

Box 5

PROJECT 62

ORO-S-745
12 April 1957

Staff Memorandum

ANALYSIS OF BATTLE CASUALTIES
FOR THE STABLE PERIOD OF THE KOREAN WAR

By

Frederick W. Cleaver

19990122 021

*Approved for external
release by H.M. Cole
on 3 Apr 69.*

"DTIC USERS ONLY"

Operations Research Office
The Johns Hopkins University
7100 Connecticut Avenue
Chevy Chase, Maryland
Washington 15, D.C.

Reproduced From
Best Available Copy

One copy

✓ U-19970

THIS IS A WORKING PAPER

representing the opinion of the writer, and not necessarily that of ORO. This Staff Memorandum is preliminary, tentative, and subject to revision and expansion.

PRIVILEGED COMMUNICATION

The information disclosed in this document constitutes proprietary information owned by the Operations Research Office of The Johns Hopkins University, and is not to be used by or for any party other than the United States Government without written consent of the owner. Any Government employees who improperly divulges this material is subject to the criminal penalty under 18 U.S.C., Section 1905 (1 September 1948).

This is a more detailed presentation of material included as part of ORG-T-71 (AFFE)

ANALYSIS OF BATTLE CASUALTIES FOR THE STABLE PERIOD OF THE KOREAN WAR

S-745

INTRODUCTION

Concomitances of the "Cease-fire" negotiations in the Korean War were the establishment of a stable MLR and a condition of limited objective warfare. Although consideration of this type of warfare is of secondary importance in conjunction with major anticipated conflicts, the fact that continued instances of attritional wars with satellite countries are within the realm of possibility causes the casualty structures of the various phases of such wars to be of interest. In this paper, an analysis is made of the battle casualties sustained by the US Army in Korea for the period September 1952 through July 1953. It is believed that the results of this analysis will be of interest, even though generalization may not be appropriate with the possible exception of some of the KIA to WIA ratios obtained.

SOURCE OF DATA

In and after September 1952, Eighth Army made use of a special casualty report form, AFFE Form 413, for the feeding of casualty data from subordinate units to Division where standard casualty report Form 241 (AFFE) was prepared for forwarding to Eighth Army and thence to AFFE and DA. This feeder form introduced, in a way that made complete and accurate recording easy for combat units, a numerical code classification system for several important categories of information. Table One shows the classification system for those categories of interest to this study. In addition, systems of (1) part of the body wounded, and (2) nature of injury (burn, blast, etc.) were provided.

After the end of hostilities, the AG Statistical and Accounting Branch (AFFE) prepared punch cards for each battle casualty for which information in the encoded form outlined above was available; however, the project was

suspended before tabulations were made. In furtherance of its research program in AFTE, ORO requested the completion of this tabulation with the results shown in the following sections.

It should be mentioned that in Form 413 no definitions of types of operations were provided other than the descriptive statements shown in Table One. Individual interpretation on the part of the preparer of the feeder form was therefore made necessary so that possibilities of overlapping interpretations were great. The effect of this will be clearly seen when a joint consideration of nature of operation and causative agent is made. For this reason, it is felt that a rough aggregation of types of operations into offensive and defensive categories may ultimately be more appropriate.

PRESENTATION OF DATA

The classes of information on casualties studied in this tabulation were the type of casualty, the causative agent, and the nature of the operation in which the casualty was engaged. Two subclasses of type of casualty were used, KIA plus DOW and WIA: MIA casualties were not considered. The causative agents considered were small arms, artillery and mortar fire, grenade, mine, and a miscellaneous group. The operations considered were: (1) on ground, static, harrassing fire; (2) on ground, attacked by enemy; (3) on ground, ambushed by enemy; (4) on ground, attacking enemy; (5) on ground, advancing against enemy; (6) on ground, on patrol against enemy; (7) on ground, in engagement with enemy sniper; (8) on ground, withdrawing under enemy fire; (9) on ground, returning from combat mission; (10) on ground, not in combat, performing duties in combat area; and (11) other types of actions. It should be re-emphasized that the time period covered by this study is September 52 to July 53.

