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Appendix A

SELECTED CASUALTY EXPERIENCE,
45TH DIVISION IN ITALY,
WORLD WAR II

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Part One: The Operational Setting

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January 5, 1972
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CASE FILE

Gentlemen:

Reference your letter of 23 December 1971 concerning the release of copies of two studies which HERO completed under contract to RAC: "Average Casualty Rates for War Games Based on Historical Combat Data" and "Historical Analysis of Wartime Replacement Requirements; Experience for Selected Major Items of Combat Equipment."

The Office of the Chief of Research and Development, Department of the Army, has authorized the release of the above studies to Logistics Management Institute with the following stipulations:

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- b. Furnish one copy to the Army Library, ATTN: ASDIRS.
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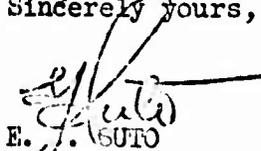
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Please inform this office of the "AD numbers" assigned to the documents by DDC.

Sincerely yours,


E. SUTO
Manager
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Enclosure 1

THE SALERNO OPERATION, September 10-October 6, 1943

Tactical Situation

After the Allied seizure of North Africa and Sicily in 1942-1943, the British Eighth Army crossed the Strait of Messina to the toe of Italy, landing at Reggio di Calabria September 3, 1943, against light opposition. Six days later the Fifth US Army came ashore at Salerno, 150 miles farther up the Italian boot and only 50 miles south of Naples. The initial Salerno landing was made by the British X Corps on the left and the US VI Corps on the right, spearheaded by the 36th Infantry Division.

Eight German divisions were in southern Italy but widely dispersed, several considerably understrength, and expecting Italian support. This last expectation evaporated when Italy left the war on September 7. At Salerno itself the 16th Panzer Division, under command of XIV Panzer Corps, held the shoreline from the base of the Sorrento Peninsula south to Agropoli, a frontage of about 30 miles. On August 31, 16th Panzer Division had reported an effective strength of 14,909, somewhat over its authorized 13,726. Defense of its long frontage was based on the hill mass encircling the beach, in whose commanding heights artillery and mortars were positioned, supported by numerous antiaircraft batteries (capable of doubling as antitank and antipersonnel weapons), and three 132mm. railway guns on a line roughly paralleling the beach. The division's armor was assigned to mobile local defense of the beach area. Wire and other barriers on the beach itself were minimal, although a thin line of teller mines had been laid near the water's edge.

The US Fifth Army's landings went off without excessive difficulty or losses on September 9, VI Corps putting the 36th Infantry Division ashore at Paestum with two regimental combat teams, the third following up during D-day. 16th Panzer Division met the landing with scattered resistance by armor, heavy mortar and artillery fire, and a tank attack in some force late in the day.

US 45th Infantry Division, which had been held as a floating reserve on D-day, landed its 179th RCT the morning of September 10, supported by 3 battalions of light artillery, 1 tank battalion, and 1 tank destroyer battalion. The next day the division's 157th RCT was landed, the two combat teams being committed on a frontage of approximately 6 miles by late September 11.

During the first three days of the Allied landings XIV Panzer Corps had been receiving reinforcements from the German Tenth Army in southern Italy as rapidly as they could be moved, so that by the night of September 11 it had been possible to concentrate 16th Panzer Division and 29th Panzergrenadier Division opposite VI Corps.

On September 12 XIV Panzer Corps launched a vigorous counter-attack at the junction of the US 45th and 36th Infantry Divisions. In the 45th Infantry Division zone, now contracted to a frontage of about 3.5 miles, two regiments only were committed (the third not yet being ashore), backed by three battalions of field artillery. Enemy attacks were delivered in rapid succession by combined armor and infantry elements supported by artillery. Penetrations against the two regiments of 45th Infantry Division (the third regiment of the division came ashore on the 14th) were as deep as 2.5 miles by September 14, but were held there principally by artillery fire supported by the heavy guns of the fleet offshore, tanks and tank destroyers, and aircraft temporarily diverted from "strategic" targets. As an example of the intensity of this action, it is recorded that two battalions of the 45th Division artillery fired 3650 rounds on September 13 and all three battalions fired 6687 rounds on September 14.

From September 16 to October 6, Fifth Army pressed out of the Salerno beachhead against enemy delaying action, the advance being impeded more effectively by road and bridge demolitions than by fire. By October 6 Fifth Army was firmly established along the south bank of the Volturno River, with Eighth Army in position on its right.

Methodology

General

Intelligence documents of 45th Infantry Division were searched for enemy identifications throughout the period studied. These revealed contacts or suspected contacts with elements of the 16th Panzer Division and the 29th Panzergrenadier Division, as well as occasional tentative identifications of other units. Inquiry developed the information that these two divisions were at the time subordinate to the German XIV Panzer Corps. While records of both divisions were found to have been returned to West Germany, some pertinent records of XIV Panzer Corps had been microfilmed.

Examination of XIV Panzer Corps microfilmed records revealed considerable detailed information on some of its subordinate units, much less on others, of which both 16th Panzer and 29th Panzergrenadier Divisions were in the latter category. Nevertheless certain strength, equipment, and casualty data relative to both divisions were found which were amenable to some degree of breakdown by extrapolation from records of similar divisions which had been reported in much greater detail.

It was possible to determine from XIV Panzer Corps records that by the time US 45th Infantry Division had begun offensive action, the 16th Panzer Division had been concentrated so that the major part of its combat strength faced 45th Infantry Division, although elements were in front of British X Corps on the 45th's left and US 36th Infantry Division on its right, and some were preparing to counterattack. Units of 29th Panzergrenadier Division, from battalion to company size, were attached to 16th Panzer Division so that, in effect, 45th Infantry Division was faced throughout the battle by a single Panzer division. On this basis, strengths and losses of 16th Panzer Division have been adopted for comparison with those of 45th Infantry Division, without applying any factor for difference in frontage.

Initial Strengths

45th Infantry Division entered the Salerno battle with a strength of 15,591, or 9.4% above its T/O allotment of 14,248, the bulk of the overstrength being accounted for by the two attached battalions. This strength was fairly well maintained by replacements during the period, a high of 15,892 being reached on September 15 and a low of 14,867 on October 3. The division's average daily strength throughout the period September 10-October 6 was 15,456.

A report for August 31, nearest found to the beginning of the period, showed a strength for 16th Panzer Division of 14,909. This was slightly more than its authorized strength of 13,726 and probably reflects attachments. Its average daily strength over the period was 13,404. Although distribution of strength in time or by types among units of the division was not indicated in any of the documents found, reports of similar divisions for the same period indicate that shortages were primarily among combat personnel of the infantry and armor.

Equipment

45th Infantry Division entered combat completely equipped with fully serviceable weapons. In addition it was reinforced by a tank battalion with 17 light and 53 medium tanks and a tank destroyer battalion with 36 M18 TDs.

In the light of its overall strength, close to T/O, it is assumed that the 16th Panzer Division had approximately its full complement of weapons (see attached T/O&E). On the basis of the August 31 strength report cited above 168 armored vehicles (evidently in addition to tanks) were on hand, of which 153 were combat ready and 15 deadlined for maintenance. (The total authorized for a Panzer division was either 238 or 357; sources are conflicting.) There is evidence that corps artillery, including 3 x 132mm. railway howitzers, supported the division at various times and various levels of intensity during the battle.

Casualties

During the 27 days of combat from September 10 through October 6, 45th Infantry Division sustained 1221 battle casualties, amounting to 7.9% of its average daily strength during the period. The average daily casualty rate was 45.2.

While no detailed casualty reports of 16th Panzer Division for the entire period were found, total casualties of 1300 for the division for the Salerno battle were reported by XIV Panzer Corps to Tenth Army. This total represents 9.1% of the division's average daily strength and an average daily rate of 48.2 casualties.

These casualties have been somewhat arbitrarily broken down according to the known postures of the division at various times during the period, using professional judgment on the basis of the situation, the known circumstances, and the casualties of the 45th Division during the same periods. Thus, it has been assumed that not more than 380 of the German casualties were suffered during the last 16 days, when the action was less intense, and of these not more than 20 were suffered in the last ten days (through October 5). This leaves a total of 920 casualties to be allocated to the first 6 days of the operation. Fifty casualties have been allocated to each of the first two days, and 100 casualties to the next day. This leaves 720 casualties for the period of intensive counterattack, September 12-14. Despite the arbitrariness of these allocations, the orders of magnitude must be reasonably correct, and the results of using these estimates for the purposes of the study will not be significantly distorted from what must have actually occurred.

Note on Sources

1. Principal sources of data for this analysis were:

a. US Army records on file at the Federal Records Center, Alexandria, Virginia, consisting principally of 45th Infantry Division:

- (1) After-action reports;
- (2) Daily Command and G-3 Journals;
- (3) G-1 Personnel Status Reports.
- (4) G-2 Periodic Reports and Intelligence Summaries.

b. German records on microfilm in the National Archives, Washington, D.C., consisting to the extent possible of the equivalents of those consulted for 45th Infantry Division data.

c. Hq. Fifth Army, Fifth Army History. Florence, 1944.

d. US War Department, Military Intelligence Division, Salerno. Washington, 1944.

e. US War Department, FM 101-10 (tent.), Ft. Leavenworth, 1943.

f. US War Department, FM E-101-10. Washington, 1942 (with changes to February 1944).

2. German records present to the researcher serious but not insurmountable limitations. Most such records were fragmentary to a greater or less degree when taken into US custody after the war, not only because of destruction and dispersion but because of the inevitable constraints on record-keeping during intense combat. Within recent years almost all of these records have been returned to West Germany. Some were microfilmed, the choice of those to be recorded being unhappily left to agencies apparently little interested in the quantitative aspects of conflict. Nevertheless it has been possible, as has been discussed in connection with the use of these records, to arrive at credible numbers either directly or by extrapolation.

Enclosure 2

THE VOLTURNO CAMPAIGN, November 1-30, 1943

Methodology

General

Search of intelligence documents of 45th Infantry Division for the period, as well as of German documents retrieved from microfilm in the National Archives, indicated the continued presence of XIV Panzer Corps opposite 45th Infantry Division. Both 45th Infantry Division identifications and XIV Panzer Corps documents indicated that 26th Panzer Division was opposed to 45th Infantry Division throughout.

Initial Strengths

Despite 45th Infantry Division's losses at Salerno and in the pursuit to the Volturno, it entered the Volturno Valley action at a strength of 15,083. It ended its 30 days of combat at a total strength of 13,945. During the period it suffered 1231 battle casualties, or 559 less than the discrepancy between its strengths for November 1 and November 30. The division's average daily strength for the month was 14,083, its average daily attrition rate was 60 and its average daily casualty rate was 41. Two of its three infantry regiments were engaged for the first 10 days and all three committed during the remaining 20 days.

Microfilmed records of XIV Panzer Corps contained several sets of strength and casualty figures for 26th Panzer Division, all of them unfortunately at some variance with each other. A strength report indicating 12,209 enrolled on November 4 was found, as was a report for December 1 indicating 12,285, an average daily strength of 12,247. Of this total, 4408 were carried as "combat" troops (infantry and armor), including the division's two panzer-grenadier regiments whose combined strength totalled 2154 as of November 4. The T/O for combat troops was 6213. The shortage of 1805 in T/O combat troops suggests in the light of reported strength that there were minor support and possibly combat attachments to the division.

