainder of B company still lacked targets except for the TOW sections at hill 403 who were now able to engage lead elements of the 2nd Red tank battalion right column vicinity 537-015. Since the 1st platoon of A company was badly depleted and the observation of the left column of the 1st Red tank battalion was very restricted by terrain, the battalion commander directed a Slumine minefield be emplaced forward of the 1st platoon of A company to cause the 1st Red tank battalion left column to turn right, away from the high ground east of WISSELSROD.

6. Red artillery fires starting at 0421 hours entered phase 2 of their employment. The major effect of their fires was felt by A company as the CLGP forward observer was suppressed along with two tanks of the 3rd platoon. The smoke suppressing the A company CLGP forward observer caused a CLGP round to be lost. The A company commander decided to utilize this smoke to withdraw the remaining tank of the 1st platoon and the CLGP forward observer and directed they follow the Mech platoon of A company in withdrawing to secondary positions. At this time, elements of the 2nd platoon of A company started to engage the 1st Red tank battalion right column and by 0430 hours destroyed two tanks and two BMP vehicles. The TOW section of A company located at 548-980 was able to engage elements of the left column of the 1st Red tank battalion as they came within line of sight and range just southeast of DIPPERZ. By 0430 hours the TOW section destroyed two BMP vehicles and one tank from the 1st Red tank battalion left column and was also able to destroy one BMP from the attacking right column. In the exchange of fires, one TOW was destroyed. Blue artillery fires against the 1st Red tank battalion did not cause any weapon losses. Blue B company TOW sections still remained the primary weapon systems for engaging Red targets because of range. Elements from both the left and right columns of the 2nd Red tank battalion were engaged and two lead tanks destroyed. Red artillery was placed on hill 403 killing one of the TOW weapons. Blue B company commander started to move the scout platoon TOW weapons to positions south of KEULOS at this time to occupy positions offering greater fields of fire. Smoke from Red artillery and terrain restrictions prevented their employment at or near maximum ranges from their old positions vicinity of hill 359. By 0425 hours the 1st and 3rd (Mech) platoons of B company had reached their secondary positions. At 0430 hours, the Blue artillery net was jammed and another CLGP round was lost. Red losses from 0415 to 0430 hours increased considerably from the first 45 minutes as more Red weapons came within range of Blue direct fire weapons. Red and Blue losses from 0415 to 0430 hours is at table 2. Both Red and Blue unit locations as of 0430 hours is at figure 5.

Table 2

A summary of both Blue and Red force losses by cause from 0415 to 0430 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	5	1	--
TOW	5	4	--
Arty	1	2	--
CLGP	--	1	--
Mine	3	--	--
Total	14	8	0
Total Remaining	73	21	6

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	--	--	--	--
BMP	--	1	--	--
BRDM	--	--	--	--
Arty	--	1	--	--
Total	0	2	0	0
Total Remaining	19	7	11	10

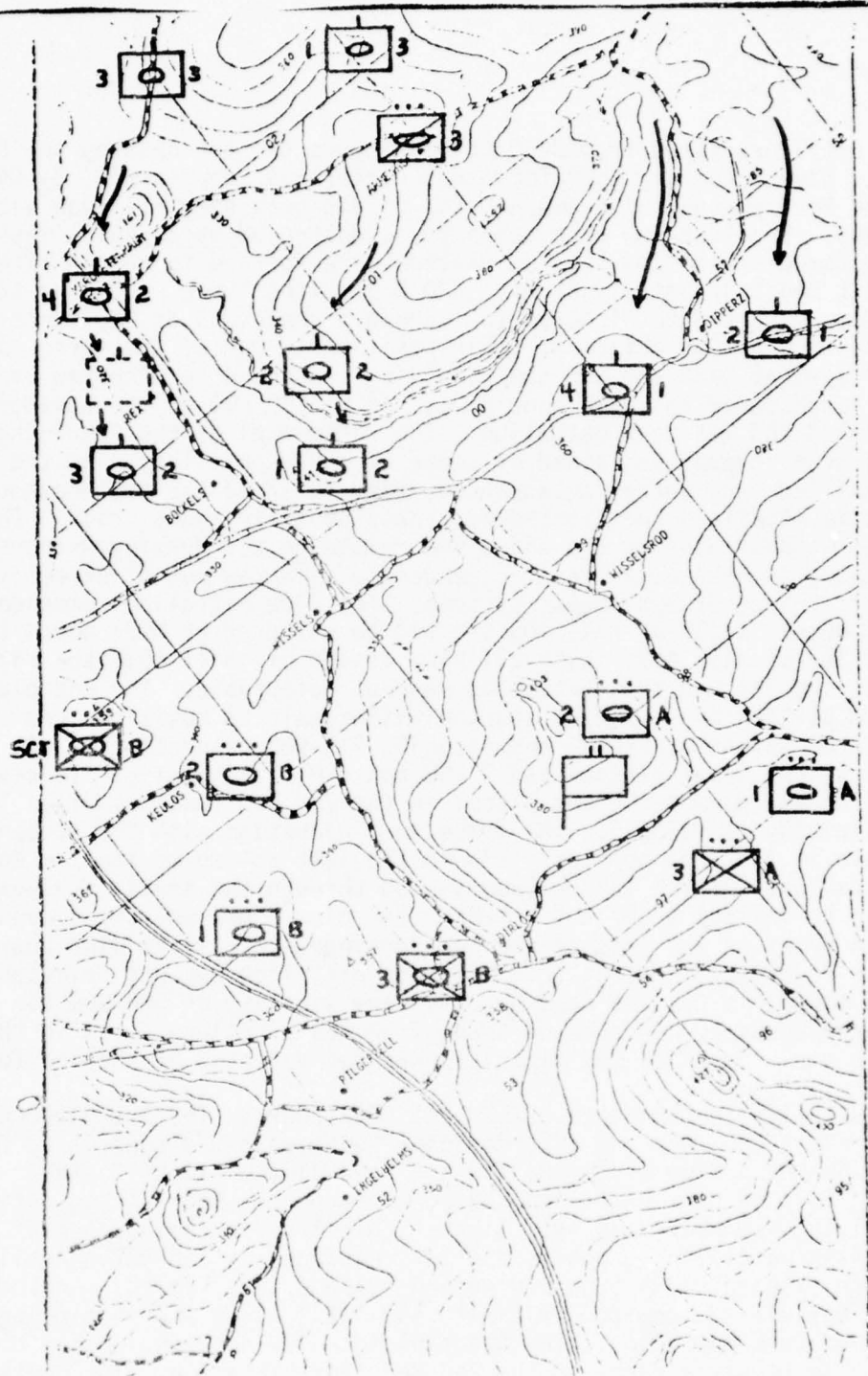


Figure 5. Red and Blue locations as of 0430 hours.

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7. Red artillery fires from 0430 to 0440 hours did not destroy any Blue systems. Blue A company CLGP forward observer was suppressed. By 0430 hours the Mech platoon of A company was in its secondary position vicinity of 550-965. The last TOW of A company was destroyed by a SAGGER missile and only three tanks from the 2nd platoon were forward to return fires of the 1st Red tank battalion. At 0430 hours, the three remaining tanks of A company started to withdraw to secondary positions as Red forces closed to within 1000 meters of their positions. One of the three tanks was destroyed at 0438 and the two remaining continued to withdraw as A company surrendered the high ground east of WISSELSROD to the advancing but depleted Red 1st tank battalion. The withdrawal of the remaining elements of A company was aided by smoke from Red artillery. As the left column 1st Red tank battalion advanced, they observed the emplacement of the Slumine minefield and started to bypass to their right front. This slowed down their advance and aided the remaining withdrawing weapons of A company in obtaining the time needed to withdraw out of effective direct fire range of Red weapon systems. The Blue battalion commander's tank 500 meters south of hill 403 started to withdraw at 0433 hours to the vicinity of hill 427. With all Blue assets off hill 403, the right column of the 2nd Red tank battalion was not detectable. The 2nd platoon and Scout platoon of B company started withdrawals to positions one kilometer northwest of DIRLOS and vicinity 516-988 respectively. At this point, the Scout platoon had 2 TOW and 4 MICV remaining. To cover their withdraw, 81mm smoke was placed on the 2nd Red tank battalion left column vicinity of WISSELS. The smoke in conjunction with the steepness of terrain in the area seriously slowed the left column of the 2nd Red tank battalion. As the left column passed through the smoke, TOW weapons were able to destroy a BMP and a tank. The 81mm smoke was then moved to remain in front of the left column and continued to fall at 0440 hours. Since the right column of the 2nd Red tank battalion was not detectable, a FASCAM minefield was emplaced by artillery vicinity of 530-005 to check their advance. Because of smoke from Red artillery fires in the area, the emplacement of the minefield was not detected by the Red forces.

8. Red artillery began phase 3 (ICM) at 0441 hours. The 1st platoon of B company lost one tank and its remaining tanks were all suppressed from 5 to 10 minutes. Blue A company did not have line of sight to the advancing 1st Red tank battalion due to terrain and their firing activity from 0441 to 0450 hours was very light. To help slow the advance of the 1st Red tank battalion, a road crater was emplaced at 555-977. Artillery fires were also called but no Red weapon systems were killed. Another FASCAM minefield was emplaced vicinity 548-982 to also aid in slowing the 1st Red tank battalion. The Scout platoon TOW section located hill 367 was able to place fires on the 2nd Red tank battalion. To counter this threat, Red on call artillery was placed on hill 367 killing one TOW

and one Dragon. The remaining TOW was moved from hill 367 and attached to the 2nd platoon of B company. This left a total of three TOW systems remaining in the whole battalion. At this point the left flank of the Blue battalion started to close toward PILGERZELL. The right column of the 2nd Red tank battalion struck the FASCAM minefield at 530-005 and lost one tank at 0442 hours. A summary of both Red and Blue losses by cause from 0430 to 0450 hours is at table 3. Red and Blue locations as of 0450 hours is at figure 6.

9. Red artillery from 0451-0500 hours destroyed one MICV from the Mech platoon of A company and one tank from the 2nd platoon of B company. In addition, two Dragons and one MICV were also suppressed in A company. Blue artillery fires on the left column of the 2nd Red tank battalion did not produce any kills. As the 1st Red tank battalion approached WISSELSROD, they stopped their advance and assumed positions east and west of WISSELSROD and prepared to tie down as many Blue systems as possible in supporting the main attack by the remaining elements of the 2nd Red tank battalion and the trailing 3rd Red tank battalion. Fires by A company on the 1st Red tank battalion were very light as they did not want to disclose their prepared positions to the stationary Red weapons. Blue B company was able to engage the lead advancing elements of both columns of the 2d Red tank battalion. However, fires were controlled to disclose only a minimum number of defensive positions. The 2nd platoon of B company was able to kill two lead tanks of the left column of the 2nd Red tank battalion. Artillery fires and CLGP rounds also destroyed Red tanks. To disrupt the advancing left column of the 2nd Red tank battalion, another FASCAM minefield was emplaced vicinity 540-990. At 0458 hours, the 81mm mortars were moved rearward and B company started to experience jamming on its command net.

10. The majority of Red artillery missions from 0500-0510 hours fell on B company. However, only one MICV was destroyed. One tank from A company was also destroyed. Blue A company again fired very little at the stationary 1st Red tank battalion, destroying only one tank. Artillery and CLGP rounds were directed against the left column of the 2nd Red tank battalion destroying one tank and one BMP. By 0505 hours, the left column of the 2nd Red tank battalion, consisting of a company minus, reached hill 403. The remaining TOW systems of the battalion all fired but did not destroy any Red weapons systems. The Scout platoon on the Blue battalion left flank continued to move down the autobahn as the left flank of the battalion was brought closer to PILGERZELL. By 0510 hours, the last CLGP mission available to Blue was fired and the 81mm mortar platoon completed its move. The strength of the Blue companies at this time was as follows: B company had 4 tanks, 6 MICV, and 5 Dragons while A company had 5 tanks, 3 MICV, and 4 Dragons.