TABLE ONE

Code Systems for Type of Casualty, Causative Agent, and Nature of Operations
Provided by AFPE Form 413.

Type of Casualty:

1. Killed in Action
2. Died of Wounds
3. Non-Battle Death
4. Missing
5. Missing in Action
6. Captured

In addition, information on the degree of seriousness of wounds or injuries was provided for.

Causative Agent:

1. Small Arms (Rifle, MG, etc., excluding aerial strafing)
2. Bayonet or knife
3. Artillery or Mortar Fire
4. Grenade
5. Mine
6. Aerial Strafing
7. Aerial Bombardment
8. Anti-aircraft Fire
9. Aircraft Crash
10. Other

Nature of Operations:

1. Plane Pilot, on combat mission
2. Plane Pilot, in flight, not on combat mission
3. Member of Ground Maintenance
4. Not Crew Member, performing duties in plane, not on combat mission
5. Crew Member, performing duties in plane, on combat mission
6. Passenger in Plane in Combat Area, no duties on plane, on official orders.
7. Passenger in Plane in Non-Combat Area, no duties on plane, on official orders.
8. Passenger in Plane, no duties on plane, leave or pass status
9. Accidental by US or Allied Forces
10. On ground, static, harrassing fire
11. On ground, attacked by enemy
12. On ground ambushed by enemy
13. On ground, attacking enemy
14. On ground, advancing against enemy
15. Not stated or otherwise not classified
16. On ground, on patrol against enemy
17. On ground, in engagement with enemy sniper
18. On ground, in engagement with enemy (type not known)
19. On ground, withdrawing under fire of enemy

20. On ground, returning from combat mission
21. On ground, not in combat, performing duty in combat area
22. On ground, not in combat, not performing duty, not on leave or pass in combat area.
23. On ground, not in combat, not performing duty, on leave or pass in combat area.
24. On ground, not in combat, absent without leave in combat area
25. On ground, hospitalized
26. On ground, in confinement

During the period of this study, 14,812 battle casualties were recorded. Of these, 2812 were either KIA's or DOW's while exactly 12,000 were WIA's; this gives a KIA to WIA ratio of 1 to 4.25 for the period. The total casualties for each combination of type, causative agent, and operation are presented in Appendix One. The remainder of this section will deal with the percentage relationships in the casualty structure together with KIA-WIA ratios.

Causative Agent:

The percentage distribution of casualties by causative agent is given below in Table Two together with KIA-WIA ratios.

TABLE TWO
DISTRIBUTION OF CASUALTIES BY CAUSATIVE AGENT AND KIA-WIA RATIOS

Causative Agent	Percent	KIA to WIA Ratio	% KIA
Small Arms	10.3	1:2.46	28.37
Artillery and Mortar	71.8	1:4.43	18.41
Grenade	8.6	1:8.28	10.78
Mine	4.0	1:3.20	23.81
Other	5.5	1:4.50	18.16
Total	100.2	1:4.25	18.98

~~The low percentage of small arms casualties is unusually striking,~~

coupled with the high percentage of KIA's among the casualties it indicates that CCF small arms fire was ^{less frequently employed than is normally the case and probably} generally restricted to relatively close range.

~~however, it is not~~

as such →

Artillery casualties were strongly predominant with 71.8%. Grenades inflicted almost as many casualties as small arms, but ^wshoed a low percentage of KIA's. Mines were the least productive of casualties of any of the agents studied but ~~shoed~~ ^{produced} resulted in an above average percentage of KIA's. The composition of the category, "other" may be determined from Table One.

Nature of Operation:

The percentage distribution of casualties by nature of operation is given below in Table Three together with KIA-WIA ratios.

