FAST-VAL:
Case Study of A Two-Company
NVA Attack on A Marine Company
in A Defensive Position
on Foxtrot Ridge

S. G. Spring, K. Harris and J. R. Lind

A Report prepared for
UNITED STATES AIR FORCE PROJECT RAND
This material contains information affecting the national defense of the United States within the meaning of the espionage laws, Title 18 U.S.C., Secs. 793 and 794, the transmission or the revelation of which in any manner to an unauthorized person is prohibited by law.

This research is supported by the United States Air Force under Project Rand—Contract No. F44620-67-C-0045—Monitored by the Directorate of Operational Requirements and Development Plans, Deputy Chief of Staff, Research and Development, Hq USAF. Views or conclusions contained in this study should not be interpreted as representing the official opinion or policy of Rand or of the United States Air Force.
R-819-PR
November 1971

FAST-VAL:
Case Study of A Two-Company NVA Attack on A Marine Company in A Defensive Position on Foxtrot Ridge (U)

S. G. Spring, K. Harris and J. R. Lind

A Report prepared for
UNITED STATES AIR FORCE PROJECT RAND
PREFACE

The Forward Air Strike Evaluation Model, Phase II (FAST-VAL II), was developed at Rand to measure the influence of close air support upon the outcome of ground engagements of regimental size or smaller. This two-sided simulation model measures the contribution of artillery, mortars, and small arms as well as air-delivered weapons upon the outcome of a fire fight. This research is intended to assist the Air Force in selecting weapons, vehicles, and operational techniques for the close-air-support mission.

This report describes one of a series of case studies used to compare the results of FAST-VAL simulations of small-unit (company-size) actions in Vietnam with actual combat results. Data for this series of case studies came from interviews with fire-fight participants and from official records. The interviews with military personnel were conducted in Okinawa and Vietnam during March and April 1969 under joint Air Force-Marine Corps sponsorship.

These comparisons are the basis for the critical evaluation of the FAST-VAL model and its parameters presented in R-810-PR, FAST-VAL: Summary Report on the Comparison of Model with Combat Results (Infantry Fire-Fight Outcomes and Effectiveness of Small Arms, Bombs, Artillery, and Mortar Rounds).

This report describes an attack by two North Vietnamese Army companies against a U.S. company in a defensive position and compares results of a simulation of the action with combat results.

* * * * * * * * *

We gratefully acknowledge the assistance and cooperation of the U.S. Marine Corps in providing us information that made this study possible. The results and conclusions we have drawn, however, should not be interpreted as reflecting the official opinion or policy of the U.S. Marine Corps.

* A bibliography of related FAST-VAL reports appears on the following pages.
BIBLIOGRAPHY OF RELATED FAST-VAL REPORTS


R-817-PR Harris, K., and S. G. Spring, FAST-VAL Expected Casualties from Small-Arms Fire (U), The Rand Corporation, November 1971 (Confidential).


R-821-PR Weaver, K. K., and S. G. Spring, FAST-VAL: Case Study of an Attack by a Marine Platoon on an NVA Company Near Kinh (1) South of Da Nang (U), The Rand Corporation, November 1971 (Secret).

R-822-PR Lind, J. R., S. G. Spring, and K. Harris, FAST-VAL: Case Study of a Series of Mortar Attacks on a Marine Infantry Company at LZ Margo, 16 and 17 September 1968 (U), The Rand Corporation, November 1971 (Secret).
<table>
<thead>
<tr>
<th>Code</th>
<th>Reference</th>
</tr>
</thead>
</table>
SUMMARY

Calculation of expected casualties in ground combat from small-arms, mortar, and artillery fires and air ordnance is a principal purpose of the FAST-VAL II model. Another purpose is the evaluation of the influence of casualties on the performance of ground units. The case study described in this report was examined as part of an effort to determine how well FAST-VAL II performs these functions. This report compares the casualties computed by the model and its evaluation of unit performance with the losses sustained in an actual battle and the behavior of the units that took part.

The comparison is based on a two-company North Vietnamese Army (NVA) attack on an open-foxhole defensive position held by a Marine infantry company, and a 70-round combined mortar and artillery bombardment of the Marine position on the previous night. At first light, the NVA companies made a stand-up advance against the Marine position, starting small-arms fire at a range of about 100 meters. During the attack, the NVA fired 24 to 29 mortar rounds and delivered about 7000 small-arms rounds.

The NVA mortar/artillery attack reportedly inflicted 1 Marine casualty. Reports suggest that twenty-three 82mm mortar rounds and forty-seven 130mm artillery rounds were delivered. In simulating an attack with this combination of weapons, computed casualties ranged from 2.03 when all troops were assumed to be crouched in foxholes to 3.89 when 15 percent of the 106 Marines were assumed to be standing up in their foxholes. The differences between actual and computed casualties were tested statistically and no reason for rejecting the comparison was revealed.

The NVA two-company attack was unusual in that the NVA advanced standing up and firing from the hip and shoulder instead of advancing by bounds. The NVA attack was stopped short of the Marine position, although a few NVA soldiers actually did get into the position's wire. Marine casualties were reported to have been between 3 and 6. Computed Marine casualties caused by mortar rounds and small-arms fires delivered during the infantry assault were 4.5 to 5.0. Statistically, the correspondence between simulation and actual results is good.
An excursion was made assuming that the NVA advanced by bounds. In this simulation, one company of NVA reached the Marine position and engaged in hand-to-hand combat. The NVA were repulsed, but the Marine casualties in this instance rose to 33. This dramatic change in simulation results demonstrates the importance of obtaining accurate, fine-grained details of combat situations.

In evaluating unit performance in a simulation, the decision rules currently embodied in the FAST-VAL II model require an attacking infantry company to break off an attack when its casualties rise to 30 percent and to stop to reorganize at a casualty level of 23 percent. Reorganization may take up to two hours. In the FAST-VAL simulations, the NVA companies "stopped" or "broke" at approximately the same point in the engagement as the actual attack was turned back by Marine fires. But since we are uncertain about the NVA unit strength and the casualties they sustained, this verification of unit behavior is not conclusive.

The FAST-VAL model outputs reflected all significant aspects of the actual combat action being simulated; we therefore feel that this case study contributes to a belief in the "realism" of FAST-VAL simulations.
I. INTRODUCTION

A major mission of the U.S. Air Force is close support of ground forces in battle. This is a complex mission, conducted in concert with ground units, generally under ground-force rules and directed toward augmenting ground weapon systems. Rand's objective in the FAST-VAL project has been to provide an analytic aid to the selection of tactics, techniques, vehicles, and munitions for this mission.

The FAST-VAL model has been used to examine in detail the interaction of men and weapons on the battlefield. In the earlier phases of this study, hypothetical combat situation scenarios were used. Highly detailed, confirmed descriptions of actual engagements of small units—our area of current primary interest—were not available. The situation changed in the spring of 1967. While the first battle of Khe Sanh, South Vietnam, was being fought in April and May of that year, the U.S. Marine Corps recorded the details of the action in depth and, at Rand's request, made the records available for use in Rand tactical studies.

Both the firing records of the artillery batteries supporting the Marine infantrymen and a fine-grained after-action report prepared by the Marine infantry regiment involved in the fighting were provided. In addition to providing records, the Marine Corps allowed Rand to interview key participants in the Khe Sanh fight. Most significantly, members of the study group were able several times to interview the infantry company commander in that part of the battle of prime interest to the analysis. The application of artillery was discussed with both the forward observer and the commander of the artillery units delivering the supporting fires. The Combat Activities (COACT) File of the Joint Chiefs of Staff provided data on the sorties flown and the air-delivered munitions used during the battle.

A FAST-VAL II simulation was made of one portion of this first battle for Khe Sanh. The simulation results in terms of casualties suffered by the Marines were quite similar to those given in the after-action report and described in the interviews. Additionally, unit reaction to casualties bore close resemblance to the reaction
implied by the model. These results suggested quite strongly that the
FAST-VAL methods of evaluating weapons effects and their influence on
unit performance and battle outcome are realistic and that the FAST-VAL
methodology warranted additional case study examination.

To facilitate further investigations, the Air Force entered
into a joint agreement with the Marine Corps that enabled members of
the FAST-VAL study group to visit South Vietnam and the Pacific theater
to interview military personnel with recent battle experience and to
gather data on artillery battery fire and air munition deliveries.
In March and April 1969, 23 Marine Corps officers were interviewed in
Okinawa and South Vietnam on 16 different combat actions, and 3 U.S.
Army officers were interviewed on 3 engagements.

The scenario for the case study presented here was taken from
an interview with 1st Lt. Richard Bartolomea, USMC, on the operations
of I Company, 3d Battalion, 4th Marine Regiment in late June and early
July 1968.

This case study (which deals with an engagement between two
NVA infantry companies and a Marine infantry company, with the former
launching an attack on a hasty defensive position) enables us to com-
pare FAST-VAL-computed casualties from small-arms, mortar, and artil-
lery fires with the casualties that these fires actually caused in a
combat situation; to compare the influence of casualties on unit per-
formance in battle with the influence that FAST-VAL attributes to them;
and finally, to observe the model's ability to simulate significant
combat incidents at company and battery levels.
II. THE TACTICAL SITUATION EXAMINED

The study's scenario was taken from an operation run by the 3d Battalion, 4th Marine Regiment in June and July 1968 to intercept North Vietnamese Army (NVA) infiltration routes running south through Quang Tri province in the vicinity of Khe Sanh. The battalion patrolled Route 9, key terrain features, and trails to destroy the enemy and to disrupt his movement through the area. The action examined involved India (I) Company and took place on a ridgeline (nicknamed Foxtrot Ridge by the Marines) that runs northwest to southeast, located generally by map coordinates XD 871383 and XD 877381 (Fig. 1).

India Company occupied the ridgeline on 18 June 1968 as a base of operations for searching its tactical operations area. As a general practice, patrolling was carried out in daylight hours, with all troops returning to the base area at night. Many signs of the enemy were found, but relatively few contacts were made and these were with small enemy groups. The pace of the action quickened on the evening of 30 June.

The new phase of activity started at about 2040 hours with artillery fires from Co Roc ridge located near the Laotian border, and mortar fires from sites generally west of the Marine position. Later in the evening or early in the morning of 1 July, sounds of digging and lights revealed the enemy's presence southwest of the Marine position. A listening post some 100 meters southwest of India's 2d platoon position made contact with the lead element of an enemy force just before 0500 hours on 1 July, and shots were exchanged (Fig. 2). The listening-post crew, 3 men, withdrew about 20 meters and then were approached again by the NVA a few minutes later. Marines threw grenades at the intruders and withdrew into the company position.

The enemy assault started at first light, about 0600 to 0700 hours, and was two-pronged. The main thrust, made by a reinforced infantry company of 120 to 130 men, hit the 2d platoon position from a finger running generally from XD 874378 to XD 879380 (Fig. 2). The apparent objective was to seize the position as a base for subsequent
Fig. 1 — Area of the operation

★ Marines' location
Fig. 2—Deployment of forces early on 1 July 1968
operations against India's main position. In the secondary effort, an understrength company of 40 to 50 men struck the saddle that separated the 2d platoon from the remainder of the company to isolate the platoon and prevent its reinforcement.

In the attack, the NVA companies used their unit small arms--rifles and machine guns--and rifle-projected grenades (RPGs); early in the attack, they were supported by nine 82mm and fifteen to twenty 60mm mortar rounds. Machine guns carried forward in the assault were fired from the hip much like a rifle. Marines returned fire with rifles, machine guns, recoilless rifles, and 60mm mortars. The attack was driven off before the two forces met in hand-to-hand combat. The NVA suffered severely in the attack and, in the withdrawal, pulled back in small groups and individually rather than in a coordinated movement.

During the fight, the Marine 60mm mortars fired three concentrations against the attacking NVA formations. To light the battlefield, illumination rounds were put up by the mortars and by 105mm and 155mm artillery batteries. After the withdrawal started, Marine mortars and artillery continued to pound the areas just in front of the Marines' perimeter wire.

Starting about 0800 hours on 1 July, Foxtrot Ridge was searched by India Company ground patrols and by aerial observers (AOs) for enemy groups and weapon emplacements. Small-arms and mortar fires were exchanged; and the Marines used gunships, fixed-wing aircraft, and artillery.

Late in the day on 1 July, enemy activities increased again; and for the next several days, contacts with small NVA groups occurred several times a day. Enemy contacts slackened and India moved to a new base 1 kilometer east of Foxtrot Ridge on 14 July.