Table 3

A summary for both Blue and Red losses by cause from 0430 to 0450 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	6	--	--
TOW	4	1	--
Arty	--	--	--
CLGP	--	--	--
Mine	1	--	--
<u>Total</u>	<u>11</u>	<u>1</u>	<u>0</u>
Total Remaining	62	20	6

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	3	--	--	--
BMP	2	2	--	--
BRDM	--	1	--	--
Arty	1	1	--	1
<u>Total</u>	<u>6</u>	<u>4</u>	<u>0</u>	<u>1</u>
Total Remaining	13	3	11	9

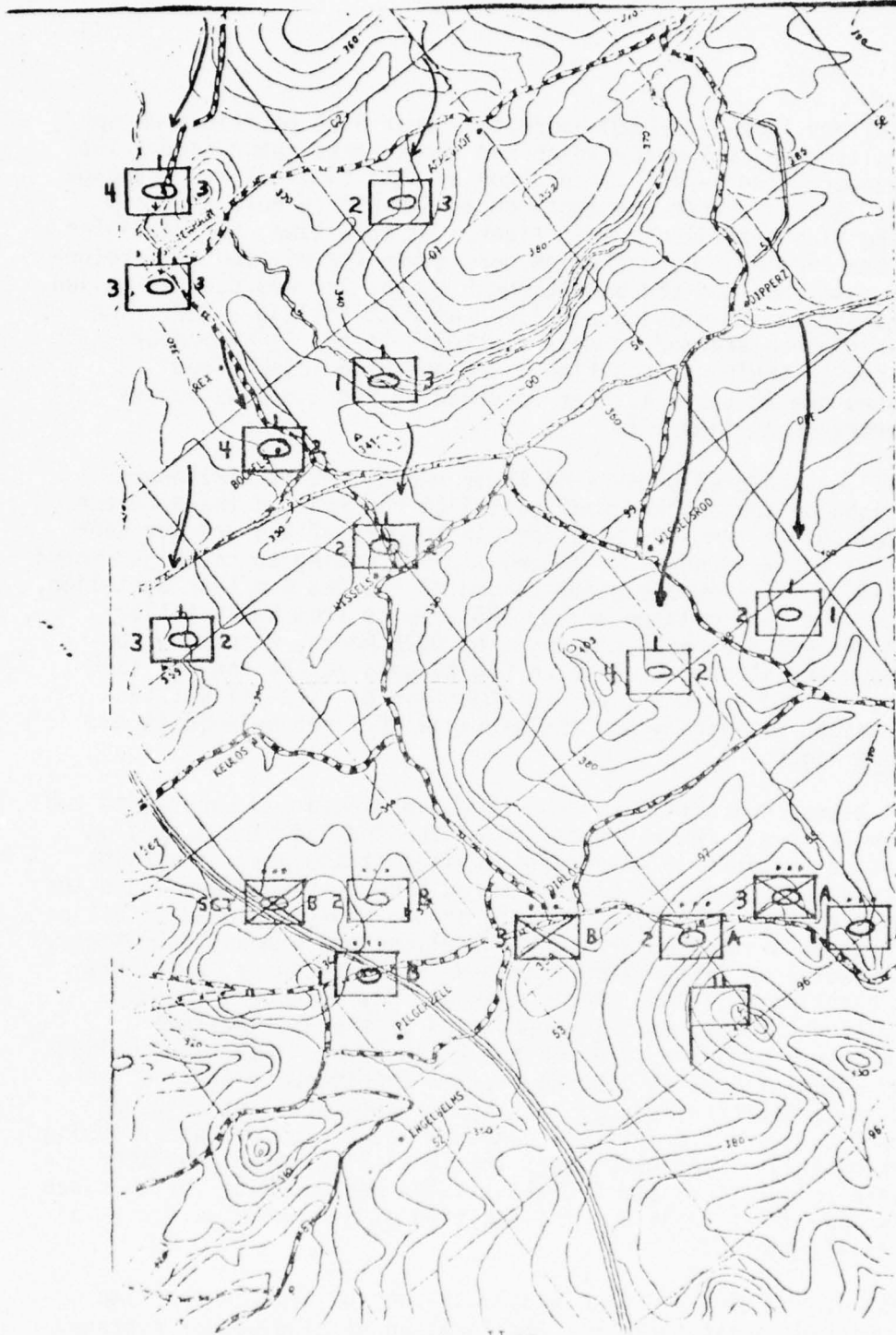


Figure 6. Red and Blue locations as of 0450 hours.

11. Red artillery from 0511-0520 hours fell over Blue positions except for the 1st platoon of B company which had three tanks suppressed. The company commander withdrew the 1st platoon at this time taking advantage of the smoke. A road crater was emplaced at 519-987 to help slow any advance on the Blue battalion's left flank. At this time, the remaining elements of the 2nd Red tank battalion were given the mission of developing blocking positions for the breakthrough by the 3rd Red tank battalion. The last Blue 155-mm ICM mission was fired at 0515 killing a BMP. The 107-mm mortar platoon started to move southwest as the 81-mm mortar platoon was now in their new position. Red and Blue losses from 0450-0520 hours are at table 4. The location of Red and Blue forces as of 0520 hours is at figure 7.

12. Red artillery entered phase 4 of their employment at 0521 hours. The right column of the 2nd Red tank battalion now reached the autobahn and was proceeding to blocking positions in support of the 3rd Red tank battalion. All the weapons of B company started moving to the high ground vicinity 527-959. To slow the right column of the 2nd Red tank battalion, a FASCAM minefield was emplaced at 519-985. Smoke from Red artillery also covered the withdraw of B company. By 0528 hours, B company completed its move and started to fire on Red targets as the 2nd Red tank battalion now reached and was clearing objective B. The 1st Red tank battalion remained stationary and the exchange of fires between it and A company were light.

13. At 0531 hours, Red artillery destroyed one Dragon and suppressed two tanks and two Dragons. The right column of the 2nd Red tank battalion assumed positions vicinity 520-980 and remained stationary. The right column of the 3rd Red tank battalion entered KEULOS at 0533 hours and the left column approached hill 403. Because of the badly depleted condition of the left column of the 2nd Red tank battalion, one company from the 3rd Red tank battalion left column remained in the vicinity of 542-980 to occupy a blocking position. Red's plan was now to bypass the Blue resistance with the three remaining companies of the 3rd Red tank battalion to secure crossing sites on the FULDA River. For the remainder of game play which stopped at 0600 hours, Red continued to execute its plan of bypassing Blue resistance. In the exchange of fires between forces after 0540 hours, very little pressure was placed on the bypassing 3rd Red tank battalion. At 0600 hours the total Blue force consisted of seven tanks, eight MICV, and 8 Dragons. The Red and Blue force losses from 0520 to 0600 is at table 5. The position of Red and Blue forces at 0600 hours is at figure 8.

14. The loss of both Red and Blue weapon systems by type in the time frame they occurred is at table 6. The location of Blue weapon systems as they were lost throughout game play is at figure 9. As the game progressed, many more engineer obstacles were emplaced. The complete number and location of obstacles employed is at figure 10.

Table 4

A summary for both Blue and Red losses by cause from 0450 to 0520 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	4	--	--
TOW	1	1	--
Arty	1	1	--
CLGP	3	1	--
Mine	--	--	1
<hr/>			
Total	9	3	1
Total Remaining	53	17	5

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	1	--	--	--
BMP	--	2	1	--
BRDM	1	--	--	--
Arty	2	--	1	--
<hr/>				
Total	4	2	2	0
Total Remaining	9	1	9	9

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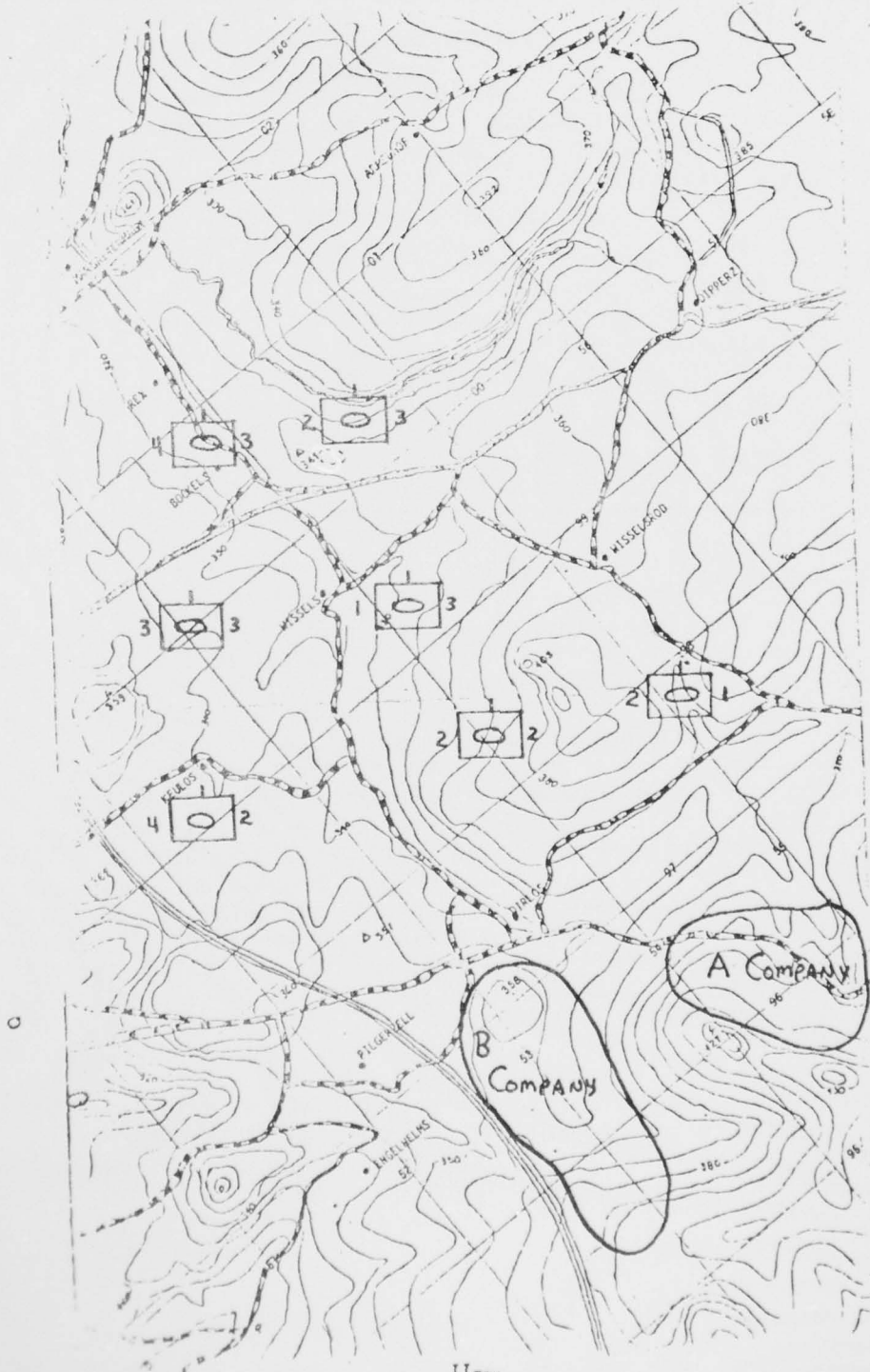


Figure 7. Red and Blue locations as of 0520 hours.