A recapitulation of strengths and losses for November indicated receipt of 1200 replacements during the month, but provided no breakdown by arm or by distribution. It was assumed, therefore, that 90% or 1080 went to the panzer and panzergrenadier regiments, or 360 to each regiment. A daily replacement rate of 12 for each of the three regiments was then assumed. Daily combat strengths of the panzergrenadier regiments were derived by subtracting casualties and adding replacements for the period studied, resulting in an average daily combined combat strength of 2057 in the two regiments committed.

Equipment

In infantry weapons and artillery, with which the battle was almost exclusively fought, 45th Infantry Division was at its T/E strength. Fire support by corps artillery was on call, although the available records do not specify times or extent of such support.

Due to the nature of the terrain, the panzer regiment of 26th Panzer Division was not engaged, except probably in indirect fire support of the two panzergrenadier regiments. The number of artillery tubes present during the month is not specified in any of the records; it is assumed that the authorized number was present, and that these were reinforced by the full complement of tank guns: 103 long or superlong 75mm. guns.

Frontages

Throughout the month 45th Infantry Division operated on frontages of 8 miles (November 1-5), 8.5 miles (November 6-15), and 8 miles (November 16-30). Two regiments were committed until November 10, when the third was placed in line, and all three remained committed until the end of the month. These frontages are deceptive, as invariably must be the case with combat in mountains; as armor people said in Korea, "the frontage of a tank battalion is one tank." Combat elements, except as very small patrols, can move only along roads and over occasional narrow stream valleys. Most of the terrain must be covered by fire, but an assault force is limited in size and composition by the physical constraints of terrain. During the river crossing phase (November 1-5), five crossing sites were used, three in the center on a 1.5 mile frontage, one 4 miles south of the center, and one 2.5 miles north. From November 5 to the end of the month the infantry regiments operated on frontages varying between 8 and 8.5 miles, although the action

consisted principally in assaults on a series of hill masses by forces of battalion strength or less.

Frontages of the 26th Panzer Division were slightly greater than those of the 45th, approximately two-thirds being opposed to the 45th Division and one-third being opposite the left wing of the US 34th Division. Elements of the four panzergrenadier battalions of the 26th Panzer Division defended successive hill positions until driven off by fire or turned out of position.

Casualties

Calculation of 45th Infantry Division battle casualties was based on data derived from division records at Alexandria, Virginia. These data in their readily available form do not break down casualties by type or causative agent. They do indicate daily division overall strengths and daily battle losses. From them it may be concluded that during November the division sustained a total of 1231 battle casualties, or 8.7% of its average daily total strength and 17.9% of its average daily strength committed to combat.

The scattered German records found on microfilm contained three separate fragmentary reports of 26th Panzer Division casualties for the period, all in disagreement though not widely so. These records included scattered daily reports of casualties, three 10-day summations of casualties, and one report of total casualties by type and unit for the period November 4-15. Taken together, they indicated a total of 829 battle casualties in November, of which 433 could be confidently attributed to 17 of the 30 days involved. The balance of 396 was then prorated over the remaining 13 days on the basis of the nature and intensity of combat as revealed by tactical accounts. This process resulted in an average daily casualty rate of 27.6 and indicated casualties at 6.8% of average daily total strength and 40.3% of average daily strength committed.

Note on Sources

Principal sources of data for this analysis were:

a. US Army records on file at the Federal Records Center, Alexandria, Virginia, consisting principally of 45th Infantry Division:

- (1) After-action reports;
- (2) Daily Command and G-3 Journals;
- (3) G-1 Personnel Status Reports;
- (4) G-2 Periodic Reports and Intelligence Summaries.

b. German records on microfilm in the National Archives, Washington, D.C., consisting to the extent possible of the equivalents of those consulted for 45th Infantry Division data.

c. Hq. Fifth Army, Fifth Army History. Florence, 1944.

d. US War Department, Military Intelligence Division,

Volturno.

e. US War Department, FM 101-10 (tent.). Ft. Leavenworth, 1943.

f. US War Department, FM E-101-10. Washington, 1942 (with changes to February 1944).

German records for the Volturno battle were considerably more detailed than those for Salerno, discussed in an earlier paper in this series. This was especially true of casualty data for 26th Panzer Division, with which 45th Infantry Division was engaged, although these data were not explicit for the entire period and certain assumptions had to be made, as outlined under Initial Strengths and Casualties. It is felt the basis for these assumptions is sufficiently sound to warrant considerable confidence in the results of calculations based upon them.

Enclosure 3

THE ANZIO OPERATION, February 1-29, 1944

Tactical Situation

In a move to outflank the powerful German Gustav Line blocking the Italian peninsula between Naples and Rome, the US Fifth Army landed its VI Corps January 22, 1944, at Anzio on the Tyrrhenian Sea 100 miles north of the Gustav Line. The landing was made with the US 3rd Infantry Division on the right and the British 1st Division on the left.

By January 31, when the first element of the 45th Infantry Division was landed, the beachhead had been expanded to 18 miles at its base and 9 miles in depth, with a narrow salient thrusting out an additional four miles toward Campoleone. This Campoleone salient was entirely within the zone of the British 1st Division on the left of VI Corps. The landings had been opposed by elements of two German divisions under command of I Parachute Corps, assisted by scattered elements of other formations and considerable corps artillery.

One regiment of the 45th Infantry Division was landed January 30 to cover a 7-mile frontage between the right flank of VI Corps and the sea. A second 45th Infantry Division regiment was landed February 1 to cover a frontage of 5 miles behind the Moletta River on the opposite flank, between the 1st British Division and the mouth of the Moletta. Neither regiment was engaged except by patrol actions during the first six days. All of the 45th Infantry Division was landed by February 5 and, save for the regiment in the Moletta River sector, held in corps reserve.

Enemy reaction to the Campoleone salient was prompt and violent. By February 8 it had been reduced by concentric attacks, and VI Corps looked forward to a general assault on the beachhead by infantry and armored divisions rushed into the area by the German Fourteenth Army. The one committed regiment of the 45th Division, on the left flank of the sector, was heavily engaged by the right flank elements of the German assaulting formations, particularly during the period February 7-9. By mid-month the German buildup totalled nine divisions and two independent infantry regiments, opposed the four US and British divisions in the beachhead.

In preparation for the expected German attack, the three infantry regiments of the 45th Infantry Division were by February 11 concentrated behind what had been the eastern shoulder of the Campoleone salient, enabling the badly depleted British 1st Division to shorten its front. On February 11 the 45th Infantry Division launched a counterattack in regimental strength, which was intensified on the 12th. Efforts to reach the complex of buildings called "the Factory" were unsuccessful. However, the division maintained pressure until February 16, when the enemy attacked the division front with at least 14 infantry battalions, backed by powerful artillery concentrations and supported by scattered armor elements and occasional air strikes. These attacks were finally contained the night of February 20 after bitter fighting which drove back the 45th Infantry Division front 2.5 miles.

During the period February 21-23 the 45th Division was involved in a major regrouping of units in the Campoleone sector, and some front-line elements, under heavy German attack, could not be disengaged to rejoin the main elements of the division. While the 45th Division did not play a major role in the confused series of attacks and counterattacks which both sides were engaged in during this period, it was involved indirectly in the more intensive activities of units on its flanks.

From February 23 until the end of the month, the 45th's sector was relatively quiescent, marked by patrolling, strengthening of positions, and holding against occasional probing attacks. On February 29 an enemy attack against the US 3rd Infantry Division on the 45th's right involved one 45th regiment. Throughout the month the entire beachhead area was within range of enemy artillery, which had excellent observation from high ground inland. Although VI Corps artillery, supported by warships in the harbor, fired an estimated 20 rounds for each fired by the enemy, the latter's superior observation and his ability to blanket the entire beachhead undoubtedly, but to an undetermined extent, offset this advantage.

Methodology

General

Both 45th Infantry Division intelligence sources and German documents for the period indicated that, except for three days, the 45th Infantry Division was at no time confronted by elements of a single division. Throughout the 29 days of battle, enemy

forces were shifted about on a task force basis so that, during the heavy German attacks of February 16-20, elements of four different divisions plus two independent infantry regiments were engaged with the three infantry regiments of the 45th Infantry Division.

Initial Strengths

Three separate statements of 45th Infantry Division strength and casualties were found, each of which was in considerable disagreement with the others. Under the necessity of making an arbitrary choice, since there was no means of comparing the relative probable validity of the three documents, that with the most recent date was accepted. This report showed a total strength of 15,532 as of February 1 and a total strength of 14,253 on February 29. The average strength for the month was 15,165.

The nonavailability of detailed German strength and casualty figures was particularly frustrating in attempting to analyze results of 45th Division operations at Anzio. No strength figures for the German divisions engaged in whole or in part against the division were discovered for February. Strength figures for the infantry elements of these divisions were present, however, for at least one day during the period. Using these numbers it was possible, by adding reported casualties since the beginning of the month, to approximate the infantry strengths at the opening of the period. In addition, overall strength figures for nine German divisions within a three-month period including February were found, including some of those engaged against the 45th Infantry Division. The German strength reports were broken down by effective strength (gefechtstärke) and other elements of the divisions. This effective strength, corresponding to the US "combat strength," included infantry, armor, reconnaissance elements, field artillery and antitank and antiaircraft artillery, and was found to average 50.4% of total strength. It was further determined that infantry strength averaged 40% of effective strength, or 20% of that of the division. Thus, an approximation of each division's strength was arrived at by multiplying the ascertainable infantry strength in each instance by a factor of 5. For each phase of the battle the overall strengths thus derived were divided by the proportion of infantry strength committed (1 regiment committed of two present = $\frac{1}{2}$ of overall strength). These fractions of overall division strength were then added on the basis of infantry commitment to arrive at daily overall strengths, resulting in a maximum of 24,491 and a minimum of 5782, with a daily average of 11,684.

A comparison of the results of this process with secondary historical works which had been prepared while the German records were present in the Archives, suggests that the overall German strength was probably somewhat higher than that produced by this method. This is particularly true with respect to figures for the strength of German forces engaged in their major offensive of February 16-19. This is quite understandable, in the light of the German commitment of miscellaneous units in task forces, as well as the manner in which they shifted units. Thus we have assumed that neither those German records available to us, nor our own somewhat hasty and fragmentary intelligence reports, have given us a complete German order of battle. For this reason, in each of the Anzio engagements considered in detail, an arbitrary 25% has been added to the strengths of the German units positively identified, and 25% has also been added to their casualty totals.

A perhaps significant commentary on the quality of the German forces opposed to the 45th Infantry Division is provided by an appreciation by the German Fourteenth Army dated February 27, 1944. This document describes three of the divisions engaged with the 45th (65 Infantry Division, 114 Jäger Division, and 715 Infantry Division (mtz)) as "green" (jünge). It points out that because of their low state of training an exceptionally high proportion of wounds sustained by them were inflicted by shell fragments (75%) and enemy aircraft (10-15%). Elsewhere in the German documents are found complaints of the quality of replacements being received and indications that service support units were being stripped to provide infantry replacements.

Casualties

Casualties of the 45th Infantry Division were reported, as were its strengths, in three documents with different totals. As in the case of strengths, the most recently dated document was used, although there were indications that, in some cases, casualty figures reflected accumulations of casualties of previous days which were reported late. In these cases, clearly erroneous totals have been redistributed among prior days on the basis of known intensity of combat. Total 45th Infantry Division casualties for the month were 2839, concentrated as might be expected in the period February 11-20. The average daily casualty rate was 97.9.

