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**ANALYSIS OF
PRE-INVASION AIR OPERATIONS
PACIFIC AREA
NOVEMBER-DECEMBER 1943**

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ANALYSIS OF PRE-INVASION AIR OPERATIONS, PACIFIC AREA
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FORWARD

This study is an analysis of the preparatory air bombardments of Tarawa and Cape Gloucester in World War II and of the application of the lessons learned in those campaigns to subsequent amphibious operations in the war against Japan. The subject covered here is related to several other histories prepared by the Historical Division: AHS No. 38, Operational History of the Seventh Air Force 6 November 1942-31 July 1944; AHS No. 43, The Fifth Air Force in the Conquest of the Bismarck Archipelago, November 1943-March 1944; AHS No. 96, AAF in Amphibious Landings in World War II. The present study was written by Dr. Joe G. Taylor, USAF Historical Division, Research Studies Institute, Air University, Maxwell Air Force Base, Alabama.

Like other Historical Division studies, this history is subject to revision, and additional information or suggested corrections will be welcomed.

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CONTENTS

	Page
I. INTRODUCTION	1
II. THE OBJECTIVES	7
Tarawa	7
Cape Gloucester	9
III. THE BOMBARDMENTS	12
Early attacks.	12
Pre-invasion bombardment of Tarawa	14
Pre-invasion bombardment of Cape Gloucester.	19
IV. EFFECTS OF THE PRE-INVASION BOMBARDMENTS	24
Tarawa	24
Cape Gloucester.	27
V. LESSONS LEARNED AND THEIR APPLICATION.	31
General.	31
Specific lessons of Tarawa	33
Specific lessons of Cape Gloucester.	37
Application of lessons learned: Central Pacific	40
Application of lessons learned: Southwest Pacific	47
VI. CONCLUSIONS.	51
GLOSSARY	54
FOOTNOTES.	55

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Chapter I

INTRODUCTION

In the autumn of 1943, Japanese forces in the Pacific were on the defensive everywhere. Substantial losses in the naval battles of the Coral Sea and Midway had blunted the striking power of the Imperial Navy, and the series of engagements around Guadalcanal had reduced its strength still more. The flow of new vessels from American shipyards compounded the effect of Japanese naval losses. The Nipponese fleet had no choice but to draw back from the borders of the newly-won empire and await the opportunity for a decisive battle. Unfortunately for Japan's naval planners, American production constantly increased the odds against Japanese success when that decisive battle should take place.

No offensive action was possible for the Imperial Army so long as the navy was on the defensive. The armies were still strong, especially at Rabaul and around Wewak in New Guinea, but they could use their strength only for holding territory already occupied. The prospects even for that were not good. Japanese ground forces had undergone stinging defeats in New Guinea--the Kokoda Trail, Buna, Lae, and Finschhafen--and in the Solomons they had lost Guadalcanal and New Georgia. By the end of November 1943, moreover, the Allies had established a firm beachhead on Bougainville.

Perhaps the Japanese could have remedied their surface disadvantages had they had control of the air, but this they did not have.

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USAFHS-125, Chap. I

2

To be sure, their aircraft factories were turning out fighters and bombers faster than ever before, and the possibilities were good for continued increases, but this production could never match that of the United States, even though the greater part of American production was to be employed in the European Theater of Operations.

Production of aircraft, however, was only a part of the story. Japan had begun the war with a small group of highly skilled pilots, but practically all of these had been thrown into the fighting. Some losses had been incurred while victories were being won in the earlier campaigns, and then had come the disastrous loss of pilots in the Coral Sea and at Midway, making it necessary to train new airmen for the carriers. In the meantime, attrition in other areas, New Guinea particularly, had skimmed off the cream of Japanese army pilots. By autumn of 1943, good pilots were definitely in short supply. Perhaps the Japanese army and navy could have adequately trained new contingents had they had a breathing space, but such was not permitted. Attrition continued over the Solomons, New Britain, and New Guinea. The number and skill of Japanese pilots was constantly decreasing while the number and skill of their adversaries was increasing.

Not only were Japanese pilots of poor quality in comparison with their opponents, but it was also evident by late 1943 that Japanese aircraft were inferior to those they met in battle. Early in the war, Nipponese bombers, well protected by fighters, had been effective against the weakly defended Allied targets, and fighters had quickly done away with the obsolete Allied models opposed to them in the Philippines,

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

USAFHS-125, Chap. I

3

Malaya, and the East Indies, and in the strength of their numbers had dealt sternly with the B-17's and P-40's which attempted to operate. By late 1943, Allied bombers usually had escort when attacking targets defended by fighters, and Allied fighter defenses had become so strong that Japanese bombers usually made attacks only at night and with no great success. As their opponents increased in numbers and proficiency, Nipponese airmen discovered that the maneuverability of their aircraft availed little against P-40's, P-38's, and the new P-47's and F6F's which dived and struck, then zoomed to dive and strike again, refusing to engage in dogfights. Moreover, the Americans held to formations from which they could support one another--when a Japanese pilot succeeded in getting in position to fire on an American plane, he was all too often shot down before he could use his advantage. To add to the enemy pilot's troubles, he had no armor to protect him from enemy fire, and his aircraft was prone to break to pieces, explode, or burn when hit. The installation of armor and self-sealing gas tanks would have reduced the maneuverability which was his chief advantage. In contrast, the American fighters could take an amazing amount of punishment and yet return to bases where they were made ready to fly and fight again.

By the autumn of 1943, Allied forces had conducted a successful defense which had stopped the forward sweep of the Japanese forces, had carried out equally successful limited offensives of their own, and were ready to begin drives toward the Philippines and Japan. In the South Pacific, airfields on Guadalcanal and New Georgia were fully developed, and fields on Bougainville would soon be ready to contribute to the neutralization of Rabaul. In the Southwest Pacific Area (SWPA), Port

~~CONFIDENTIAL~~

USAFHS-125, Chap. I

4

Moresby had been defended successfully, and the capture of Buna, Lae, Finschhafen, and airfield sites in the interior of New Guinea afforded bases for the support of major offensives. In the Central Pacific, the last Japanese offensive effort had been thrown back at Midway, American fleet units had gained experience in carrier raids and South Pacific amphibious operations, and an American offensive was in order.

Adm. Chester A. Nimitz's Pacific Ocean Areas (POA) command included both the South and Central Pacific Theaters, but Bougainville had been the last major objective in the south. The next POA advance would be in the Central Pacific and was to be aimed at Tarawa and Makin Atolls in the Gilbert Islands. Surface forces available to Admiral Nimitz would include 10 fast carriers (CV's and CVL's), 8 or more escort carriers (CVE's), 11 battleships, 12 cruisers, 66 destroyers, and enough transports and cargo carriers to mount a powerful amphibious operation by the end of October or soon thereafter.¹ Large numbers of ground troops were not on hand in the Central Pacific, but the small islands of the Polynesian Atolls would not have afforded room for using large masses of infantry in any case. The 2d Marine Division, reequipped and brought up to strength after its part in the Guadalcanal operation, could be used for the assault on Tarawa, and the amphibiously trained 27th Infantry Division was available to make the attack on Makin.