Table 5

A summary of both Blue and Red losses by cause from 0520 to 0600 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	9	--	--
TOW	--	--	--
Arty	--	--	--
CLGP	--	--	--
Mine	1	2	--
Total	10	2	0
Total Remaining	43	15	5

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	--	--	--	--
BMP	--	1	--	--
BRDM	--	--	--	--
Arty	2	--	1	1
Total	2	1	1	1
Total Remaining	7	0	8	8

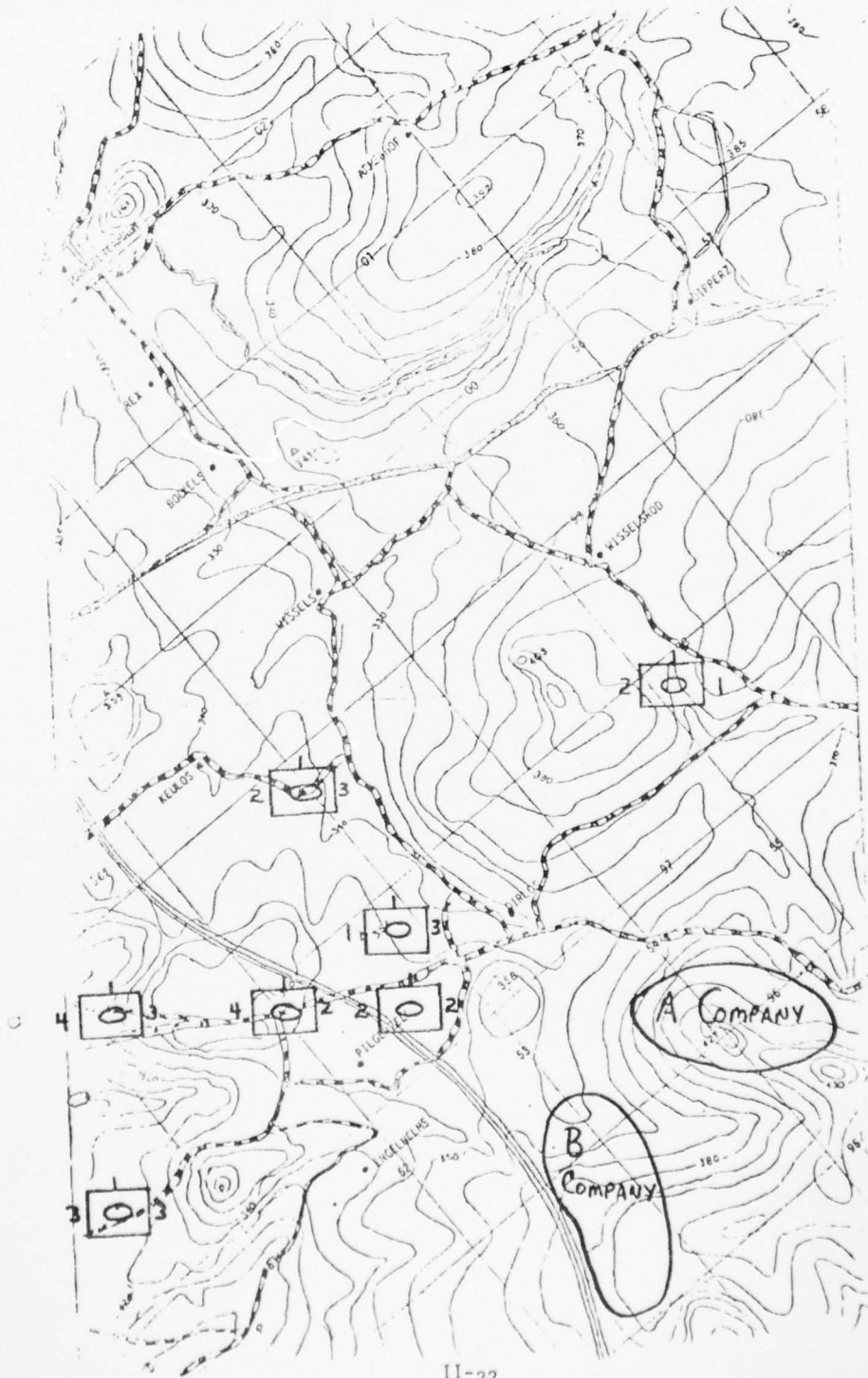


Figure 8. Red and Blue locations as of 0600 hours.

Table 6

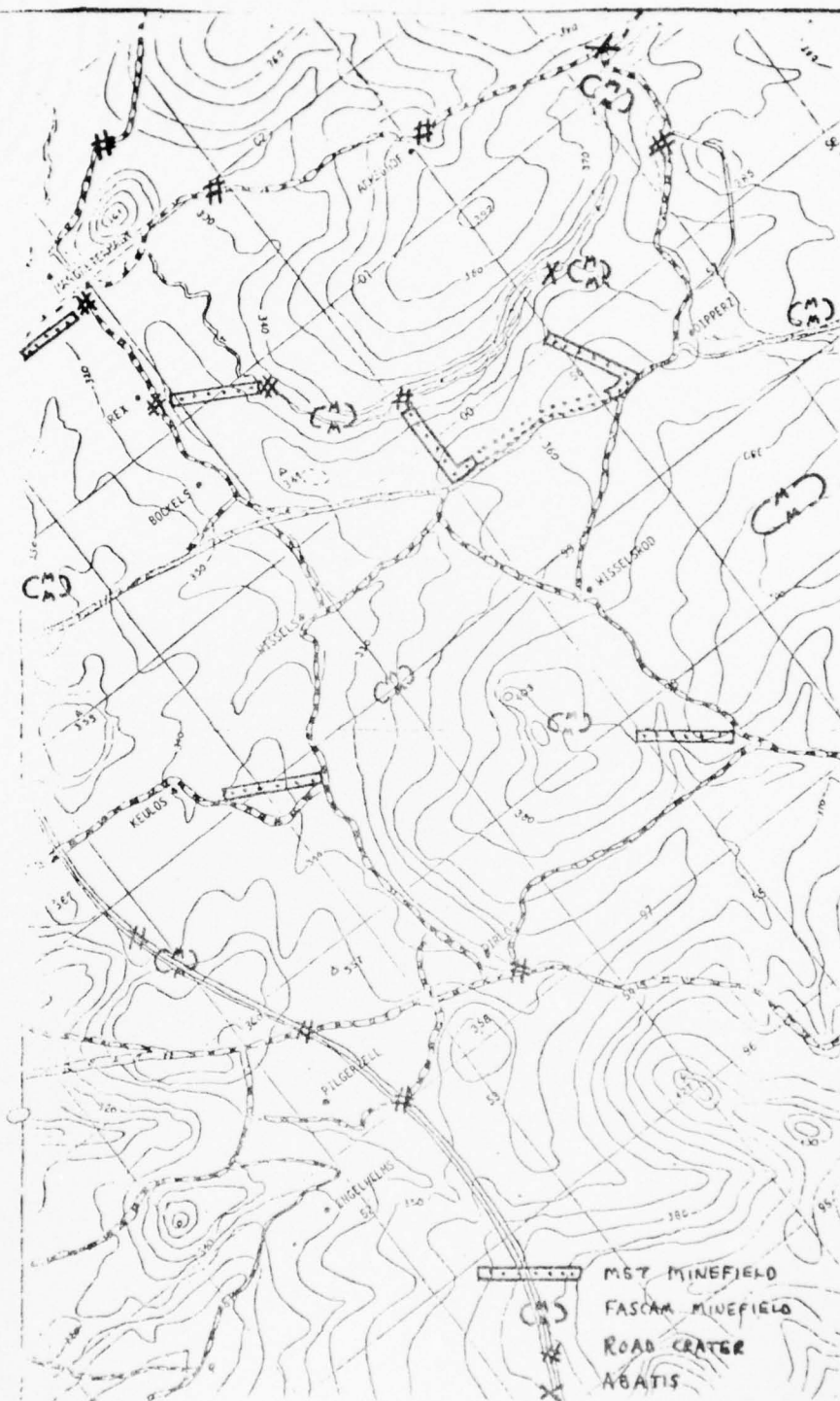
Red and Blue weapon system losses by type in the time frame they occurred are as follows:

	Blue				Red		
	Tank	TOW	MICV	Dragon	Tank	BMP	BRDM
0330-0340	1	--	--	--	--	--	1
0341-0350	2	--	1	1	--	--	--
0351-0400	--	1	--	1	1	1	3
0401-0410	2	--	1	--	2	2	1
0411-0420	1	--	--	--	10	1	--
0421-0430	--	2	--	--	9	8	--
0431-0440	2	3	--	--	7	1	--
0441-0450	4	1	--	1	4	--	--
0451-0500	3	1	1	--	5	1	1
0501-0510	1	--	1	--	4	1	--
0511-0520	--	1	1	--	--	1	--
0521-0530	--	--	--	--	2	1	--
0531-0540	--	1	--	1	4	--	--
0541-0550	2	--	--	--	2	--	--
0551-0600	--	--	--	--	2	1	--
Total Lost	18	10	5	4	52	18	6
Total Survivors	7	0	8	8	43	15	5

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Figure 9. Location of Blue weapon systems lost from 0330 to 0600 hours.



II-25

Figure 10. Blue barrier emplacement as of 0600 hours.

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APPENDIX III  
RUNNING SUMMARY  
CLEAR ALTERNATIVE

Red Force

1. Force Structure. The threat force consisted of one tank regiment composed of three tank battalions and one motorized rifle battalion with the following total number of weapon systems employed (excluding artillery):

- a. 95 T-72 tanks
- b. 33 BMP w/Sagger
- c. 11 BRDM/BRDM-2 w/Sagger

2. Maneuver Units. Cross attachment and reinforcement of the BMP from the motorized rifle battalion resulted in three tank maneuver battalions being formed each reinforced by 10 BMP. All three tank battalions were composed of four companies, including three tank heavy companies each with seven tanks and three BMP, and one company of nine tanks for a total of twelve companies in the regiment. Reconnaissance assets for the regiment included:

- a. One regimental reconnaissance company with three BMP.
- b. Two battalion reconnaissance companies (troops) each with three BRDM/BRDM-2.

3. Field Artillery/Mortars. Artillery/Mortar assets available consisted of the following:

- a. One 122-mm howitzer (towed) battalion (DS)
- b. One 152-mm howitzer (SP) battery (DS)
- c. One 130-mm howitzer battery (GS)
- d. One 122-mm MRL battery (GS)
- e. Six 120-mm Mortars (organic)

4. Red Concept of Operation. The 2nd tank battalion is to conduct the main attack on two axes with two companies in each axis along the avenue

ARMENHOF-MARGRETEHAUN/REX/BOCKELS/WISSELS/DIRLOS/PILGERZELL to seize objectives B and D. (Figure 1). The 1st tank battalion is to conduct a supporting attack on two axis with two companies in each axis along the avenue HILL 385/DIPPERZ/WISSELSROD/HILL 427 to seize objectives A and C. The 3rd tank battalion is to follow the 2nd tank battalion and be prepared to assume the mission of the 2nd tank battalion on order. After these intermediate objectives are secured, the regiment is to continue to advance to secure river crossing sites vicinity of 430-900. In conjunction with this, artillery fires will be phased as follows:

- a. Phase 1 - ICM concentration to obtain maximum coverage and kill on enemy.
- b. Phase 2 - HE concentration to obscure the vision of the enemy until the assault begins.
- c. Phase 3 - ICM concentration to get maximum coverage and kills on the enemy as he is moving to subsequent defensive positions.
- d. Phase 4 - Balanced ICM and HE concentrations to provide obscuration for secondary objective assaults and still get maximum coverage and kills on the enemy.