Casualties of the five infantry divisions and two independent regiments engaged at different times against the 45th Infantry Division during the period were generally available on a daily basis, although in a few cases cumulative totals for as many as four days

had to be distributed on the basis of known intensity of combat. Total casualties were broken down to correspond with fractions of divisions engaged against the 45th Infantry Division, this breakdown being arrived at not only through 45th Infantry Division intelligence identifications but by checking German records for coordinates of elements thus identified. By this method, casualties inflicted by or in support of the 45th Infantry Division were calculated as 3183 total and an average daily rate of 109.8.

Notes on Sources

Principal sources of data for this analysis were:

- a. US Army records on file at the Federal Records Center, Alexandria, Virginia, consisting principally of 45th Infantry Division:
 - (1) After-action reports;
 - (2) Daily Command and G-3 Journals;
 - (3) G-1 Personnel Status Reports;
 - (4) G-2 Periodic Reports and Intelligence Summaries.
- b. German records on microfilm in the National Archives, Washington, D.C., consisting to the extent possible of the equivalents of those consulted for 45th Infantry Division data.
- c. Hq. Fifth Army, Fifth Army History. Florence, 1944.
- d. Department of the Army, Historical Division, Anzio. Washington: Government Printing Office, 1947.
- e. US War Department, FM 101-10 (tent.). Ft. Leavenworth, 1943.
- f. US War Department, FM E-101-10. Washington, 1942 (with changes to February 1944).

Appendix A

SELECTED CASUALTY EXPERIENCE,
45TH DIVISION IN ITALY,
WORLD WAR II

Part Two: The Engagements

Enclosure 1

SALERNO--ATTACK FROM THE BEACHHEAD, September 11, 1943

Posture: Attack against a hasty defense.

On September 11, the 45th Division, with two infantry regiments and three light artillery battalions ashore, attacked inland from the beaches. The 45th was opposed in large part by units of the 16th German Panzer Division. It is assumed that approximately one-half of the 16th Panzer Division was engaged on the defensive, while the remainder was assembling for a planned counterattack.

45th Division Statistics

Manpower

Two infantry regiments plus three artillery battalions are assumed to have a total numerical strength of 8,388.

Weapon Lethality

The most serious difficulty in arriving at a reasonable approximation of the force ratio between the 45th Division and the defending German forces is to give due weight to the substantial amount of naval gunfire support, carrier aircraft support, and land-based air support provided to the attacking forces. The figures shown below are based upon the best estimates of the amount of available supporting aerial and naval forces, and considered judgments as to the extent to which these were applied in support of 45th Division attacks on September 11.

Direct naval support was given to the entire operation by a British force consisting of three battleships, two fleet carriers, and three escort carriers. Naval gunfire support provided by the American warships to the American units consisted of three cruisers, eighteen destroyers, plus "many smaller combatant craft and big numbers of mine sweepers." We have calculated that the following specific firepower support was available:

Preceding page blank

3 Battleships @	38,204,056	114,612,100
2 Fleet Carriers @	75,947,500	151,895,000
3 Escort Carriers @	30,379,000	91,137,000
Total		<u>357,644,000</u>

(Approximately one-fourth of this was available to the 45th Division)

3 Cruisers @	23,911,756	69,623,400
18 Destroyers @	5,376,936	96,784,848
Total		<u>166,408,200</u>

(Approximately one-half of this was available to the 45th Division)

It is assumed that approximately 400 fighter bombers, based in Sicily, were available for direct air support. Due to the distance of bases from beachheads, only one-fourth normal effort is assumed to have been available:

$400 \times 3,037,900/4 + 303,790,000$

(Approximately one-fourth of this was available to the 45th Division)

Thus the total weapon lethality available to the 45th Division was:

2 Infantry regiments	54,557,700
3 FA battalions	24,129,700
1 Tank battalion	126,908,200
1 Tank destroyer battalion	18,652,200
Naval support	172,615,000
Land-based air support	75,947,500
Total Weapon Lethality	<u>472,810,300</u>

Casualties

Total of 251, or 251/day, 2.99% of average daily strength.

16th Panzer Division Statistics

Manpower

One-half of the total division strength, or: 7,325.

Weapon Lethality

One-half of the total division weapon lethality, at 90% availability, or 162,960,600.

Casualties

The assumed loss was 100 men, or 100/day, 1.368% of average daily strength.

Comparisons

Manpower ratio: $\frac{8388}{7325} = \frac{1.145}{1.000}$

Firepower ratio: $\frac{472,810,300}{162,960,600} = \frac{2.901}{1.000}$

Force ratio product:
(attacker) $\frac{3.322}{1.000}$

Force ratio product:
(defender) $\frac{.301}{1.000}$

Results: Attack not fully successful; successful defense.

Enclosure 2

SALERNO--GERMAN COUNTERATTACK, September 12-14, 1943

Posture: Attack against a hasty defense.

On September 12, XIV Panzer Corps launched a vigorous counter-attack at the junction of the US 45th and 36th Infantry Divisions. The 45th, with two infantry regiments and three light artillery regiments ashore, defended mostly against the attack of the 16th Panzer Division, which penetrated as deep as 2.5 miles by September 14. The attack was held off with considerable aid from the fleet and land-based aircraft.

45th Division Statistics

Manpower

Two infantry regiments plus three artillery battalions are assumed to have a total numerical strength of 8,388.

Weapon Lethality

Naval gunfire, carrier aircraft, and land-based air support were on September 12 about the same as on September 11. On September 13, because of the gravity of the situation, the firepower support to the 45th was roughly doubled. On September 14, it was augmented by land-based strategic bombers. The firepower figures are as follows:

<u>September 12</u>	
2 Infantry regiments	54,557,700
3 Artillery battalions	24,129,000
1 Tank battalion	126,908,200
1 Tank destroyer battalion	18,652,200
Naval support	172,615,000
Air support	<u>75,947,500</u>
Total Weapon Lethality	472,809,600
<u>September 13</u>	472,809,600
Increased naval support	172,615,000
Increased air support	<u>75,947,500</u>
Total Weapon Lethality	721,372,100

September 14	721,372,100
Strategic air force	<u>399,453,000</u>
Total Weapon Lethality	1,120,825,100
Total Lethality	2,315,006,800
Daily Average	771,668,933

Casualties

Total of 402, or 134/day, 1.6% of average daily strength.

16th Panzer Division Statistics

Manpower

Total division strength: 14,229.

Weapon Lethality

Total division weapon lethality, at 90% availability:	325,921,300
Estimated Corps Artillery Support:	<u>8,197,100</u>
Total Lethality	334,118,400

Casualties

The assumed loss was a total of 720, or 240/day, 1.687% of average daily strength.

Comparisons

Manpower ratio: $\frac{14,229}{8,388} = \frac{1.696}{1.000}$

Firepower ratio: $\frac{334,118,400}{771,668,900} = \frac{.433}{1.000}$

Force ratio product: $\frac{.734}{1.000}$
(attacker)

Force ratio product: $\frac{1.361}{1.000}$
(defender)

Results: Attack failed; successful defense.

Enclosure 3

SALERNO--ADVANCE TO NAPLES, September 17-25, 1943

Posture: Attack against a delaying action.

During the period September 17-25, the 45th Division at full strength, reinforced with one tank battalion and one tank destroyer battalion, pressed out of the Salerno beachhead. The 16th Panzer Division opposed it in a delaying action, including extensive road and bridge demolitions. It is assumed that one-half of the available German force was withdrawn to prepare a defensive position, and that only half the division was in the combat line actually opposing the 45th Division.

45th Division Statistics

Manpower

Total division strength was involved, plus tank and tank destroyer attached battalions, making a numerical strength of 15,576.

Weapon Lethality

Division	139,310,467
1 Tank battalion	126,908,210
1 Tank destroyer battalion	<u>18,652,237</u>
Total Weapon Lethality	284,870,914 *

*Probable small-scale air support is not included, since time did not permit a search for confirmation of its presence and its volume. This means a probable slight distortion in the lethality ratio, and of the average force ratio. However, this is offset by the fact that an indeterminate German air support was also present but not counted in the German total.

Casualties

Total of 386, or 42.89/day, .276% of strength.

16th Panzer Division Statistics

Manpower

Approximately half of the division engaged against the 45th Infantry Division: 6,702.

Weapon Lethality

Approximately half of the division firepower at 90% effectiveness, 162,960,600 + 10 x 88mm. guns, 6,180,720, or 169,141,300.

Casualties

Estimated at a total of 144, or 16/day, .239% of strength.

Comparisons

Manpower ratio: $\frac{15,576}{6,702} = \frac{2.324}{1.000}$

Firepower ratio: $\frac{284,870,914}{169,141,310} = \frac{1.684}{1.000}$

Force ratio product:
(attacker) $\frac{3.914}{1.000}$

Force ratio product:
(defender) $\frac{.256}{1.000}$

Results: Attack partially successful; successful delaying action.

Enclosure 4

VOLTURNO--ATTACK IN THE MOUNTAINS, November 6-13, 1943

Posture: Attack against a prepared defense.

During the first five days of November the 45th Division was in the area of the Volturno River, which it crossed during the period. Thereafter it attacked the German 26th Panzer Division, which was defending from prepared positions in mountainous terrain. About two-thirds of the 26th Panzer Division was engaged against the 45th, with the tanks presumably employed as artillery weapons. It is assumed that the two divisions received comparable support from corps artillery and tactical air.

45th Division Statistics

Manpower

Full division strength, plus a tank battalion and a tank destroyer battalion, from division records an average daily strength of 15,579.

Weapon Lethality

Full division strength	139,310,500
1 Tank battalion	126,908,200
1 Tank destroyer battalion	<u>18,652,200</u>
Total Weapon Lethality	284,870,900

Casualties

Total of 656, or 82/day, .526% of strength.

26th Panzer Division Statistics

Manpower

It is assumed that two-thirds of the division strength was engaged against the 45th, or 8,165.

Weapon Lethality

Two-thirds of the nonarmor elements of the division strength plus the tank weapons,

Division strength		85,832,900
Tank weapons		<u>44,493,800</u>
	2/3 of	130,326,700 =
Total Weapon Lethality		86,884,400

Casualties

Two-thirds of the total division casualties were attributed to the 45th; an estimated total of 241, or 30.12/day, .369% of strength.

Comparisons

Manpower ratio: $\frac{15,579}{8,165} = \frac{1.908}{1.000}$

Firepower ratio: $\frac{3.278}{1.000}$

Force ratio product:
(attacker) $\frac{6.254}{1.000}$

Force ratio product:
(defender) $\frac{.16}{1.000}$

Results: Attack failed; successful defense.

Enclosure 5

ANZIO-I--MOLETTA RIVER DEFENSE, February 7-9, 1944

Posture: Attack against a hastily prepared defense.

Following daylight bombing of rear areas, in the evening of February 7 the 65th German Infantry Division attacked from the west, at about 2100, striking one regiment of the 45th Division as well as other units, and driving them back. Bitter fighting continued until February 10, when the Germans paused to consolidate their gains and bring up reserves. Both naval and air support were employed by the Allies; the Germans also used air support; and both sides received heavy artillery support.

45th Division Statistics

Manpower

One-third of the division's manpower, plus a third of the tank destroyer battalion, a total of 5310 men, were engaged. Other battalion-sized units were distributed elsewhere, in reserve or in relatively inactive sectors of the line.

Firepower

The firepower available to the 45th Division included:

1/3 Division firepower	46,436,800
1/3 Tank destroyer battalion firepower	6,216,800
1/16 Corps artillery, naval and air support	<u>34,307,500</u>
Total Weapon Lethality	86,961,100

Casualties

Total casualties of the 45th Division were 107, of which 90%, 96, or 32/day, are credited to the 65th German Division. This is .602% of average daily strength.