Central Pacific air strength, aside from patrol bombers and gunfire spotting planes (which were invaluable in their specialties but of little use in air attacks on enemy land targets), was divided into two parts. Task Force 57, land-based air, had operational control of two

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USAFHS225, Chap. I

5

Seventh Air Force heavy bombardment groups with a strength of about 60 B-24 bombers, but the Central Pacific distances were so great that the effectiveness of the B-24's was reduced. Some fighters and light bombers were also assigned to the Seventh Air Force, but the distances from friendly bases to enemy targets made them useless save for defense. Because of the small number of Army Air Forces bombers available and the handicaps under which they operated, carrier-based aircraft necessarily would be the chief offensive air weapon.² Aboard his fast carriers, Admiral Nimitz had approximately 340 fighters (mainly F6F's), 200 dive bombers (mainly SBD's), and 150 torpedo bombers (TBF's). In addition, his escort carriers had a complement of some 100 F6F's and F4F's, 30 SBD's, and 50 TBF's.³

While Central Pacific commanders were making plans for the seizure of the Gilbert Islands, Gen. Douglas MacArthur's SWPA planners were looking toward Cape Gloucester on the western tip of New Britain. The capture of Cape Gloucester and the establishment of a motor torpedo boat base at Arawe on the southwest coast of New Britain would cut off all possibility of supplies from Rabaul reaching the Japanese troops in New Guinea, contribute to the isolation of Rabaul, and give flank protection to planned Allied moves westward along the coast of New Guinea. The Seventh Fleet, which came under MacArthur's SWPA command, was extremely weak when compared to Central Pacific forces, but this was of little moment so long as it could transport troops and supplies to the objective and give a modicum of fire support, because no interference from Japanese surface units was expected. Sufficient ground forces were available, and the 1st Marine Division, recovered from the effects of the Guadalcanal

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

USAFHS-125, Chap. I

6

campaign, was selected to make the assault at Cape Gloucester. Elements of the 1st Cavalry Division were to seize weakly defended Arawe.

Air support for the Cape Gloucester operation would be given by Gen. George C. Kenney's Allied Air Forces (AAFSWPA). Tactical elements of AAFSWPA included some Royal Australian Air Force fighters, Beauforts, and Bostons (A-20's) as well as the American Fifth Air Force. The latter would provide almost all the air strength needed for the operation. In the late autumn of 1943, Fifth Air Force consisted of three heavy, three medium, and one light bombardment groups, in addition to fighters and transport aircraft. On 4 December, just after intensive preparation for the Cape Gloucester landings had begun, bombers assigned to Fifth Air Force squadrons numbered 140 B-24's, 179 B-25's, 16 B-26's, and 44 A-20's, any of which could reach western New Britain targets from available Allied bases. Approximately 330 fighters, of which 98 were P-38's and more than 100 were P-47's, were assigned to combat units. Available for a very limited supporting role in the operation were two groups of Thirteenth Air Force B-24's, about 48 planes in all.⁴

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USAFHS-125

Chapter II
THE OBJECTIVES

Tarawa. The Gilbert Islands, of which Tarawa is one atoll, are located on the equator west of the 180th meridian. Tarawa, the objective of the 2d Marine Division, is in shape an irregular triangle with sides 18 by 12 by 12 miles. A reef, broken by the entrance to the lagoon, makes up the west side; on the east and south there are 47 small islands. The Japanese had erected their defenses on Betio Island, the westernmost of those on the southern side of the triangle.¹

Betio is about 4,000 yards long and less than 1,000 yards wide at the western end; it tapers to a narrow tail less than 200 yards wide at the eastern end. An airstrip had been built in the center of the island. Normally Betio, which does not rise more than 10 feet above sea level at any point, was covered with coconut and pandanus trees and with thick secondary growth, but much of the vegetation had been cleared away by the Japanese in the process of building the airstrip and preparing their defenses.

The Japanese had announced the seizure of the Gilberts from the British early in 1942, though the actual occupation in strength did not begin until the following September. The September occupation force, composed of 1,122 special naval landing troops and 1,247 construction personnel, was reinforced in March 1943, by another naval landing force of 1,497 men and in May by a second construction unit with a strength of 970.

USAFHS-125, Chap. 2

8

Thus, at the time of the Allied assault, the garrison consisted of almost 5,000 men, including about 2,600 first-rate combat troops. These men were in excellent physical condition and were provided with adequate supplies of all kinds.²

The defenses erected on Betio were truly formidable. Obstacles on the beaches, fortunately incomplete, were designed to force landing craft into prepared fields of fire. Fourteen coast defense guns ranging from 8-inch to 80-mm. in size were sited to fire on shipping offshore, and 12 large antiaircraft guns, 127-mm. and 75-mm., backed by 31 antiaircraft machine guns of 13-mm. bore, could fire on aircraft, shipping, or assaulting troops. Much of the beach was mined, and 25 field guns from 37-mm. to 75-mm. were sited for beach defense. Similarly disposed were 13 light tanks mounting 37-mm. guns. An uncounted number of 13-mm. and 7.7-mm. heavy machine guns could fire on the beaches. Added to all these weapons were the rifles and light machine guns of the infantry units.

These weapons were well-concealed and so well-emplaced behind shelters of coconut logs, sand, concrete, and steel that during the preliminary bombardment most of them were impervious to anything save a direct hit by a heavy bomb or a large caliber shell. Back from the beaches were command posts, bomb shelters, and communications centers which provided protection for personnel inside and which, though not designed for the purpose, were used as defense positions after the garrison had been driven back from the beaches. Some of these shelters withstood direct hits from 16-inch shells.³

Betio's airstrip was operational, but it would be under direct attack,

USAFHS-125, Chap. II

9

thus making it highly unlikely that it could serve as a base for air attacks which could interfere with the assault. There were, however, other Japanese airfields within range, any of which could be reinforced from the Carolines. Nauru was the nearest of these, but bases in the Marshalls were just as much a danger. Well-developed bases were located on Roi, Mille, and Maleolap, and seaplane bases were to be found at Ebye and Jaluit Islands. Planes from these points could certainly make attacks on the invasion force, and if not countered, might prove a most serious obstacle to success.⁴

Cape Gloucester. Cape Gloucester proper is on the northwestern tip of New Britain Island, less than 100 miles across the Vitiaz Straits from the Huon Peninsula of New Guinea. The name was often used, however, to describe the entire western end of New Britain, an area some 15 miles wide at the tip but 40 miles across from Iboki to Arawe, 60 miles from the tip on the north and south coasts. The main objective of Southwest Pacific forces was an area less than five miles deep extending from the western tip about 20 miles to the eastward along the north coast. It was in this area that most of the fighting took place.

In World War II lore, Cape Gloucester shares with Bougainville the doubtful distinction of being considered the worst place in the world. The weather was invariably hot and humid, and to the fungus-infected Marines and soldiers, it seemed that the rains were constant. Leeches, mosquitoes, crocodiles, and snakes were the most apparent forms of animal life; the mosquitoes claimed many victims, and the crocodiles at least one. The terrain, except for a narrow strip along the coast and the plain of kunai grass where the airfield was located, was either swamp or

~~CONFIDENTIAL~~

USAFHS-125, Chap. II

10

mountains, and stinking rain forest thrived equally well in the swamps and on the hillsides. The kunai grass grew much higher than a man's head. On the flat north coast, only grass-topped Target Hill and jungled Hill 660 afforded any elevation, but just south of the airfield lay Mount Talawe, 6,600 feet high, and Mount Langla, a constantly smoking volcano which merged with Talawe. Beaches along the coast were few; in most places the jungle grew down to the water line.⁵

The Japanese force at Cape Gloucester was the 65th Independent Brigade, but its resemblance to a normal brigade was slight. No less than 41 separate units, or fragments of units, reported to the brigade commander. Total strength was about 10,000 men, many of whom were service troops supporting the supply line from Rabaul to New Guinea. Among the smaller combat units were elements of four field artillery battalions, three anti-aircraft battalions, and a machine gun company. The main combat organizations were the 53d and 141st Infantry Regiments and the 51st Reconnaissance Regiment. The combined strength of these combat units was perhaps 6,000 effectives, and all of them were in the battle area except the battalion-strength 51st; this unit was on Rooke Island when the invasion began, but it crossed over to New Britain in time to take part in the fighting.⁶

The 53d Regiment, two battalions strong, had the task of defending the airdrome, and had prepared strong positions. One of these commanded the logical place for a landing, a beach 1,000 yards east of the field; the other was in the foothills of Mount Talawe and commanded the airfield in order that the runway could be kept under fire should the invaders capture it. Other positions, defended by miscellaneous units and supported by artillery emplaced inland, were located at Sag Sag and Tauali and at