This study covers the NVA mortar and artillery fires delivered at about 2040 hours on 30 June and the NVA infantry assault in the early hours of 1 July. The examination ends at the time the assault is stalled by Marine fires.
III. SIMULATION OF THE SITUATION

To provide a basis for comparing FAST-VAL's computed casualties and its evaluation of unit performance with actual casualties and actual results and experience, we simulated both the NVA artillery/mortar attack on the evening of 30 June and the infantry assault on India Company in the early hours of 1 July 1968.

TYPE OF DATA NEEDED

Information used in the FAST-VAL simulation model falls into two general categories: (1) parameter values entering into the evaluation of casualty and casualty-related influences on unit performance; (2) data required for computing casualties produced by ground weapons fires and, where applicable, air munitions.

Parameter values used in calculating the influence of casualties on unit performance remain unchanged from simulation to simulation. (But one purpose of this case study and related studies is to verify the realism of the results produced with the parameter values now incorporated in FAST-VAL.)

Information for computing casualties is taken directly from accounts of the fire fight. Inputs for the model include the weapons fired, their target or targets, the number of rounds fired, and the range or ranges at which rounds were delivered. For area weapons, the artillery, mortars, and air munitions and their fusing and delivery mode (height of burst, etc.) must be described. Other information may be essential; e.g., a targeted man may choose to leave his primary (upper) posture and seek a safer (lower) posture when he comes under fire, a change which FAST-VAL can reflect if descriptions of the two postures are input. (Specifically, a rifleman's upper posture in a hastily defended position might be standing in an open foxhole; and his lower posture, crouching in the same foxhole.) Computing destruction of materiel (machine guns, mortars, artillery pieces, etc.) is simpler than evaluating attacks on personnel, since the "posture" and level of protection of materiel remain generally the same throughout
an encounter. And finally, the casualties expected per unit of fire (artillery or mortar round, air munition, small-arms burst, etc.), based on range, delivery mode, the target, and target posture, must be supplied to FAST-VAL--after they have been developed by preliminary calculations.

REPORTED CASUALTIES

Lt. Bartolomea estimated Marine casualties during the artillery and mortar attacks late on 30 June at 1 KIA (killed in action) and several WIA (minor wounds). The Unit Diary for that day(1) reported 1 KIA and no WIA (wounded in action). The Division Journal does not indicate that any casualties were suffered by India Company.

In his interview, Lt. Bartolomea estimated that his company suffered 8 KIA and 12 WIA in the NVA infantry assault on the morning of 1 July. In his opinion, most of the wounds were minor, although many of the WIA were evacuated. The Unit Diary for 1 July(2) sets the losses in India Company at 3 KIA, 4 WIA, and 5 WIANE (wounded in action, not evacuated). Unit Diary for 5 July(3) changes the report of 1 July in that 1 of the 5 reported as WIANE was changed to WIA. These losses were sustained during the whole day; however, our interest rests in the losses suffered in the NVA infantry assault that ended at about 0800 hours. To sort out the casualties taken during the assault, we reviewed the 3d Division Journal for 1 July 1968. Journal entry 56 related that 2 Marines were evacuated at about 0630 hours. Journal entry 51 identifies 1 KIA and 2 WIA sustained at about 0725 hours. Journal entries 60, 83, and 122 set Marine casualties taken after 0900--the approximate end of the infantry assault--at 1 KIA and 4 WIA. When the 5 casualties experienced subsequent to the NVA assault are deducted from the total for the day, the casualties inflicted by the NVA infantry stand at approximately 2 KIA, 1 WIA, and 4 WIANE. Taking only the casualties reported for the assault period in the 3d Division Journal, Marine casualties are 1 KIA and 4 WIA. Since the Journal is 1 short in its reporting of KIA, we think it appropriate to add 1 KIA to the Journal figures and make them record 2 KIA and 4 WIA. FAST-VAL
does not count WIANE as casualties; therefore, in our view, Marine casualties were between 3 and 6.

Considerable divergence of opinion exists on the NVA losses in the infantry assault. Lieutenant Bartolomea thought that the losses were 107; Ref. 4 reports 93 NVA casualties; and Refs. 5 and 6 report 170. It seems quite probable that all of these reports are based on a period considerably greater than that of primary interest in this case study. According to Lt. Bartolomea, areas around the Marine position were not swept and NVA losses not counted until after a heavy application of artillery fires and (perhaps) helicopter gunships as well. Therefore, we expect calculated casualties to be less than any of the reported figures.

Although there was a relatively heavy exchange of grenades, including RPGs, no casualties were credited to them for either side.

INPUT DATA

Simulations were based primarily on information drawn from the interview with Lt. Bartolomea. He was the only source of information on the following: exchanges of small-arms fires; Marine mortar missions; the size of the forces involved, in finite numbers; the deployment of forces; the NVA routes of approach; and the time and duration of the attack. Official reports were used to substantiate his observations or, in some cases, to show a differing view of the action.

Personnel and Weapons. Figures 3, 4, and 5 show the organizational structure of the Marine company and the two NVA companies used in the simulations. Table 1 summarizes the data in these figures.

The relative locations of personnel and equipment within the deployment of forces shown in Fig. 2 are input to the model by the means outlined in Ref. 7.

Estimates of Rounds Fired During the Infantry Assault, 1 July 1968. Each committed Marine rifleman fired 100 rounds. The 2d platoon's machine guns fired 200 rounds each and those in the other platoons fired 50 rounds each.

Marine 60mm mortars fired three missions during the assault. The first aimed at coordinates 877371, the second at 875383, and the third
Fig. 3—Organization of Company 1, 3d Battalion, 4th Marine Regiment, 30 June – 1 July 1968
Fig. 4—Organization of NVA Rifle Company 1, 30 June - 1 July 1968
Fig. 5 — Organization of NVA Rifle Company 2, 30 June – 1 July 1968
Table 1
NUMBERS OF MARINE AND NVA PERSONNEL AND WEAPONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Marine India Company</th>
<th>NVA Company 1</th>
<th>NVA Company 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riflemen</td>
<td>54</td>
<td>81</td>
<td>32</td>
</tr>
<tr>
<td>Crew members and</td>
<td>52</td>
<td>46</td>
<td>15</td>
</tr>
<tr>
<td>support personnel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit weapons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine guns</td>
<td>6</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>60mm mortars</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>106mm recoil-less rifles</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grenade launchers</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

at 874383. Twenty rounds were delivered in the first mission and 18 in each of the succeeding ones.

NVA riflemen fired about 50 rounds each; and their machine guns, fired from the hip, expended 100 to 150 rounds each.

NVA 82mm mortars delivered 9 rounds early in the infantry attack and their 60mm mortars hit the Marine position with 15 to 20 rounds.

Ranges of Small-Arms Fires. The NVA began firing at 100 yards. The Marines held their fire until the NVA were about 50 yards away. Two considerations legislate against using these separations as "average" ranges for the exchange of small-arms fire: (1) The situation was a moving one, with separation of forces decreasing with time; (2) neither side was deployed in a straight line. Therefore, in the first simulation, weapons were afforded a range of 75 yards during the advance of the NVA from a 100-yard separation to a 40-yard separation, and a range of 45 yards was assumed for the remainder of the engagement. We repeated the simulation with weapons on both sides having a firing range of 75 yards until the forces were separated by about 50 yards; from a 50-yard separation to one of 30 yards, weapons were fired at a range of 50 yards; for the rest of the fight, firing was at a 30-yard range.

Postures. Marine machine-gun crews were in three-man foxholes, 4 by 6 feet, and 2 feet deep. Machine-gun positions had low
parapets on which to rest the gun bipod mounts. Other Marines occupied two-man open foxholes about 3 by 5 feet, and 4-1/2 feet deep.

During the infantry attack, the Marine upper posture was a standing position in their foxholes; and the lower posture, crouching in these foxholes.

Marine posture while the NVA shelling was under way on the evening of 30 June is not clear. However, it seems probable that most Marines were crouched in their foxholes while a relatively small percentage of them maintained surveillance of the area. To us, it seemed likely that not more than 15 percent of the Marines remained on watch and were standing in their foxholes. Simulations cover these two possibilities as well as the possibility that they were all crouched in their holes (see Appendix A).

The NVA riflemen and machine gunners were generally in the open (unprotected) during the infantry attack. Despite a lush growth of elephant grass, portions of their forces could be seen from Marine positions at all times during the advance. They were moving forward in a generally upright position.

In all simulations, the NVA upper posture is standing, and the lower is prone in the open on average terrain.

Expected Casualties from Small Arms. FAST-VAL casualty outcomes for an engagement are derived from "building blocks" made up of expected values for 6-round bursts. Expected casualties per unit of fire are functions of several factors--range, aiming and ballistic errors, terrain, posture of the target (protection available to the targetted personnel), size of the area covered by fire, and the probability of acquiring the target. Expected casualties per 6-round burst used in the simulation are shown in Table 5, Appendix C (p. 58).

Expected Casualties from Mortars and Artillery. Calculation of casualties from explosive ordnance is carried out in the manner outlined in Ref. 8. Expected casualties from these munitions are not a direct input to the model as are the expected casualties per unit of point-target munition fire such as small arms. Instead, expected casualties per volley are calculated.
IV. ANALYSIS OF SIMULATION RESULTS

This section details the results of simulations for (1) the artillery and mortar attack, (2) the NVA infantry assault, and (3) a posture variation for the NVA during the assault.

ARTILLERY AND MORTAR ATTACK IN EARLY EVENING OF 30 JUNE 1968

The Marine position was hit in the evening prior to the NVA infantry assault by artillery and/or mortars. Lieutenant Bartolomea estimated that 70 rounds of mixed artillery and mortar arrived; Ref. 9 identifies the fires as 47 rounds of 130mm artillery.

We simulated these fires using four alternative combinations of rounds: seventy 82mm mortar rounds; forty-seven 82mm mortar and twenty-three 152mm artillery rounds; forty-seven 152mm rounds and twenty-three 82mm rounds; and seventy 152mm rounds. In making these simulations, we substituted 152mm artillery rounds for 130mm rounds, since data on the effects of 130mm rounds were unavailable. Table 2 shows computed Marine casualties for the four mixes of NVA fires delivered against different Marine postures. Figure 6 displays the results graphically.

---

Table 2

COMPUTED MARINE CASUALTIES FROM NVA ARTILLERY AND MORTAR FIRE, EVENING OF 30 JUNE 1968

<table>
<thead>
<tr>
<th>NVA Ammunition Mix</th>
<th>Percent of Marines on Watch&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Computed Marine Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 82mm rds</td>
<td>0</td>
<td>0.65</td>
</tr>
<tr>
<td>70 82mm rds</td>
<td>7/8</td>
<td>1.31</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>1.61</td>
</tr>
<tr>
<td>47 82mm rds plus</td>
<td>0</td>
<td>1.33</td>
</tr>
<tr>
<td>23 152mm rds</td>
<td>7/8</td>
<td>2.26</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>2.75</td>
</tr>
<tr>
<td>47 152mm rds plus</td>
<td>0</td>
<td>2.03</td>
</tr>
<tr>
<td>23 82mm rds</td>
<td>7/8</td>
<td>3.11</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>3.89</td>
</tr>
<tr>
<td>70 152mm rds</td>
<td>0</td>
<td>2.69</td>
</tr>
<tr>
<td></td>
<td>7/8</td>
<td>3.88</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>4.84</td>
</tr>
</tbody>
</table>

<sup>a</sup>In upper posture.
Fig. 6—U.S. casualties versus fraction of troops standing in foxholes (Foxtrot case—alternate mixes of incoming rounds)
The Unit Diary\(^1\) recorded 1 KIA for India Company on 30 June, and Lt. Bartolomea thought that 1 KIA and several minor injuries resulted from this shelling. The division journal\(^\text{10}\) for the day fails to identify the hour at which the casualty was sustained.

Official reports and the interview suggest that twenty-three 82mm mortar and forty-seven 130mm artillery rounds was the most probable combination of weapons delivered; computed casualties for this combination are compared with reported casualties in Fig. 7. The 95th percentile line, derived from the assumption that the FAST-VAL calculated casualty probability is the expected value of a binomial distribution, indicates that there is no statistically significant difference between the computed and reported casualties.

**NVA INFANTRY ASSAULT, 1 JULY 1968**

The attack consists of advancing troops delivering about 7000 rounds of small-arms fire and supported by 24 to 29 mortar rounds (nine 82mm mortar rounds and fifteen to twenty 60mm mortar rounds). Marines are assumed to be standing in foxholes during the attack. Table 3 shows computed casualties for both defender and attacker. Official records set Marine casualties at between 3 and 6 for this portion of the engagement.