TABLE THREE
DISTRIBUTION OF CASUALTIES BY NATURE OF OPERATION
AND KIA-WIA RATIOS

Nature of Operation	Percent	KIA to WIA Ratio	% KIA
1. On ground, static, harassing fire	31.7	1:3.82	24.13
2. On ground, attacked by enemy	4.8	1:3.11	20.77
3. On ground, ambushed by enemy	1.7	1:2.22	31.05
4. On ground, attacking enemy	10.6	1:5.10	16.38
5. On ground, advancing against enemy	4.8	1:5.45	15.48
6. On ground, on patrol against enemy	11.2	1:3.65	21.49
7. On ground, in engagement with enemy sniper	1.1	1:4.33	18.75
8. On ground, withdrawing under enemy fire	0.3	1:11.50	8.00
9. On ground, returning from combat mission	1.1	1:4.71	17.50
10. On ground, not in combat, performing duties in combat area	16.1	1:6.47	15.47
11. Other	16.5	1:3.40	17.60
Total	99.9	1:4.25	18.98

Unfortunately, the numbers of and strengths in engagements in the various categories of operations for the period covered by the data have not been abstracted from records at this time, so a comparison of operations on a casualty per man engaged basis cannot be made. The ratio of KIA to WIA shows considerable variation over the spectrum of operational types indicating ambushes to be the most lethal type while withdrawals were least lethal.

coor
time
field
13.8
ad
imil
star

Certain of the categories of operations can be combined into offensive and defensive groups. Categories 4 and 5 may be considered active offensive groups while categories 2 and 3 are active defensive operations. Category 1 may also be considered as a constituent of a defensive grouping insofar as the stable phase of operations is concerned since it consists of casualties sustained by troops in front line defensive positions when no active offensive operations by either side were under way. A comparison of casualties for the offensive group consisting of ^{categories} 4 and 5 with a defensive group consisting of ^{categories} 2 and 3 shows that 15.4% of all casualties for the period were sustained on active offense (including counterattacks) of whom 16.10% were KIA's and that 6.5% of all casualties were sustained on active defense of whom 26.07% were KIA's; the inclusion of category 1 in a general defensive grouping results in this grouping's accounting for 38.2% of all casualties for the period of whom 21.67% were KIA's.

The difference between the percentages of casualties who were KIA's for offensive and defensive groupings is quite large. It is possible, by use of the statistic "t", to distinguish whether this difference in percentages is the result of random fluctuation or actually reveals an essential superiority of ~~one~~ defense over offense in the production of fatalities among casualties inflicted. A large value of "t" indicates that the probability that the former reason for the difference is low, and, hence, the latter explanation is more acceptable. ^{If a} value of "t" that is so high that the probability that the former reason ^{is true} is as low as ^{results} .05, the observed difference is said to be "significant at the 5% level."

The differences manifested above are $\pm 9.93\%$ for the active defense group and $\pm 5.57\%$ for the general defensive group, values ^{which} ~~when~~ are 62% and 34.5% greater,

respectively, than the offensive group.

The resulting value of "t" for the active defense group is

$$"t" = \frac{P_D - P_O}{\sigma_{P_D - P_O}} = \frac{.0993}{.0161} = 6.18 "$$

while for the general defensive group, a "t" value of

$$\frac{.0557}{.0142} = 3.91$$

both of which are far more highly significant at the 5% level.

Joint Consideration of Nature of Operations and Causative Agent:

In addition to the results given above, a detailed analysis of the percentage contribution of each causative agent to the casualties inflicted in each type of operation has been made possible by the tabulation of the casualty data. KIA to WIA ratios have also been computed on the same basis. Table Four (A through J) shows these results for the various types of operations.

ADD The fundamental reason for this difference is probably the fact differences in the facility with which medical aid could be given to troops casualties in offense as compared with casualties in a "pinned down" defensive situation. Furthermore, the extensive use of elaborate trench work in defensive position reduced the incidence of light wounding's from fragments and ~~artillery~~ ~~casualties~~ ~~were~~ ~~then caused by~~ since those casualties inflicted by artillery would have to be the results of almost direct "hits."