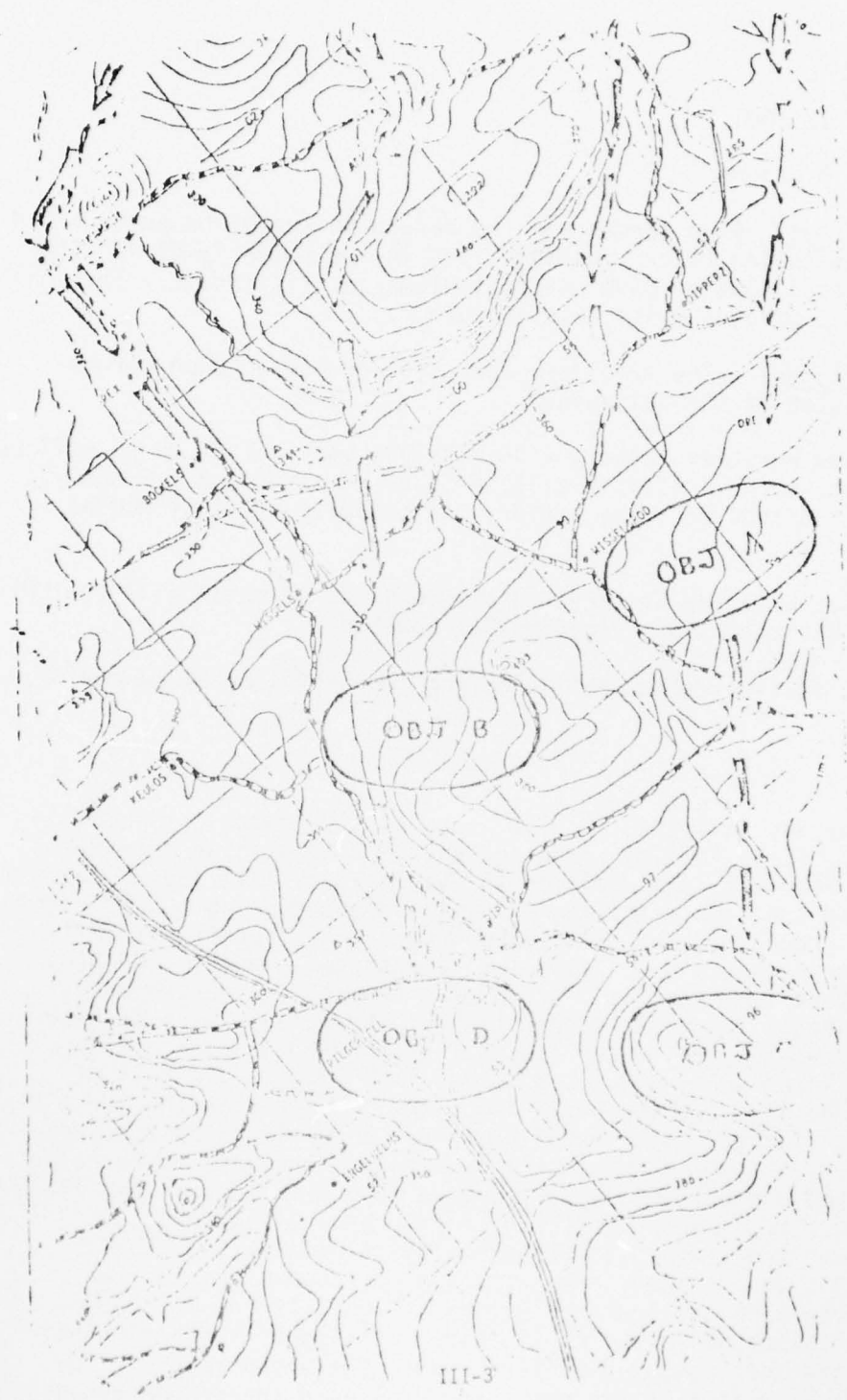
#### Blue Force

1. Force Structure. The Blue force opposing the threat force consisted of four companies composed under the clear alternative organization as follows:

Company A	Company B
3 tank platoons	3 mech platoons
Company C	AT Company
3 tank platoons	3 AT platoons

- a. Each tank platoon was composed of three tanks and each Mech platoon was composed of three MICV/Rifle squads each with one Dragon.
- b. The AT (TOW) platoon was composed of four TOW. The AT company was employed throughout the battalion tank force sector. Each TOW was mounted on the improved TOW vehicle (ITV).
- d. The total number of Blue weapon systems employed (including the headquarters elements), is as follows:

- (1) 25 tanks
- (2) 10 MICV



III-3

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(3) 12 TOW

(4) 9 Dragon

2. Blue Concept. Blue forces were to defend in sector to prevent Red forces from securing river crossing sites in the vicinity of 430-900. The initial positions of Blue weapon systems is at figure 2. The initial positions of Blue units is at figure 3.

3. Blue Artillery. The artillery forces allocated to Blue forces played consisted of the following:

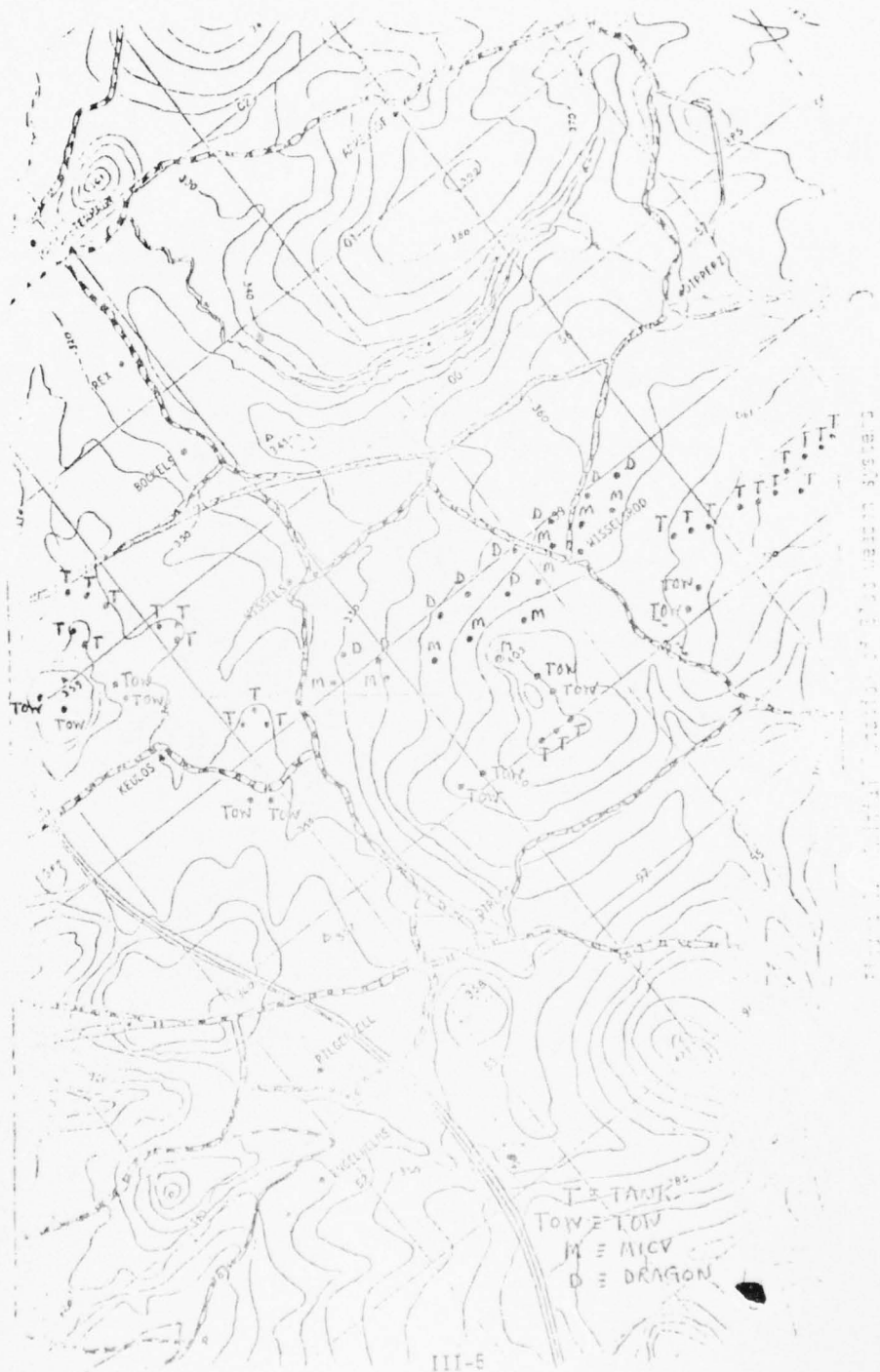
a. 155-mm howitzer battery - 40 missions one-half of which will be ICM and one-half HE. Additionally, 25 CLGP missions and 7 FASCAM missions were allocated. The battery was composed of eight M109A1 howitzers.

b. 203-mm howitzer battery - 3 missions all of which will be ICM. The battery was composed of four M110A1 howitzers.

In addition, missions were available from the battalion 81-mm mortar platoon.

#### Game Play

1. Game play was initiated at 0330 hours by the impact of scheduled Red artillery fires falling along the entire line of Blue defensive positions. Heaviest fires fell in the vicinity of Hill 359 suppressing three TOW and one tank, vicinity of Hill 403 suppressing two TOW, and on the high ground east of WISSELSROD suppressing four tanks. All suppressed weapons could not fire for five to ten minutes. By 0334 hours, one tank from the 2nd platoon of A company was destroyed by artillery fires. The first observation of the threat force by Blue forces occurred as the 1st Red tank battalion reconnaissance troop, composed of three BRDM, attempted to bypass an abatis vicinity of 573-012. (The Blue barrier emplacement as it existed at the start of game play is at figure 4.) Artillery fires were placed on the three BRDM; however, they were successful in evading the mines surrounding the abatis and did not sustain any damage from artillery fires. The 2nd Red tank battalion and the regimental reconnaissance units also had to bypass road craters in the vicinity of 564-015 and 545-025 respectively. The 2nd Red tank battalion reconnaissance unit was composed of three BRDM and led the advance of the left column of the 2nd Red tank battalion while the right column was led by the regimental reconnaissance unit composed of three BMP. The advancing four Red columns, each composed of two companies, followed the reconnaissance units with a one kilometer separation. By 0340 hours the Red reconnaissance elements were located at 571-004, 558-014 and 545-024.



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Figure 1. Blue carrier plan

111-7

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2. Red artillery fires landing from 0341 to 0350 hours destroyed one MICV belonging to the mech company commander located on Hill 403 and one tank belonging to the 1st platoon of C company located vicinity of Hill 359. Two TOW sections (2 TOW each) in close proximity to Hill 359 were severely limited in their ability to observe forward because of the smoke from Red artillery. Another TOW section 300 meters southeast of Hill 403 was also severely limited in its forward observation capability. Company A located east of WISSELSROD was not suppressed as Red artillery fires fell over their positions. A CLGP forward observer located with A company engaged one of the reconnaissance BRDM of the 1st Red tank battalion but failed to destroy it as the BRDM dropped out of sight at the time the round was due to impact. Conventional artillery fires were also called on the 1st Red tank battalion reconnaissance troop and the now observed 1st Red tank battalion right column but did not destroy any weapons. By 0348 hours, the smoke from the Red artillery fires had cleared enough to allow the TOW section located 300 meters southeast of Hill 403 to engage and destroy one of the BRDM reconnaissance vehicles of the 1st Red tank battalion. The Blue battalion commander directed that the primary targets of the TOW systems would be the BRDM and BMP vehicles since they carried Sagger missiles and posed the greatest threat initially. The advance of the 2nd Red tank battalion was effectively masked by Hills 392 and 361. All Red direct fire weapon systems remained out of range of Blue direct fire weapon systems except for the 1st Red tank battalion reconnaissance troop. By 0350 hours, the lead elements of the four advancing Red columns were located at 578-000, 569-007, 558-016, and 545-025.