**Table 3**

**COMPUTED CASUALTIES FROM NVA INFANTRY ASSAULT, 1 JULY 1968**

<table>
<thead>
<tr>
<th>NVA Mortar Rounds</th>
<th>Effective Ranges of Small Arms in Simulation (yd)</th>
<th>Computed Marine Casualties</th>
<th>Computed NVA Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 82mm, 15 60mm</td>
<td>75, 40</td>
<td>4.33</td>
<td>51.32</td>
</tr>
<tr>
<td>9 82mm, 15 60mm</td>
<td>75, 50, 30</td>
<td>4.48</td>
<td>54.53</td>
</tr>
<tr>
<td>9 82mm, 20 60mm</td>
<td>75, 40</td>
<td>4.90</td>
<td>51.28</td>
</tr>
<tr>
<td>9 82mm, 20 60mm</td>
<td>75, 50, 30</td>
<td>5.04</td>
<td>54.50</td>
</tr>
</tbody>
</table>

To obtain a measure of the relative effects of NVA small arms, the situation was simulated without the NVA mortar fires. The result showed less than 1 Marine casualty inflicted by NVA small arms. Based
Fig. 7—U.S. casualties versus fraction of troops standing in foxholes (Foxtrot case—simulation of artillery and mortar attack)
on these results, approximately 4 to 5 of the Marine casualties recorded in Table 2 were inflicted by mortars.

Figure 8 shows that simulated Marine casualties are within the range of reported casualties.

The NVA infantry assault was stopped in all simulations after the reported amounts of Marine small-arms and mortar rounds had been delivered. In all simulations, NVA Company 1 "stopped" and NVA Company 2 "broke." Operational rules now embodied in the FAST-VAL model require an attacking infantry company to stop to reorganize when its casualties reach 23 percent and break off the attack when casualties rise to 30 percent. Reorganization may take up to two hours. The results of the simulations were in substantial agreement with the outcome of the actual attack—the NVA withdrew.

A VARIANT TO TEST THE INFLUENCE OF NVA POSTURE DURING THE INFANTRY ASSAULT, 1 JULY 1968

To test the influence of NVA posture on the results of the engagement, we repeated the simulation of the infantry assault, giving the NVA greater protection than they were reported to have. In the interview, Lt. Bartolomea said that the NVA advanced in an upright, standing position and this was the posture accorded to them in the original simulation. In this subsequent simulation, the NVA troops are all assumed to be prone in average terrain.

For this variant, weapons of both sides are given a firing range of 75 yards until the separation of forces reaches 50 yards; from a 50-yard separation to a separation of 30 yards, the range for weapons fire is 50 yards; for the remainder of the engagement, firing is at 30 yards.

Small-arms fires for both sides and Marine mortar fires are the same as they were in the original simulation. The NVA were permitted to fire nine 82mm mortar rounds and twenty 60mm mortar rounds. The results of this simulation were significantly different from those of the original simulation and from the results of the engagement itself in that NVA Company 1, the larger company, reached the position and engaged the Marines in hand-to-hand combat. In the actual fight, as well
Fig. 8—U.S. casualties versus NVA small-arms fire received
(Foxtrot case—simulation of entire engagement)
as in the original simulation, the NVA advanced until they were very close to the position—some got into the wire—but the main bodies never became engaged at close quarters.

The FAST-VAL technique for resolving hand-to-hand combat (discussed in Ref. 11) is arbitrary and is based entirely on the rifle-men of the two forces. Briefly, we presume that each attacking rifle-man, in hand-to-hand combat, fires his rifle at half the rate he did during his advance from the final coordination line to the objective, and that the expected kill probability (P_k) for each 6-round burst he fires is the same as it is during this advance. Each defending rifle-man is presumed to have a rate of fire 0.8 that of his foe and the same P_k per 6-round burst. The outcome is determined by which side becomes a "loser" first. If the attacker's casualty level reaches 30 percent before the defender's reaches 50 percent, the attacker loses. If the reverse happens, the defender loses.

By our formula, NVA Company 1 lost in the hand-to-hand encounter; thus, the whole NVA force was turned back. NVA Company 2 "broke" during its advance and never reached the Marine position. The overall outcome agrees with outcomes of other simulations and with that of the actual engagement.

At the time the hand-to-hand phase began, NVA Company 1 had lost 23 men, and in the ensuing fight they lost an additional 15 men—a total of 38. NVA Company 2 had 15 casualties. The total NVA losses were 53, not greatly different from the computed results in the earlier simulations (51.28 to 54.53).

In the original simulations, the outcome of the fight was decided in the opening phases and the NVA advance was stopped by the time the Marine mortar fires came to an end. NVA Company 1 suffered between 31 and 33 casualties—just in excess of the 23 percent casualty level, 29 casualties, required by FAST-VAL rules to cause it to "stop." NVA Company 2 took between 19 and 22 casualties—more than the 30 percent casualty level, 14 casualties, needed to "break" it. In an analytical sense, there was some overkill.

In the variant, the NVA companies were given better protection, and their losses in the opening phase, particularly to mortar
fire, were not as severe. NVA Company 2 was broken in the early phase but its casualties, 15, were just slightly more than the 14 required to cause it to break. NVA Company 1 survived the Marine mortar fires and fought its way into the Marine position but was forced to withdraw when its casualties rose to the break level, 38.

The Marine casualties at the end of the fight were much higher because of the hand-to-hand phase in the variant. Simulated Marine casualties up to the start of the hand-to-hand combat, the point at which the actual fight ended, were 8. The increased level of protection assumed for the NVA reduced their losses in the early part of the fight and allowed them to close with the Marines and to inflict an additional 25 casualties.

This variant illustrates clearly that accurate data on the postures of engaged forces are essential to realistic simulations.
Appendix A

INTERVIEW WITH 1ST LT. RICHARD BARTOLOMEA, USMC

This is a transcription of a taped interview with 1st Lt. R. J. Bartolomea, USMC, conducted by Kay Harris, of The Rand Corporation, in Okinawa on 26 March 1969. Bartolomea is identified as B and Harris as K.

Sketches of troop and weapon deployments drawn by Lt. Bartolomea are reproduced at the end of the interview. Map references are taken from map sheet 6342 II, scale 1:50,000, Army Map Service stock No. L701463422.

The text of this interview is assigned the overall classification of Confidential, Group 4, since it reveals detailed information concerning friendly combat casualties. In the interest of simplicity and clarity, no attempt has been made to separately classify each question and answer.
K: This tape contains an interview with 1st Lt. Richard J. Bartolomea, United States Marine Corps, concerning the operations of India Company, 3d Battalion, 4th Marines in late June and early July 1968.

B: It started on the 30th of June; early in the evening about 5:30 or 6 o'clock. The LPs were sent out later that evening. The LPs usually went out right before dark and then right after dark moved into their permanent positions.

K: What is an LP?

B: An LP is a listening post.

During the day you conduct outposts which are fire-team-sized units, about four men; depending on the enemy situation and the terrain. They can be anywhere from 100 to 500 meters away from the line. For example, in the particular case we're talking about, there was a clump of trees directly to our south on the western side of our defensive perimeter. We always put a listening post down in there because it not only provided cover and concealment but it was also a natural access of approach for the enemy. In a like manner, the second platoon always put an LP/OP during the day.

The first report of small arms that I received came from the second platoon which was manning the platoon-sized combat post approximately 200 meters or 150 meters from the other two platoons and the company CP which was along this...

K: Let's identify the coordinates.

B: The second platoon CP was at 876382/383. That consisted of a platoon reinforced. When I say reinforced, I mean by a section of machine guns and also 106 recoilless rifles. The other two platoons and the company CP were located on the ridge line running from 871384 to 87153841. These two platoons were also reinforced by a machine gun squad each. Another 106 recoilless rifle and the 60mm mortars were set up.

K: Where were they?

B: The 60mm mortars were approximately 874384.

K: How many were there?

B: There were two guns, two tubes, manned by the entire mortar section. Usually we operated with three. As far as I can recollect, one of them was out at the time. The 106 rifle we had on our defensive
position, which was along the ridge line, worked some of the time and didn't work some of the time. The 106 of the second platoon's hill operated real well.

The listening post heard movement at about 0400 in the morning, give or take a couple of hours. The three men that were out on it actually came into contact at about 0530. They estimated that they hit the point of the main attack body which, at first word, was estimated at an NVA battalion reinforced with 82mm and 50 calibers. Incidentally, on the 30th, in addition to taking 82s, we also received—I'm not exactly sure of the caliber or the type of artillery rounds they were—I believe either 152s or 122s. They are probably identified exactly in the report. First of all we took 82mm rounds—that was around 6 o'clock to 6:30 or quarter of seven. This was on the 30th...opened up that night around 8:30.

It's interesting to note that the NVAs, at least those I've been in contact with, never used mortars during the night. They're afraid that the muzzle flash will give away their positions. They are easy to destroy. The 82mm rounds that the NVA fired did much more damage, as far as WIA were concerned, than the bigger artillery ordnance—mainly because of the accuracy involved.

Getting back to the beginning of the contact; after the second platoon LP made the contact with the point, they pulled back about 20 meters. Their first estimate was that they killed one or two of the point men. About ten minutes later they were again probed and the NVA was no more than 20 or 30 feet away from them. They fired again at the NVA using the M-26 grenades; then pulled inside the perimeter.

It was just turning first light when the main body of the NVA forces attacked us. They moved up the finger running in the 874378 area all the way to the finger beginning at 879380. The main attack was roughly against the second platoon. As far as we could make out, the object was to gain the high ground that the second platoon occupied, since it was higher than the ground that the CP and the other two platoons were occupying. Then, holding that ground, launch their final
attack on our position. There were arty missions being called during
the whole contact that morning. As a matter of fact they were calling
for 155s, 8 inches, as well as 105s--sometimes 50 meters from the line.
The artillery officer with us and his assistant, did an out-
standing job with his artillery. The 106 recoilless rifle probably did
more damage to the attacking unit than any other piece of ordnance that
we used, including the small arms, machine guns, and what have you.

K: At 0800 when the attack was launched, what size unit do
you think initiated the attack?

B: I would say it was two companies.

K: A two-company attack?

B: I would say a company reinforced hit the second platoon's
hill and a company (minus) tried to occupy the saddle between our two
positions. This is where the two platoons got their kills. I think
the artillery and the 106 pretty much foiled them getting to the saddle.
The 106 located right on the eastern side of the second platoon CP did
more damage to the company reinforced that was attacking them. The main
attack I believe came before 0800. It came right at dawn. That's
when the largest body hit us.

All through the day we took casualties by just sweeping with
local security patrols. What I mean by local security patrols are
patrols, usually squad-sized reinforced by a machine gun team with
one light 60 machine gun, sweeping the first strand of wire directly
in front of our friendly positions. The first platoon swept the south
and they took two KIA, I think. I'm pretty sure two marines were killed
and a number were wounded sweeping the saddle. The NVA worked pretty
heavily in the saddle at this time. As a matter of fact we had artill-
ery mission going right into the saddle.

K: You mean the early morning attack reached the saddle
and...?

B: Yes, ma'am.

K: Did they overrun the second platoon?

B: No. They never did. There were maybe three or four NVA
that actually got inside the line. They came closer to overrunning on
the fourth than they did on the first. As far as numbers of people getting inside the line is concerned.

K: But they did move inside the saddle in the early morning and started to dig themselves in?

B: Yes. This is one of their favorite tactics. The hill right here was probably their staging point early in the attack. The center of the hill would be 873380. That was probably their staging point, or as we call it in the Marine Corps, their final coordination line.

K: Did they attack then from the southeast direction or the northeast?

B: I think they probably took the long way around. Although they got this far when they kicked off the attack, they probably came around this way and followed the contour lines all the way up. The main body hit farther over to the southeast moving to the northwest. Then another body, which was smaller in size, was probably given the job to cut off the two bodies. I forgot to mention that the saddle between the two objectives was not physically manned, and all there was there was water. When Fox, 2/3, held the hill earlier, in the middle part of June I believe, they only put a squad up on top where the second platoon had their command post, and they did physically occupy the saddle. That meant that there were holes already dug here.

K: I see. So the NVA came and occupied those holes?

B: Yes, and they also dug their own holes. They've got two unique tools that they use; a little axe-spade thing no longer than two feet--and a shovel. They're amazing in what they can do in a little time. There were holes already dug in and I'm sure some of these were occupied by the NVA.

Getting back to the patrolling; second platoon swept in front of their line, came under sniper fire, turned the whole sweep, returned fire on the spotted enemy but never got an actual confirm. When I say confirmed, I mean an actual body lying there.

The third platoon swept in front of the entire length of the company CP area. The first platoon was given the job of sweeping the saddle which was probably the toughest job of all.
K: The other platoons?
B: The second platoon swept south along their wire all along here.

K: The first platoon?
B: The first platoon swept south. Second platoon swept south of their position. The third platoon swept south in front of the company CP position. For the size of the attack, it didn't last very long. This is probably why our company commander ended up getting the Navy Cross. He did a marvelous job as a company commander.