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

USAFHS-125, Chap. II

11

intervals all along the north coast from the airfield to the central shore of Borgen Bay. Dual-purpose antiaircraft guns were installed around the airfield. The greater part of the garrison was held in a reserve area between Mount Talawe and the western shore of Borgen Bay from whence it could move to reinforce any threatened point. The defense positions were not so strong as those on Tarawa, nor were they defended by as many heavy weapons. On the other hand, the dense rain forest concealed them well, making their destruction by aircraft a difficult task.⁷

For all practical purposes, Fifth Air Force had succeeded in keeping the Cape Gloucester airdrome neutralized from the beginning of construction. Aircraft landed there from time to time, but there was little danger of the field's being used against the Allies. The complex of airdromes around Rabaul was still active, and it was well-stocked with planes. Bombers and fighters could fly from Rabaul to attack targets in the Cape Gloucester area, but they would be more effective if the airfields at Cape Hoskins on the north coast and Gasmata on the south coast were in condition to serve as staging points, thus allowing more time over the target. Unlikely, but possible, were attacks from the much battered strips at Wewak which still based some Japanese planes and could stage others moving eastward from Hollandia.⁸

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MSAFHS-125

Chapter III
THE BOMBARDMENTS

Early attacks. Air attacks on both Tarawa and Cape Gloucester began long before either place was a definite amphibious objective. Tarawa was the target for 11 B-24's on the night of 22 April 1943 and was struck by 500-pound and fragmentation bombs. Two B-24's made a diversionary attack on the night of 18 June, and returning crews reported that they had scored direct hits on the runway with 500-pound bombs, leaving it temporarily unserviceable.¹

The heaviest strikes on the Gilberts prior to the preinvasion operations came on 18-19 September 1943 when the Seventh Air Force and carrier units combined to attack Tarawa and Makin. The series of strikes, which involved 48 B-24 sorties and planes of 2 carrier task forces, scattered demolition and fragmentation bombs about Betio, set several fires, sank some ships, destroyed 8 to 10 enemy planes on the ground, and resulted in several others being shot down in air combat. "This strike was effective . . . in . . . damage to the air facilities . . . but . . . the effect . . . was slight in reducing the strength of the Jap's bases at the intended time of occupation. It came too soon. Neutralization could not possibly be maintained with the small force of B-24's which were the only airplanes effective for this job."²

The first Fifth Air Force attack on Cape Gloucester was made by three B-25's on 22 December 1942, less than a week after the initial

USAFHS-125, Chap. III

13

Japanese occupation. During the four months following, bombers on armed reconnaissance north of New Guinea frequently dropped their bombs on Gloucester when no better targets were found. The runway which the Japanese began building was harassed by 24 B-24's, 2 PBV's, and 1 B-17 during this period.

Attacks in squadron strength against western New Britain targets began in May, after a reconnaissance flight on 30 April revealed that the Cape Gloucester Airfield was operational. Light and medium bombers flew some 90 sorties against the Gloucester area during May, June, and July, and armed reconnaissance aircraft continued to unload bombs on the same area. In addition to sorties directed against the airfield, others were directed at shipping. On 28 July, 25 B-25's attacked an enemy convoy near Cape Gloucester and crippled two destroyers; these unfortunate vessels were bombed again the following day.

The intensity of AAFSWPA attacks was greatly increased during August, September, and October. B-25's, Beaufighters, and A-20's flew more than 200 sorties against barges, and B-24's and PBV's made several attacks on larger vessels which ventured south from Rabaul. Crews returning from barge strikes could sometimes report barges definitely destroyed, but the Japanese were so expert at camouflage that pilots normally reported only that they had bombed and strafed suspected hideouts. The future was to reveal, however, that the barge hunts had been eminently successful. In addition to the missions against shipping during this 3-month period, Fifth Air Force and Royal Australian Air Force (RAAF) planes flew about 250 sorties against the Cape Gloucester Airfield, antiaircraft guns, troops,

~~CONFIDENTIAL~~

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USAFHS-125, Chap. III

14

and supply dumps.

By the middle of November, AAFSWPA was able, without reducing the interdiction of barge routes, to give more attention to the strip, troops, and defense positions. In the meantime, plans for the invasion of New Britain had become definite. B-25's, B-26's, and B-24's made heavy attacks, some 80 sorties in all, on 22, 29, and 30 November, dropping some 150 tons of bombs. These explosives were merely a sample of what the luckless Japanese at Cape Gloucester could expect during the days remaining before the 1st Marine Division went ashore.³

Pre-invasion bombardment of Tarawa. Neutralization of Tarawa's and adjacent airfields in preparation for the amphibious attack was initiated by Seventh Air Force bombers. Heavy bombardment units moved forward to bases within easier range of their objectives as they prepared to begin the operation. Headquarters of the 11th Bombardment Group was established on Funafuti, with two squadrons based on that island and one each on Canton and Nukufetau. The 30th Group's headquarters was set up on Nanomea; two of its three squadrons were located adjacent to group headquarters, the third on Canton Island. Advanced Headquarters Seventh Air Force and Headquarters VII Bomber Command were both established on Funafuti. All of these units were ready to begin operations by 13 November.⁴

Seventh Air Force heavy bombardment squadrons managed to keep 85 per cent of their B-24's in commission during GALVANIC, as the Gilberts operation was called. Since only some 60 of the bombers were assigned, however, this availability rate did not mean that large-scale strikes were possible. Had every available plane been sent against Tarawa once

~~CONFIDENTIAL~~

USAFHS-125, Chap. III

15

each day from 13 through 20 November, only some 350 sorties could have delivered bombs. Actually, 348 sorties were dispatched, but 69 of these were abortive, and those planes which did drop bombs attacked a number of targets of which Tarawa was only one. Another factor reducing the bombardment effort was the fact that reconnaissance flights ordered by the Navy had priority over offensive strikes.⁵

The primary mission of the B-24's was not to destroy defenses on Tarawa and Makin, the amphibious objectives, but rather to neutralize airfields from which Japanese aircraft might interfere with the landings. Of the 300 tons of bombs dropped by the heavy bombers throughout the operation, only 63 tons, or 21 per cent of the total, were dropped on Betio; the percentage for both Betio and Makin was only 35. Mille, struck eight times, received a heavier weight of bombs than Betio; Jaluit received almost as much, and Maleolap and Nauru were the targets for more than 25 per cent of the tonnage dropped. Three tons were expended on shipping.⁶

The anti-air mission of the B-24's was evident in the bomb loads, even on those missions sent against Tarawa. The first strike on Betio, 13 November 1943, was by 17 B-24's which dropped 55x500-pound general purpose (GP) bombs and 74x20-pound fragmentation bombs. Fragmentation bombs made up the entire load of the 9 planes which struck the next day, but about one-third of the 702x20-pound load fell in the water. Other targets were attacked on the 15th and 16th, but on the 17th 3 B-24's dropped 45x100-pound GP bombs of which only 5 hit in the water. Two planes unable to attack Mille dropped 500-pound and 100-pound bombs on Betio on the 18th,

USAFHS-125, Chap. III

16

claiming a few direct hits on the runway. The last B-24 strike was the largest; on the 19th, 24 B-24's bombed defense positions from as low as 4,000 feet. Nine 500-pound and 150x100-pound GP bombs were dropped during this strike, but fragmentation bombs, 2,520 of which were released, made up most of the bomb load. All of the 500-pound bombs, half of the 100-pounders, and 80 per cent of the 20-pounders were reported to have hit on land. This indicates that, despite the low bombing altitude, nine tons out of the 35 dropped were wasted.⁷