3. Red artillery fires from 0351 to 0400 hours shifted slightly but did not destroy any Blue weapon systems. Two tanks were suppressed in A company but the weapons systems of C company located vicinity Hill 359 received the greatest concentration of artillery. Two tanks from C company along with two TOW sections of the AT company were suppressed. A TOW section southeast of Hill 403 was also suppressed for 5 minutes. By 0352 hours, the advancing left column of the 1st Red tank battalion was within range of the Blue tanks of A company. Because the number of targets at this time was limited, the platoons of A company engaged one target with all the tanks of the platoon rather than having the platoon engage multiple targets. By 0400 hours, A company destroyed three Red tanks. The CLGP observer located with A company also engaged and destroyed one tank and one BMP. These losses reduced the strength of the lead company of the 1st Red tank battalion left column to 50 percent. The right column of the 1st Red tank battalion was not engaged with direct fires but a FASCAM minefield was emplaced by artillery at 0454 hours vicinity of 567-002 to slow its advance. By 0459 hours the right column had lost its lead tank to the FASCAM minefield. The three

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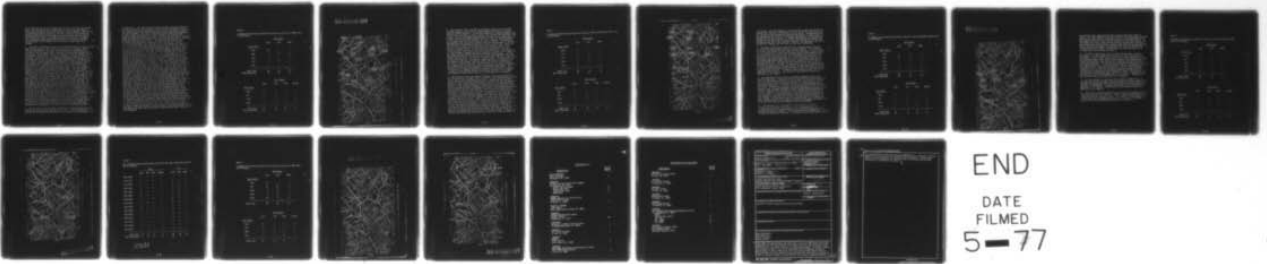
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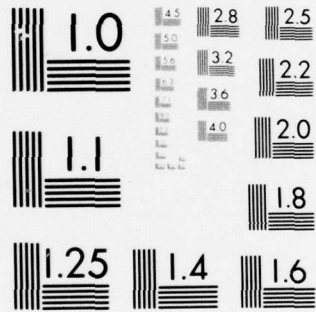
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three BRDM vehicles of the 2nd Red tank battalion were observed at 0454 hours vicinity 550-010 and by 0359 hours all three were destroyed by TOW systems located vicinity Hill 359 and vicinity 528-982. With all its reconnaissance vehicle destroyed, the left column of the 2nd Red tank battalion was forced to turn right and travel further west to utilize the terrain more fully in preventing exposure to direct fire weapons. The regimental reconnaissance BMP vehicles were sighted by the Blue forces located on Hill 403 but were not exposed long enough to be engaged. ○

4. From 0401 to 0410 hours, Red artillery entered phase 2 of their employment and destroyed two MICV from the 3rd platoon of B company and one TOW vicinity 558-981. No other weapon systems were damaged by Red artillery fires but both A and C companies each had two to three tanks suppressed. The remaining TOW of the section located at 558-981 started a movement rearward to the vicinity of 540-964 to assume an overwatch position. As the 1st Red tank battalion advanced, the exchange of direct fires between it and A company increased significantly. By 0410 hours, tanks from A company engaged and destroyed four tanks from the 1st Red tank battalion left column and one of the two remaining BRDM vehicle of the 1st Red tank battalion reconnaissance troop. The 1st Red tank battalion left column also lost one tank at 0409 hours to a FASCAM minefield which was artillery emplaced at 0402 hours. The CLGP forward observer and a TOW section vicinity of Hill 403 also engaged the 1st Red tank battalion left column destroying two BMP and one tank. The strength of the 1st Red tank left column, which started out as two companies, was now reduced to five tanks and four BMP. The right column of the 1st Red tank battalion was better concealed by terrain and only lost one BMP to TOW fires and one tank was lost in a minefield vicinity 563-998. The last BRDM of the 1st Red tank battalion reconnaissance troop was also destroyed by the TOW weapons located southeast of Hill 403. The left column of the 2nd Red tank battalion still remained masked by terrain and did not receive any Blue fires. By 0405 hours, the regimental reconnaissance BMP vehicles were within range and line of sight of the TOW section located vicinity 539-980 and the CLGP forward observer attached to B company located on Hill 403. Within 5 minutes, two of the three BMP were destroyed (both by CLGP rounds). The TOW section did not destroy any of the reconnaissance BMP vehicles but their fires did produce a signature which enabled the remaining BMP to engage and destroy one of the TOW weapons. At 0410 hours, the remaining MICV of the 3rd platoon B company and the 2nd platoon B company started to move to their secondary positions 500 meters east of DIRLOS. All other Blue units remained in position. ○

5. Red artillery fires from 0411 to 0420 hours did not destroy any Blue weapons and very few were suppressed by smoke. A TOW vicinity of Hill 359 engaged and destroyed the last BMP of the regimental reconnaissance troop

at 0411 hours. The remaining TOW from the section located southeast of Hill 403 started to move rearward to the vicinity of 540-964 to assume an overwatch posture in conjunction with the other TOW weapon enroute to the same location. The fires of the Blue forces remained concentrated on the 1st Red tank battalion as both columns of the 2nd Red tank battalion remained masked by terrain. From 0411 to 0415 hours, A company tanks destroyed four Red tanks from the 1st Red tank battalion, three of which were from the right column. The CLGP forward observer with A company also engaged and destroyed 2 BMP from the left column. Conventional artillery fires did not destroy any weapons and TOW fires were nonexistent since the remaining elements of the two TOW sections located east of Hill 403 were both moving rearward. To channel and slow the Red forces of the 1st Red tank battalion, FASCAM minefields were emplaced by artillery to the right (vicinity 558-002) and in front (vicinity 559-989) of the right column. The lead company of the right column of the 1st Red tank battalion was now stopped because of the losses it sustained and was waiting to join forces with the trailing company of the column as it advanced forward. A summary of Red and Blue losses as of 0415 hours is at table 1. The locations of Red and Blue forces as of 0415 hours is at figure 5. The four advancing columns were at the following strengths as of 0415 hours: the 1st Red tank battalion left column had five tanks and one BMP left and the right column had ten tanks and two BMP left while the 2nd Red tank battalion left column had fourteen tanks and six BMP left and the right column had sixteen tanks and four BMP left. The four Blue companies were at the following strengths: A company had seven tanks, B company had seven MICV and nine Dragons, C company had nine tanks, and the AT company had ten TOW. The three remaining Blue tanks were in the battalion headquarters. At 0416 hours the company commander of A company consolidated the remaining elements of the 1st and 2nd platoons into the 1st platoon. The 1st platoon of B company also started to withdraw to secondary positions at this time. Since line of sight to the 2nd Red tank battalion was restricted by terrain, the Blue battalion commander directed that a Slumine minefield be emplaced to the front of the Red forces in the vicinity of REX. Due to losses, the 1st platoon of A company started to withdraw to the vicinity of Hill 427 to occupy secondary positions. The Third platoon of A company remained in position to cover the withdrawal of the 1st platoon of A company and the 1st platoon of B company. In conjunction with the withdrawal, 81mm smoke was placed forward of the 1st Red tank battalion right column and at 0420 hours the 3rd platoon of A company joined the withdrawal. All Blue elements were now moving except C company and the TOW sections west of Hill 403 who now had line of sight to the lead elements of both columns of the 2nd Red tank battalion. TOW weapons and CLGP rounds destroyed two BMP and one tank in the 2nd Red tank battalion.

Table 1

A summary of both Blue and Red force losses by cause as of 0415 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	12	--	1
TOW	3	3	5
Arty	--	--	--
CLGP	2	6	--
Mine	3	--	--
<hr/>			
Total Lost	20	9	6
Total Remaining	75	24	5

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	3	--	--	--
BMP	1	1	--	--
BRDM	--	--	--	--
Arty	2	1	3	--
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Total Lost	6	2	3	--
Total Remaining	19	10	7	9

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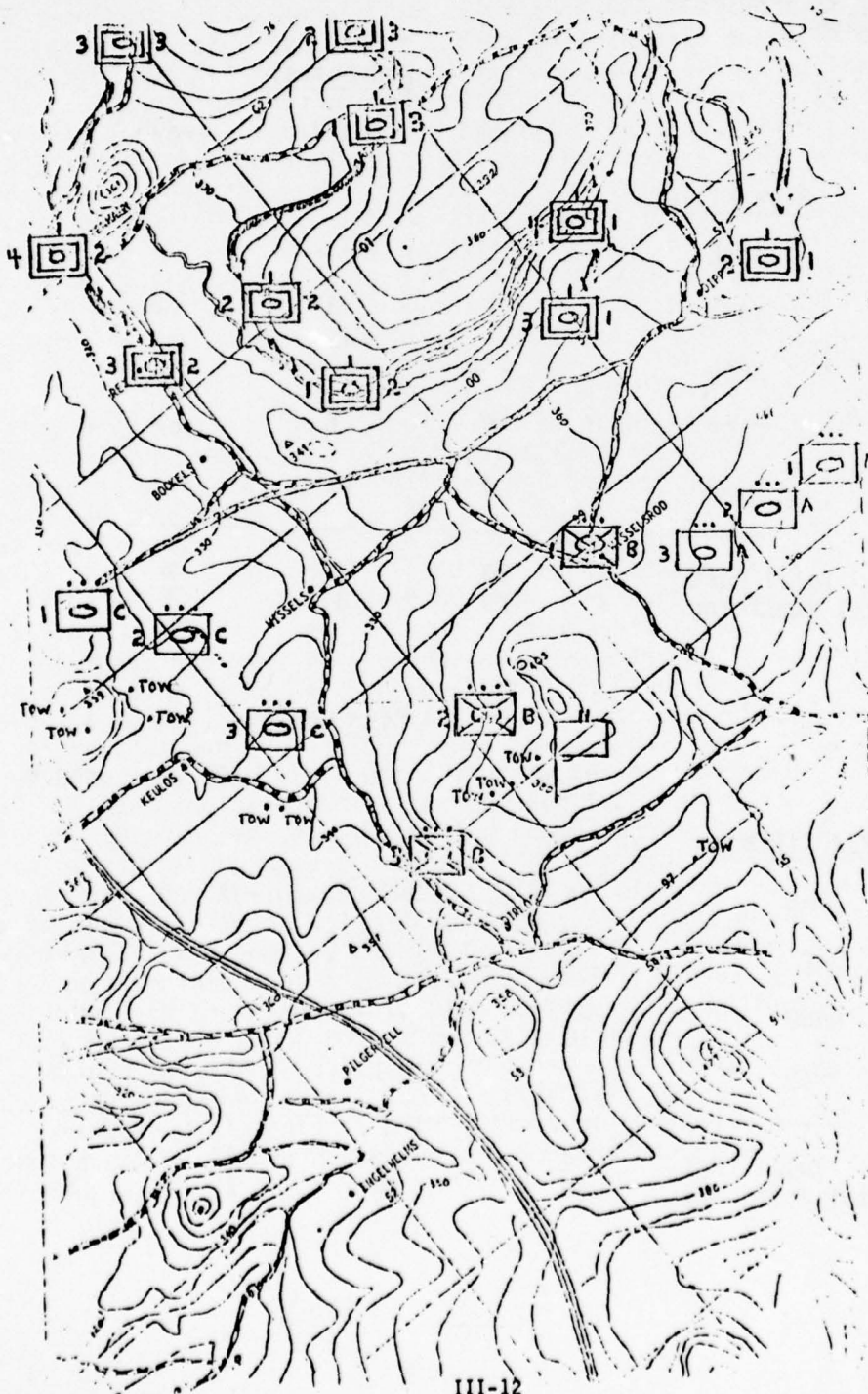


Figure 5. Red and Blue locations as of 0415 hours

6. Red artillery fires from 0421 to 0430 hours again did not destroy any Blue weapons as most of the rounds landed to the rear of the withdrawing A and B companies. As the 3rd platoon of A company withdrew, two of its tanks were lost to direct fires of the 1st Red tank battalion right column. The two TOW weapons withdrawing in advance of A company were now in position on the eastern slope of Hill 427. The 1st and 2nd platoons of B company were also in position just west of DIRLOS. The battalion headquarters tanks started to withdraw with the 3rd platoon of A company and continued to withdraw to positions vicinity of Hill 427. After the loss of the two tanks of the 3rd platoon of A company, direct fires between A company and the 1st Red tank battalion ceased as terrain restricted the visibility of the 1st Red tank battalion. The exchange of fires between C company and the TOW sections vicinity of Hill 359 with the advancing 2nd Red tank battalion increased significantly. The 2nd Red tank battalion left column lost four tanks and 2 BMP while the right column lost two tanks. No tanks in C company were lost but two TOW weapons vicinity Hill 359 were destroyed by Sagger missiles. At 0425 hours the two remaining TOW weapons vicinity of Hill 359 started to withdraw to positions vicinity of Hill 367. By 0425 hours the 1st and 2nd platoons of C company also started to withdraw to secondary positions as the right column of the 2nd Red tank battalion closed within 1000 meters. The 3rd platoon of C company remained in position to cover their withdrawal. A summary of Red and Blue losses from 0415 to 0430 hours is at table 2. The location of Red and Blue forces as of 0430 hours is at figure 6.