German 65th Infantry Division Statistics

Manpower

One-half of the 65th Infantry Division, plus miscellaneous small units, was engaged against the 45th Division, a total of 7312.

Firepower

The 65th Division is estimated to have had 1/2 full division, plus 1/4 firepower, plus 1/16 normal support, a total of 58,600,775. Normal higher echelon artillery support was reduced to 1/4 of strength by a severe shortage of ammunition.

Casualties

Total casualties for the units engaged were 335, or 112/day, 1.53% of daily strength.

Comparisons

$$\text{Manpower ratio:} \quad \frac{5310}{7312} = \frac{.726}{1.000}$$

$$\text{Firepower ratio:} \quad \frac{86,961,100}{58,600,775} = \frac{1.483}{1.000}$$

$$\text{Force ratio product:} \quad \frac{.928}{1.000}$$

(attacker)

$$\text{Force ratio product:} \quad \frac{1.077}{1.000}$$

(defender)

Results: The defender was more successful than the attacker.

Enclosure 6

ANZIO-II--APRILIO COUNTERATTACK, February 11-12, 1944

Posture: Attack against a prepared defense.

Two regiments of the 45th Division, having relieved the British 1st Division, occupied 2 miles, or 1/11 of the front. On February 11 the division counterattacked against the German 715th Infantry Division, with the objective of retaking the complex of buildings known as "the Factory." With the 191st Tank Battalion attached, and supported by the 27th Armored Field Artillery Battalion, the 45th Division troops reached the Factory and even entered some of the buildings on the southeast corner, but ultimately were forced to withdraw and abandon the attempt after two days of heavy fighting.

45th Division Statistics

Manpower

The average daily strength of the 45th Division was 15,255, two-thirds of which, or 10,170, was engaged in this action. In addition were the troops of the tank battalion, 642, and two-thirds of the tank destroyer battalion, 400, a total of 11,212 men.

Firepower

The total firepower, including 2/3 of divisional and tank destroyer battalion firepower, one tank battalion, 4/11 of normal firepower in support, plus 1/6 of a major supporting air effort, equals 533,085,900.

Casualties

The 45th Division suffered a total of 168 casualties, or 84/day, .749% of average division daily strength.

715th Infantry Division Statistics

Manpower

The manpower is assumed to have been full division strength, plus some miscellaneous units, 13,319 men.

Firepower

Firepower is calculated at normal for a division plus 1/4, plus 4/11 of the normal artillery and air support, a total of 136,958,500.

Casualties

The 715th plus its additional elements suffered 206 casualties, or 103/day, .773% of daily strength.

Comparisons

Manpower ratio: $\frac{11,212}{13,319} = \frac{.842}{1.000}$

Firepower ratio: $\frac{533,085,900}{136,958,500} = \frac{3.892}{1.000}$

Force ratio product:
(attacker) $\frac{3.277}{1.000}$

Force ratio product:
(defender) $\frac{.305}{1.000}$

Results: Attack failed; successful defense.

Enclosure 7

ANZIO-III--GERMAN "BOWLING ALLEY" OFFENSIVE,
February 16-19, 1944

Posture: Attack against prepared defense.

The Germans, having made sizable gains and consolidated their positions, on February 16 launched a major offensive, in an attempt to break through to the beach and divide the Allied forces. The brunt of the attack fell on the 45th US Division, and the tank destroyer battalion attached to it. Elements of six German divisions were in the attack, which pushed the 45th back. Fierce fighting followed for three days, during which heavy air and artillery support was given to the 45th Division. After taking heavy punishment, the Germans halted on February 19-20.

45th Division Statistics

Manpower

Including the 600 men of the attached tank destroyer battalion, manpower averaged 15,797.

Firepower

In addition to regular division firepower and that of the tank destroyer battalion, the 45th Division had a supporting tank battalion (191st) and naval, air, and artillery support of varying amounts.

<u>February 16</u>	
Divisional firepower	157,960,700
Tank battalion	126,908,210
3/11 normal general artillery support	<u>149,705,500</u>
Total	434,574,400

<u>February 17</u>	
Divisional firepower	157,960,700
Tank battalion	126,908,210
6/11 normal general artillery support	299,411,000
1/2 major air effort	<u>303,790,000</u>
Total	888,069,900

<u>February 18</u>	
Divisional firepower	157,960,700
Tank battalion	126,908,210
2/3 normal general artillery support	365,946,700
1/4 major air effort	151,895,000
Total	<u>802,710,600</u>

<u>February 19</u>	
Divisional firepower	157,960,700
Tank battalion	126,908,210
6/11 normal general artillery support	299,411,000
1/3 major air effort	<u>202,526,700</u>
Total	<u>786,806,600</u>

Total, February 16-19	2,912,161,500
Average daily firepower	728,040,375

Casualties

45th Division casualties for this action totalled 1375, or 343.8/day, 2.17% of average daily strength.

German Statistics

Determining which of the numerous German units which were present at Anzio were involved against the 45th Division with complete precision is impossible from available records. From evidence available it has been deduced that the major forces consisted of two regiments of the 715th Infantry Division, the Infantry Lehr Regiment, and panzergrenadier regiments and other elements of 3rd and 29th panzergrenadier divisions, roughly equivalent of two infantry and one panzer division.

Manpower

The average daily strength is estimated at 26,421, a figure that may be too low.

Firepower

The firepower is estimated at the equivalent of two infantry and one panzer division (tanks were used by both sides in large numbers), plus artillery and air support, as follows:

2 infantry divisions	170,964,000
1 panzer division	<u>362,134,726</u>
Total	533,098,700

<u>February 16</u>	
Divisional firepower	533,098,700
1/2 normal general artillery support	41,395,800
1/2 major air effort	<u>60,758,000</u>
Total	635,252,500

<u>February 17</u>	
Divisional firepower	533,098,700
1/2 normal general artillery support	41,395,800
1/4 major air effort	<u>30,379,000</u>
Total	604,873,500

<u>February 18</u>	
Divisional firepower	533,098,700
1/2 normal general artillery support	41,395,800
1/8 major air effort	<u>15,189,500</u>
Total	589,684,000

<u>February 19</u>	
Divisional firepower	533,098,700
1/2 normal general artillery support	<u>41,395,800</u>
Total	574,494,500

Total, February 16-19	2,404,304,500
Average daily firepower	601,076,125

Casualties

Total German casualties were 2247, an average of 561.8/day, 2.12% of average daily strength.

Comparisons

Manpower ratio:	$\frac{15,797}{26,421} = \frac{.598}{1.000}$
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Firepower ratio:	$\frac{728,040,375}{601,076,125} = \frac{1.211}{1.000}$
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Force ratio product: $\frac{.724}{1.000}$
(attacker)

Force ratio product: $\frac{1.382}{1.000}$
(defender)

Results: The defender was more successful than the attacker.

Enclosures 8 and 9

ANZIO-IV--GERMAN BEACHHEAD DEFENSE LINE OFFENSIVE,
February 21-23, 1944

Posture: Attack against prepared defense.

Action during this period continued, although on a reduced scale, on both sides of the salient where the German attack of the preceding days had been halted. On the left flank of the 45th Division, one battalion, trapped in an advanced position, was relieved by the British after a bitter struggle. On the right flank, the Germans made a series of counterattacks, meeting stiff opposition and gaining little. The German forces were an assortment of units, but primarily the 114th Infantry Division. Both sides received artillery and air support.

45th Division Statistics

Manpower

Manpower of the 45th Division plus the attached tank destroyer battalion averaged 15,807 daily.

Firepower

Firepower of the 45th and the tank destroyer battalion, plus 2/11 normal support, totalled 257,764,400.

Casualties

The casualties totalled 655, or 218.3/day, 1.381% of strength.

114th Division Statistics

Manpower

The total manpower, including miscellaneous attachments, was 15,265.

Firepower

Firepower of the divisional elements totalled 106,852,500. With one-half normal artillery and air support, the total is 148,243,300.

Casualties

German casualties amounted to 500, or 166.7/day, 1.092% of average daily strength.

Comparisons

Manpower ratio: $\frac{15,807}{15,265} = \frac{1.035}{1.000}$

Firepower ratio: $\frac{257,764,400}{148,243,300} = \frac{1.739}{1.000}$

Force ratio product:
(attacker) $\frac{.555}{1.000}$

Force ratio product:
(defender) $\frac{1.802}{1.000}$

Results: The defender was more successful than the attacker.

Note: Both sides were attacking and counterattacking at this time, and, while the 45th Division was generally defending, overall Allied posture was largely that of counterattack. This engagement is shown here as an Allied, 45th Division defense posture, since in general the Germans retained the initiative in this sector. It is believed useful, however, to show this same action also as a German defense posture on the chart, in which the defender was more successful than the attacker.

Appendix B

SELECTED CASUALTY EXPERIENCE,
79TH DIVISION IN FRANCE,
WORLD WAR II

Part One: The Operational Setting

Enclosure 1

THE LORRAINE CAMPAIGN, September 11-23, 1944

In the second week of September 1944 both Allied and German forces were preparing an offensive in Lorraine, west of the Moselle River. The Allies, who were pursuing from Normandy and southern France, were able to implement their plans first. The 79th Infantry Division was assembled near Joinville at nearly full T/O strength. The German 16th Infantry Division was just entering and organizing the Chaumont-Neufchateau sector on September 11 when the French 2nd Armored Division, on the right flank of the 79th, began to attack between the 16th Division and Kampfgruppe Ottenbacher. The 79th advanced and spread out along the north and west flanks of the 16th's area, attacking in force on September 13. The 16th was driven from point after point, and both Allied divisions took large numbers of prisoners. By the end of September 16 the 16th Division had ceased to exist as a combat unit. It had suffered 6705 casualties since September 11.* The record showed that it lacked 6837 of a T/O of 12,411 men. It may be assumed that the bulk of those missing were combat troops.

The 79th Division and the French 2nd Armored Division continued across the Moselle as the 16th disintegrated before them. On September 19, advance units crossed the Mortagne River, encountering troops of the 21st Panzer Division which, with the 112th Panzer Brigade as reinforcement, undertook a delaying action in compliance with orders to fall back to the Meurthe River. The 21st Division (reinforced) was holding a 17-mile front. The 79th Division was engaged on a 7-mile front. The 21st Division held the line on the east bank of the Meurthe River until the 23rd, when the 79th pushed on to the Foret de Mondon, where the bulk of the German force in its sector was dug in. Closing in on the forest, the 79th forced the enemy to withdraw.

Strengths and Casualties

Figures on the daily strength and casualties of the 79th Division for the month of September were extracted from G-1 records.

*It is assumed that virtually all combat losses of the division in September took place in this 6-day period.

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They show a strength of 13,951 on September 13 and 13,615 on September 16, an average of 13,758 over the period. Casualties for the same period average 76.25/day, or .554% of strength. The fact that casualties increased sharply from a total of 6 on September 12, to a total of 43 on September 13 clearly indicates that the attack was opened on the 13th.

Replacements received in the next few days brought the strength of the 79th to 13,624 men on September 19. By September 23 the stiff opposition of the 21st Panzer Division had reduced the strength of the 79th to 13,148, resulting in an average daily strength from September 19 to 23 of 13,386. Casualties during the same period averaged 112.8/day, .843% of average daily strength.