1. P_D and P_O are percentages of KIA's to total casualties for defensive and offensive groups, respectively, $\sigma_{P_D - P_O}$ is the standard deviation of the difference of P_D and P_O with sample sizes of 965 and 2280 for active defensive and offensive groups, respectively, as shown in Appendix A. The sample size of the general defensive group is 5996.

A. On Ground, Static Harassing Fire (31.7% of total casualties)

The percentage distribution of causative agents for this type of operation is given in Table Four-A with appropriate KIA to WIA ratios.

TABLE FOUR-A

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	2.4	1:2.43
Arty and Mortar	90.8	1:3.88
Grenade	2.5	1:3.65
Mine	0.4	1:5.00
Other	3.8	1:3.59
Total	99.9	1:3.82

This category contains the largest percentage of casualties and includes those losses sustained by troops occupying front-line defensive positions during periods in which neither side was engaged in active offense. As would be expected, mortar and artillery fire were intensely predominant in casualty causation. The inclusion of other agents indicates that some casualties inflicted by enemy patrols may have been included in this category. KIA to WIA ratios are, in general, somewhat higher than average in this type of action.

B. On Ground, Attacked by Enemy (4.84% of total casualties)

The percentage distribution of causative agents for this type of operation is given in Table Four-B with appropriate KIA to WIA ratios.

TABLE FOUR-B

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	25.4	1:1.70
Arty and Mortar	49.7	1:3.34
Grenade	22.0	1:6.19
Mine	0.0	--
Other	3.1	1:10.00
Total	100.2	1:3.11

In this type of action, artillery and mortar casualties are predominate again while small arms account for one quarter of the losses. ^Tthe KIA to WIA ratios for both types of causative agent were high relative to their ^{for the entire period.} average. This is particularly true of small arms in which 37% of the casualties were KIA's. This may be attributed to either or both of two causes. The CCF ✓ practiced rigid fire discipline which discouraged the firing of weapons at ranges at which there was not a high probability of success, and the large number of PPSH's and sub-machine guns with which the CCF Infantry Platoons are equipped; although inaccurate at more than 50 yards, ^{these} ~~these~~ ^s weapons are more likely to result in the infliction of more than one wound on any of its victims than is the rifle and hence increase the chances that the victim will be killed. *In addition, it is probable that medical aid was less readily obtained under the restrictive conditions of active defense.*

C. On Ground, Ambushed by Enemy (1.7% of total casualties)

The percentage distribution of causative agents for this type of action is given in Table Four-C together with appropriate KIA to WIA ratios.

TABLE FOUR-C

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	33.1	1:1.41
Arty and Mortar	44.8	1:1.85
Grenade	20.1	1:24.00
Mine	.0	--
Other	2.0	1:1.50
Total	100.0	1:2.22

It has been mentioned above that this category of operation produced the highest KIA to WIA ratio. This is due to the apparently high lethality of ~~small~~ arms with more than 2 kills out of every five casualties and artillery and mortar with only a slightly lower percentage. The category "other," whose composition can be found from Table One, also showed a high lethality although only a few casualties were caused by these agents. For some unexplainable reason, hand grenades were approximately three times less lethal in this type of operation than its weighted average for all operations.

Artillery and Mortar accounted for roughly ^{written out} 4/9 of the casualties while ^{written out} small arms caused 1/3. As was the case in the previous type of operation, no casualties were caused by mines.

D. On Ground, Attacking the Enemy (10.6% of total casualties)

The percentage distribution of causative agents for this type of action is given in Table Four-D together with appropriate KIA to WIA ratios.

TABLE FOUR-D

Causative Agents	Percentage	KIA to WIA Ratio
Small Arms	7.0	1:3.95
Arty and Mortar	78.2	1:4.50
Grenade	11.7	1:35.40
Mine	0.5	1:1.67
Other	2.7	1:9.50
Total	100.1	1:5.10

It is seen from the above table that artillery and mortar casualties far outnumber those of any other agent. Small arms are again only scantily represented in the distribution. It has been noted above that KIA to WIA ratios in offensive actions are significantly smaller than in defensive actions. KIA to WIA ratios for all agents except mines are less than average in this type of operation with hand grenades proving extremely non-lethal. The low percentage of casualties inflicted by mines may indicate a possible lack of effectiveness in the CCF mine laying program or a superior detection capability on the part of US troops.