7. Red artillery fires from 0430 to 0440 hours destroyed two MICV from the 2nd platoon of B company vicinity 534-974. Other artillery fires fell to the rear of the withdrawing Blue forces. Smoke from Red artillery along with the 81-mm smoke being placed to the front of the 2nd Red tank battalion right column aided in providing cover to the withdrawing Blue forces. As the remaining elements of the 1st Red tank battalion reached the high ground vicinity of 550-980 and 558-977, they stopped awaiting the advance of the 2nd Red tank battalion and trailing 3rd tank battalion. The depleted condition of the 1st Red tank battalion was also a major consideration in stopping their advance. By 0440 hours, the remaining tanks of A company and the battalion headquarters tanks had assumed their secondary positions. For the remainder of game play, the 1st Red tank battalion ceased to advance. Their main mission was to tie down as many Blue weapon systems as possible in support of the main attack by the 2nd and 3rd Red tank battalions. The 3rd platoon of C company joined the rest of the company and started to withdraw at 0435 hours as the TOW sections vicinity of 528-982 and 540-980 provided cover. The TOW weapons were able to destroy two tanks and one BMP of the left column of the 2nd Red tank battalion and four tanks in the right column. These losses reduced the 2nd Red tank battalion right column to a total of eight tanks.

Table 2

A summary of both Blue and Red force losses by cause from 0415 to 0430 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	3	--	--
TOW	6	2	--
Arty	--	1	--
CLGP	1	1	--
Mine	2	--	1
<b>Total Lost</b>	12	4	1
<b>Total Remaining</b>	63	20	4

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	3	--	--	--
BMP	--	1	--	--
BRDM	--	1	--	--
Arty	--	--	--	--
<b>Total Lost</b>	3	2	--	--
<b>Total Remaining</b>	16	8	7	9

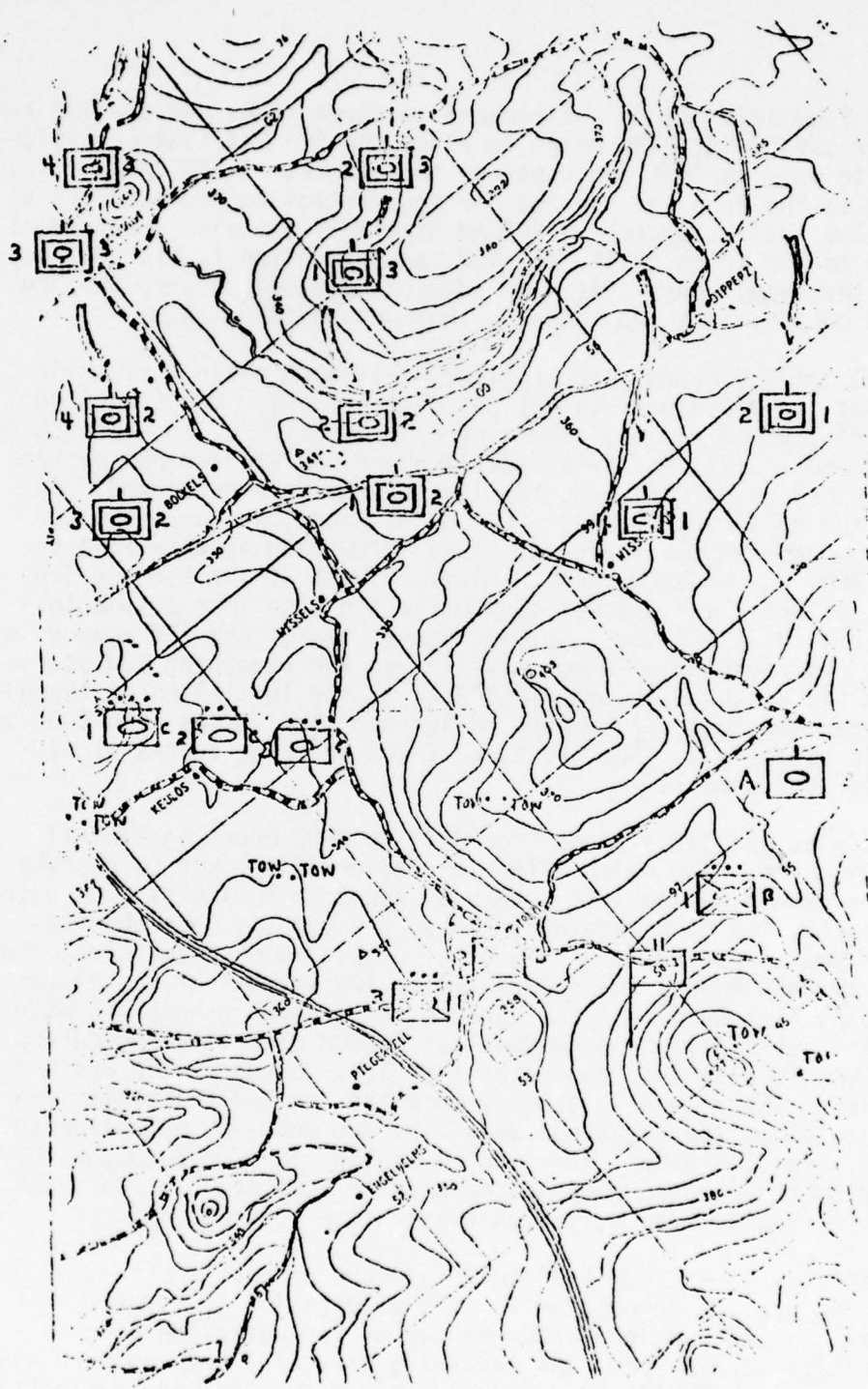


Figure 5. Situation at 0430 hours

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and two BMP. The left column was reduced to three tanks and one BMP and stopped their advance at 0438 hours to allow the 3rd Red tank battalion left column to pass through and continue the attack. A FASCAM minefield was emplaced to the front of the 2nd Red tank battalion right column at 524-997 to slow their advance. A FASCAM minefield was also emplaced at 558-979 just to the front of the 1st Red tank battalion to disrupt their movement in the event they started to advance. By 0440 hours, the 3rd platoon of C company lost two tanks as they were withdrawing.

8. From 0440 to 0450 hours, Red artillery initiated phase 3 of their employment but again did not destroy any Blue weapons. The scheduled artillery fires by Red all fell short of Blue locations. In the exchange of fires between the 1st Red tank battalion and the Blue weapon systems on the eastern slope of Hill 427, two TOW weapons were destroyed. By 0442 hours, the remaining weapons of C company and TOW weapons of the AT company had assumed their new positions. TOW weapons were able to destroy two BMP and two BRDM from the left columns of the 2nd and 3rd Red tank battalions. The 3rd Red tank battalion also lost a tank to a minefield vicinity of 542-008. By 0448 hours, one of the TOW weapons on Hill 367 was destroyed by a Sagger missile and the remaining TOW started to move down the autobahn toward PILGERZELL as the left flank of the Blue battalion began to close. A summary of Red and Blue losses from 0430 to 0450 hours is at table 3. The location of Red and Blue forces as of 0450 hours is at figure 7.

9. Red scheduled artillery fires from 0451 to 0500 hours again fell short of Blue units. The major effect of Red artillery was to obscure the vision of the remaining tanks of C company for 3 to 5 minutes. Despite this suppression, the five remaining tanks of C company were able to destroy four Red tanks. Red tanks were also lost to minefields and Blue artillery. By 0454 hours, the two remaining TOW weapons of the AT company started to pass through PILGERZELL enroute to the high ground vicinity of 520-957. Blue artillery emplaced the last FASCAM minefield 200 meters north of KEULOS to slow the advance of the right column of the 3rd Red tank battalion. The remaining company from the 2nd Red tank battalion now stopped to allow the right column of the 3rd Red tank battalion to pass through. By 0500 hours, the five remaining tanks of C company had been reduced to three and C company prepared to move down the autobahn and bring the left flank of the battalion closer to PILGERZELL.

10. Red artillery fires from 0501 to 0510 hours did not destroy any Blue weapons but did provide some cover for the withdrawing tanks of C company. By 0503 hours the two remaining TOW weapons of the battalion were in position vicinity of 529-955. The remaining MICV of B company were also in position vicinity of 523-962. The advance of the 3rd Red tank battalion

Table 3

A summary of both Blue and Red force losses by cause from 0430 to 0450 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	1	--	--
TOW	12	6	--
Arty	--	--	--
CLGP	--	1	--
Mine	2	--	1
<b>Total Lost</b>	<b>15</b>	<b>7</b>	<b>1</b>
<b>Total Remaining</b>	<b>48</b>	<b>13</b>	<b>3</b>

	<u>Blue Losses</u>			
	Tank	TOW	NICV	Dragon
<u>Red Killer</u>				
Tank	2	1	--	--
BMP	--	3	--	--
BRDM	--	2	--	--
Arty	--	--	2	--
<b>Total Lost</b>	<b>2</b>	<b>6</b>	<b>2</b>	<b>--</b>
<b>Total Remaining</b>	<b>14</b>	<b>2</b>	<b>5</b>	<b>9</b>