Available German records for this period consist of two sheets, one for each division, showing the personnel and weapons situation as of October 1, 1944. Given are: the personnel strength as it should have been, the number missing, the number of replacements received during the preceding month, and the number of casualties suffered. Since other sources indicate that the only engagements of consequence in which the two divisions were engaged occurred during the periods when they were facing the 79th Division and the French 2nd Armored Division, September 11-16 and September 19-23, it has been assumed that these casualties in each case were sustained during those periods. The strength at the beginning of September was calculated by subtracting from the given T/O strength for October 1 the number lacking, adding the total casualties, and subtracting the number of replacements. Subtracting the daily average number of casualties inflicted by the 79th Division and by the French gives the strength figures for each day. Since the French were engaged two more days than the US 79th Division, an average of the remaining days of combat gives the average daily strength for this study.

Weapons

In calculating the German weapon strength, it was assumed that the figures shown on the October 1 report were considerably lower than they would have been when the 79th Division attacked. On the further assumption that the heavy weapons of the 16th Division would have been maintained in action as long as possible, the regular T/E of a German infantry division has been adjusted for the action of September 11-16. The weapons for the 21st Panzer Division and the 112th Panzer Brigade have been similarly estimated. While these figures cannot be considered precise, they are certainly within a reasonable order of magnitude for such units under such conditions.

General Comment

These two actions, selected on the basis of a chance discovery of German documentary material, indicate the validity of undertaking a study of this sort from the opposite direction from that used for the major portion of this one. Since US figures are not very difficult to obtain, it would be a great saver of time to search first for existing German information and then compare with that of US units.

These actions of the 79th Division in Lorraine clearly establish the possibility of producing reasonable results from a relatively small amount of information, using historical and military professional judgment in interpretation. Month end figures are no substitute for daily figures, however. It is believed that the latter, if available, would closely follow the pattern established in this deductive method.

Appendix B

SELECTED CASUALTY EXPERIENCE,
79TH DIVISION IN FRANCE,
WORLD WAR II

Part Two: The Engagements

Enclosure 1

LORRAINE--ADVANCE TO THE MOSELLE RIVER, September 13-16, 1944

Posture: Attack resulting in withdrawal.

On September 11 the US 79th Division was assembled around Joinville, with the French 2nd Armored Division on its right flank. The French launched an attack that day upon the German 16th Infantry Division, while the US 79th was advancing to contact and positioning itself along a 40-mile front facing the same German unit. On the 13th, the 79th attacked, driving the 16th back, taking so many prisoners and inflicting so many casualties that after September 16 the 16th Division ceased to exist as a unit. It is assumed from the historical record that the French inflicted 60% of the casualties, since they were engaged against about half of the 16th Division for a period 20% longer than that of the 79th Division's engagement.

79th Division Statistics

Manpower

13,758, approximately total division strength.

Firepower

Full divisional firepower, 139,310,467, plus five tanks, 11,253,680, for a total of 150,564,100.

Casualties

The 79th Division suffered a total of 305 casualties, or a daily average of 76.25, .554% of strength.

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16th Infantry Division Statistics

Manpower

The average daily strength of the 16th Infantry Division was 8437, of which half, 4219, is estimated to have opposed the 79th.

Firepower

The weapons of the 16th Division are calculated at considerably less than T/O strength, on the basis of division records. Half of the total weapon lethality, 9,315,600 is estimated to have opposed the 79th Division.

Casualties

The 16th Division sustained a total of 6705 casualties, 60% of which are credited to the French. The remaining 40% total 2682, or 670.5 daily average, 15.89% of strength.

Comparisons

$$\text{Manpower ratio:} \quad \frac{13,758}{4,219} = \frac{3.261}{1.000}$$

$$\text{Firepower ratio:} \quad \frac{150,564,100}{9,315,600} = \frac{16.163}{1.000}$$

$$\text{Force ratio product:} \quad \frac{52.707}{1.000}$$

(attacker)

$$\text{Force ratio product:} \quad \frac{.019}{1.000}$$

(defender)

Results: Successful attack; catastrophic failure of defense.

Enclosure 2

LORRAINE--ADVANCE TO THE MEURTHE RIVER, September 19-23, 1944

Posture: Attack against delaying action.

Between September 19 and 23, the US 79th Division, having smashed the German 16th Infantry Division a few days before, headed northeast and encountered elements of the German 21st Panzer Division, reinforced by the 112th Panzer Brigade. Some German detachments were trapped by the French, operating on the right flank of the 79th Division. The Germans were holding a 17-mile front, 7 of which was facing the 79th Division.

79th Division Statistics

Manpower

The average strength was 13,386.

Weapon Lethality

The 79th is assumed to have had full divisional firepower, plus five tanks, a total of 150,564,000.

Casualties

The 79th suffered a total of 564 casualties, or 112.8/day, .843% of daily strength.

21st Panzer Division Statistics

Manpower

The average daily strength of the 21st Panzer Division was 10,748 and that of the attached 112th Panzer Brigade is estimated as 2929, for a combined strength of 13,677, 7/17 of which, or 5632, was opposed to the 79th Division.

Weapon Lethality

The weapons of the 21st Division as calculated from the records, including 11 Mark IV and 1 Mark V tank, have a combined lethality of 68,843,300. Those of the 112th Panzer Brigade were estimated to have a combined lethality of 90,026,300, making a combined total of 154,829,400. Of this, 7/17, or 63,753,284, was opposed to the 79th Division.

Casualties

The 21st Panzer Division suffered a total of 494 casualties. It is assumed that the 112th Panzer Brigade suffered 133, a total of 627. 7/17 of these, or 258, are credited to the 79th Division, a daily average of 51.6, .916% of strength.

Comparisons

Manpower ratio: $\frac{13,386}{5,632} = \frac{2.377}{1.000}$

Firepower ratio: $\frac{150,564,147}{63,753,284} = \frac{2.362}{1.000}$

Force ratio product:
(attacker) $\frac{5.614}{1.000}$

Force ratio product:
(defender) $\frac{.178}{1.000}$

Results: Successful attack; partly successful delaying action.

Appendix C

SELECTED CASUALTY EXPERIENCE IN OKINAWA,
WORLD WAR II

Part One: The Operational Setting

Enclosure 1

OKINAWA--US 7TH AND 96TH DIVISIONS

Okinawa was the last battle of the Pacific War. The US Pacific Fleet landed the US Tenth Army on Okinawa in the Ryukyu Islands, a southern outpost to the home islands of Japan. It was defended by the Japanese 32nd Army, comprised of some 77,000 regular troops, augmented to nearly 120,000 by Okinawan conscripts, reservists, and home guard. The Tenth Army comprised four Army infantry divisions and two Marine divisions, plus corps and army supporting units, to a total strength that ran between 190,000 and 225,000. As a measure of the intensity of the three months of combat from April 1 to June 30, 1945, the Japanese lost 110,000 killed and 7400 captured, while Tenth Army lost 7300 killed and 31,800 wounded. The Japanese defense was characterized by their usual fanatical infantry defense from well-sited and deeply dug positions carried to the ultimate degree and supported by the only instance in the Pacific War of relatively massive, accurate, and thus very effective Japanese use of artillery. The American attack featured massive artillery, naval gunfire, and air support of tank-infantry assault teams which burned and blasted the Japanese out of their cave and bunker positions with direct gunfire, demolition charges, and flamethrower tanks.

Narrative of the 7th and 96th Divisions

Tenth Army landed over the Hagushi beaches in the center of Okinawa on April 1, 1945, with the 7th and 96th Divisions on the right. These two divisions crossed the island and wheeled right, attacking to the south down the long axis of the island. During the first four days only delaying forces were encountered, but at the end of this period heavy resistance was met from the outpost line of resistance. This line--sometimes called the Machinato Line--protected the main battle position, or the island's citadel, the Shuri massif, which was fortified as a series of concentric positions.

As the 7th and 96th Divisions were making costly progress against the Machinato Line, the Japanese launched an unsuccessful counterattack in the strength of four battalions on the night of April 12-13 and lost heavily. By April 19, with an additional division in line on the right, the 27th, the attack against the

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Machinato Line was resumed, and at the cost of heavy casualties it was breached by April 24. This brought the American forces up against the second defense line protecting the Shuri position. By the end of April the 77th Infantry Division had relieved the 96th and the 1st Marine Division had replaced the 27th, as the attack continued to grind ahead with small but steady gains against extremely stubborn resistance and at the cost of heavy casualties.

When the Japanese command felt that their position at Shuri was deteriorating and also that the American forces had been attrited sufficiently they launched a counteroffensive the night of May 3-4. One full strength division, the 24th, was to make the main effort on the Japanese right through the 7th Division area. The 44th Independent Mixed Brigade, a fresh unit, was to attack also, with remnants of the 62nd Division supporting by holding attacks, and two amphibious engineer regiments making seaborne raids on both sea flanks of Tenth Army. The Japanese artillery was brought from its caves for this attack to make its fires more effective. Special precautions, including smoke screens, were taken to protect the guns from American observation. These precautions were not effective, however, and American artillery destroyed an estimated one-half of the remaining Japanese artillery that night by counterbattery fires. This was a blow from which the Japanese artillery was unable to recover, and their artillery fire was noticeably reduced from that date onward.

The Japanese attack was generally unsuccessful, being broken up by defensive mortar and artillery barrages and small arms fire from front-line hasty defensive positions. There was a penetration of about one mile in the center along the boundary between the 77th and 7th Divisions. An attempt was made to exploit this weakness on the night of May 4-5 by further abortive attacks. On the 5th, remnants of these Japanese penetrations were mopped up by US combat patrols. American losses were considered heavy, nearly 400 in these two divisions, but the Japanese lost over 5,000 men in the counteroffensive and at least 60 pieces of artillery. These losses so weakened the Shuri defenses that eventual withdrawal from that position was inevitable.

On May 9-10 the 96th Division returned to the front, relieving the 7th Division on the left of the line. Progress was slightly less difficult on the flanks of Shuri, and when the 96th reached the coastal town of Yonabaru on May 21 it was possible to commit the 7th Division on the left flank as the island widened affording maneuver room. Progress by the 7th on this flank was encouraging despite local counterattacks on May 25 and 26.

These counterattacks, and the stubborn resistance by what was later determined to be a covering force, heralded the Japanese withdrawal from the Shuri Line, which was rapidly becoming untenable. This withdrawal to the final defense line at the southern end of the island, the Yuza Dake-Yaeju Dake Line, was completed on May 31. As the withdrawal became apparent toward the end of May, large numbers of Japanese troops, artillery, and transport were observed moving south and were attacked by the Americans day and night with artillery, naval gunfire, and planes.

During the week after the fall of the Shuri Line, Tenth Army pursued to the south against delaying rear guard elements. The soft clay soil of this part of the island--reduced to a morass by monsoon rains and the churning action of high explosives--served to delay the advance as much as the Japanese rear guard. By June 11 the 96th and 7th Divisions had pushed through the outposts and were engaged against the imposing escarpment position of Yuza Dake-Yaeju Dake. This coral ridge, perpendicular to the direction of advance, rose sharply 150 feet from the rolling low ground. It was organized for all-around defense with deeply dug cave and bunker positions much as Shuri had been. The straight unbroken glacis of the escarpment was ideal for the organization of mutually supporting machinegun fires and defensive concentrations of mortar and artillery fires across its front. With an unshaken enemy such as was encountered at the beginning of the battle for Shuri it would have been virtually impregnable to frontal assault. However, the Japanese defenders by this stage of the battle consisted of remnants of the original combat units reinforced with service troops and home guards. Japanese artillery had been almost eliminated. Infantry units were still armed with a quantity of automatic weapons and light mortars, however, and put up a stubborn resistance for over a week. They finally succumbed to combined frontal and flanking attacks against the escarpment, which burned and blasted the Japanese out with flamethrower tanks, demolitions, and close-in tank-infantry assault.