All during the day we took 82s and 60mm rounds and all resupply birds (helicopters) were shot at by 50 calibers. The 50 calibers were located somewhere in the vicinity of the ridge running from the 870378 all along that ridgeline to about 877377.

K: How many machine guns do you think there were?
B: There were two we were sure of. Air strikes got one of them. You could actually see it from our position—the gun being blown right out of the parapet.

K: Where were the 82mm mortars?
B: I don't know if anybody was really sure where they were. I know what we found when the third platoon went out on patrol three days later—two 60mm positions on the hill mass of 873380.

K: How many 82mm mortars did they have?
B: I would say anywhere from three to five.
K: How many 60mm mortars did they have?
B: I would say between six and eight. There were definitely more 60s than 82s. Not knowing exactly what the TO (Table of Organization) is for an NVA company, but for a Marine company the TO is three tubes per company. The light machine guns were used right in the assault. In other words, they did lay down a base of fire. By base of fire I mean a unit situated on a piece of terrain where they can get cover and provide fire to an attacking unit. They use their light machine guns right in the assault. As a matter of fact, we captured a good number of light machine guns. We got a heavy 30 caliber too. It had the regular antiaircraft sight on it, and on its tripod it must have stood something like four feet off the ground. It was an
old weapon but functioned real well. As a matter of fact, we put it up and used it ourselves in our defense. We used some of their light machine guns also.

Just interjecting here; the NVA weapons that they carry, basically their AK-47s or AK-50s, are exactly alike except the AK-47 has a wooden stock and the AK-50s had a metal folding stock. They are real good weapons; they don't jam. This is mainly because it's a very simple weapon as far as moving parts are concerned.

K: Let's see now; we have the attack and we will come back to it in great detail in the questionnaire. Now we'll look at the patrolling. You were getting mortar fire during the patrolling period. Is this correct?

B: None of the patrolling action could actually be called patrolling in the true sense of the word. It's what we would call a low-level security patrol. None of the patrolling during the 1st to the 4th went further than 200 meters outside the line. It would have been just about suicidal to send a platoon out there.

K: When did you then return the patrol to their position?

Late in the afternoon?

B: No. The first thing in the morning, 7 or 7:30, we had our local security patrols, squads reinforced sweep the immediate area. Then in the evening we would sweep again.

K: But on this particular day, it was in the morning early?

B: Yes.

K: What time did the patrol start out?

B: The first platoon was the first to sweep the saddle. That started about 8:30. No, even later than that; it was about 9:30. They had been out there for 15 minutes when the second platoon went out. The third platoon was the last to sweep their wire; they swept it after lunch around 1 o'clock.

K: And when would they have completed their action?

B: It took the first platoon about two and one-half hours to sweep the saddle. We reconnoitered by fire the whole way, clearing out the few NVA still in there. The second platoon returned because of the amount of sniper fire they were receiving. When I say sweep the
wire, you have to remember that the wire, the last strand of defensive wire, was no more than 40 meters in front of the foxholes. So if you heard a tube pop, and if somebody yelled "a tube popped," you would see the whole squad come running back into their holes. Then they'd have to go back out and start all over again. So it's pretty tedious and it could take quite a long time to do an effective job. I would say on the average it would take about two and one-half to three hours just to sweep the front position.

K: Then the platoons returned to their positions about mid-afternoon?

B: Right. In midafternoon no ground contact occurred—the rest of daylight no ground attack occurred.

K: Were you firing artillery mission?

B: Yes. Also we had Huey gunships working out for us most of the day. As a matter of fact, one Huey sat down on the ground in a bomb crater to get an NVA prisoner and the crew chief got shot trying to capture him because he was only wounded. The Huey, the gunbirds, did a real fine job that day. As we were discussing earlier, it's a constant struggle between your work and the work you do for other people. It's true for air and arty particularly. Who's going to do the job, arty or air? At the time it was beneficial to have air and artillery working together because a lot of units were being probed and taking sniper fire.

K: What about after the patrols were back—in the evening? Was there any contact?

B: It was just intermittent mortar fire—no heavy bombardment.

K: What about the two companies that had made the attack? What did they do? They withdrew? Where did they go? Did they return to their staging post?

B: Well, they went further than their staging point because as patrolling revealed around the 6th and the 7th, a Hugh bunker complex was found near the ridgeline that I talked about earlier, namely the ridgeline running from the 870387 to 877377. There was a pretty elaborate network of bunkers there, and this probably was their battalion CP. Knowing that an 82 mortar and 50-caliber machine guns are basic
battalion TO weapons, there was a consensus that a battalion sized force was actually in the battle for the ridgeline itself. I don't think that the battalion hit us all at one time. I'm sure there were reserve forces back on this ridgeline that we talked about.

K: Let's start with the first question--infantry deployment, opening battle phase--where did it take place?

B: The actual battle took place on a ridge that I call "Fox-trot Ridge." Its coordinates were 873388 and 875383, which was south-east of Khe Sanh.

K: When did it start, giving the date and the hour?

B: The actual attack started the 1st of July right at first light, which was about 0530 or 0545.

K: What were the friendly units?

B: There was a company, reinforced, in the entire complex with one platoon, reinforced, on a hilltop a hundred meters to the east of the rest of the company.

K: Would you give the name?

B: Second platoon, I Company, 3d Bn, 4th Marines manned the hilltop directly east of the rest of the company. First platoon and third platoon along with the weapon section and the I company CP were together.

K: What was the enemy force? Estimate the force at the start of the fight, during the fight, and at the end.

B: The estimated force--actually the estimates came after they attacked the place--it was an NVA battalion that tried to take the ridgeline. The actual attack took place probably with two companies.

K: Were they VC or NVA units?

B: It was definitely NVA regulars.

K: Was the fight part of a planned operation? Was there prior contact with any patrols?

(U) B: Foxtrot Ridge (the guys named it for Fox Company, 2d Battalion, 3rd Marines), and I'm not sure of the date, exactly, when 2/3 was there. I think it was the middle part of June. In this area, all along the south of Route 9, had been a sore spot and a known enemy
infiltration route. It was all part of Operation Scotland II.

K: Why was your company in this area? When did it come in?

B: India Company moved to Foxtrot Ridge on 18 June. They just patrolled the area, as far as I know; I wasn't there on the 18th of June. It turned out lighter than we thought as far as contact with the enemy was concerned. There were signs of the enemy—not all of them fresh. The 30th of June's patrol patrolled north right along Route 9 and foiled an enemy ambush on a convoy coming out of Khe Sanh.

K: When was that?

B: This was June 30th. I didn't take this patrol out. I arrived when they were patrolling and my platoon Sergeant took the patrol out. He was the platoon commander then. It resulted in no friendly WIs or KIAs and no confirmed enemy casualties.

K: Would you repeat your unit mission?

B: Generally, the mission out in this area was to man company patrol bases. They had been working on this job for some time. Rather than being a spirited offense, it was more like a slack-off. That's where you run patrols out of your company patrol base, but most of the time you seem to be in a static defense position and the NVA on the offense. The mission was to find the enemy and destroy him by the best possible means.

K: What was the enemy's mission in your opinion? Can you guess?

B: The area that we were operating in was definitely an infiltration route. There wasn't any tactical advantage for the enemy to hold this piece of ground, this particular piece of ground known as Foxtrot Ridge. It was just another hill in a series of hundreds of them out there. I think that at this stage of the game, which was only last summer and before the bombing halt, that many of the enemy's commanders, rather than seeking out a specific mission, were just satisfied to engage any U.S. armed forces and try to destroy them. But, you have to take into account that this was an infiltration route and getting friendlies out of the area would probably be beneficial to the NVA in the long run. It would be easier for them to move through the area without worrying about being destroyed by a task force like the....
K: What happened first?
B: You'd have to say it started in the evening of the 30th when we were prepped by 82s and heavy artillery from Co Roc Ridge. The actual ground action came early on the morning of the 1st around 0200 or 0300, when the enemy moved. After detecting them, you could hear digging, you could see lights, you could actually see bodies. You knew that they were out there from the signs—the lights, digging, and other noises.
K: Now the first attack, how long did this thing last?
B: The main attack lasted about a half hour, 30 minutes. They didn't use any heavy prep of the area and the trip flares that were set out around the battlefield gave them away a lot sooner than they wanted. They really couldn't get the attack off the ground with the impetus that they probably had hoped for. The main attack lasted only about 30 minutes.
K: Would you describe the size of the attacking force.
B: The main attack was handled by a company reinforced. When I say reinforced, I mean by heavy automatic weapons. No mortar fire or anything like that. I'd say in the vicinity of 120 men. This might seem to be high; in most fire fights in the area the forces were a lot smaller than in this. The feint attack that we talked about earlier was launched at approximately the same time. This separate attack, I would say, was handled by a company minus. When I say a company minus I am speaking in terms of 40 or 50 men.
K: During this half hour period, how many casualties did you have?
B: We took one KIA that I'm sure of—on the evening of the 30th, by one of the heavy artillery pieces, around 2030. First Platoon suffered one KIA. We had numerous WIsAs in the sense of the word that they were wounded but not medevaced. They were treated right there by the platoon corpsmen or the head corpsman and they went right back to their foxholes. In other words, they had a little piece of shrapnel in the arm or something like this. In assessing the casualties, let's say from the evening of the 30th until after the first phase, I would say very light; 8 KIAs and about maybe 12 WIsAs. I have seen the
report here and I think that their friendly casualties were way off.

K: These casualties occurred primarily during the first half hour?

B: Yes. The second platoon took the brunt of the WIs and KIAs.

K: How many would you say? What percentage did they take?

B: Well, I would say, just off hand, at least 70 percent of the casualties for the period we just talked about were taken by the second platoon. I know for example that one machine gun crew was entirely wiped out.

K: The three were killed?

B: Yes, they were killed.

K: What about casualties from mortars? Ten percent?

B: Casualties, in terms of WIs, were incurred by mortars and the artillery. But small arms automatic weapon fire definitely did more harm than anything else.

K: During the attack phase they were not supported by mortar fire during the half hour attack?

B: No, they weren't supported by mortar fire. They used their automatic weapons and their rocket projected grenades,lichoms (Chinese type hand grenade), and what have you. You can't term an RPG as supporting arms because it's TO to their battalion or company.

K: Define an RPG.

B: An RPG is a rocket projected grenade. Like our 3.5 rocket launcher. The round is smaller, it's a lot more accurate and does a lot more damage. It's a lot easier to carry; it's generally made out of a piece of bamboo--hollowed out. It's real simple, but it does a lot of damage. It's really effective against bunkers. It's more in the category of our M-72 LAW.

K: During this period of time what kind of protection was available to you and your company? What kind of protection could a rifleman have used when he's firing these weapons? Did you have trees, foxholes, logs, or what kind of positions?
B: The riflemen were all in foxholes. Ninety-nine percent of all of these foxholes were open. We found that unlike the NVA, the Marine riflemen don't like to operate out of a foxhole with overhead cover.

K: How big were these holes? Their dimensions?

B: It's usually about four and a half feet deep, five feet long and maybe three feet wide.

K: How many men in one of these?

B: Well, there's supposed to be two--it's supposed to be a two-man buddy hole. In the case when you're getting incoming, you might have five people in there. You know if you're sitting around, batting the breeze and you hear a tube "pop" you'll always go in a hole.

K: Now when you were in the standing position...

B: It's a two-man buddy hole.

K: Two men?

B: Except when you're in a machine gun hole, then it's three men. You have your gunner, assistant gunner, and ammo man.

K: Can you describe the machine gun position? Is it also uncovered?

B: Yes it is. It's uncovered, usually with a parapet built right in front of it. By parapet I mean a leveled off piece of ground or a rack made out of sandbags, where they can lay their gun with its bipod in front of the hole and fire from it. It's bigger than a two-man hole, in most cases. I'd say it's body deep, it's probably about four feet wide and about six feet long, figuring that you're going to have three men in there. The actual way it's set up on the ridge [tape garbled]. Well, not only machine guns, but a lot of the holes are set up with covered living quarters. The living quarters were an extension of the hole, only it was overheaded with logs and sandbags. It was set up something like, well almost like a trench, if you want to call it that. Half of it was covered, you could lay your poncho in there and sleep; you could keep the chow and your water and gear and you could walk right out the entrance and into your buddy hole.

K: This is a divergent kind of question. Why did Marines build living quarters covered and didn't want cover in a fire fight?
B: They don't define it—your PFCs, lance corporals, and corporals. They don't like to have anything over their heads when they're fighting.

K: It's psychological?