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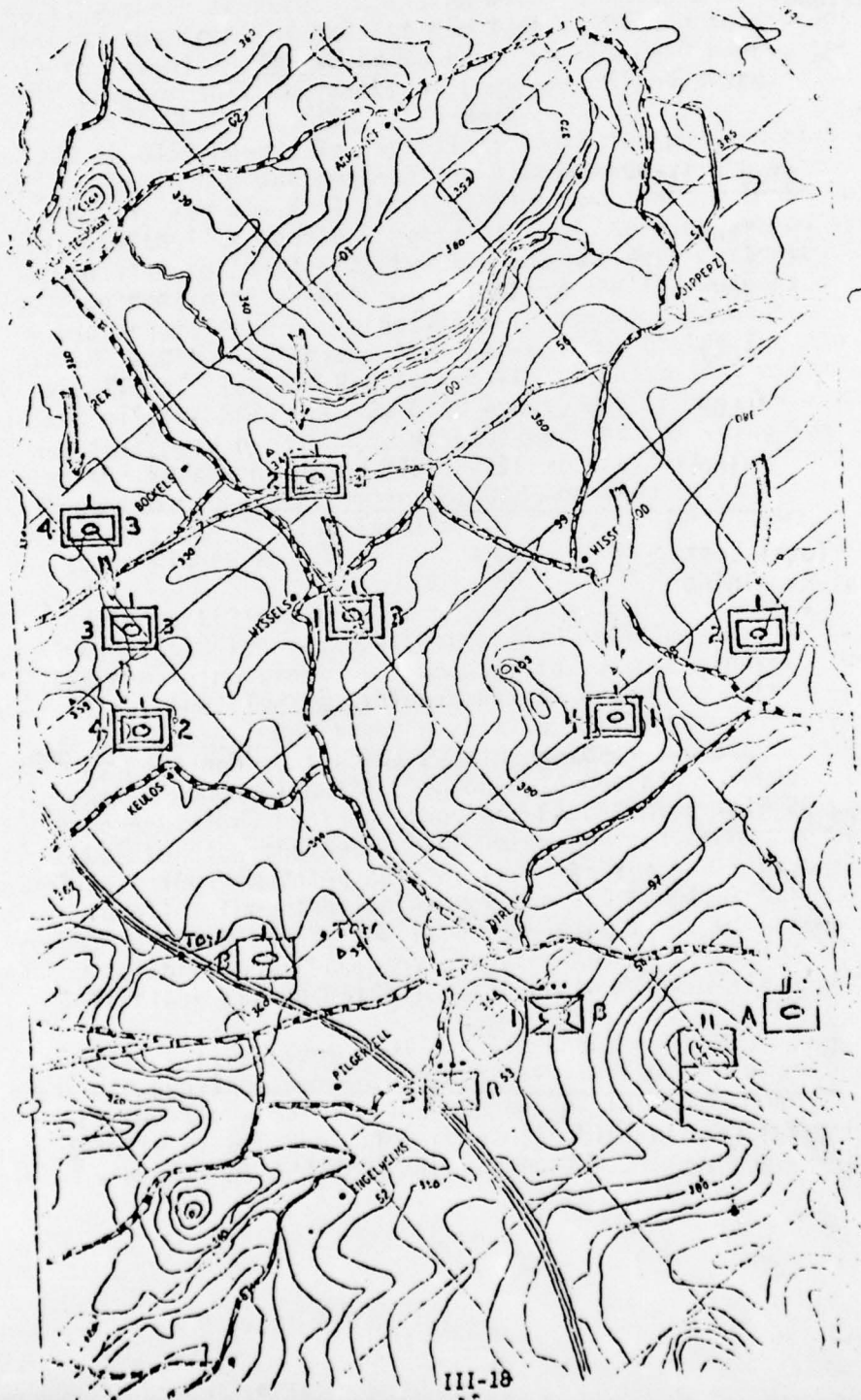


Figure 7. Old and New locations as of 1950 hours. 0

was slowed as they approached the Blue emplaced minefields south of KEULOS. The lead company of the left column of the 3rd Red tank battalion maneuvered to the vicinity of 540-980 to set up a blocking position for the company following it and the two companies of the right column. The only Blue direct fires other than the periodic exchange of fires from the 1st Red tank battalion and A company, came from the two remaining TOW weapons as they each engaged and destroyed one tank from the 3rd Red tank battalion left column. By 0510 hours the remaining tanks of the C company had passed through PILGERZELL.

11. From 0511 to 0520 hours, Red artillery entered phase 4 of their employment. All Blue weapon systems were now in position waiting for Red weapons to come within range, except for the TOW systems who were not restricted by range. Blue artillery was placed on the company from the 3rd Red tank battalion that had set up a blocking position and three tanks were destroyed. The last mission available from the 8 inch battery was fired at 0512 hours. The CLGP forward observers engaged and destroyed three BMP vehicles from 0512 to 0520 hours. As the three remaining companies of the 3rd Red tank battalion attempted to bypass the Blue resistance by following the route KEULOS/Hill 367/Hill 340 two tanks were destroyed by minefields and their advance was slowed. A summary of Red and Blue losses from 0450 to 0520 hours is at table 4. The location of Red and Blue forces as of 0520 hours is at figure 8.

12. For the remainder of game play which stopped at 0600 hours, Red continued to execute its plan of bypassing Blue resistance. Much of the movement of the bypassing Red force was masked by the hill one kilometer northwest of ENGELHELMS. A summary Red and Blue losses from 0520 to 0600 hours is at table 5. The location of Red and Blue forces as of 0600 hours is at figure 9.

13. The losses of both Red and Blue weapons systems by type in the time frame they occurred is at table 6. Table 7 summarizes both Red and Blue losses by cause for the entire game. The location of Blue weapon systems as they were lost throughout game play is at figure 10. The complete number and location of obstacles employed is at figure 11.

Table 4

A summary of both Blue and Red force losses by cause from 0450 to 0520 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	5	--	--
TOW	2	3	--
Arty	3	--	--
CLGP	2	1	1
Mine	8	1	--
<hr/>			
Total Lost	20	5	1
Total Remaining	28	8	2

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	2	--	--	--
BMP	--	--	--	--
BRDM	--	--	--	--
Arty	--	--	--	--
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Total Lost	2	--	--	--
Total Remaining	12	2	5	9

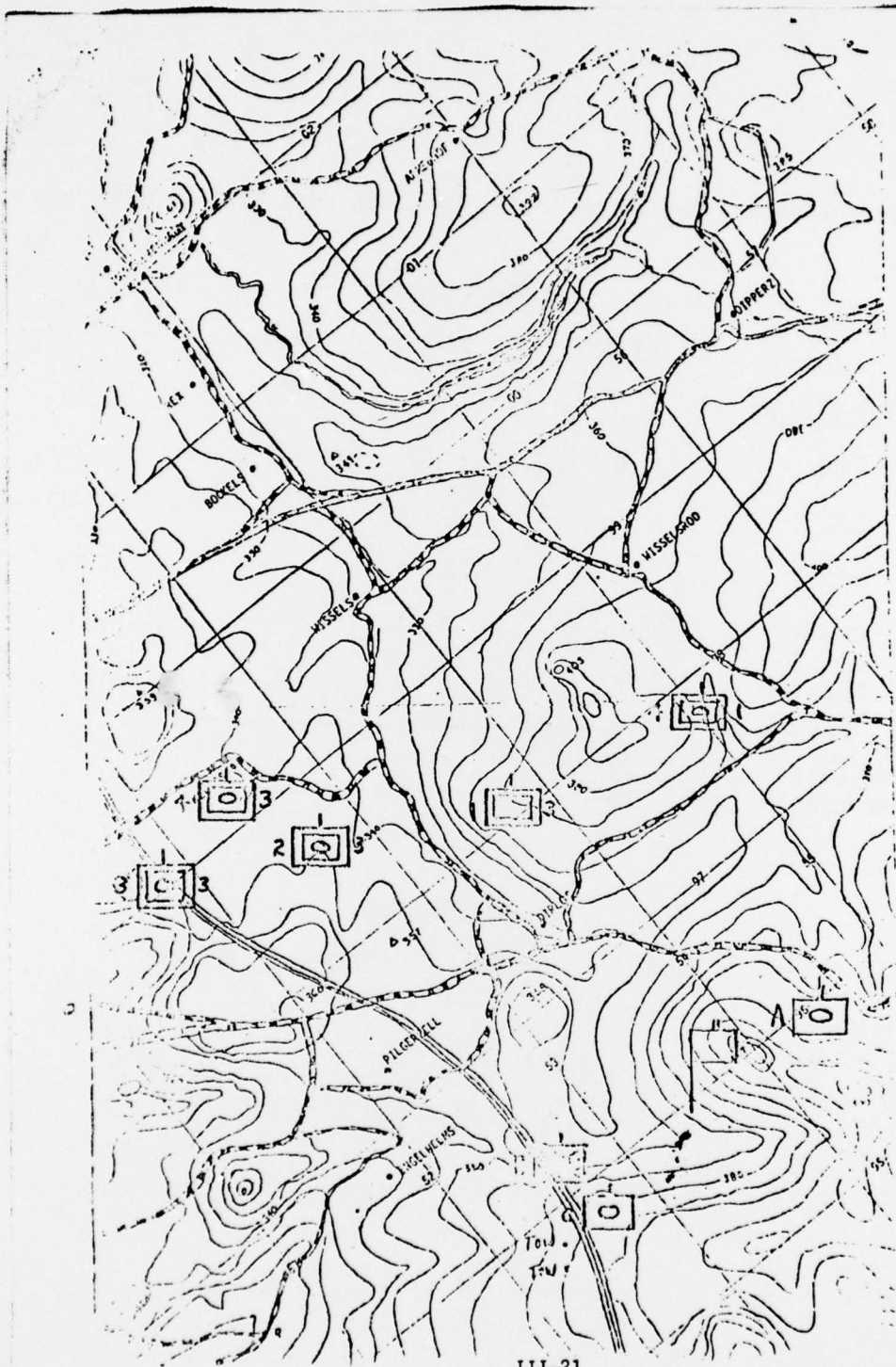


Figure 3. Red and Blue locations as of 0520 hours.

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Table 5

A summary of both Blue and Red force losses by cause from 0520 to 0600 hours is as follows:

	<u>Red Losses</u>		
	Tank	BNP	BRDM
<u>Blue Killer</u>			
Tank	6	--	--
TOW	--	--	--
Arty	2	2	--
CLGP	--	2	--
Mine	5	1	2
<b>Total Lost</b>	<b>13</b>	<b>5</b>	<b>2</b>
<b>Total Remaining</b>	<b>15</b>	<b>3</b>	<b>0</b>

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	3	--	--	1
BNP	--	--	--	--
BRDM	--	--	--	--
Arty	1	1	--	--
<b>Total Lost</b>	<b>4</b>	<b>1</b>	<b>--</b>	<b>1</b>
<b>Total Remaining</b>	<b>8</b>	<b>1</b>	<b>5</b>	<b>8</b>