E. On Ground, Advancing Against Enemy (4.8% of total casualties)

The percentage distribution of causative agents for this type of action is given in Table Four-E together with appropriate KIA to WIA ratios.

TABLE FOUR-E

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	10.9	1:12.00
Arty and Mortar	67.1	1:4.73
Grenade	16.0	1:8.50
Mine	2.4	1:1.43
Other	3.8	1:12.50
Total	100.2	1:5.45

It is difficult to estimate where a person completing the Form 413 would have established the boundary between this and the previous types of actions. Consequently it is believed that a large amount of inter-changeable usage of the two categories occurred. The percentage structure does not differ radically for the two categories so it is likely that an aggregation of the two is advisable. This will be done later. The KIA to WIA ratio for small arms is smaller in this type of action than in any other. It is possible that this change is caused by an increase in the range of engagement.

F. On Ground, On Patrol Against Enemy (11.2% of total casualties)

The percentage distribution of causative agents for this type of operation is given in Table Four-F together with appropriate KIA to WIA ratios.

TABLE FOUR-F

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	27.2	1:1.80
Arty and Mortar	36.1	1:5.44
Grenade	22.0	1:7.89
Mine	11.1	1:3.11
Other	3.2	1:2.53
Total	99.6	1:3.56

In this type of operation, artillery and mortar fire was again the principal cause of casualties; small arms and grenades also made sizeable contributions to the casualty structure. Although the percentage of casualties inflicted by mines is small, it is in this type of operation that 30% of the mine casualties were sustained, the highest percentage of any type of operation. The KIA to WIA ratios for small arms was higher than average in this type of operation as is the ratio for the miscellaneous agents while the ratio for artillery and mortar is lower than average.

G. On Ground, In Engagement with Enemy Sniper (1.1% of total casualties)

The percentage distribution of causative agents for this type of operation is given in Table Four-G together with appropriate KIA to WIA ratios.

TABLE FOUR-G

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	93.8	1:4.20
Arty and Mortar	4.3	1:6.00
Grenade	.0	--
Mine	0.6	No KIA's
Other	1.2	No KIA's
Total	99.9	1:4.33

As would be expected, the cause of casualties in this type of operation is almost entirely small arms, however, the KIA to WIA ratio for this agent is considerably below average. This probably reflects the differences in range of engagement for sniper operations as compared with the close contact operations above. It is likely that the casualties listed for the other causative agents were sustained in attempts to dislodge snipers.

H. On Ground, Withdrawing Under Enemy Fire (0.3% of total casualties)

The percentage distribution of causative agents for this type of operation is given in Table Four-H together with appropriate KIA to WIA ratios.

TABLE FOUR-H

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	10.0	No KIA's
Arty and Mortar	68.0	1:10.33
Grenade	6.0	No KIA's
Mine	6.0	1:2.00
Other	10.0	No KIA's
Total	100.0	1:11.50

Since the period ^{of} this study was one to which the stable MLR applied, the number of casualties in this type of operation is the smallest of any studied, and since no major withdrawal occurred, the generalization of both percentages and KIA to WIA ratios to other phases or to future warfare is unjustified. It is likely that this category was used to cover casualties sustained in withdrawal of OP's and ^{small} forward elements back to main lines.

The predominance of artillery and mortar as causative agents is not unexpected. No explanation can be advanced for the extremely low KIA to WIA ratios, ~~which is particularly striking for artillery where of the 22 casualties sustained none was killed.~~

I. On Ground, Returning from Combat Mission (1.1% of total casualties)

The percentage distribution of causative agents for this type of operation is given in Table Four-I together with appropriate KIA to WIA ratios.