B: I think it is. Well, for one thing, when you have an overhead, and you're actually in a fort-type bunker, you can't use your LAW to any great degree because of the backslash when it's fired. They like to be able to move around. If the enemy gets inside the lines and it comes to hand-to-hand, they don't want to be cooped up. They want to be in something they can get out of real quick and move up to another position. It's just one of those things. Unlike the enemy who always has overhead.

K: When mortar fire comes in heavily and the rifleman gets down, would he crouch in his hole or would he tend to go into where this overhead covered him?

B: Well, the majority of them just crouch down in the holes and put their flak jackets on. A 60mm mortar round would have to land right beside you to do any damage. An 82 would almost have to do the same thing. A heavier piece of artillery, when you're in an open hole, could land close enough for you to get some concussion. There's a chance that you'll get shrapnel from an airburst. I've never seen the enemy use an airburst or a delayed fuse. Almost all of their fuses are quick and you have to take a direct hit to get hurt.

K: Now let's turn around and look at the NVA as they made this attack. What kind of protection did they have? For example, was he in the open as he came across or was there tree cover to hide behind? Was he standing or crawling? This type of thing.

B: Because it was night and because of the terrain around the battle site, he had real fine concealment. I might distinguish the difference between concealment and cover. When I say something was in cover, I mean hiding and out of sight. The elephant grass was four to ten feet high; real well used trails all through it. They had a lot of concealment until the final attack began. They actually got in the strands of wire—the first strand of wire—[tape garbled]. So, in moving into the attack they couldn't be observed.
K: You mean they were firing their rifles?

B: No. The only firing that was done was on the LP which was out in front of the line. They didn't actually fire their weapons until the assault began. When the assault began they were for the most part out in the open. I don't mean in the open in terms of a rice paddy, but in other words, some parts of their forces were showing. Most of the enemy's forces were exposed—you could actually physically see them.

K: What about the extension of their machine gun range?

B: Well, their machine guns were used right in the assault.

K: You mean they moved up right with the rifleman?

B: Yes. They carried the light machine gun—about the weight of our M-60. They didn't use a base of fire to my knowledge anyway—I didn't see one and if they had one it was a real light one, maybe one or two machine guns. Just going on the number of light machine guns that we captured [tape garbled]. So they definitely used them in the assault as well as their RPGs.

K: Could you describe the protection that their mortars had?

B: Just outstanding protection as far as the personnel were concerned. What they did was to get in an old bomb crater and dig a tunnel right into the ground. They put the mortar tube just outside of the tunnel where they come out, throw a couple of rounds in, and then go back into their caves. It would take a direct hit with an 8 incher to do any real damage to their cover.

K: How much covering would they have on top?

B: Their mortar positions would have four to six feet of earth on top. Although it could be caved in by a direct hit of an 8 incher with light fuse on it [tape garbled].

K: Did you find any specially protected positions like bunkers?

B: When we started on our long-range patrols—which was later—we found some real elaborate bunkers.

K: And what were they like?

B: They were all basically the same. Also, they had the A fighting bunker, which was A-framed, using logs, dirt, and rocks for cover. Their command posts were much larger—I'd say they were able to take
ten to fifteen men. There were shelves dug into the sides of the bunker where they might have placed their radios or other type of communication gear.

K: How much covering was on top?
B: Anywhere from two to four feet of earth and logs.
K: Just one log?
B: Log, yes, they always used logs.
K: What size of logs?
B: Well, they are four to five inches in diameter—they were good sized logs. They camouflaged real well—you could walk right over one and not even see it, unless you actually saw the aperture. Most of their bunkers were living bunkers rather than fighting bunkers. I noticed that all the entrances were facing to the south and they were attacking from the south to the north. They definitely were living quarters rather than fighting quarters.

K: I'm trying to break down this enemy attack to the point at which they withdrew. Can you estimate the casualties they had taken when the withdrawal began? I'd like to break the attack into two parts. Is that a logical break?
B: Well, you could probably logically break it into two parts. Offhand, the sporadic rifle fire put on during the attack didn't cause any WIA's or KIA's among the friendlies. After the first attack was over and for the next four days their mortars were coming in.

K: This half hour attack—they came forward. How far did they advance?
B: Well, there were three or four of them that got within five feet of a foxhole. One machine gun man was killed, the NVA got right inside. Most of them were killed when they reached the last strand of wire. The ones that got through did most of the damage. I'm not sure of the figures, but I think from the evening of the 30th when they started prep fires, through the attack on the morning of the 1st we took eight KIA's and about twelve WIA's. Four or five NVA soldiers got right inside the lines and did 90 percent of the damage as far as KIA's were concerned. Six of the eight were killed by three or four soldiers.
K: Can you describe the withdrawal—was it disorganized?
B: Yes, it was.
K: Did they withdraw by platoons?
B: No, they withdrew as individuals; not one by one but by
twos and threes. There just weren't enough people left for an
organized withdrawal. From what I heard and from what I've seen of
them you have to be impressed with their leadership and their resolve
in taking objectives. So much damage was done that I'm sure it was
just individuals turning around and running.
K: How many casualties did you take during the withdrawal?
B: During the withdrawal? I don't know of any. I know my
platoon didn't take any.
K: During the attack were there particular turning points?
Did their casualties get so high that they had to withdraw?
B: If, by that, you mean was there something in particular
that caused the withdrawal, then I'd have to say that it was the re-
coilless rifle fire. That would definitely have to be credited with
causing the withdrawal and the failure of the attack in general. It
was devastating.
K: Let's turn now to the small arms employment. How many
rounds would each Marine rifleman start with? How many would they
have at the beginning of this attack?
B: Being in the defense posture that we were, it was just so
heavy.
K: Can you guess at the average number of rounds?
B: A BA (basic allowance) for a rifleman is 180 rounds. Six
magazines is what they're issued when they come into the country. That
is not at all close to what they carry—most of them carry fourteen or
fifteen magazines, if not more.
K: In this situation [tape garbled] the average rifleman?
B: I would say that the average rifleman in this situation
had four times the BA—180 and four times that is 720—and probably
even more. They don't have magazines for all these rounds, they have
the rounds in cases. They could shove them into magazines.
K: How many grenades would they have?
B: Grenades. A BA for a rifleman is anywhere from four to six grenades; and this again was higher. I would say that each man had a good twenty-five grenades. I'd say, on the average, each hole, each two-man buddy hole, had at least thirty grenades and within a matter of seconds you could have gotten a lot more.

K: How many machine guns were there?
B: We had six machine guns; two to each platoon.
K: How many rounds were with each machine gun?
B: Again, the BA for rounds carried is 2400 for a squad. A squad consists of two guns. It was a lot more than this. I would say each gun had at least 4000 rounds with it.

K: During this attack, after they started attacking, roughly at daylight, at what range would you say the rifle firing began?
B: Enemy or friend?
K: Enemy.
B: One hundred meters at the most. They didn't get a chance to employ small arms as they should have. The Marine small arms was within 50 meters. The heaviest bursts of small arms fire were about 50 meters.

K: How many rounds would you say that the average rifleman fired--Marine rifleman, that is--during this half an hour?
B: One hundred rounds--five magazines.
K: And they were standing in their foxholes during that time?
B: Yes. Either that or lying down on the ground in front of their foxholes or beside of them.

K: Now, I'm going to ask you for an opinion. How did the accuracy of your rifle fire compare with the accuracy on the firing range in the U.S.? Would you say half as accurate, just as accurate?

B: I think that they're completely accurate; at the range that they're using. In other words, with an M-15 rifle you're firing at 50 meters. If you have two left windage, and it's supposed to be four left windage, it's not going to make any difference. If you move the windage one click, it's one inch for every hundred meters. If you're firing and you aim it at his heart and hit him two inches below the heart--it's still going to do some damage.
K: At what range did the Marine machine guns fire?
B: The machine guns fired at the same range. The machine
guns didn't fire very much; they're not supposed to.
K: The next question is how many rounds were fired, on the
average, by the machine guns?
B: Very few. I would say that second platoon probably fired
maybe 200 rounds per gun. Third platoon and first platoon didn't fire
as many--maybe 50. In the concept of your plan for fire, a machine
gun should not open up until their small arms increase to such a vol-
ume that it's necessary for them to open up. You have your final
protective line of fire and every company commander would hate to give
away a machine gun position; and therefore, would not let him open up.
K: Were these mounts bipod or tripod?
B: They were all bipod; we didn't have any tripods.
K: Now let's talk about the question of targets for small
arms fire. What were the targets? Were you firing at areas, at
individuals or at groups of individuals?
B: Well, we were firing at individuals. That isn't right
either, but it was done.
K: Now what were the chances of picking out the right tar-
get? By this, I mean did the men always have a target to fire at that
you could identify as such, or did they fire into areas into which
may or may not have contained NVA?
B: We said this attack lasted about 30 minutes. In the
first 10 minutes, you definitely had any target you wanted. You could
actually see the man standing--it was like a turkey shoot. After that,
I would have to say that they were probably firing at area or at a
movement, or at shadows--that would probably be the case.
K: In your opinion, what were the chances that the area you
were firing into did actually contain a target--fifty-fifty?
B: Well, even better than that.
K: Sixty-fourty?
B: Well, seventy-thirty.
K: Seventy-thirty. O.K. Now the enemy small arms fire. At what range were they delivered? Earlier you said one hundred meters. How would you estimate his rates?

B: It was much lower.

K: Can you say rounds per minute, or would it be easier to say heavy, moderate, light?

B: It would be easier to say light, probably.

K: Light. The average NVA rifleman--how much would he have fired during the thirty minutes period?

B: The best I think that I could do is give you the average amount of rounds that an NVA rifleman carries with him. We found that from the bodies we recovered, the majority had three magazines--each magazine held 30 rounds--90 rounds. Now, the NVA doesn't rely on their small arms as much as their chicom (grenades) and their RPGs. I would say that other than their automatic weapons, that each NVA soldier got no more than 50 rounds off during the whole thing.

K: How many grenades would they have thrown during the engagement?

B: They threw a lot of them. I'll base my answer on the amount that my platoon took and I'll probably have to times that by two or three and get second platoon's. I'd say that second platoon took in the vicinity of maybe 75 or 100 grenades. We received maybe about 20.

K: When the NVA were firing their rifles were they standing or were they kneeling?

B: They were in the assault position--they were actually moving right towards us.

K: So they were upright and standing?

B: Yes they were.

K: At what range did their machine gun fire?

B: Their machine gun fired right along with their rifles.

K: Could you estimate his rate of machine gun fire?

B: In terms of light-moderate-heavy?

K: Well, that will do.
B: It was moderate. They were firing four- or five-round bursts for about two minutes at a time. Then they tried to move to a new area. I would say that the machine gunners, the NVA machine gunners, probably didn't get off any more than 100 to 150 rounds per machine gun.

K: What kind of mount did their machine gunners use? Was it a bipod mount?

B: It's just like our M-60; it's bipod. They carry it in the assault position--it's almost like a rifle to them.

K: Give me an estimate of the casualties that you inflicted on the NVA.

B: During the attack, like I said, we were credited with 107 KIAs; then we took a body count the next morning. Out of 107, I would say that the recoilless rifle and the 60 mortars accounted for at least 60 or 70 of these. And we had our 60 mortars firing for us all night. And when I say firing for us, I mean right in front of our lines, sometimes more than 25 meters away.

K: Now we are ready to go into mortar fires. What unit or units supported you?

B: Our company mortar section fired in support of us all during the attack. Both illumination and HE; that's high explosive.

K: Who directed the fire?

B: The weapons-platoon commander. The platoon commander would tell the weapons-platoon commander where he wanted the fire. It was pretty much of a show between the second and third platoons in calling in fires.

K: Can you break this down into particular missions?

B: Yes. The first mission fired was on a finger to the south of second platoon's hill.

K: Can you give a coordinate on that?

B: Right. 877381.

K: How was the target described?

B: Enemy in the open--fire for effect.

K: How was its location described? Was it given by the coordinate?
B: No, it wasn't anything that elaborate at the time because the mortars section had a complete view of what was going on down there and they had their registration fires. When you move into a defense position, one of the first things your mortars do is fire registration fires. What I mean by registration fires, they pick out terrain objects, like avenues of advance, and they register on them and plot them in their fire-direction center. That's a real fancy name for it--it's not actually that elaborate.

K: The first mission; how many rounds were requested? Or was it left up to the--?

B: It was completely left up to the mortar section
K: How many were fired?
B: I'd just have to guess.
K: You said the fire was easy to observe?
B: Yes, it was observed.
K: What range from the target?
B: It varied between 300 and 500 meters.
K: How would you evaluate the results?
B: Extremely devastating. It did a real good job. Because it was so close and because it could be observed, it was easy to make corrections. You could actually see these rounds landing in the midst of the enemy. As I said before, you didn't have time to just sit there and count the enemy going down, but you knew it was right on top of them and you knew that it was doing some damage because they were in the open.