On the 279 effective B-24 sorties flown during GALVANIC, eight bombers were lost, two to antiaircraft fire, one to Japanese fighters, one operationally, and four to unknown causes. Thirty-seven crew members were killed or missing in action, and 31 were wounded. The accomplishments were small; none of the enemy airfields was neutralized, nor was it likely that they could have been by the small force available, especially since the Japanese could bring in aerial reinforcements from the Carolines. In view of the type of defenses encountered on Betio, it seems almost certain that the attacks on that island with small bombs had no effect other than harassment.⁸

To deliver the naval air preparation of the objectives and to support the Marines after they went ashore, nine fast carriers and six escort carriers (CVE's) were directly assigned to the GALVANIC Operation, and another fast carrier group under Rear Adm. F. C. Sherman was located at Espiritu Santo, within supporting distance. Two more CVE's were loaded with 46 fighters to be used as an air garrison for the objectives after the occupation had been completed. Not counting Admiral Sherman's or the garrison aircraft, some 366 fighters, 200 dive bombers, and 190 torpedo

~~CONFIDENTIAL~~

USAFHS-125, Chap. III

17

bombers were available to defend the fleet, strike the objectives, and neutralize the airfields from which the Japanese might strike the assembled shipping. Three CVE's were assigned to each of the attack forces (Tarawa and Makin), and a complement of three fast carriers was used exclusively for attacks on air bases in the Marshalls. This left more than 200 fighters, some 110 torpedo bombers, and about 120 dive bombers available for use at Tarawa if necessary, though in the event a proportion of the strikes from the fast carriers was sent against Makin.⁹

Carrier air action began when Admiral Sherman's force moved up from Espiritu Santo and dropped 90 tons of bombs on Nauru, aiming most of them at the airfield. On 19 November, planes from Yorktown, Lexington, and Compens struck Mille and Jaluit with 130 tons of bombs, supposedly neutralizing airfields on those islands. The Japanese were nonetheless able to deliver air attacks against the invasion force, from the Marshalls, before the end of the GALVANIC Operation, but the fleet was able to defend itself handily. The Southern Carrier Group, assigned to carry out the aerial bombardment of Tarawa, put 115 tons on Betio on 18 November, 69 tons on the 19th. The bombs apparently destroyed or seriously damaged two of the eight-inch coast defense guns, and they silenced three of the emplaced tanks; at least one fuel dump was destroyed, and many of the buildings on the island were leveled. Over-all, the effect on the defenses was slight; perhaps the greatest contribution of the air attacks was to cause the defenders to shoot up a large part of the ammunition for their dual-purpose guns.¹⁰

The last air attack before the troops went ashore came on D-day

USAFHS-125, Chap. III

~~CONFIDENTIAL~~

18

morning, 20 November. Planning and execution of this strike were awry; the air attack was due at 0545, but the planes did not appear overhead until 0615. The result of their tardiness was that the defenders enjoyed a breathing space of 30 minutes without bombardment--time which was almost certainly used to good effect in making defenses ready. This final preparatory air strike lasted 10 minutes, demolished a few of the buildings still standing, but still had little effect on the defenses. A strafing attack by fighters while the assault waves moved toward the beaches may have served the purpose of hindering fire on the first wave, but it had no permanent effect.¹¹

Naval gunfire bombardment was expected to be the decisive factor in reducing the Japanese defenses on Betio to the point that conquest of the island by infantry would be possible. This phase of the preparatory bombardment began on 19 November when three cruisers and two destroyers fired 250 tons of shells at selected targets. Naval gunfire on D-day morning was divided into three phases: until one hour before the landings, fire was directed at specific targets, particularly coast defense guns; during the final hour before the first wave went ashore, the beaches and areas just inland from the beaches were saturated with area fire; finally, after ground fighting had begun ashore, neutralization fire was placed on unoccupied parts of the island, and supporting fire was available to the Marines on call. As noted above, fire during the first phase was interrupted for 30 minutes while waiting for tardy aircraft to arrive. It is impossible to determine how many shells were fired before the Marines went ashore, but some 3,000 tons fell on Betio

USAFHS-125, Chap. III

19

~~CONFIDENTIAL~~

in all, including 740x16-inch, 590x14-inch, 810x8-inch, and 2,360x6-inch. Many rounds from the destroyers' 56-inch guns contributed to the total tonnage.¹²

Pre-invasion bombardment of Cape Gloucester. Even before the decision to capture western New Britain was made, attacks on the airfield and barge lanes were preparing Cape Gloucester for invasion. Technically, preparation for invasion began on 15 October 1943, but it became intensive with the coming of December. General Kenney states that he intended to see the Marines go ashore with their rifles on their backs, and that he "believed the bombs would make it possible if . . . [he] put enough of them in there."¹³ Most of the bombers assigned to V Bomber Command at Fort Moresby were available for use against Cape Gloucester, but the planning of the air attacks was largely in the hands of First Air Task Force at Dobodura. After 18 December, this air task force was specifically put in charge of preparation of the objective and support of the landing. B-24's dropped most of the tonnage on Cape Gloucester, but all types of AAFSWPA bombers and P-40's, P-39's, and Beaufighters took part.

The pattern for the month's operations was set during the first week in December. On the 1st, 19 B-25's, 10 B-26's, 17 A-20's, and 12 Beauforts dropped 31 tons of bombs and thoroughly strafed supplies and barge hideouts along the shore of Borgen Bay. Fifty-seven B-25's dropped 62 tons of bombs and fired 175 rounds of 75-mm. and almost 90,000 rounds of .50-caliber ammunition into the same area the next day. On 3 December, 40 B-24's bombed antiaircraft positions and supply dumps

~~CONFIDENTIAL~~

USAFHS-125, Chap. III

20

with 279 half-tonners while B-25's contributed about 30 tons of smaller explosives. Weather prevented bombing of assigned targets by 41 B-24's on 4 December, but 32 tons were dropped on targets of opportunity along the New Britain coast; B-25's and Beaufighters flew under the weather to attack barges. On the 5th, 40 B-24's dropped 310 half-ton bombs on guns and stores, and two A-20's sank a small ship which attempted to run the aerial blockade of the Cape. Forty-two B-24's dropped 160 tons of 1,000-pounders on the 6th, hitting stores, guns, and bivouacs, as well as a suspected headquarters at Ulimangai Village. While this strike was going on, 50 B-25's, 9 P-40's, and 2 Beaufighters were hunting barges; 12 of the craft were reported definitely destroyed, and others were damaged. B-25's unable to find barge targets bombed, strafed, and shelled defensive positions along Borgen Bay. On the 7th, 43 B-24's dropped 520x300-pound GP bombs and 142x1,000-pounders on anti-aircraft positions around the airfield, and 50 B-25's and as many P-40's ranged the coast, bombing and strafing barge hideouts, villages, and defense positions. During this oneweek, almost 1,000 tons of bombs were dropped on Cape Gloucester or enemy communications leading to the Cape.¹⁴

Bad weather and support of the landing at Arawe on the south coast of New Britain reduced the effort against Cape Gloucester during the period 8 to 15 December. The available striking power was increased, however, when two squadrons of the 380th Bombardment Group (Heavy) were temporarily withdrawn from Darwin and joined V Bomber Command. B-25's flew 78 sorties against the Cape during the period, and B-24's 71, dropping more than 300 tons. The chief B-24 strike came on the 15th,

USAFHS-125, Chap. III

21

when 58 sorties dropped more than 200x1,000-pound bombs on bivouacs and 82 one-ton bombs on Japanese positions atop Target Hill. This last elevation was well-named; because it dominated the planned landing beaches, it was to receive a great deal of attention.¹⁵

From the 16th through the 19th, more than 300 sorties by B-24's and medium bombers released almost 750 tons over the Cape, including 80x2,000-pounders. The B-24's began flying 2 sorties a day on the 19th, and on that day all records for the Southwest Pacific were broken when 101 B-24's and 44 B-25's and A-20's dropped 397 tons, including 590 half-ton bombs. This record stood through the 25th, but major attacks were delivered each day. Sorties for the days from 20 through 25 December, inclusive, amounted to more than 700, of which about half were flown by B-24's. Almost 1,500 tons of bombs were dropped during this 6-day period. Personnel areas were increasingly important as targets, so more 500-pound and smaller bombs were used than had previously been the case.¹⁶