TABLE FOUR-I

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	5.6	1:8.00
Arty and Mortar	38.9	1:5.20
Grenade	16.9	1:4.40
Mine	31.2	1:3.55
Other	7.5	1:11.00
Total	100.1	1:4.71

Although artillery and mortar was highest contributor to the casualty structure of this type of operation, the extent of it's contribution is smaller than in most other categories. The agent which caused the second most casualties in this type of operation was the mine; its percentage contribution is higher for this operation type than for any other. It may reasonably be expected that exposure to this agent is the same or less for this type of operation as for a combination of categories D and E, attacking enemy and advancing against enemy, respectively; however, the actual number of mine casualties is greater for this category than it is for the above mentioned combination by a factor of two. This indicates that a tendency towards ^athe ^creduction in acuteness of surveillance existed in returns from combat as compared with advances. The ^{large}~~astounding~~ percentage difference between the returns and advances is caused, in addition to the above, by the reduction in occurrence of casualties from other agents which is to be expected particularly if the preceding actions have been successfully terminated. It is of interest that the KIA to WIA ratio for mines in returns from combat is somewhat lower than the same ratio for offensive actions as given in Table Six-B. Grenades accounted for 16.9% of the casualties and

in this category achieved its second highest KIA to WIA ratio. The incidence of casualties from small arms and the fatality of this agent in this type of operation were relatively low.

J. On Ground, Not in Combat, Performing Duties in Combat Area (161% of total casualties)

The percentage distribution of causative agents for this type of operation is given in Table Four-H together with appropriate KIA to WIA ratios.

TABLE FOUR-J

Causative Agent	Percentage	KIA to WIA Ratio
Small Arms	3.8	1:4.24
Arty and Mortar	82.1	1:5.59
Grenade	1.8	1:10.00
Mine	7.3	1:4.11
Other	5.1	1:6.10
Total	100.1	1:6.47

This type of operation included casualties inflicted on troops in CP's and medics as well as most artillery casualties other than forward observers. Also included were casualties among personnel fixing bunkers on the front lines and running wire to OP's. As would be expected, artillery and mortar casualties predominated with mine casualties a poor second in percentage. Small Arms and Grenade casualties were virtually negligible. The KIA to WIA ratios for all agents was below average probably due to the greater facility with which medical attention could be given to casualties in this type of operation.

The percentage distributions of casualties by types of operations for each causative agent is of interest, and although it is possible to assimilate the characteristics of these distributions from the foregoing or even to compute it, it is felt that some value would be derived from explicit presentation. Table Four-K shows these distributions. KIA to WIA ratios are also

*Effect of
artillery
operations*

given here for comparison in this different context, although they are, of course, the same as those shown in Table Four A-J.

(INSERT TABLE FOUR-K)
OUT IN FINAL TEXT

From Table Four-K it is seen that the largest percentage of small arms casualties ~~are~~ ^{were} sustained ~~in~~ ^{on} patrols, ~~one-third~~ ^{40%} of artillery and mortar casualties were sustained in ~~enemy attacks~~ ^{Static, harassing actions}, almost 30% of the hand grenade casualties were sustained in patrol action, and both patrols and non-combat troops in the combat area sustained approximately 30% of the casualties due to mines.

L. Aggregation of Offensive and Defensive Casualties by Causative Agent

An aggregation of some of the types of action into offensive and defensive groups is of interest. The indefiniteness of the boundaries of certain categories may even make consideration of these aggregates more desirable. In a previous section, an aggregation of general defensive operations was made from categories 1, 2, and 3, while a more restrictive active grouping used only categories 2 and 3. Similarly, an aggregation of active offensive operations was formed from categories 4 and 5. Using the same basis, it is possible to compare the percentage distribution of causative agents for each group of operations together with the appropriate KIA to WIA ratios. Table Four-L shows these values.