K: You said you did not know how many rounds were fired?
B: No, I don't.
K: Take a guess.
B: I would say that on the first mission, itself, 15 to 20 rounds anyway.
K: How long a period of time?
B: A couple of minutes.
K: When did it come in? Did the enemy machine-gun and rifle fire slacken?
B: Oh, yes.
K: How much would you say? Half of what it was, or more than that?

B: The first volume of enemy small arms was quite heavy. When they began to attack, their volume of small arms like any attack was real heavy to try to gain some sort of fire superiority. The 106 recoilless rifles started to fire, Marines started to return fire, and mortars started popping amongst them; I would say it decreased about three quarters.

K: To three quarters, or by three quarters?

B: By three quarters.

K: So, you'd say they were firing about a quarter of the rate that they had been firing?

B: Right.

K: Can you identify another mission?

B: The second mission--it might not have been the second but the next mission that I remember--was into the saddle area that we talked about already.

K: Could you give the coordinates on that?

B: Right. The saddle area was in the vicinity of 875383. Again, it was close to the lines and real easy to observe. Because the number of enemy there was less than on the second platoon's eastern flank, you couldn't observe the damage as well, but you knew that it was right there.

K: Now, on the second mission, how much was fired?

B: I'd say about the same thing, 15 or 20 rounds.

K: At that point, had the enemy been firing small arms?

B: Yes. There was small arms fire coming out of the battle area, directly in front of the third squad of the third platoon.

K: While this mission was being fired, did the small arms fire disappear?

B: No, it didn't. Mainly because, as we mentioned before, there were enemy dug in.

K: Did it reduce the fire at all?

B: Oh yes, it definitely did.

K: To about what?
B: Well, maybe half. When we talked about the first mission and how it reduced enemy fire, it permanently put an end to some enemy fire. But here, the rounds would land and as soon as they were over, they could pop up out of their holes and start firing.

K: While it was coming in?
B: While it was coming in; it was almost nil.
K: Almost. But there were some?
B: Oh, yes, there were still some. You could hear the small arms. In other words, it is hard to pinpoint when there's the tremendous volume of fire going out. It's hard to pinpoint exactly what is enemy and what is friendly, other than the AK-47--it has a pretty distinct sound to it.

K: Now, was there a third--was there another mission you could identify?

B: There were a lot more missions all night long--all along the fingers running to the south.
K: This was after the attack?
B: No, this was still during the attack. In other words, there might have been seven concentrations around our perimeter. The first mission was fired in support of the second platoon. Naturally, the second mission was fired in support of the company as a whole because the saddle was such a vital piece of terrain.

K: O.K., missions one and two occurred during this attack?
B: Yes. Also, mission three was directly in front of third platoon's line which was also during the attack.

K: O.K., could you give a coordinate for the third mission?
B: 874383--which was only about one hundred meters to the south or to the southwest of the second mission--this was also during the attack.

K: How many rounds would that be?
B: When you give a fire for effect to your mortar platoon commander, it stays about the same, 10 or 15 rounds. You have to remember that during these fire missions, the mortars were intermittently putting out illumination fires.

K: What was the observation on the results.
B: We had 105s firing a little for us too, and 155s which are a lot better as far as the light goes. They give out a lot more candle power than the 60mm does. There would be gaps—artillery light would run out and the mortars would take up the slack.

K: So that was it—there were three missions then, during the attack?

B: Right.

K: Now the enemy mortar fire—there was none during the attack.

B: No, there wasn't any during the attack itself.

K: First of all, to make a comment, how would you evaluate the performance of the mortar units?

B: Just outstanding.

K: Let's move on now to the artillery. What unit or units? Can you name batteries?

B: All I knew is that it was 3/12—third battalion, 12th Marines. I'm not even sure how many guns there are in a battalion.

K: Now, we are going to question you mission by mission. I think we have the firing records, but I'd like you to discuss a particular mission.

B: Being a platoon commander, I didn't have a direct line to the battery itself. I had to go to the FO attached to the India Company, the forward observer. There were a lot of missions during the night. I don't think that there was a great degree of fire support from arty during the main attack. I think most of the concerted effort by the artillery people was put out a little after the attack. Then we could definitely get into something substantial about missions.

K: O.K., were there any artillery missions that you especially observed?

B: During the attack? No, there weren't.

K: Now, air strikes?

B: None during the attack.

K: Now let's get on to infantry unit questions. What is the normal strength of your unit?
B: Well, a TO company operates at 210.
K: How many were present here; do you know?
B: I'll say this--when I joined the platoon I had 17 men.
The TO of a rifle platoon is about 46 men. So, I would say counting
everybody on the hill--not just our company--we had the 106 people
there. They were attached to us and we were responsible for them.
They were part of the company, operationally anyway. Including our
weapons platoon, I would say that we had about 104. I know that at
one point, I think on the 3rd and the 4th, we had 94 people with
us on the hill. That is real low.

K: Was your unit's organization changed in any special way?
B: Yes. The 106 recoilless rifle people were attached to us.
K: Now, the enemy, did he have weapons that were unusual?
B: No, not for a battalion-sized unit--nothing except for his
ability to get heavy artillery fire from near the Laotian border. He
had some special type of FO teams, but as far as any special kind of
weapon, he only employed his regular mortars. He carried a 50 caliber,
which was the heaviest piece of automatic weapons that he had.

K: Was he organized in any unusual way?
B: They were organized--they are extremely well organized,
just like any other...

K: Was there anything peculiar or special that was different?
B: Oh, no. It wasn't a special unit.
K: How much ammunition would you estimate was available?
B: I said before that on the average we counted three maga-
zines, which were equivalent to 90 rounds.

K: O.K., what about the machine gun?
B: The machine guns; I really don't know. We found an assault
pack and I think 100 rounds went into it.

K: What about grenade launchers?
B: Well, we found seven of them. I'm sure there were a lot
more than that.

K: How many grenades would be available?
B: Not many; probably three or four per launcher.
K: What about the amount of 60mm mortars ammunition?

B: The 82s must have had an awful lot from what happened in the next four days. They were continuously trapping us with 82 and 60mm mortars. They must have had a good supply on hand or close enough to them so they could get to it easily.

K: In the next questions I'm going to be asking for impressions. I know that you can't be precise. For example, you were in a defensive position, but I'm going to be asking about movement rates. How fast would a unit of your type and size move nontactically in this kind of terrain not with any enemy present? If you were just going to move your unit, how fast would you move?

B: I would say we could cover 1000 meters per half hour.

K: How fast could you move if you were on patrol and you were sure there were enemy elements?

B: I would say your movement would be restricted to 50 meters an hour, in some cases. It all depends on where your patrol was at the time. If you're walking along a high piece of terrain and you're moving towards the higher piece of terrain and there're signs of enemy around you'd recon. You might advance 10 meters in two hours; in other cases you might advance 100 meters in an hour. The one thing that's real bad in that type of terrain, and as much as everybody would like to use it, you just can't just use flank security. The terrain is just too rugged to use any type of flankers. You're always in a column and you try to keep spread out as much as you can. You're a column of Indians.

K: Now, you are receiving incoming and you're seeking more cover in the ground around you; how many rounds or what rate of fire makes you seek cover?

B: One "pop" of the tube. It has a very distinct pop and everybody just yells "tube popped" and everybody gets down in a hole. Now did you mention suppression fires on the mortars?

K: No. I was thinking of [tape garbled].

B: A lot of people would ask, when you get down in your hole, how do you ever find out where the mortars are? Generally, they shoot where the sound comes from.
K: I see. When you are seeking more cover, how did this reduce the rate of fire?
B: It would stop our firing.
K: What about when mortar and machine-gun crews take cover? Do they still manage to fire but at a lower rate?
B: Your machine guns never fire. It's just too valuable a weapon to let it fire whenever you want to. You will give away the positions and the enemy will try to get them. I mentioned before that, out of eight KIAs I believe we had, three of them were machine gunners who opened up too soon. The enemy definitely wanted to knock it out of there. So the machine gunners never fire. The only people who are really concerned when you take incoming are your mortar people, your platoon commanders, and your arty FO. He immediately wants to work up some kind of counter-mortar fires.
K: How would you say the casualties affected your unit's performance as a whole? In your platoon how many casualties did you take during this attack?
B: We took one WIA.
K: Only one. Your platoon wasn't degraded by casualties then?
B: No, we took a lot more casualties later on. We took more casualties as a company, and also in my platoon, from the 2d to the 10th, than we did in this whole attack. This was when we were getting hit with ground troops.
K: At what level of casualties would you say that a company would be unable to advance in an attack? Thirty percent?
B: No, I would say it's more than that. In the case of the NVA soldier, who is drastically underrated for his fighting ability, it would take 60 percent to 70 percent to keep him from attacking.
K: How about a Marine company? I'm not talking about the company disintegrating but being unable to move in an organized way with covering fires and maneuvering.
B: It will probably vary a lot.
K: In your opinion.
B: I would say that it would probably be the same.
K: Now at what level of casualties do you think a company would lose its ability to fight, break out, and fall apart?

B: I would say there would have to be over 50 percent casualties.

K: In either the offense or defense?

B: No, in the defense I think it could sustain more than 50 percent casualties and still....

K: What about the offense?

B: In the offense, it would really be tough to have the company continue after taking more than 50 percent casualties. In the defense; a lot depends on the defensive posture that you're in. What type of terrain feature you're occupying, how much barbed wire you have, how many mines you have out in front of you and what kind of fields of fire you have. I would say that a company in a model situation, and this is not the extreme of model, could operate at 20 percent strength and still do a real fine job against a larger force.

K: How do casualties affect a machine gun crew's rate? For instance, if you have a crew of five and had one casualty, how would this reduce the crew's ability to fire?

B: It doesn't reduce the effectiveness of the gun per se because all it takes to fire a machine gun is one man and another man to help you with the ammo.

K: Let's suppose that you have two casualties in a crew of five. What do you have, a crew of two or three? Let's take two casualties out of a crew of three. What kind of rate could be maintained?

B: Well, he's only going to stop when he runs out of ammo and has to reload--get another bandolier of ammo to put on the gun.

K: Would this cut him to half his rate?

B: I would say 50 might be a little high; maybe 40 percent. If one out of three were wounded, I don't see where it would cut down your effectiveness at all. Two out of three, yes it would cut it down to about 40 percent.

K: Can you estimate how many mortar rounds the company took during the night?
B: On the evening of the 30th?
K: On the ridge where the two platoons were?
B: Mortar and artillery fire?
K: Yes.
B: We took approximately 70 rounds.
K: Seventy rounds total?
B: Total.
K: And the casualties in this?
B: Very light. I know of one KIA. As I have said before, there's a lot of people that you have to report as WIA's even though they're not really medevaced. In other words, they rate a purple heart because they're wounded in action.
K: Are these what you call "bandaid cases"?
B: Yes, that's a very appropriate name for it. I've never heard it called that but I think it an appropriate name. I would think that probably 70 percent of the WIA's were probably bandaid cases, although there may be more than that. A lot were medevaced or should have been. It's hard to tell. You have a corpsman there. It looks a lot worse than it really is. You get a long scratch across the arm, and there's all kinds of blood coming down. It might be only a superfluous wound, but you know, in view of what's going on you don't want to mess around with people, you want to get them in a chopper and get them out. The same with a head wound, any kind of head wound. You should get them out. You might take him to the rear, take out a piece of shrapnel, put a bandage over his head, wash with a little Mercurochrome, and that's it. He'd be out in the field the next day. I was a platoon commander of the third platoon.
NOTES:
0530 - 0630 - attack phase I
0630 - 1030 - phase II
1030 - 1500 - local security phase, phase III
1500 - 1900 - phase IV

Sketch notes drawn by Lt. Bartolomea

Main attack at 0530 on 1 July 1968 with approx 120 men. Attack lasted about 30 minutes.

Fig. 8 — Sketch notes drawn by Lt. Bartolomea
Fig. 9—Deployment of forces on the night of 30 June – 1 July 1968

Deployment of forces on the night of 30 June – 1 July 1968
(from sketch notes drawn by Lt. Bartholomeo)
Fig. 10—Sketch of operations area drawn by Lt. Bartolomea

Notes:
1P's had three men
- Identifies location of 60mm mortar concentrations
Some minor changes have been made in the original sketch to improve clarity.
Appendix B

ARTILLERY FIRES IN THE VICINITY OF 1/3/4
ON 30 JUNE AND 1 JULY 1968

(U) The Marine Corps allowed us to review the records of artillery fires delivered into the vicinity of the position held by India Company, 3d Battalion, 4th Marine Regiment on 30 June and 1 July 1968. The fires identified are plotted on Fig. 11.