During the week before the landings, lone B-24's were sent over the objective at night to harass the defenders. These bombers remained over the target for hours at a time, releasing 100-pound bombs now and then, and throwing hand grenades and beer bottles out the hatches between bomb releases. It is doubtful that any material damage was accomplished by these missions, but occasional bomb explosions interspersed with bursting grenades and the whistle of falling beer bottles were believed to be effective in denying sleep to the Japanese.¹⁷

While the pulverizing of Cape Gloucester was going forward, airfields from which the Japanese might interfere with the landings were

~~CONFIDENTIAL~~

USAFHS-125, Chap. III

22

not neglected. Wewak's strips were bombed by 48 B-24's on the first day of December, and on the 22d, 39 B-25's struck the same targets in a low-altitude attack. The strips at Madang and Alexishafen were given some attention; 6 B-25's and 8 P-39's hit the former on 22 December, and 31 B-25's and 9 B-26's attacked the latter on the 23d. Thirty-seven B-24's struck Cape Hoskins on 18 December, and thereafter that strip had little capacity for interfering with the amphibious operation. Gasmata required more effort; on 13 December, B-24's and B-25's showered down 248 tons of bombs on this airfield, and Beauforts, Vengeances, and P-40's bombed and strafed it on the 19th. P-40's dealt Gasmata a final blow with a strafing attack on the 23d.

AAFSWPA and South Pacific planes combined their efforts in order to weaken the probable reaction to the Cape Gloucester invasion from Rabaul. Thirteenth Air Force B-24's made 4 strikes (67 sorties) against the Rabaul airfields, harbor, and town from 19 through 26 December. Fifth Air Force planes had bombed Rabaul heavily in October and November, and RAAF Beauforts, flying at night, contributed 57 sorties from 13 through 25 December. All this effort had not neutralized Rabaul, but the runways had been damaged, a few planes had been destroyed on the ground, and fighters escorting the bombers had shot others out of the air. Rabaul's capacity to interfere had not been eliminated, but it had been reduced.¹⁸

The attacks on Cape Gloucester appropriately reached a climax on 26 December, the day of the landings. Eighty-seven B-25's prepared the beaches, bombing and strafing as the assault boats moved toward the shore. Thirty-two A-20's bombed and strafed Target Hill and Hill 660.

USAFHS-125, Chap. III

23

the two high points commanding the beaches, and 40 B-24's bombed the same targets. White phosphorus bombs were among those dropped on Target Hill, and the smoke which resulted cut off any possible observation from that elevation. Bombers flew no less than 249 sorties during the day and dropped more than 400 tons of bombs, mostly 1,000-pounders. Some of the air attacks were made after the Marines were ashore, but against predetermined targets. Four cruisers and four destroyers added naval gunfire to the final preparation of the beaches. The Marines charged ashore and through the Japanese beach defenses without opposition, seized Target Hill, and began advancing on the airfield.¹⁹

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

Chapter IV

EFFECTS OF THE PRE-INVASION BOMBARDMENTS

Tarawa. Practically all of the higher commanders concerned with the GALVANIC Operation agreed that the preliminary air and naval gunfire bombardment of Betio was insufficient in quantity and poorly executed. It was also agreed, however, that the assault which succeeded by such a narrow margin with the help of bombs and shells would have failed without them.

There was no sustained blockade of the Gilberts before the invasion, and the preparatory bombardment did not continue long enough to affect the supply situation. Adequate stocks of food, medicine, and clothing were on hand, and the defending troops were evidently in fine physical condition and possessed of high morale. As noted earlier, the supply of dual-purpose ammunition had been reduced appreciably by lavish expenditure during the air attacks, and a shortage of 75-mm. and 13-mm. rounds existed when the Marines went ashore. There was not a general shortage of ammunition; perhaps the defensive fires would have been heavier had there been more dual-purpose ammunition available, but the assaulting Marines were certainly not conscious that the garrison was hoarding ammunition.¹

From the point of view of the Marines, the most fortunate effect of the preparatory bombardment was disruption of Japanese communications. The attackers could appreciate what a handicap this was to the enemy, because breakdown in communications plagued the American forces for the first two days of the operation, and particularly on D-day. It was soon

~~CONFIDENTIAL~~

USAFHS-125, Chap. IV

25

~~CONFIDENTIAL~~

apparent, however, that the Japanese were in even worse condition so far as communications were concerned. The bombs and shells had broken wires over all the island, and attempts to use runners failed because no man could move about on the fire-swept waste of Betio and live. Despite the losses they had suffered up to that time, the Japanese might have driven the Marines into the ocean had they been able to organize a determined counterattack on the first night of the battle. Because communications had been so disorganized, it was not possible to organize a counterattack at the crucial moment; when it was launched, two nights later, it was too little and too late and served only to hasten the Allied victory.²

The effect of the preliminary bombardment on the weapons and fortifications on Betio was disappointing to all concerned save the Japanese. Air attacks by land-based and carrier-based aircraft knocked down most of the buildings on the island, and some of the coast-defense guns were disabled. Presumably air attacks and the naval bombardment on the 19th had damaged the fire control apparatus of the remaining coast-defense guns because, although they were able to fire, their accuracy was poor and their effort as compared with their potential was feeble. Smaller guns and automatic weapons, however, were able to deliver a tremendous volume of fire when the assault commenced.

It was possible to locate and damage the coast defense guns because the necessary emplacements were large and thus, despite the efforts at camouflage, rather conspicuous. The same was not true of smaller weapons, and these, emplaced and revetted behind layers of coconut logs, sand, steel, and reinforced concrete, were immune to anything except a direct hit by a heavy bomb or a large caliber shell. Near hits accomplished little or no damage to dugouts and pillboxes. Large bomb craters were found near

~~CONFIDENTIAL~~

USAFHS-125, Chap. IV

26

~~CONFIDENTIAL~~

dugouts and their only accomplishment was to throw more sand over the emplacement."³ "Direct hits of 500-lb. bombs on some of the larger concrete dugouts had no effect beyond chipping off a corner or disturbing the sand on the top. Direct hits by 16 inch guns (apparently) on the top of one of the heavy covered emplacements did no damage."⁴

The bombs dropped by land-based and carrier-based planes alike were either too few in number or too light in weight to accomplish the desired destruction. In most cases, they were not aimed at the defenses which needed most to be destroyed. Shellfire might have been more effective, but it too suffered from several disadvantages. First, the high velocity and flat trajectory of shells from naval guns resulted in many overs and ricochets when they were fired at flat targets such as Betio. Secondly, after the first few minutes of the D-day bombardment, such a cloud of dust and smoke had appeared over Betio that fire could not be aimed at any particular target; shells were simply pumped into the area. Finally, the soil of Betio was of such consistency that shells which did penetrate the earth exploded with an unusually narrow cone of destruction, thus lessening their effect.⁵

No one has any real knowledge as to the effect of the preliminary bombardment of Tarawa on garrison personnel. How many of the defenders were dead or incapacitated before the Marines went ashore is simply unknown. Certainly enough Japanese were left alive almost to win the battle. Inasmuch as the shelters stood up so well under bombing and shelling, pre-landing casualties were probably not heavy. Exposed troops would have been highly vulnerable, of course, but there was no reason for the men of

~~CONFIDENTIAL~~

USAFHS-125, Chap. IV

27

the garrison to expose themselves until the Marines had begun to land, and even then the beach defenders could fight from well-protected positions. Many of the Japanese found dead in open trenches had evidently been killed by bursts from destroyer guns, delivered in support of the assault troops after they were ashore. Even then, however, most of the Japanese had to be pried from their positions by Marines wielding grenades, demolition charges, and flamethrowers.⁶

Cape Gloucester. In the Cape Gloucester operation, strikes directed at supplies and supply lines were probably the most successful part of the pre-invasion air attacks. Some of the bombs dropped were wasted because of the concealment of supply dumps afforded by the jungle, but supply areas had been carefully plotted on target maps, and many of the bombs crashed into the dumps, demolishing, burning, and spoiling the supplies on hand. Even more effective were the frequent barge hunts which finally made it almost impossible to send supplies from Rabaul to troops on the western end of New Britain. As a result of the bombing of supply dumps and interdiction of the barge lines, the Japanese on Cape Gloucester were short of practically everything except small arms ammunition. At the time of the invasion, the garrison was on half-rations, and health and morale were lowered as a result.