The escarpment was secured by June 17 and by June 21 organized resistance had ceased on Okinawa as the final defensive positions were taken and the command posts of 32nd Army and subordinate units overrun. Individual resistance from Japanese hiding in caves and holes or attempting to infiltrate to the forested mountains in the northern part of the island continued to June 30 with several thousand more Japanese being killed or captured--at the cost of numerous American casualties.

Japanese Organization

The 32nd Japanese Army was organized into three infantry formations, an artillery command, several separate combat support units such as antiaircraft and mortar, and a number of service support and base units totalling some 77,000 in all. This number was brought to over 110,000 by Okinawan conscripts, reservists, and home guard as has been noted. These were used, along with the service support and base units, as individual replacements, or organized as unit replacements up to light infantry battalion in size and composition to maintain the fighting strength of the two divisions and one brigade of 32nd Army.

The 62nd Division was a veteran unit with extensive combat experience in China. It consisted of two brigades of five battalions each. Each battalion, except the fifth in each brigade, had five rifle companies, a heavy machinegun company, and an infantry gun company. The fifth battalions had three rifle companies and a machinegun company. The 62nd, although having the usual service support units, had no organic division artillery units or other combat support.

The 24th Division, while it had seen no combat, was a full strength division with three infantry regiments and an artillery regiment.

The 44th Independent Mixed Brigade had two infantry regiments, one of which, having lost its heavy weapons to submarine attack en route, had only small arms, light machineguns, and light mortars.

The 5th Artillery Command had one battalion of the 1st Medium Artillery Regiment, the 23rd Medium Artillery Regiment, the 100th Heavy Artillery Regiment, and one battalion of the 7th Heavy Artillery Regiment. Counting coast defense guns used in a field artillery role, there were deployed at least 287 guns and howitzers of 70mm. or larger. This included 52 150mm. howitzers, 12 150mm. guns, and 170 70mm. and 75mm. howitzers of the infantry gun companies and 75mm. guns of the artillery. In addition there were 72 75mm. AA guns, 54 20mm. AAMGs, 96 81mm. mortars, 24 320mm. spigot mortars, 52 47mm. AT guns, 27 37mm. AT guns, 14 medium tanks with 57mm. guns, and 13 light tanks. Infantry units included 333 heavy machineguns, 1208 light machineguns, and 1100 50mm. mortars.

Japanese Tactics

Because of a shortage of troops and the battering that beach defenses had taken to no avail on other Japanese islands, the Japanese 32nd Army commander--General Ushijima--elected not to defend the Hagushi beaches. Rather, they were outposted with a delaying force falling back on the Machinato Line. This was the outpost line for the main battle position, the Shuri Line. Both of these lines, as well as the southern defenses, which were originally designed to defend the Minatoga beaches at the southeastern tip of Okinawa, were heavily fortified with clearly sited and deeply dug underground positions. These fortifications had numerous entrances connected by an intricate system of tunnels. In some of the larger hill masses the tunneling had given the defenders great maneuverability where the heaviest bombs and shells could not reach them. Such underground mobility often enabled them to convert an apparent defensive operation into an offensive one by moving troops through tunnels into different caves or pillboxes and sometimes into the rear of attacking forces. The caves were often reinforced with concrete and steel in the firing bays.

From these intricate and elaborate underground positions the Japanese performed in their familiar manner, characterized by expert handling of light mortars and machineguns, fierce local counterattacks, willingness to fight to the next to the last round and then commit suicide with the last, aggressive reverse slope defense, full exploitation of cover and concealment, and ceaseless efforts to infiltrate front lines and cause havoc in the American rear.

The most striking feature of the Japanese defense was the quantity of artillery and the effectiveness of its use. Never previously in the Pacific War had use on this scale and with this skill been experienced. Although widely dispersed and protected in caves as defense against American firepower, the Japanese artillery was nevertheless closely integrated into the general tactical scheme of the Shuri and Machinato defenses. Mutual support through coordination of firepower between adjacent positions was the keynote. Through meticulous survey, verified by precision registration, and controlled by buried communications lines, the Japanese were able to deliver accurate concentrations on any avenue of approach or defiladed assembly area within range. In preparations for counterattacks it was possible for the Japanese to deliver over 1,000 rounds on each front-line US regiment.

US Organization

The 7th and 96th US Infantry Divisions were organized according to the T/E, although somewhat under T/O strength at all times. In addition they each had attached a medium tank battalion (75mm. guns), a LVTA battalion (75mm. howitzers), a 4.2" mortar company, and their share of 55 flamethrower tanks of the 713th Tank Battalion.

In addition to the division artilleries of the six divisions, Tenth Army employed six 155mm. howitzer battalions and nine 155mm. gun battalions. This totalled 216 105mm. howitzers, 144 155mm. howitzers, and 108 155mm. guns in 39 battalions. In one attack 27 of these battalions were massed and shifted from target to target under one command. Also employed as field artillery were the 36 75mm. howitzers of each LVTA battalion. Reinforcing all of these fires were the guns of the fleet. Normally each committed infantry battalion had in direct support one destroyer with five 5" guns, each committed regiment had in general support a cruiser mounting 9 to 12 8" guns or 15 6" guns, plus 12 to 16 5" guns, and divisions had in general support a battleship mounting 9 14" or 16" guns plus up to 24 5" guns.

US Tactics

Other than for an occasional lucky hit which might destroy a firing bay or cave entrance, indirect artillery and naval gunfire had little effect on the deep-dug Japanese fortifications other than to drive the defenders underground and thus neutralize them until the fire was lifted. Air attack was a bit more effective, as it was delivering heavier charges of explosive and napalm, but it was not the answer either. However, on the rare occasions when the enemy came into the open to counterattack or withdraw, this supporting firepower was tremendously effective.

The answer to the strong, integrated Japanese defenses was the heavily supported tank-infantry team, including the newly developed armored flamethrower, closely supported by artillery. Each such team worked in close coordination with the assault, consolidation, mop-up, and defense of ground gained by purely infantry units. Rockets, napalm, aerial bombs up to 2,000 pounders, mortars, smoke, naval bombardment, and artillery neutralized, stunned, and weakened the enemy as the tank-infantry teams worked their way to assaulting positions. They then closed in while 105mm. and 155mm. artillery fire, conducted by forward observers, continued fire. Some of this fire was direct and over open sights.

This pattern was refined during the slow, grinding attack southward. Fighting was fragmented into numerous small-unit actions, all tied together by the higher unit plan, doctrine, and communications. Assault groups of tanks and riflemen, demolition squads, BAR men, machinegunners, each trying by all the means their wits could devise, and acting with high courage, were required to take any single position to their front. Guns and howitzers battered cave openings, dugouts, and pillboxes, forcing enemy gunners back into tunnels for protection and decreasing their fields of fire. Taking advantage of the resulting "dead spaces," infantry and tanks crept up on the most exposed strong point; the tanks attacked the position point-blank with cannon, machineguns, and napalm, while the infantry prevented enemy "close-quarters attack troops" carrying heavy explosive charges from closing in on and blowing up the tanks. Once the American troops gained a foothold on top of the enemy position, they could move down from above on other cave openings. The Japanese made this difficult and costly by placing machinegun fire on the position from the reverse slope or adjacent positions and mortar fire from positions in rear.

Each small action, a desperate adventure in close combat, usually ended in bitter hand-to-hand fighting to drive the enemy from his positions. This was immediately followed by organization of the position to hold the gains made against the inevitable counterattack. This might come immediately out of deep caves under the position, or be mounted that night from the next position to the rear. In these close-quarter grenade, bayonet, and knife fights, the Japanese often placed indiscriminate mortar fire on the melee. The normal infantry technique in assaults on caves and pillboxes involved the coordinated action of infantry-demolition teams supported by direct fire weapons including machineguns, 2.36" rocket launchers, flamethrowers, and tank guns. Cave openings were blown closed by 20-pound satchel charges buried in the opening arch and detonated. In some cases quantities of gasoline were pumped into the cave and fired. The Tenth Army commander--General S.B. Buckner--aptly termed this the blowtorch and corkscrew method--napalm or straight gasoline was the blowtorch, explosives and the bayonet were the corkscrew.

Methodology

Engagements have been selected only when the available records for Japanese forces appear to be adequate for analysis, in a combat situation in which available reports and secondary narratives indicate that the opposing postures were relatively unambiguous.

The data available for the 7th and 96th Divisions was quite complete, insofar as strength and casualties were concerned. In the previous research, which had made this data available to HERO, however, there had been no need to record either strengths or casualties of units attached to, or directly supporting, these divisions. Accordingly, the casualty figures derived from analysis of the various key engagements of these divisions is applicable only to the division strength. On the other hand, the availability of the supporting forces is essential in order to be able to evaluate the overall opposing strength ratios, and the amount of force and firepower applied in order to inflict the casualties on opposing Japanese forces in the division sectors.

Japanese strengths in the various engagements are based upon what is known of the overall Japanese force structure on Okinawa, as applied to units identified in intelligence reports as opposing the 96th or 7th Divisions. In addition, it is known that General Ushijima continuously drew upon the personnel of rear area and supporting units to maintain his front-line elements at something close to their original strength, or at least a minimum effective strength. Thus, despite casualties, it has been assumed in most instances that Japanese units in an engagement were kept at or near the strength with which they started the engagement. This assumption has been modified to a considerable degree, however, in the later engagements.

Japanese casualty figures on Okinawa, derived solely from US sources, included only killed, broken down into several categories, including estimated dead as well as counted dead and estimated numbers sealed in caves. While every Japanese soldier on the island ultimately became a casualty, accuracy of these daily figures is impossible to validate. There are no figures at all on Japanese wounded. On the assumption that Japanese wounded were 3-4 times as great as their killed, but bearing in mind the Japanese practice of holding positions at all costs until all--including previously wounded--were dead, while at the same time recognizing that numbers of wounded must have been evacuated during the kind of combat which took place on Okinawa, it was found that doubling the number of counted dead while ignoring other estimated categories, gave the most plausible total for dead and wounded.

Appendix C

SELECTED CASUALTY EXPERIENCE IN OKINAWA,
WORLD WAR II

Part Two: The Engagements

Enclosure 1

OKINAWA-I--96TH INFANTRY DIVISION, ADVANCE FROM BEACHHEAD,
April 1-4, 1945

Posture: Attack against delaying action.

The 96th Division landed virtually unopposed on April 1 and moved inland. The Japanese 1st Specially Established Regiment was encountered the following day, fighting a delaying action, about two-thirds of its strength against the 96th Division.

96th Infantry Division Statistics

Manpower

Average daily strength of the 96th Division was 12,677. Attached to it were a tank battalion, an amphibious tank battalion, one company of a chemical mortar battalion, and three engineer (C) battalions, making the total strength 20,796.

Firepower

The firepower of the 96th Division is calculated as follows:

Divisional firepower	139,310,467
Tank battalion (105mm. guns)	150,773,792
Amphibious tank battalion	63,454,105
Chemical mortar battalion	5,115,496
3 Engineer (C) battalions	15,183,804
Naval gunfire support	106,127,400
Normal air support	<u>30,000,000</u>
Total	509,965,100

Casualties

96th Division casualties totalled 320, or 80/day, .631% of average daily divisional strength.