Fig. 11—Artillery fires delivered in the vicinity of 1/3/4's position on 30 June and 1 July 1968
Appendix C

SMALL-ARMS FIRES

NVA fires began when the opposing forces were separated by about 100 yards; the Marines held their fires until the separation approached 50 yards. Two factors dictate against using these separations as "average" ranges for the exchange. First, neither side was deployed in a straight line; second, the situation was a mobile one, with the distance between the forces decreasing with time.

In the first simulations, we attributed to the weapons of both sides a range of 75 yards during the NVA advance from a 100-yard separation to a 40-yard separation; and a range of 40 yards for the remainder of the fire fight. We repeated the simulation with weapons of both sides having a firing range of 75 yards until the forces were separated by about 50 yards; from a force separation of about 50 yards to 30 yards, the weapons fired at a 50-yard range; and for the rest of the fight, a 30-yard firing range ensued.

Small arms were presumed to fire in 6-round bursts, with the trajectory of the rounds corresponding to those of the U.S. 7.62mm machine gun. Assumptions pertaining to muzzle heights, ballistic errors, and aiming errors are given in Table 4.

Targets for all weapons were assumed to be an area 5 yards wide and 9 yards deep, containing one man. The vulnerable area of the man located in the target area is a function of the range, approach angle of the round, muzzle height of the weapon, and the assumed posture of the man. The NVA had two postures in which they were vulnerable to small-arms fire: (1) standing in the open, and (2) prone in average terrain. During their advance, NVA troops standing in the open received mortar fire, which "suppressed" some to a prone position. Marines were presumed to have one set of upper and lower postures: standing in an open foxhole and crouching in the same hole.

The expected casualties per 6-round burst for various conditions are given in Table 5.
Table 4

SMALL-ARMS WEAPON CHARACTERISTICS

<table>
<thead>
<tr>
<th>Weapon</th>
<th>Posture</th>
<th>Muzzle Height (in.)</th>
<th>Ballistic Error (mils)</th>
<th>Aiming Error (mils)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marine Small-Arms Weapons</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rifle</td>
<td>Standing in foxholes</td>
<td>6</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Machine gun</td>
<td>Bipod mount</td>
<td>16.5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td><strong>NVA Small-Arms Weapons</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rifle</td>
<td>Fired from the hip</td>
<td>40</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Machine gun</td>
<td>Fired from the hip</td>
<td>40</td>
<td>0^a</td>
<td>20^a</td>
</tr>
</tbody>
</table>

^aNVA machine guns were fired as they were carried forward in the attack; therefore, they are given the same ballistic and aiming errors as the rifles.

Table 5

EXPECTED CASUALTIES PER 6-ROUND BURST OF SMALL-ARMS FIRE

<table>
<thead>
<tr>
<th>Weapon</th>
<th>Range (yd)</th>
<th>Target Posture^a</th>
<th>Expected Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marines Firing on NVA Targets (Troops)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rifle</td>
<td>30</td>
<td>Standing in the open</td>
<td>0.06939</td>
</tr>
<tr>
<td>Machine gun^b</td>
<td>30</td>
<td>Standing in the open</td>
<td>0.167451</td>
</tr>
<tr>
<td>Rifle</td>
<td>30</td>
<td>Prone in the open</td>
<td>0.016568</td>
</tr>
<tr>
<td>Machine gun</td>
<td>30</td>
<td>Prone in the open</td>
<td>0.080022</td>
</tr>
<tr>
<td>Rifle</td>
<td>40</td>
<td>Standing in the open</td>
<td>0.049635</td>
</tr>
<tr>
<td>Machine gun</td>
<td>40</td>
<td>Standing in the open</td>
<td>0.159433</td>
</tr>
<tr>
<td>Rifle</td>
<td>40</td>
<td>Prone in the open</td>
<td>0.010617</td>
</tr>
<tr>
<td>Machine gun</td>
<td>40</td>
<td>Prone in the open</td>
<td>0.008757</td>
</tr>
<tr>
<td>Rifle</td>
<td>50</td>
<td>Standing in the open</td>
<td>0.036186</td>
</tr>
<tr>
<td>Machine gun</td>
<td>50</td>
<td>Standing in the open</td>
<td>0.144260</td>
</tr>
<tr>
<td>Rifle</td>
<td>50</td>
<td>Prone in the open</td>
<td>0.007308</td>
</tr>
<tr>
<td>Machine gun</td>
<td>50</td>
<td>Prone in the open</td>
<td>0.041730</td>
</tr>
<tr>
<td>Rifle</td>
<td>75</td>
<td>Standing in the open</td>
<td>0.020062</td>
</tr>
<tr>
<td>Machine gun</td>
<td>75</td>
<td>Standing in the open</td>
<td>0.100492</td>
</tr>
<tr>
<td>Rifle</td>
<td>75</td>
<td>Prone in the open</td>
<td>0.003894</td>
</tr>
<tr>
<td>Machine gun</td>
<td>75</td>
<td>Prone in the open</td>
<td>0.022310</td>
</tr>
<tr>
<td><strong>NVA Firing on Marine Targets (Troops)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rifle</td>
<td>30</td>
<td>Standing in open foxholes</td>
<td>0.003846^c</td>
</tr>
<tr>
<td>Machine gun</td>
<td>30</td>
<td>Standing in open foxholes</td>
<td>0.003846^c</td>
</tr>
<tr>
<td>Rifle</td>
<td>40</td>
<td>Standing in open foxholes</td>
<td>0.002699^c</td>
</tr>
<tr>
<td>Machine gun</td>
<td>40</td>
<td>Standing in open foxholes</td>
<td>0.002699^c</td>
</tr>
<tr>
<td>Rifle</td>
<td>50</td>
<td>Standing in open foxholes</td>
<td>0.002052^c</td>
</tr>
<tr>
<td>Machine gun</td>
<td>50</td>
<td>Standing in open foxholes</td>
<td>0.002052^c</td>
</tr>
<tr>
<td>Rifle</td>
<td>75</td>
<td>Standing in open foxholes</td>
<td>0.001226</td>
</tr>
<tr>
<td>Machine gun</td>
<td>75</td>
<td>Standing in open foxholes</td>
<td>0.001226</td>
</tr>
</tbody>
</table>

^aTroops crouched in foxholes are presumed to be invulnerable to small-arms fires.
^bAll Marine machine guns are bipod mounted.
^cNVA machine guns were carried forward and fired much like rifles in the assault; therefore, machine guns and rifles were assumed to have the same expected casualties per burst.
Appendix D
EXPECTED DAMAGE PATTERNS FOR MORTARS AND ARTILLERY

The probability of damage to a target, at the weapon aim point, or at points nearby, is computed for each target type with specific target vulnerability criteria, weapon delivery conditions, and warhead fragmentation data and blast characteristics.

In this appendix, the target types for the simulation are defined from interview data. The method of computing target vulnerable areas is detailed, target vulnerability assessments are outlined, and delivery conditions for mortars are specified. Tables 6 and 7 list computed damage patterns and lethal-area patterns.

TARGET DEFINITION

FAST-VAL permits the degree of protection available to troops to vary. Casualty probabilities are calculated for each protection level for each weapon. Among the several FAST-VAL standard postures are (1) standing, (2) prone, (3) standing in open foxholes, and (4) crouching in open foxholes. The FAST-VAL open foxhole is 2 by 4 feet, and 4 feet deep.

In the case study examined in this report, Marines were hit by artillery and mortars while they were crouching in foxholes.

DEFINITION OF VULNERABLE AREA OF FOXHOLES

Fighting positions occur in a wide variety of sizes. The Joint Munitions Effectiveness Manual (JMEM) group proposed that, in addition to the plan area of the position, the vulnerable area should include an area equal to the crater radius of the shell or bomb on each side.

For our purposes, we assume that a position of dimensions A and B will have a vulnerable area as shown in the sketch at the top of the following page.
Table 6
WEAPON DATA FOR ONE-ROUND VOLLEY, 81MM MORTARS

a. LETHAL AREAS FOR TYPICAL TARGETS

<table>
<thead>
<tr>
<th>Item</th>
<th>Prone Men</th>
<th>Men Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attack/volley index number</td>
<td>103701</td>
<td>103705</td>
</tr>
<tr>
<td>Lethal area, ft²</td>
<td>3147.7</td>
<td>9071.2</td>
</tr>
</tbody>
</table>

b. SINGLE-SHELL DATA

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range, ft</td>
<td>2524.66</td>
</tr>
<tr>
<td>Drag factor</td>
<td>0.4461</td>
</tr>
<tr>
<td>Shape factor</td>
<td>1.0</td>
</tr>
<tr>
<td>Height of burst, ft</td>
<td>0.0</td>
</tr>
<tr>
<td>Angle of fall, deg</td>
<td>75.0</td>
</tr>
<tr>
<td>Velocity of burst, ft/sec</td>
<td>357.3</td>
</tr>
<tr>
<td>Weight of explosive, lb</td>
<td>2.1</td>
</tr>
</tbody>
</table>

c. ATTACK/VOLLEY DATA

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pattern of definition</td>
<td></td>
</tr>
<tr>
<td>Range (x)</td>
<td></td>
</tr>
<tr>
<td>Spacing between aim points, ft</td>
<td>0.0</td>
</tr>
<tr>
<td>No. of aim points</td>
<td>1</td>
</tr>
<tr>
<td>Deflection (y)</td>
<td></td>
</tr>
<tr>
<td>Aim-point offset, ft</td>
<td>0.0</td>
</tr>
<tr>
<td>Shells/bombs at aim point</td>
<td>1</td>
</tr>
<tr>
<td>Ballistic error</td>
<td></td>
</tr>
<tr>
<td>Range (σx), ft</td>
<td>52.5</td>
</tr>
<tr>
<td>Deflection (σy), ft</td>
<td>17.8</td>
</tr>
<tr>
<td>Pattern aim error</td>
<td></td>
</tr>
<tr>
<td>Range (REP), ft</td>
<td>0.0</td>
</tr>
<tr>
<td>Deflection (DEP), ft</td>
<td>0.0</td>
</tr>
<tr>
<td>Target definition</td>
<td></td>
</tr>
<tr>
<td>Range (σx), ft</td>
<td>16.6</td>
</tr>
<tr>
<td>Deflection (σy), ft</td>
<td>16.6</td>
</tr>
</tbody>
</table>

*U.S. 81mm mortars are presumed to be equivalent to NVA 82mm mortars.*
Table 7

LETHAL AREAS FOR TYPICAL TARGETS (6-ROUND VOLLEY 155MM HOWITZER)

a. LETHAL-AREA DATA

<table>
<thead>
<tr>
<th>Item</th>
<th>Men Standing in Open Foxholes</th>
<th>Men Crouched in Open Foxholes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attack/volley index number</td>
<td>135502</td>
<td>135503</td>
</tr>
<tr>
<td>Lethal area, ft²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single shell</td>
<td>1313.64</td>
<td>139.67</td>
</tr>
<tr>
<td>Volley</td>
<td>7851.0</td>
<td>835.0</td>
</tr>
</tbody>
</table>

b. SINGLE-SHELL DATA

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range, ft</td>
<td>28,871.33</td>
</tr>
<tr>
<td>Drag factor</td>
<td>.4182</td>
</tr>
<tr>
<td>Shape factor</td>
<td>1.0</td>
</tr>
<tr>
<td>Height of burst, ft</td>
<td>0.0</td>
</tr>
<tr>
<td>Angle of fall, deg</td>
<td>30.6562</td>
</tr>
<tr>
<td>Velocity of burst, ft/sec</td>
<td>994.09</td>
</tr>
<tr>
<td>Weight of explosive, lb</td>
<td>15.7</td>
</tr>
</tbody>
</table>

c. ATTACK/VOLLEY DATA

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pattern of definition</td>
<td></td>
</tr>
<tr>
<td>Range (x)</td>
<td></td>
</tr>
<tr>
<td>Spacing between aim points, ft</td>
<td>0.0</td>
</tr>
<tr>
<td>No. of aim points</td>
<td>1</td>
</tr>
<tr>
<td>Deflection (y)</td>
<td></td>
</tr>
<tr>
<td>Aim-point offset, ft</td>
<td>60, 180, 300, -60, -180, -300</td>
</tr>
<tr>
<td>Shells/bombs at aim point</td>
<td>1, 1, 1, 1, 1, 1, 1</td>
</tr>
<tr>
<td>Ballistic error</td>
<td></td>
</tr>
<tr>
<td>Range, (σx), ft</td>
<td>204.4</td>
</tr>
<tr>
<td>Deflection (σy), ft</td>
<td>19.5</td>
</tr>
<tr>
<td>Pattern aim error</td>
<td></td>
</tr>
<tr>
<td>Range (REP), ft</td>
<td>121.4</td>
</tr>
<tr>
<td>Deflection (DEP), ft</td>
<td>59.0</td>
</tr>
<tr>
<td>Target definition</td>
<td></td>
</tr>
<tr>
<td>Range (σx), ft</td>
<td>16.6</td>
</tr>
<tr>
<td>Deflection (σy), ft</td>
<td>16.6</td>
</tr>
</tbody>
</table>
\[ A_v = AB + 2BR + 2AR + \pi R^2 \]

where \( R \) is the crater radius of the shell or bomb.