TABLE FOUR-L COMPARISON OF CASUALTY STRUCTURES FOR OFFENSIVE AND DEFENSIVE AGGREGATIONS

CAUSATIVE AGENT	ACTIVE OFFENSE		ACTIVE DEFENSE		GENERAL DEFENSE	
	Percent	KIA-WIA Ratio	Percent	KIA-WIA Ratio	Percent	KIA-WIA Ratio
Small Arms	8.2	1:5.68	27.2	1:1.60	6.9	1:1.69
Arty&Mortar	74.9	1:4.55	48.4	1:2.86	83.4	1:3.75
Grenade	13.0	1:17.46	21.5	1:8.66	5.8	1:5.58
Mine	1.1	1:1.50	0.0	--	0.4	1:5.00
Other	2.6	1:8.83	2.8	1:5.75	3.6	1:3.88
Total	99.8	1:5.20	99.9	1:2.86	100.1	1:3.59

TABLE FOUR-K

PERCENTAGE DISTRIBUTION OF CASUALTIES BY TYPES OF OPERATIONS FOR

VARIOUS CAUSATIVE AGENTS

TYPE OF OPERATION	Small Arms		Art'y & Mortar		Grenades		Mines	
	%	KIA-WIA Ratio	%	KIA-WIA Ratio	%	KIA-WIA Ratio	%	KIA-WIA Ratio
Harassing Fire	11.8	1:1.70	3.4	1:3.34	12.4	1:6.19	---	---
Attacked by Enemy	7.2	1:2.43	40.0	1:3.88	9.5	1:3.65	4.1	1:5.00
Ambushed by Enemy	5.4	1:1.41	1.0	1:1.85	3.9	1:24.00	---	---
Attacking Enemy	7.1	1:3.95	20.8	1:4.50	14.3	1:35.40	1.4	1:1.67
Advancing Against Enemy	5.1	1:12.00	4.6	1:4.73	9.0	1:8.50	2.9	1:1.43
On Patrol	29.6	1:1.80	5.7	1:5.44	28.8	1:7.89	31.5	1:3.11
Engagement with Sniper	9.8	1:4.20	0.1	1:6.00	---	---	0.2	No KIA's
Withdrawing under Enemy Fire	0.3	No KIA's	0.3	1:10.33	0.2	No KIA's	0.5	1:2.00
Returning from Combat	0.6	1:8.00	0.6	1:5.20	2.1	1:4.40	8.5	1:3.55
Not in Combat, but in Combat Area	6.0	1:4.24	18.3	1:5.59	3.5	1:10.00	29.6	1:4.11
Other	16.2	1:3.13	14.5	1:5.70	16.3	1:9.35	21.5	1:2.60
Percent of Total Casualties	10.3		71.8		8.6		4.0	

The differences in casualty structure between active offense and defense are quite pronounced. Although artillery and mortar casualties predominate in both aggregations, the percentage of losses to this agent were much lower in active defense than in active offense, while small arms and grenade casualties were percentagewise far more numerous in active defense than in active offense. Mine casualties, negligible in active offense, were non-existent in active defense. The shift in casualty structure between offense and defense is accompanied by an increase in the KIA to WIA ratios for all causative agents except the mine. A comparison of overall aggregate ratios has been made previously. "T" tests similar to those described above, show the differences in percentage of fatal casualties between active offense and defense are significant for small arms, artillery and mortar and grenades.¹ It is likely that these differences may be attributed to the greater facility with which medical attention could be given to casualties under offensive conditions as compared with conditions that exist when troops are "pinned down" in active defense. In addition, the difference for small arms may be related to differences in range of engagement.

The Predominance of Mortars in Artillery Caused Casualties

On Form 413, a space was provided for a more complete description of the conditions under which the casualty was sustained. Preparers of the form sometimes added more details on the type of causative agent. In the preparation of the punch cards used in this analysis, the AGSA branch segregated into a single category those casualties which this description indicated were caused by mortars. The numbers of casualties in this segregated category, therefore, constitute a

¹The "t" values are 26.49 for small arms, 25.01 for artillery, and 2.35 for grenades. A value of 2 is generally considered significant.

assuming the preparers can accurately distinguish this agent from artillery.

minimum number of mortar casualties, since the remainder included both casualties for which the description indicated artillery was the causative agent as well as casualties for which no description was given but which were checked as "artillery and mortar fire." The proportions of mortar and artillery in this latter case cannot be determined.