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First Specially Established Regiment Statistics

Manpower

The Specially Established Regiment, whose mission was to delay the invaders, comprised about 2000 men. 1400 are estimated to have opposed the 96th Division, replenished from reserves as the action proceeded.

Firepower

Firepower of the Japanese force is estimated at approximately that of an infantry battalion, 4,381,000, since only light weapons were available to it.

Casualties

Japanese casualties are estimated at 1848, or 462/day, 33% of strength.

Comparisons

$$\text{Manpower ratio:} \quad \frac{20,796}{1400} = \frac{14.854}{1.000}$$

$$\text{Firepower ratio:} \quad \frac{509,965,100}{4,381,000} = \frac{116.704}{1.000}$$

$$\text{Force ratio product:} \quad \frac{1733.521}{1.000}$$

(attacker)

$$\text{Force ratio product:} \quad \frac{.00058}{1.000}$$

(defender)

Results: Successful attack; partly successful delaying action.

Enclosure 2

OKINAWA-II--96TH INFANTRY DIVISION, MACHINATO OFFENSIVE I,
April 5-12, 1945

Posture: Attack against a fortified position.

During this period the 96th Division attacked the Kakazu Ridge, heavily fortified and stubbornly defended by the 12th and 13th Independent Infantry Brigades, supported by 10 105mm. howitzers and 8 320mm. mortars.

96th Division Statistics

Manpower

The average daily strength of the 25th Division (12,677) and attachments (7216) made a total strength of 19,893.

Firepower

Firepower for the 96th is assumed to be the same as in the preceding action, 509,965,100.

Casualties

96th Division casualties totalled 1605, or 200.6/day, 1.583% of strength.

12th and 13th Independent Infantry Battalion Statistics

Manpower

Average daily strength of the Japanese units was 2900 men.

Firepower

Firepower is estimated as follows:

2 battalions	8,761,956
10 105mm. howitzers	5,061,890
8 320mm. mortars	<u>8,790,768</u>
Total	22,614,614

Casualties

Japanese casualties are estimated at 4798, or 599.8/day, 20.682% of strength.

Comparisons

Manpower ratio: $\frac{19,893}{2900} = \frac{6.859}{1.000}$

Firepower ratio: $\frac{509,965,100}{22,614,600} = \frac{22.55}{1.000}$

Force ratio product:
(attacker) $\frac{154.67}{1.000}$

Force ratio product:
(defender) $\frac{.0065}{1.000}$

Results: The attacker was more successful than the defender.

Enclosure 3

OKINAWA-III--96TH INFANTRY DIVISION, MACHINATO OFFENSIVE II,
April 19-23, 1945

Posture: Attack against a fortified position.

During this period the 96th Division was attacking the Machinato Line, outpost of the Shuri defense complex, strongly defended by the 62nd Infantry Division. After heavy fighting the American troops broke through the outpost line on the 23rd.

96th Infantry Division Statistics

Manpower

Manpower of the 96th Division (12,921) plus attachments (7216) averaged 20,137.

Firepower

96th Division firepower is assumed to have continued at 509,965,100.

Casualties

Casualties of the 96th Division totalled 900, or 180/day, 1.39% of strength.

62nd Division Statistics

Manpower

Opposing the 96th was the 62nd Infantry Division supported by two independent machinegun battalions and artillery, including 10 105mm. howitzers and 8 320mm. mortars, a total of 13,923 average daily strength.

Firepower

Japanese firepower is estimated as follows:

Divisional firepower	39,231,352
Artillery support	13,852,658
MG battalions	<u>943,280</u>
Total	54,027,300

Casualties

Japanese casualties are estimated at 2660, or 532/day, 3.82% of average daily strength.

Comparisons

Manpower ratio: $\frac{20,137}{13,923} = \frac{1.446}{1.000}$

Firepower ratio: $\frac{509,965,100}{54,027,300} = \frac{9.439}{1.000}$

Force ratio product:
(attacker) $\frac{13.649}{1.000}$

Force ratio product:
(defender) $\frac{.0733}{1.000}$

Results: Successful attack; unsuccessful defense.

Enclosure 4

OKINAWA-IV--96TH DIVISION, SHURI LINE OFFENSIVE,
May 10-25, 1945

Posture: Assault on a fortified position.

During this period the 96th Division attacked the Japanese 24th Division reinforced, along the main defenses of the Shuri Line. The Japanese on May 25 began to withdraw in order to avoid entrapment.

96th Division Statistics

Manpower

Strength of the 96th Division (12,677) with attachments was an average 21,734 daily.

Firepower

To the firepower as calculated in the earlier operations is added 30,000,000 for additional air support, since land-based air was now available, making a total of 539,965,100.

Casualties

The 96th Division suffered a total of 2125 casualties, 132.8/day, 1.049% of strength.

24th Division Statistics

Manpower

The average daily strength of the 24th Division reinforced by the 27th and 29th Independent Battalions, the 3rd Independent MG Battalion, and the 23rd AT Company, totalled 16,430.

Firepower

The Japanese firepower is calculated as follows:

24th Infantry Division	44,830,272
Independent battalions	8,761,956
23rd AT Company	375,972
Machinegun battalion	471,640
Artillery support (2 battalions)	7,425,600
8 320mm. mortars	8,790,768
Total	<u>70,656,200</u>

Casualties

The Japanese sustained a total of 9474 casualties, or 592.1/day, 3.604% of average daily strength.

Comparisons

Manpower ratio: $\frac{21,734}{16,430} = \frac{1.323}{1.000}$

Firepower ratio: $\frac{539,965,100}{70,656,200} = \frac{7.642}{1.000}$

Force ratio product:
(attacker) $\frac{10.110}{1.000}$

Force ratio product:
(defender) $\frac{.099}{1.000}$

Results: Successful attack; unsuccessful defense.

Enclosure 5

OKINAWA-V--96TH INFANTRY DIVISION, ADVANCE FROM SHURI LINE,
May 31-June 5, 1945

Posture: Attack against delaying action.

During this period the 96th Division pursued the Japanese 24th Division, driving it back toward its last defense line, the Yuza Dake escarpment. The monsoon rains hampered the operation.

96th Division Statistics

Manpower

Total strength of the 96th Division (12,990) and attachments averaged 20,911 daily.

Firepower

Firepower is estimated the same as for the preceding action, 539,965,100.

Casualties

96th Division casualties were 225, or 37.5/day, .289% of strength.

24th Infantry Division Statistics

Manpower

The 24th Division had been reduced to approximately half strength, an average daily strength of 8250.

Firepower

Firepower is estimated at one-half that of the preceding operation, or 35,328,100.

Casualties

Total casualties suffered by the Japanese were 1930, or 321.7/day, 3.899% of strength.

Comparisons

Manpower ratio: $\frac{20,911}{8,250} = \frac{2.523}{1.000}$

Firepower ratio: $\frac{539,965,100}{35,328,100} = \frac{15.284}{1.000}$

Force ratio product:
(attacker) $\frac{38.561}{1.000}$

Force ratio product:
(defender) $\frac{.026}{1.000}$

Results: Successful attack; partly successful delaying action.

Enclosure 6

OKINAWA-VI--96TH DIVISION, FINAL YUZA OFFENSIVE,
June 6-17, 1945

Posture: Attack against a fortified position.

Having penetrated to the south end of the island the 96th attacked the Japanese final fortified position, which was desperately defended by the 24th Division. By June 17 organized resistance on Okinawa had been ended and most of its original defenders were dead. Mopping up continued for about two weeks.

96th Division Statistics

Manpower

The average daily strength of the 96th Division (12,305) with attachments was 20,424.

Firepower

Firepower remained at 539,965,100.

Casualties

96th Division casualties totalled 725, or 60.4/day, .491% of average daily strength.

24th Division Statistics

Manpower

The 24th Division had been reinforced by rear area troops, but was still not over one-half of T/O strength, estimated at an average daily strength of 8250.

Firepower

Firepower is estimated at about one-half that of the normal 24th Division plus artillery support, or 35,328,100.

Casualties

Casualties for the Japanese were 3602, or 300.3/day, 3.64% of average daily strength.

Comparisons

Manpower ratio: $\frac{20,424}{8,250} = \frac{2.476}{1.000}$

Firepower ratio: $\frac{539,965,100}{35,328,100} = \frac{15.284}{1.000}$

Force ratio product:
(attacker) $\frac{37.843}{1.000}$

Force ratio product:
(defender) $\frac{.0264}{1.000}$

Results: Successful attack; unsuccessful defense.

Enclosure 7

OKINAWA-VII--7TH INFANTRY DIVISION, ADVANCE FROM BEACHHEAD,
April 1-4, 1945

Posture: Attack against delaying action.

The 7th Division landed virtually unopposed on April 1 and moved inland. Elements of the 1st Specially Established Regiment and the 12th Independent Infantry Battalion opposed it with a series of delaying actions.

7th Infantry Division Statistics

Manpower

Attached to the 7th Division (averaging 12,391 men) were a tank battalion, an amphibious tank battalion, a chemical mortar company, and 3 engineer (C) battalions, making an average daily total strength of 20,510.

Firepower

7th Division firepower is calculated as follows:

Divisional firepower	139,310,467
Tank battalion	126,908,210
Amphibious tank battalion	63,454,105
Chemical mortar battalion	5,115,496
3 Engineer (C) battalions	15,183,804
Naval support	109,127,400
Normal air support	<u>30,000,000</u>
Total	489,099,482

Casualties

The 7th Division sustained a total of 270 casualties, or 67.5/day, .545% of average daily strength.

Japanese Statistics

Manpower

Manpower of the elements of the 1st Specially Established Regiment and the 12th Independent Infantry Battalion is estimated at an average of 1400 daily, replenished from reserves.

Firepower

Firepower is estimated at about that of an infantry battalion, 4,381,000.

Casualties

Japanese casualties totalled 768, or 192/day, 13.714% of average daily strength.

Comparisons

$$\text{Manpower ratio:} \quad \frac{20,510}{1,400} = \frac{14.65}{1.000}$$

$$\text{Firepower ratio:} \quad \frac{489,099,000}{4,381,000} = \frac{111.641}{1.000}$$

$$\text{Force ratio product:} \quad \frac{1635.541}{1.000}$$

(attacker)

$$\text{Force ratio product:} \quad \frac{.000612}{1.000}$$

(defender)

Results: Successful attack; partly successful delaying action.

Enclosure 8

OKINAWA-VIII--7TH DIVISION, MACHINATO OFFENSIVE I,
April 5-8, 1945

Posture: Attack against a fortified position.

During this period the 7th began its assault on the Japanese fortified position of the Machinato Line, outposts of the Shuri area. It was stubbornly opposed by the 11th and 14th Independent Infantry Battalions.

7th Infantry Division Statistics

Manpower

7th Infantry Division had an average daily strength of 12,212, and with attachments, 19,860.

Firepower

Firepower of the 7th Infantry Division is assumed to have remained at 489,099,000.

Casualties

The 7th Division sustained 260 casualties, 65/day, .532% of average daily strength.

12th and 14th Independent Infantry Battalions Statistics

Manpower

The average daily strength is estimated at 2900.

Firepower

Firepower of the two battalions plus artillery support is estimated as follows:

2 battalions	8,761,956
10 150mm. howitzers	5,061,890
8 320mm. mortars	<u>8,790,768</u>
Total	22,614,614

Casualties

Casualties are estimated at 2120, or 530/day, 18.276% of average daily strength.