The supply situation was an important factor in determining the outcome of the campaign. The shortage of food lowered the vitality of the Japanese and made them more susceptible to the diseases so prevalent in the jungle. Almost all the defenders were infected with malaria, and most of them suffered from dysentery. The latter made treatment of the former impossible because the patient could not retain medicine long enough for it to take effect.

USAFHS-125, Chap. IV

28

~~CONFIDENTIAL~~

Bombing added to the misery of the debilitated defenders in other ways. Night harassment spoiled their rest, and buildings in which they might have found shelter from the elements were destroyed. Fungus infections were universal, and because medicines were in short supply, many of the Japanese developed crippling tropical ulcers. Japanese troops on Cape Gloucester, as elsewhere, could be depended upon to fight to the end and to prefer death to surrender, but however great their courage, their fighting ability was greatly reduced by their physical condition.⁷

The bombardment of Cape Gloucester, like that of Tarawa, had a bad effect upon the garrison's communications. Because the bombardment was a long-term affair as compared to Tarawa, some of the damage to mechanical equipment could be repaired, but the shortage of supplies was a handicap in this respect. Runners could function on Cape Gloucester, even after the battle began, and contact between units was maintained. Terrain made this a slow method of communication, however, and during the battle Japanese efforts were seldom well coordinated, usually because some units were tardy in complying with delayed orders.⁸

All the fortifications on Cape Gloucester were not subjected to air attack, but those in the Borgen Bay area were bombed intensively, and scattered strikes were made in other areas. Jungle cover protected many of these positions, saving them from direct hits, but many others were destroyed or damaged. Photographs revealed hits which knocked out bunkers, machine guns, and artillery pieces. Landslides set off by bombs obliterated some of the dugouts on Target Hill, and a prisoner of war (POW) told interrogators that a strike at dug-in forces near Sag Sag had had a devastating effect. The attitude the bombing created in the minds of the defending

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

USAFHS-125, Chap. IV

29

troops was probably as important as the destruction accomplished. Attacks day after day brought the garrison to such a point of anxiety that on the day of the invasion the beach defenders in Eorgen Bay fled from their positions; when they sought to return, they found the Marines already in possession.

Because the airfield was not jungle-covered, it was possible to lay out precision targets in that area to a greater extent than elsewhere. Because of this, artillery and dual-purpose guns were bombed most effectively. The fire power of the veteran 53d Infantry Regiment, stationed in that area, was greatly reduced. A POW reported "that his Bn. was badly shot up . . . he told how their pillboxes had been badly mauled, their artillery knocked out by bombing, that there was no effective AA left which might have been used as dual purpose guns against our tanks."⁹

The total number of casualties directly inflicted on the Japanese by the preparatory bombardment is uncertain. Qualified observers left no recorded estimate. Undoubtedly the thousands of tons of bombs dropped killed Japanese, but whether the dead should be numbered in hundreds or thousands is doubtful. Troops certainly sought shelter when bombing began, and though their shelters were crude as compared with those on Tarawa, a soldier in a foxhole was normally safe from bombing except in case of a direct hit or a very near miss. Records of the 308th Bombardment Wing indicate that the 1st Marine Division estimated 2,000 enemy killed by the preparatory air and naval bombardment, but little supporting evidence is available. The Japanese engineers in charge of barge shipments definitely lost 25 per cent of their personnel, but this amounted to only 200 men. As might be expected, the 53d Infantry Regiment in its positions about the airfield suffered most heavily, and one POW stated that this unit had lost

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

30

USAFHS-125, Chap. IV

half its men in air attacks; other prisoners did not confirm this estimate. It seems probable that the direct casualties were something over 1,000 men, but it should be remembered that nearly the entire garrison was unfit for campaigning as a result of hunger and disease largely brought on by air attack.¹⁰

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

USAFES-125

Chapter V

LESSONS LEARNED AND THEIR APPLICATION

General. During the three days of fighting at Tarawa, the 2d Marine Division lost 3,000 men, of whom 980 were killed. The 1st Marine Division lost less than 300 men killed and slightly more than 1,000 wounded in the New Britain campaign. The casualties on New Britain were sustained over a two-month period, and the total includes men killed or wounded during the drive along the north coast to Talasea; most of the losses were incurred, however, during the three weeks of fighting around Cape Gloucester and Borgen Bay.¹

A comparison of these casualty figures is interesting. The Tarawa landing force faced, discounting the Japanese killed by the preparatory bombardment, slightly less than 5,000 enemy, of whom approximately 2,600 were combat troops. The 1st Marine Division faced at Cape Gloucester, again discounting the casualties inflicted by the preliminary bombardment, some 9,000 enemy of whom 5-7,000 were combat troops. The casualty figures for the operation certainly indicate that land-based bombers and fighters, conducting a sustained campaign of preparatory bombardment and interdiction, achieved far better results than a two-day carrier plane and naval gunfire bombardment supplemented by intermittent land-based bombing. The total weight of explosives on each of the two objectives, counting all bombs and shells, was not greatly different, and because of Tarawa's small area, each tone delivered there should have been more effective than a similar amount delivered on Cape Gloucester if the same degree of accuracy were attained.

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Many factors other than the quality of the preliminary bombardments contributed to the disparity of losses. Certainly the low stage of the tide at Tarawa made it necessary for many troops to wade ashore in the face of heavy fire and led to losses which might have been avoided if the tide had been higher. On the other hand, more adequate preparation would have reduced the fire these wading troops had to face. Possibly, also, the first waves, which got ashore in tracked landing craft, might have been able to overrun more of the beach defenses and thus reduce the fire on succeeding waves had the defenses been damaged by heavy bombers.

Defensive installations at Tarawa were much stronger than those at Cape Gloucester, but the jungle cover at the latter objective made the task of identifying and hitting these installations more difficult. Many commanders on the scene in the Gilberts felt that heavy bombs, such as were delivered at Cape Gloucester by land-based planes, could have accomplished something in reducing the defenses. On Makin, where a few one-ton bombs were dropped, "unwounded enemy dead in dugouts adjacent to large bomb craters appeared to have been killed by the shock of two thousand pound daisy cutters. One heavily revetted and concrete emplaced gun position was put out of action by a two thousand pound bomb that landed nearly one hundred feet away."² Admiral Turner asserted that future amphibious objectives should be hit by "continuous heavy attacks by shore-based aircraft."³

Another factor which must be taken into consideration is that the beach defenses at Tarawa remained occupied while the ones at Cape Gloucester were abandoned. Getting ashore unopposed undoubtedly reduced considerably the casualties of the 1st Marine Division. The reason for the Tarawa garrison's holding its positions was simple: Betio was all beach, and the

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

33

defenders were safer in their emplacements than they would have been elsewhere. No matter how effective the preparatory bombardment might have been, the surviving Japanese troops would have had no choice but to fight from their positions. On the other hand, the flight of the beach defenders at Cape Gloucester was not due to lack of shelter, because their positions consisted of trenches and dugouts well-concealed under jungle cover. It seems probable that their nerves had been so shattered by bombing day after day for a month that the climactic D-day bombardment was the final blow which brought on a temporary panic. Presumably, also, the physical weakness resulting from sickness and short rations made them more susceptible to panic.