On the basis of this information, a minimum of 42.5% of artillery and mortar casualties and 30.5% of total casualties were specifically identified as mortar casualties, with a KIA to WIA ratio of 1:4.82. Even on the basis of these minimum percentages, mortar fire was seen to be the predominant cause of casualties in static, harrasing fire with 48.6% of all casualties in this category. Its minimum contributions to (B) Attacked by Enemy, (F) On Patrol Against Enemy, (H) Withdrawing under Enemy Fire, and (J) Not in Combat, Performing Duties in Combat Area, are in excess of 20% of the total casualties for each of these types of operations.

RECAPITULATION

The more informative results of the foregoing analysis may be recapitulated as follows:

1. The predominant cause of casualties was artillery and mortar fire which accounted for 71.8% of all losses. There is evidence that a majority of these casualties were caused by mortar fire. Artillery and mortar fire were especially predominant in the production of casualties in static, harrasing fire operations and active offensive operations.
2. The contributions of small arms to the casualty structure is 10.3% of total losses; however, this agent enjoyed a high overall KIA to WIA ratio of 1:2.46. Small arms were the primary cause of casualties in sniper actions and patrols. They attained a KIA to WIA ratio of 1:1.41 in ambushes. Whether this

is indicative of accurate fire associated with shorter ranges of engagement or to increased number of wounds per casualty due to the greater volume of fire permitted by the large number of sub-machine guns organic to CCF infantry platoons or to both is unknown.

3. Hand grenade casualties were almost as numerous as small arms casualties; however, the KIA to WIA ratio produced by this agent was only 1:8.28. Their contributions to casualties sustained in active defense, ambushes and patrols exceeded 20% of total losses.

4. Mines contributed only 4% of the total casualties but ^{had} ~~enjoyed~~ a high KIA to WIA ratio, 1:3.20. In active offensive operations, this agent produced only 1.1% of all casualties. Its percentage contribution to casualties sustained in returning from combat was greater than any other agent, and its effect on the casualty structure of patrols and non-combat duty in combat areas was appreciable.

5. Casualties in offensive operations showed a significantly lower KIA to WIA ratio than did casualties in defensive operations. It is further found that this offensive advantage holds true for every causative agent except the mine.

APPENDIX A

NUMERICAL DISTRIBUTION OF CASUALTIES BY TYPE,
CAUSATIVE AGENT, AND NATURE OF OPERATION

TYPE OF OPERATION	KIA AND DOW					MIA LESS DOW					TOTAL		
	Small Arms	Arty & Mortar	Grenade	Mine	Other	Total	Small Arms	Arty & Mortar	Grenade	Mine		Other	Total
Static, Harassing Fire	35	871	26	4	38	974	85	3376	195	20	140	3716	4690
Attacked by Enemy	67	82	22		2	173	114	274	136		20	544	717
Ambushed by Enemy	34	39	2		2	77	48	72	48		3	171	248
Attacking Enemy	22	222	5	3	4	256	87	1000	177	5	38	1307	1563
Advancing Against Enemy	6	84	12	7	2	111	72	397	102	10	25	606	717
On Patrol Against Enemy	162	94	41	45	15	357	291	511	324	140	38	1304	1661
Engagement with Enemy Sniper	29	1				30	121	6		1	2	130	160
Engagement with Enemy (Type Unknown)	24	184	4	6	24	242	108	898	98	21	67	1192	1434
Withdrawing Under Enemy Fire		3		1		4	5	31	3	2	5	46	50
Returning from Combat Mission	1	10	5	11	1	28	8	52	22	39	11	132	160
Not in Combat, but on Duty in Combat Area	17	297	4	34	17	369	74	1659	40	140	104	2017	2386
Other	36	67	16	29	43	191	80	382	89	70	214	835	1026
TOTAL	433	1954	137	140	148	2812	1093	8658	1134	448	667	12000	14812