(C) For foxholes and fighting bunkers we assume a crater radius:

\[ R = 2(w)^{1/3} \quad \text{(surface burst)} \]
\[ R = 3(w)^{1/3} \quad \text{(delayed burst)} \]

where \( w \) is the charge weight equivalent to TNT corrected for charge weight; and

\[ w = w_c R_1 R_2 \]

where

\[ w_c = \text{weight of explosive} \]
\[ R_1 = \text{correction of type explosive to TNT} \]
\[ R_2 = 0.9 \text{ if } (w_c R_1) \text{ is less than 50 lb} \]

TARGET VULNERABILITY CRITERIA

Target postures are used in the development of damage probabilities in the following manner. Troops crouching in open foxholes may become casualties from blast or fragments. No computations were

\* Reference 6 suggests that \( R = (2 \pm 0.5)(w)^{1/3} \) applies, depending on soil condition, when the charge is detonated at or near the surface. When the charge is buried (or the shell has a delayed fuse), permanent earth displacements occur at \( R > 3.2 \) \((w)^{1/3}\) and temporary displacements occur at \( R > 3.6 \) \((w)^{1/3}\).
made for fragment-produced casualties in the present study, since the Marines were subjected only to surface bursts and they were reported to be down in the foxholes.

Casualties are produced when mortars and artillery shells (1) land in the foxhole area, or (2) land within a crater radius from the edge of the foxhole. The vulnerable area of a foxhole 2 by 4 feet, for mortars and artillery, is

\[ A_v = 8 + 12R + \pi R^2 \]

\[ \begin{cases} (R = 2w^{1/3} \text{ for surface burst}) \\ (R = 3w^{1/3} \text{ for delayed burst}) \end{cases} \]

WEAPON DELIVERY CONDITIONS

A set of detailed assumptions on delivery and ballistic error and weapon spacings (for multiple weapons per volley) is made for each munition. Firing-table data used for mortars are given in Tables 6 and 7.

Damage Pattern Assumptions

Expected Damage. Expected damage to a target from fragmenting weapons at the weapon detonation point or nearby is computed using a modified version of Picatinny Arsenal's Full Spray model. The expected damage to a target at the volley aim point and all other points within the pattern is then computed using the delivery accuracies and Full Spray results in the FAST-VAL Target Coverage model. The sets of constants necessary for computation of damage functions for each target posture used in this study are detailed in Table 8. Each damage function is assigned a 6-digit reference number, the Weapon Code. Lethal areas for single rounds and their patterns are included.

Damage Functions. The computed damage functions are presented (in numerical order) in a so-called "people print" format. The "people print" is a matrix of damage to a target (specified by the weapon code) located in each 100- by 100-foot square. For example, weapon 103701 (an 81mm mortar round) has a pattern lethal area of 3147.7 square feet. The \( P_X \) against a man prone at a pattern aim point \( X = 0, Y = 0 \) is 0.21980.
# Table 8

## DAMAGE FUNCTIONS

<table>
<thead>
<tr>
<th>Weapon Code</th>
<th>103701</th>
<th>Lethal Area (sq ft)</th>
<th>3147.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td></td>
<td>100.0</td>
<td>200.0</td>
</tr>
<tr>
<td>-300.0</td>
<td>0.00003</td>
<td>0.00001</td>
<td>0.0</td>
</tr>
<tr>
<td>-200.0</td>
<td>0.00170</td>
<td>0.00061</td>
<td>0.0003</td>
</tr>
<tr>
<td>-100.0</td>
<td>0.00181</td>
<td>0.00045</td>
<td>0.0025</td>
</tr>
<tr>
<td>0.0</td>
<td>0.21980</td>
<td>0.00088</td>
<td>0.0060</td>
</tr>
<tr>
<td>100.0</td>
<td>0.05234</td>
<td>0.00266</td>
<td>0.0011</td>
</tr>
<tr>
<td>200.0</td>
<td>0.00099</td>
<td>0.0018</td>
<td>0.0000</td>
</tr>
<tr>
<td>300.0</td>
<td>0.00001</td>
<td>0.0000</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weapon Code</th>
<th>103703</th>
<th>Lethal Area (sq ft)</th>
<th>9071.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td></td>
<td>100.0</td>
<td>200.0</td>
</tr>
<tr>
<td>-400.0</td>
<td>0.00000</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>-300.0</td>
<td>0.00002</td>
<td>0.00008</td>
<td>0.0000</td>
</tr>
<tr>
<td>-200.0</td>
<td>0.00046</td>
<td>0.00024</td>
<td>0.0002</td>
</tr>
<tr>
<td>-100.0</td>
<td>0.16101</td>
<td>0.00291</td>
<td>0.0018</td>
</tr>
<tr>
<td>0.0</td>
<td>0.45420</td>
<td>0.00085</td>
<td>0.00216</td>
</tr>
<tr>
<td>100.0</td>
<td>0.13071</td>
<td>0.01506</td>
<td>0.0007</td>
</tr>
<tr>
<td>200.0</td>
<td>0.00692</td>
<td>0.00109</td>
<td>0.0006</td>
</tr>
<tr>
<td>300.0</td>
<td>0.00009</td>
<td>0.00004</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weapon Code</th>
<th>135502</th>
<th>Lethal Area (sq ft)</th>
<th>7851.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>0.0</td>
<td>100.0</td>
<td>200.0</td>
</tr>
<tr>
<td>-900.0</td>
<td>0.00004</td>
<td>0.00004</td>
<td>0.00003</td>
</tr>
<tr>
<td>-800.0</td>
<td>0.00015</td>
<td>0.00011</td>
<td>0.00006</td>
</tr>
<tr>
<td>-700.0</td>
<td>0.00046</td>
<td>0.00036</td>
<td>0.0017</td>
</tr>
<tr>
<td>-600.0</td>
<td>0.01115</td>
<td>0.00086</td>
<td>0.0063</td>
</tr>
<tr>
<td>-500.0</td>
<td>0.02520</td>
<td>0.00233</td>
<td>0.0092</td>
</tr>
<tr>
<td>-400.0</td>
<td>0.00646</td>
<td>0.00338</td>
<td>0.0173</td>
</tr>
<tr>
<td>-300.0</td>
<td>0.00758</td>
<td>0.00550</td>
<td>0.0083</td>
</tr>
<tr>
<td>-200.0</td>
<td>0.01078</td>
<td>0.01066</td>
<td>0.01783</td>
</tr>
<tr>
<td>-100.0</td>
<td>0.01344</td>
<td>0.01295</td>
<td>0.0076</td>
</tr>
<tr>
<td>0.0</td>
<td>0.01470</td>
<td>0.01395</td>
<td>0.0061</td>
</tr>
<tr>
<td>100.0</td>
<td>0.01412</td>
<td>0.01187</td>
<td>0.0082</td>
</tr>
<tr>
<td>200.0</td>
<td>0.01190</td>
<td>0.01176</td>
<td>0.0082</td>
</tr>
<tr>
<td>300.0</td>
<td>0.00851</td>
<td>0.00871</td>
<td>0.0082</td>
</tr>
<tr>
<td>400.0</td>
<td>0.00573</td>
<td>0.00546</td>
<td>0.0082</td>
</tr>
<tr>
<td>500.0</td>
<td>0.00328</td>
<td>0.00324</td>
<td>0.0082</td>
</tr>
<tr>
<td>600.0</td>
<td>0.00164</td>
<td>0.00162</td>
<td>0.0082</td>
</tr>
<tr>
<td>700.0</td>
<td>0.00071</td>
<td>0.00071</td>
<td>0.0082</td>
</tr>
<tr>
<td>800.0</td>
<td>0.00027</td>
<td>0.00027</td>
<td>0.0082</td>
</tr>
<tr>
<td>900.0</td>
<td>0.00009</td>
<td>0.00009</td>
<td>0.0082</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weapon Code</th>
<th>135503</th>
<th>Lethal Area (sq ft)</th>
<th>835.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>0.0</td>
<td>100.0</td>
<td>200.0</td>
</tr>
<tr>
<td>-700.0</td>
<td>0.00006</td>
<td>0.00006</td>
<td>0.00005</td>
</tr>
<tr>
<td>-600.0</td>
<td>0.00016</td>
<td>0.00015</td>
<td>0.00014</td>
</tr>
<tr>
<td>-500.0</td>
<td>0.00033</td>
<td>0.00032</td>
<td>0.00029</td>
</tr>
<tr>
<td>-400.0</td>
<td>0.00062</td>
<td>0.00058</td>
<td>0.00043</td>
</tr>
<tr>
<td>-300.0</td>
<td>0.00099</td>
<td>0.00094</td>
<td>0.00068</td>
</tr>
<tr>
<td>-200.0</td>
<td>0.00139</td>
<td>0.00131</td>
<td>0.00117</td>
</tr>
<tr>
<td>-100.0</td>
<td>0.00169</td>
<td>0.00160</td>
<td>0.0017</td>
</tr>
<tr>
<td>0.0</td>
<td>0.00181</td>
<td>0.00171</td>
<td>0.00159</td>
</tr>
<tr>
<td>100.0</td>
<td>0.00169</td>
<td>0.00160</td>
<td>0.0017</td>
</tr>
<tr>
<td>200.0</td>
<td>0.00138</td>
<td>0.00131</td>
<td>0.00121</td>
</tr>
<tr>
<td>300.0</td>
<td>0.00099</td>
<td>0.00094</td>
<td>0.00088</td>
</tr>
<tr>
<td>400.0</td>
<td>0.00062</td>
<td>0.00058</td>
<td>0.00054</td>
</tr>
<tr>
<td>500.0</td>
<td>0.00033</td>
<td>0.00032</td>
<td>0.00029</td>
</tr>
<tr>
<td>600.0</td>
<td>0.00016</td>
<td>0.00015</td>
<td>0.00014</td>
</tr>
<tr>
<td>700.0</td>
<td>0.00006</td>
<td>0.00006</td>
<td>0.00005</td>
</tr>
</tbody>
</table>
Downrange, along the round’s flight path (range) at $X = 100$ and $Y = 0$, the $P_K$ is 0.05234. At a point to the side of the aim point (deflection) at $X = 0$ and $Y = 100$, the $P_K$ is 0.00088.
# Appendix E

## SOURCES OF INFORMATION ON MARINE CASUALTIES

<table>
<thead>
<tr>
<th>Source</th>
<th>Casualties Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Diary 117, Company I, 3d Bn, 4th Marines</td>
<td>1 KIA on 30 June 1968</td>
</tr>
<tr>
<td>Unit Diary 118-68, Company I, 3d Bn, 4th Marines</td>
<td>3 KIA, 4 WIA and 5 WIANE on July 1, 68</td>
</tr>
<tr>
<td>Unit Diary 120-68, Company I, 3d Bn, 4th Marines</td>
<td>1 WIANE reported on UK 118-68, is changed to WIA</td>
</tr>
<tr>
<td>Command Chronology, 3d Bn, 4th Marines for June 1968</td>
<td>No casualties reported for 30 June 1968</td>
</tr>
<tr>
<td>Command Chronology, 3d Bn, 4th Marines for July 1968</td>
<td>No casualties reported for 1 July 1968</td>
</tr>
<tr>
<td>Divisional Journal (3d Division)</td>
<td>No casualties reported for 30 June 1968</td>
</tr>
</tbody>
</table>
REFERENCES

2. Unit Diary No. 118-68, 3 July 1968 (680703), U.S. Marine Corps, Company I RUC 13185, 3d Bn, 4th Marines.
3. Unit Diary No. 120-68, 5 July (680705), U.S. Marine Corps, Company I RUC 13185, 3d Bn, 4th Marines.
5. III MAF SITREP, 040001H to 042400H, U.S. Marine Corps (Secret).
6. FMFPAC WESTPAC SITREP, 030145Z, U.S. Marine Corps (Secret).


25. Harris, B. W., and K. A. Myers, Cover Functions for Prone Men Targets on Various Types of Terrain (U), Ballistics Research Laboratory, BRL Memorandum Report No. 1203, March 1959 (Confidential).