The conclusion follows that naval gunfire and carrier aircraft bombardment of Tarawa, even though supplemented by sporadic land-based bomber attacks, was not so effective as the sustained preparation of Cape Gloucester by heavy bombers carrying heavy bombs and medium bombers strafing and bombing from low altitude. Each operation offered unique difficulties, but these balance out without affecting the validity of the above conclusion.

Specific lessons of Tarawa. The Tarawa and Cape Gloucester operations were the first of a series of major amphibious advances in the Central and Southwest Pacific Areas. Many of the lessons learned in the two invasions were applied subsequently so as to increase the speed of the two drives towards the inner lines of the Japanese Empire. Failure to profit by these lessons, on the other hand, led on several occasions, notably at Saipan and Iwo Jima, to drawn-out battles and heavy casualty lists. In regard to the Gilberts operation, Gen. Holland M. Smith, who thought the invasions strategically unwise, had the following to say:⁴

~~CONFIDENTIAL~~

If Tarawa had to be fought, its only justification was the information we gained that saved lives and increased the efficiency of our landing techniques in subsequent operations. We were entering a new, uncharted land, a field of military enterprise in which we were guided only by theory and peacetime maneuvers . . . This was our first frontal attack on a fortified enemy atoll, and we were ignorant both of its capacity for resistance and of our own offensive limitations.

Tarawa taught many lessons concerning the needs of an assault on a small island, but the most important points brought to light concerned the pre-landing bombardment. The basic trouble with the operation was that not enough of the Japanese fortifications had been destroyed before the Marines went ashore. Admiral Turner, commander of the Fifth Amphibious Force, urged "that far more attention be paid to the destruction of enemy defenses before landings are attempted."⁵

The operation revealed that naval gunfire was not nearly so destructive of Japanese positions as had been expected. The reasons were two-fold: in the first place, Japanese fortifications of the type found on Tarawa could withstand far more shellfire than had been imagined; secondly, a heavy weight of shells thrown into a small area during a short period of time could effect temporary neutralization of the defenses, leaving the garrison too groggy to react immediately to the assault, but it accomplished little real destruction. Once the defenders had recovered from the initial shock, they were able to fight savagely from their relatively undamaged strongpoints. Neutralization fire immediately preceding the assault was essential, but also necessary was "destruction of heavy defenses, pillboxes, and dugouts along the landing beaches by slow, accurate, and deliberate fire . . . This fire is to be delivered at close ranges . . ."⁶

USAFHS-125, Chap. V

35

Apparently all concerned felt that more and heavier air bombardment was needed. Admiral Turner repeated the recommendation of his support air commander that "The assault should be preceded by several days (not hours) deliberate bombardment by day and night air attacks. Defenders should be given no rest day or night for at least a week prior to the landing."⁷

The desirability of greater use of land-based bombers was appreciated, and so was the need for more heavy bombs. The seemingly obvious conclusion, that land-based bombers should deliver the heaviest bombs possible during the period of preparation, was not explicitly stated. On the contrary, Admiral Turner's recommendations assumed that 2,000-lb. bombs would be dropped by carrier planes during the neutralization period, while heavy bombers flying from land bases would drop 100-lb. and fragmentation bombs from low altitude. It seems unlikely that the projected bomb load for the heavy bombers would have as much shock effect as an equal weight of larger demolitions, and it is certain that against such defenses as those at Tarawa, the destructive effect of small bombs was practically nil.⁸

As noted earlier, such land-based bomber effort as was available for the preparatory period of the Gilberts operation was devoted mainly to the attempted neutralization of Japanese airfields. The desired neutralization was not attained, and the Japanese mounted air attacks against the fleet, though with little over-all success. The E-24's of the Seventh Air Force would have been better employed had more of their sorties been devoted to dropping 1,000-lb. bombs on Tarawa's defenses. Such procedure was not considered--or if so no record is available--at the time or later. Had the bomb capacity of the E-24's been dropped on crowded Tarawa in the form

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

36

of one-ton or half-ton bombs, some destruction of defenses would have been certain, though it could not have been extensive in view of the small number of sorties involved. As the Marines could testify, however, the destruction of any additional guns, pillboxes, and dugouts would have been welcome and worthwhile.

Central Pacific commanders were not being unrealistic when they gave so little attention to the capabilities of the B-24 in striking defense positions. The bomber strength of the Seventh Air Force was small, and it would not increase substantially in the future. Such strength as existed was hampered by great distances and by bases crowded on small islands. The B-24's could be used against the Marshalls, but when the time came to assault the Marianas, complete dependence would of necessity be placed upon carrier aircraft until land-based planes could be established on Saipan. This necessity could have been avoided only by an amphibious operation to secure bases nearer the Marianas, thus delaying the campaign.

Thus the Tarawa campaign taught the necessity for destroying more defenses before troops went ashore. It taught that concentrated naval gunfire and carrier aircraft bombardment for a few hours before the assault could neutralize defenses temporarily but could not destroy them. It taught that deliberate, carefully aimed gunfire and aerial bombardment over a fairly long period were necessary if destruction was to be accomplished. While commanders realized that heavier bombs than those used at Tarawa were needed, and that more extensive use of land-based bombers was desirable, there was little disposition to depend upon the meagre bomber strength of the Seventh Air Force for the delivery of heavy bombs.

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

37

Specific lessons of Cape Gloucester. Unlike Tarawa, the success of the Cape Gloucester operation was never in doubt from the moment the Marines stormed ashore without opposition. As a result, there was no intensive thinking in the Southwest Pacific Area (SWPA) on means for making improvements in amphibious techniques. So long as the objective selected offered several landing places, which could be expected in New Guinea and the Philippines, there was no reason for major change. The system used at Cape Gloucester was eminently successful in all respects, and this was particularly true of the pre-invasion air operations. So far as doctrine was concerned, these operations had been classical. First, attacks were mounted on airfields near the objective with the intention of knocking them out or damaging them severely while fighters sought out and destroyed enemy planes in the air. At the same time, regular sea sweeps prevented the use of large shipping to reinforce or supply the objective and began cutting into barge traffic. Eventually barge hunts along the coasts sought out barges in their hiding places during the day, and this effort was complemented by torpedo boats which intercepted barges at night. Airfield strikes and barge hunts continued throughout the preparatory phase, but several weeks before D-day, emphasis was turned to strikes against stores, defense positions, troops, dual-purpose guns, and artillery at the objective. These preparatory strikes were made daily when weather permitted, and they increased in weight as D-day drew nearer. They reached a climax on D-day, and in conjunction with naval gunfire they achieved neutralization as well as destruction. After troops were ashore at the objective, ground support was rendered when necessary while the main effort of the air force was being directed against the next objective.⁹

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

38

Thus the main lesson of Cape Gloucester was that the system used for preparation of the objective was satisfactory; commanders were so well satisfied that the same procedure was to be used again and again against amphibious objectives within effective range of Fifth Air Force aircraft. There were other lessons also. One of the most important was realization of the fact that crew reports of bombing results against jungle targets, whether favorable or unfavorable, were not reliable. In the case of favorable reports, "it was felt to underestimate the effects of strikes on terrain of this nature."¹⁰ Most crews, on the other hand, while officially referring to results as unobserved, made it clear that in their opinion bombs were being wasted on such targets. Yet guns and stores at Cape Gloucester were destroyed and seriously damaged, and casualties were inflicted on the Japanese, testifying to the accuracy of the intelligence used to determine target areas. The physical condition of the defenders and the small amount of artillery fire received by the Marines was evidence of the effectiveness of the bombing, whatever crews may have thought.¹¹

Airdrome neutralization proved as difficult in SWPA as had been the case in the Central Pacific. So long as the enemy had the will and the manpower to repair damaged airfields, only constant surveillance and frequent attacks could keep them inoperable. Rabaul was not neutralized before the invasion of Cape Gloucester, but there had been little hope that it would be. Gasmata and Cape Hoskins Airfields had been slated for neutralization, however, and the desired result was obtained only for brief periods. Moreover, the strips on Cape Gloucester proper were open occasionally during the first 26 days of December. The Japanese made little

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

use of these fields, because planes based thereon would have been subject to strafing by Allied fighters, but the failure to knock them out and keep them knocked out revealed "very definite shortcomings."¹² There was no tendency, however, to divert effort needed against the garrison and defenses to airfield strikes. Though the Japanese did launch a major air attack against the amphibious shipping at Cape Gloucester on D-day, Allied fighters inflicted unbearable losses on the bombers and their escorts, and a destroyer was the only ship lost.