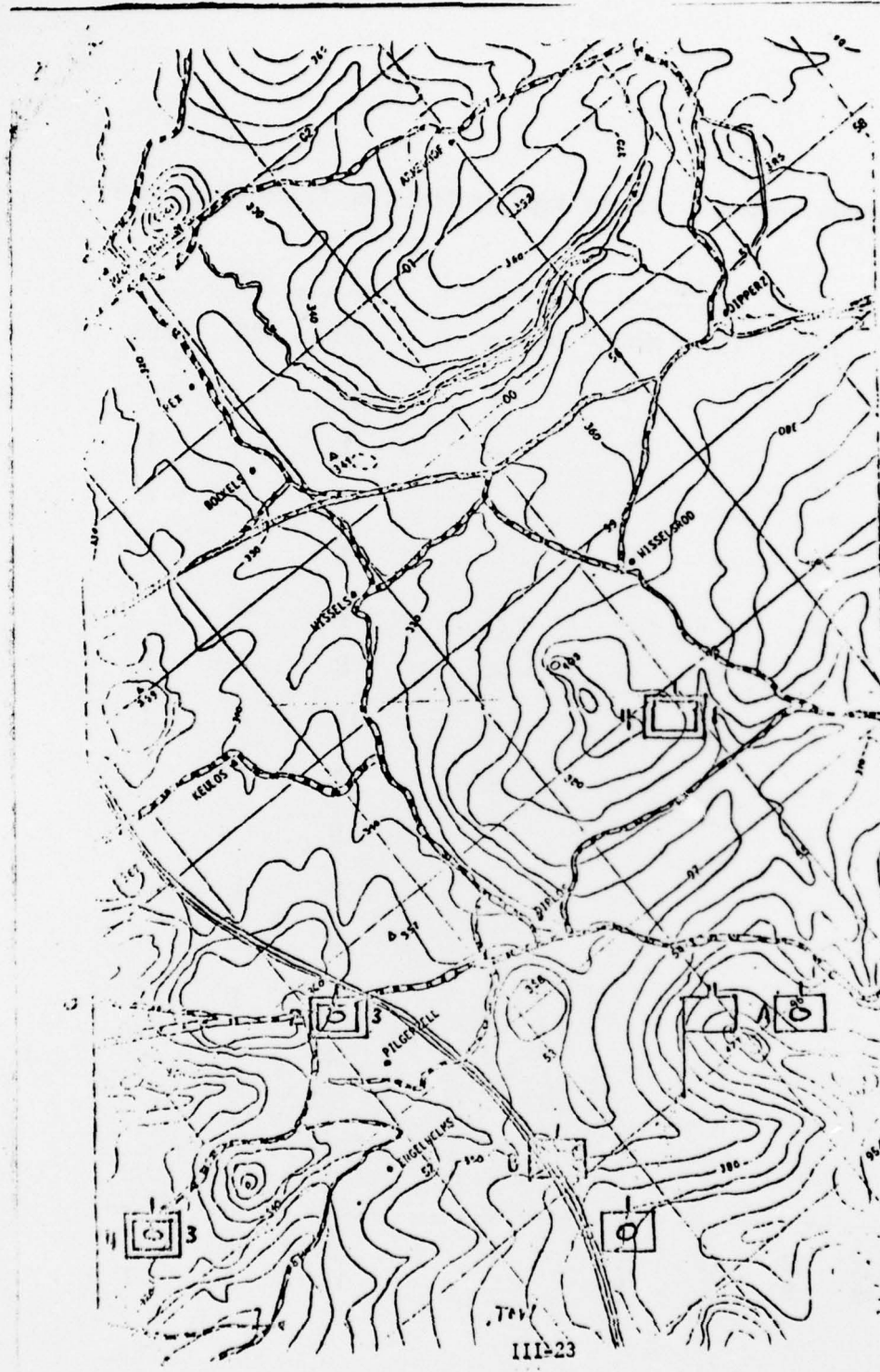


Figure 2. Road and Clue Locations as of 0600 hours.

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Table 6

Red and Blue weapon system losses by type in the time frame they occurred are as follows:

	Blue				Red		
	Tank	TOW	MICV	Dragon	Tank	BMP	BRDM
0330-0340	1	--	--	--	--	--	--
0341-0350	1	--	1	--	1	--	1
0351-0400	--	--	--	--	7	1	3
0401-0410	1	2	2	--	9	6	2
0411-0420	3	--	--	--	7	4	--
0421-0430	3	2	--	--	8	2	1
0431-0440	2	--	2	--	13	4	1
0441-0450	--	6	--	--	2	3	--
0451-0500	2	--	--	--	9	--	--
0501-0510	--	--	--	--	2	1	--
0511-0520	--	--	--	--	9	4	1
0521-0530	--	--	--	--	3	1	2
0531-0540	--	--	--	--	4	2	--
0541-0550	3	--	--	--	1	1	--
0551-0600	1	1	--	1	5	1	--
Total Lost	17	11	5	1	80	30	11
Total Survivors	8	1	5	8	15	3	0

*34 blue lost  
121 red lost*

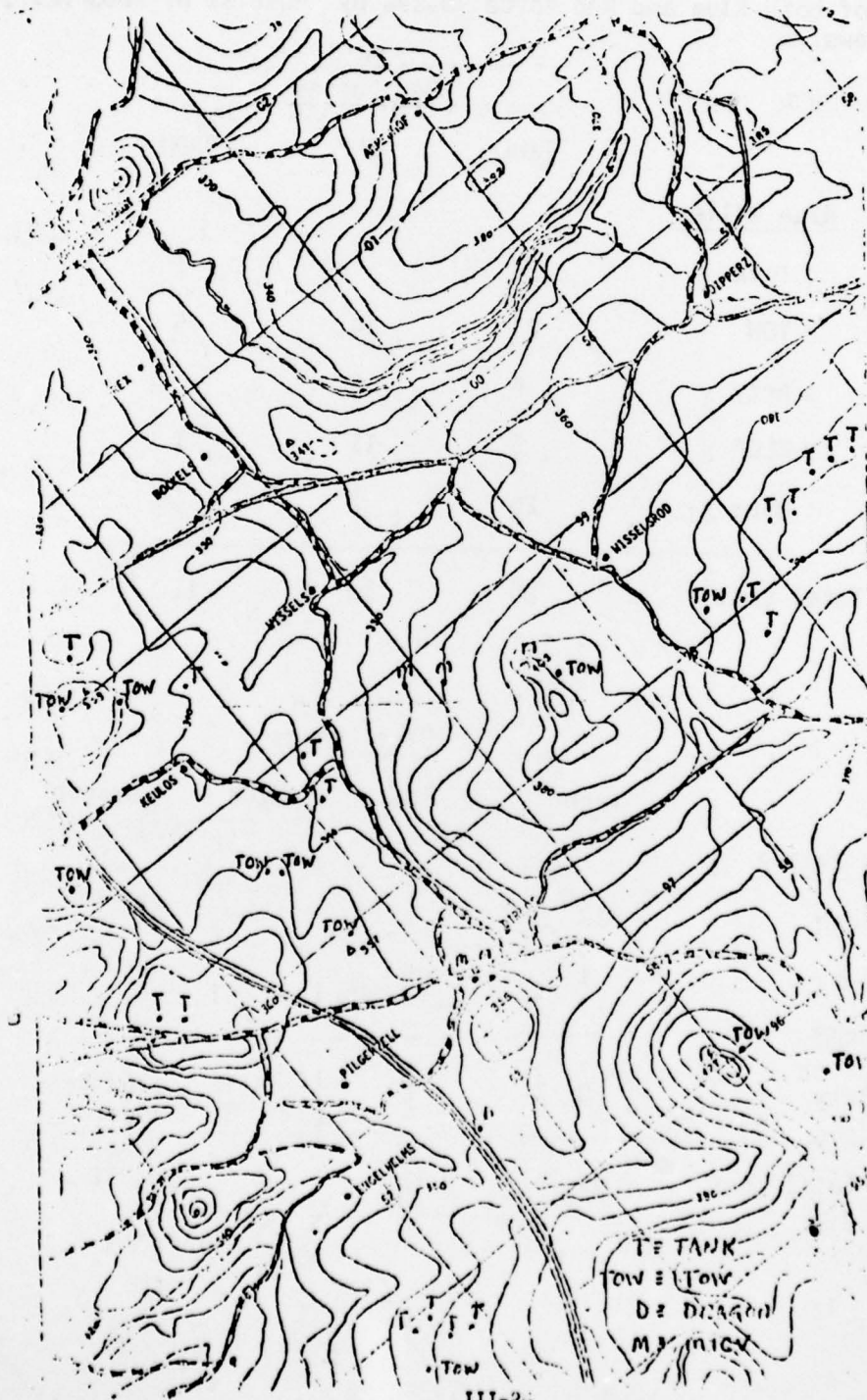
Table 7

A summary of both Blue and Red force losses by cause as of 0600 hours is as follows:

	<u>Red Losses</u>		
	Tank	BMP	BRDM
<u>Blue Killer</u>			
Tank	27	- -	1
TOW	23	14	5
Arty	5	3	- -
CLGP	5	11	1
Mine	20	2	4
<b>Total Lost</b>	<b>80</b>	<b>30</b>	<b>11</b>

	<u>Blue Losses</u>			
	Tank	TOW	MICV	Dragon
<u>Red Killer</u>				
Tank	13	1	- -	1
BMP	1	5	- -	- -
BRDM	- -	3	- -	- -
Arty	3	2	5	- -
<b>Total Lost</b>	<b>17</b>	<b>11</b>	<b>5</b>	<b>1</b>

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Map 10. Location of the weapon systems lost from 0330 to 0600 hours.

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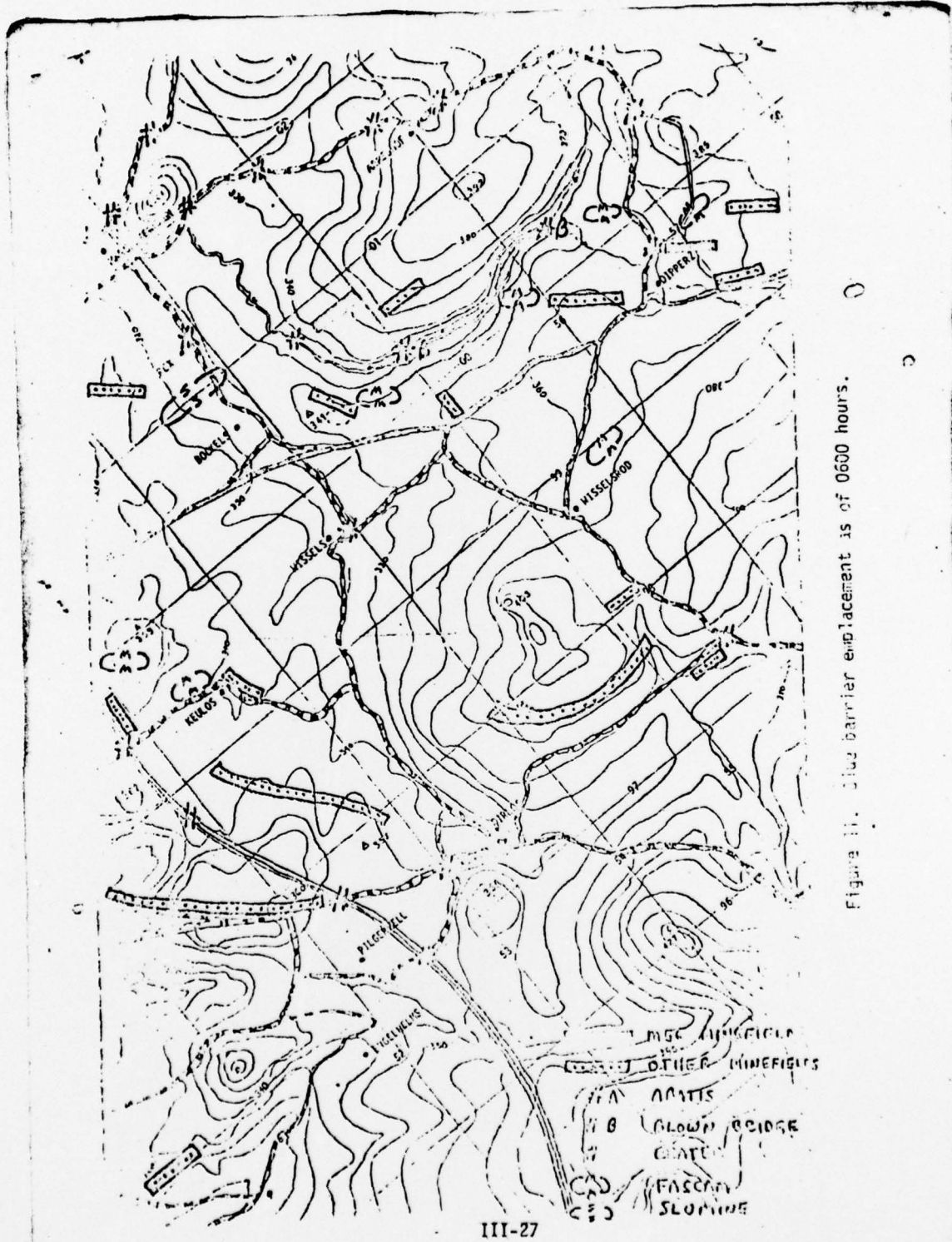


Figure 11. Steel barrier emplacement is of 0600 hours.

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cont

20. → recommendations concerning dedicated TOW companies, additional artillery batteries, and requirements for attack helicopter support. Another major result from the gaming was the identification of data voids and tactical limitations to be addressed in phase II.



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