Comparisons

Manpower ratio: $\frac{19,860}{2900} = \frac{6.848}{1.000}$

Firepower ratio: $\frac{489,099,000}{22,614,600} = \frac{21.627}{1.000}$

Force ratio product:
(attacker) $\frac{148.102}{1.000}$

Force ratio product:
(defender) $\frac{.0068}{1.000}$

Results: The attacker was more successful than the defender.

Enclosure 9

OKINAWA-IX--7TH INFANTRY DIVISION, MACHINATO OFFENSIVE II,
April 9-23, 1945

Posture: Attack against a fortified position.

During this period the 7th Division continued to attack the Machinato Line, strongly defended by reinforced elements of the 63rd Brigade, 62nd Division.

7th Infantry Division Statistics

Manpower

Average daily strength of the 7th Division was 11,354. Total average daily strength was 19,473.

Firepower

7th Division firepower was maintained at 489,099,000.

Casualties

The 7th Division suffered a total of 1525 casualties, 101.7/day, .895% of average daily strength.

63rd Brigade Statistics

Manpower

Average daily strength of the 63rd Brigade elements committed was 4731.

Firepower

Firepower of the 63rd Brigade elements and supporting units is calculated as follows:

2 Infantry battalions	8,761,956
2 Light mortar companies	5,946,000
$\frac{1}{2}$ Heavy artillery regiment	3,035,850
$\frac{1}{2}$ Medium artillery regiment	7,099,827
8 320mm. mortars	8,790,768
3 Antitank battalions	3,383,748
2 Machinegun battalions	943,280
Total	<u>37,961,429</u>

Casualties

Japanese casualties totalled 6390, 426/ day, 9.025% of average daily strength.

Comparisons

Manpower ratio: $\frac{19,473}{4731} = \frac{4.117}{1.000}$

Firepower ratio: $\frac{489,099,000}{37,961,000} = \frac{12.884}{1.000}$

Force ratio product:
(attacker) $\frac{53.043}{1.000}$

Force ratio product:
(defender) $\frac{.0188}{1.000}$

Results: The attacker was more successful than the defender.

Enclosure 10

OKINAWA-X--7TH DIVISION, ADVANCE TO THE SHURI LINE,
April 24-May 3, 1945

Posture: Attack against delaying action.

The Japanese 24th Division relieved the 63rd Brigade, and began a deliberate withdrawal to the Shuri Line, closely followed by the 7th Division. The 24th Division was supported by a tank regiment, 320mm. mortars, and other artillery support.

7th Infantry Division Statistics

Manpower

Average daily strength of the 7th Division (11,133) and attachments was 19,252.

Firepower

Additional air support (due to availability of land-based air units) resulted in a total firepower of 519,099,000.

Casualties

Casualties for the 7th Division were 800, or 80/day, .718% of daily strength.

24th Infantry Division Statistics

Manpower

Manpower of the 24th Division with attachments is estimated at 16,430.

Firepower

Japanese firepower is estimated as follows:

Divisional firepower	44,830,272
Tank regiment	18,189,000
320mm. mortars	8,790,768
Artillery support	<u>25,476,144</u>
Total	97,286,184

Casualties

Japanese casualties totalled 4268, or 426.8/day, 2.59% of average daily strength.

Comparisons

Manpower ratio: $\frac{19,252}{16,430} = \frac{1.171}{1.000}$

Firepower ratio: $\frac{519,099,000}{97,286,000} = \frac{5.336}{1.000}$

Force ratio product:
(attacker) $\frac{6.248}{1.000}$

Force ratio product:
(defender) $\frac{.160}{1.000}$

Results: Successful attack; partly successful delaying action.

Enclosure 11

OKINAWA-XI--7TH DIVISION, JAPANESE COUNTERATTACK,
May 4, 1945

Posture: Attack on a hastily prepared position.

On May 4 the 24th Japanese Division counterattacked from its Shuri Line position against the 7th Division, which held its position while the attack lasted.

7th Infantry Division Statistics

Manpower

For this attack, which came during the night, only two-thirds of the 7th Division (7294) and its supporting elements was involved, a total strength of 12,757.

Firepower

Available firepower of the 7th Division and attachments is estimated at 252,841,900.

Casualties

The 7th Division sustained 150 casualties in the one day, 2.056% of strength.

24th Division Statistics

Manpower

The counterattack was spearheaded by the 89th Regiment and half of the 22nd, supported by artillery units, but with the whole weight of the division behind it, estimated at about 16,430.

Firepower

Firepower of the Japanese is calculated as follows:

Divisional firepower	44,830,272
320mm. mortars	8,790,768
Tanks	18,189,000
Extra artillery	<u>25,476,144</u>
Total	97,286,184

Casualties

Estimated casualties were 3164, 19.257% of strength.

Comparisons

Manpower ratio: $\frac{12,757}{16,430} = \frac{.773}{1.000}$

Firepower ratio: $\frac{252,841,900}{97,286,200} = \frac{2.599}{1.000}$

Force ratio product:
(attacker) $\frac{.497}{1.000}$

Force ratio product:
(defender) $\frac{2.009}{1.000}$

Results: The attack was unsuccessful; the defense was successful.

Enclosure 12

OKINAWA-XII--7TH DIVISION, SHURI LINE OFFENSIVE,
May 5-8, 1945

Posture: Attack against fortified positions.

The 7th Division renewed its assault against the forward positions of the Shuri Line. On May 8 Yonabam Airfield was secured, but was still under intense fire from the main Shuri Line defenses.

7th Infantry Division Statistics

Manpower

7th Division strength (11,016) was increased by attachments to 19,135.

Firepower

Total firepower, including normal air support, was 519,099,500.

Casualties

The 7th Division suffered 420 casualties, 105/day, or .953% of daily strength.

24th Division Statistics

Manpower

Japanese manpower is assumed to have been about 14,000.

Firepower

Much Japanese artillery had been destroyed or captured in the previous action, reducing the firepower of the 24th Division to 85,000,000.

Casualties

Japanese casualties were 1928, or 482/day, 3.44% of strength.

Comparisons

Manpower ratio: $\frac{19,135}{14,000} = \frac{1.367}{1.000}$

Firepower ratio: $\frac{519,099,500}{85,000,000} = \frac{6.106}{1.000}$

Force ratio product:
(attacker) $\frac{8.347}{1.000}$

Force ratio product:
(defender) $\frac{.1198}{1.000}$

Results: The attacker was more successful than the defender.

Enclosure 13

OKINAWA-XIII--7TH INFANTRY DIVISION, ADVANCE FROM THE
SHURI LINE, May 22-30, 1945

Posture: Attack on a delaying action.

The 7th Division, back in the line after a rest, resumed its attack, just as the Japanese began to withdraw from the Shuri Line. In the pursuit, in abominable weather, the 7th Division eliminated the Japanese 7th Heavy Artillery Regiment (about 300 men), fighting as infantry, and also the 23rd Shipping Engineer Regiment (about 800 men). At the beginning of the period, the Japanese 3rd Specially Established Regiment, with a strength of 1000, plus the artillery, the engineers, and elements of the 4th Specially Established Regiment, were in line, engaged in a deliberate and costly, although generally successful, withdrawal to prepared positions, in front of the Escarpment Redoubt at the southern tip of the island.

7th Infantry Division Statistics

Manpower

7th Division manpower averaged 12,095 daily, and with attachments, 20,214.

Firepower

Firepower was maintained at 519,099,500.

Casualties

The 7th Division suffered a total of 625 casualties, or 69.5/day, .574% of average daily strength.

Miscellaneous Japanese Units Statistics

Manpower

The manpower of the miscellaneous Japanese units and remnants of units totalled a daily average of 4000.

Firepower

Most of the Japanese units were fighting as infantry, with an estimated firepower of 31,580,000.

Casualties

The Japanese suffered a total of 3346 casualties, or 371.7/day, 9.295% of strength.

Comparisons

Manpower ratio: $\frac{20,214}{4,000} = \frac{5.053}{1.000}$

Firepower ratio: $\frac{519,099,500}{31,580,000} = \frac{16.437}{1.000}$

Force ratio product:
(attacker) $\frac{83.059}{1.000}$

Force ratio product:
(defender) $\frac{.012}{1.000}$

Results: Successful attack; partly successful delaying action.

Enclosure 14

OKINAWA-XIV--7TH INFANTRY DIVISION, ADVANCE TO THE
ESCARPMENT REDOUBT, May 31-June 8, 1945

Posture: Attack against a delaying action.

On May 31 the division attacked the reconstituted 63rd Brigade and the 3rd Specially Established Regiment which continued to withdraw to the Escarpment positions. The enemy units were reported to be "poorly armed," which is assumed to mean armed with rifles, light machineguns, and 50mm. mortars. The attack continued during June 1-4, with the enemy suffering heavy casualties from air, artillery, and naval gunfire during the whole period of the withdrawal (June 4-May 22).

On June 5 resistance stiffened as outposts of the Escarpment were encountered. The 3rd Specially Established Regiment, the 15th Independent Mixed Regiment, and the 44th Independent Mixed Brigade were manning the outpost main line of resistance, armed with machineguns in excess of T/O strengths.

7th Division Statistics

Manpower

Average daily strength of the 7th Division was 11,384, and with its attachments, 19,503.

Firepower

Firepower was maintained at 519,099,500.

Casualties

The 7th Division suffered 495 casualties, 55/day, .483% of average daily strength.

63rd Brigade Statistics

Manpower

Average daily strength of the 63rd Brigade and other Japanese units involved during this period is estimated at 4,000.

Firepower

Firepower of these units, mainly fighting as infantry, is estimated at 31,580,000.

Casualties

Japanese casualties were 2782, or 309.1/day, 7.727% of strength.

Comparisons

Manpower ratio: $\frac{19,503}{4,000} = \frac{4.876}{1.000}$

Firepower ratio: $\frac{519,099,500}{31,580,000} = \frac{16.437}{1.000}$

Force ratio product:
(attacker) $\frac{80.152}{1.000}$

Force ratio product:
(defender) $\frac{.0125}{1.000}$

Results: Successful attack; partly successful delaying action.

Enclosure 15

OKINAWA-XV--7TH DIVISION, FINAL ESCARPMENT OFFENSIVE,
June 9-18, 1945

Posture: Assault against a fortified position.

The 7th Division continued to reduce the bitterly held enemy escarpment positions, using flamethrower tanks and supporting weapons. During the night of June 9-10 a small, well-supported, but ineffective counterattack was carried out by the 2nd Specially Established Regiment. The 44th Independent Mixed Brigade was eliminated by the end of this period.

7th Division Statistics

Manpower

Average daily strength of the 7th Division was 10,839, making a total strength, with attachments, of 18,958.

Firepower

Firepower was maintained at 519,099,500.

Casualties

The 7th Division suffered 865 casualties, or 86.5/day, .798% of average daily strength.

Japanese Statistics

Manpower

Japanese manpower had been reduced to an estimated daily average of 2500, maintained by replacements of whatever troops were available.

Firepower

Japanese firepower had been reduced to an estimated 20,000,000.

Casualties

Casualties totalled 11,040, or 1104/day, 44.16% of average daily strength.

Comparisons

Manpower ratio: $\frac{18,958}{2,500} = \frac{7.583}{1.000}$

Firepower ratio: $\frac{519,099,500}{20,000,000} = \frac{25.955}{1.000}$

Force ratio product:
(attacker) $\frac{196.817}{1.000}$

Force ratio product:
(defender) $\frac{.0051}{1.000}$

Results: Successful attack; unsuccessful defense.