The operation at Cape Gloucester confirmed air commanders in their belief in the efficacy of air interdiction of water communications. Examination of barge hideouts and interrogation of prisoners of war indicated that barge hunts had been successful beyond expectation. Some of the higher officers of the garrison had managed to escape from the Borgen Bay area by barge, but this was an exception to the rule. The destruction of barges and, to a lesser extent, casualties inflicted on shipping personnel had for all practical purposes isolated Cape Gloucester for a month before the invasion. The results were shortages of food and debilitating diseases which reduced the capacity of the garrison to resist.¹³

General Kenney was a believer in the use of heavy bombs against ground installations, and most of the tonnage dropped on Cape Gloucester was in the form of 1,000-lb. and 2,000-lb. demolitions. Medium and light bombers had carried smaller types, but the P-24's were almost entirely loaded with the heavier bombs. Since the results had been good, there was no reason for change. Indeed, later in the war when sufficient air superiority had been attained to permit the conversion of P-47's and P-38's to fighter-bomber duties, they also delivered half-ton bombs.¹⁴

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

40

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"A review of the operations at Cape Gloucester gave Allied leaders much cause for optimism as to the success of future operations."¹⁵ During the subsequent march westward along the coast of New Guinea and northward through the Philippines, SWPA commanders could plan for quick conquest of any objective within range of Fifth Air Force fighters and light bombers. Only at Leyte were serious difficulties encountered, and Leyte was so distant from Fifth Air Force bases that dependence had to be placed on naval gunfire and carrier aircraft for preparing and isolating the objective and supporting the ground forces.

Application of the lessons learned: Central Pacific. The most successful application of the lessons learned at Tarawa came in the next Central Pacific operation, the invasion of the Marshall Islands. Kwajalein and Eniwetok were atolls of the same type as those of the Gilberts, so avoidance of the errors made at Tarawa was of full benefit in preparing the objectives for attack. As a result, casualties were low in comparison with the preceding operation.

Land-based bombers played a larger part in the Marshalls than had been the case in the Gilberts, though they were still devoted more to reconnaissance and counter-air missions than to preparatory strikes. B-24's did drop more than 200 tons of bombs on Kwajalein and Roi-Namur Islands during January 1944, and for the last three nights before the landings, night-long harassing attacks kept the garrison at Kwajalein awake while inflicting incidental damage with 500-lb. bombs. On D-day morning, a half-dozen B-24's dropped 1,000-lb. and 2,000-lb. bombs on the same island and strafed from low altitude. In the meantime, medium bombers and fighters were neutralizing Japanese bases in the eastern Marshalls.

~~SECRET~~

USAFHS-125, Chap. V

41

Though land-based bombers were more active in the preparation of the Marshalls than they had been in the Gilberts, their share in the total bombardment applied to the objectives was still small. Carrier aircraft had begun their strikes in the Marshalls on 29 January, a full fast carrier air group striking each of the objectives that day. More than 550 sorties attacked targets on Kwajalein Atoll on 30 January, and naval guns sent some 2,000 shells from 16-inch guns and some 16,900 from 5-inch guns crashing into the islands. It is noteworthy that this phase of the naval bombardment was mainly aimed fire, pointed at specific defensive installations. By the time night fell on 30 January, every coast defense gun had been silenced.

Destructive fire from naval guns and air attacks against point targets were continued on the morning of the landings, and this bombardment was supplemented by shells from artillery emplaced on near-by islets. A heavy volume of naval gunfire and a bombing and strafing attack while the landing craft moved toward the beaches served to neutralize the defense positions still undamaged. Planes, naval guns, and artillery sent about 12,000 tons of bombs and shells 75-mm. or larger crashing into Kwajalein and Roi-Namur Islands. Compared to the Gilberts action, the landing forces had an easy time in occupying the two objectives.¹⁶

For a number of reasons, the principles learned at Tarawa could not be wholly applicable to the invasion of Saipan. The distance from the nearest American bases, those in the Marshalls, was too great for land-based planes to take part in preparing the beaches. Also, Saipan was much larger than the conquered atolls; naval gunfire could not blanket the entire enemy-held area, as it had done at Tarawa and Kwajalein. On the other hand, nothing in the Saipan operation invalidated the principle that a

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

42

sustained bombardment of specific targets was necessary; this lesson of Tarawa was ignored, however, and as a result the preliminary bombardment of Saipan was inadequate.

Carrier air strikes did not begin until 11 June 1944, and it was not until 12 June that dive and torpedo bombers began to attack the enemy installations. Naval bombardment also began on the 12th, but for the first two days only the fast ships of Task Force 58, untrained in shore bombardment and under orders not to close within range of coast defense guns, took part. The quality of the bombardment improved when the old battleships, which had had shore bombardment practice in earlier operations and which were not too valuable to subject themselves to coast defense fire, arrived on D minus one day (14 June). At this late date, however, not enough time remained for the destruction of many of the important targets available on Saipan. The shortcomings of the preliminary bombardment were at least partially responsible for the great number of casualties (14,224, of whom 3,252 were dead or missing) suffered by the invaders.

The occupations of Tinian and Guam were a different story. Some naval and air bombardment of Tinian went on during the preparatory phase on Saipan, and it continued during the battle on the larger island. Allied artillery emplaced on Saipan could blanket more than half of Tinian, and before the invasion took place, 13 artillery battalions were firing. Finally, a group of Army Air Force fighters--P-47's--was landed on Saipan in time to play a large part in the pre-landing bombardment of the neighboring island. Plenty of time was available for locating targets and making sure of their destruction. As a result, the Marines on Tinian suffered only 2,289 casualties, of which 399 were deaths, while killing and capturing some 6,000 Japanese. The defenders had lost 15 men for every American killed, as compared to 6 Japanese for each American killed on Saipan.

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

Guam also received a more adequate preparatory bombardment than Saipan, though artillery and land-based air could not play the important parts they had had in the Tinian bombardment. Originally it had been planned that the assault on Guam would closely follow the landings on Saipan, but the necessity for committing the available reserves on the first objective made a long delay necessary. The assault troops were returned to the Marshalls after 50 days on shipboard.¹⁷

No matter how much griping may have gone on, the marines aboard were to have good reason to thank the fates . . . For while they sweltered in the stuffy holds . . . /Rear Adm. Richard L. Conolly's support ships were subjecting Guam to the heaviest preparatory bombardment yet delivered by the navy in the Pacific. The results were altogether wonderful.

Carriers and cruisers began bombarding Guam on 5 July, and battleships arrived on 14 July. By D-day (21 July), nine cruisers, six battleships, and escorting destroyers were heaving shells into the defences on the island. A target list had been prepared and priorities assigned, and there was time for a rather elaborate system of bookkeeping, checking off targets as they were destroyed, listing damage less than destruction, adding new targets, and revising priorities as necessary. The main batteries of the battleships fired more than 6,000 x 16-inch and 14-inch shells before D-day, and cruisers and destroyers added some 22,500 rounds of 5-, 6-, and 8-inch projectiles. Even though the Japanese on Guam enjoyed many advantages of terrain, 10 died for every American who gave his life.

The Marianas campaign demonstrated again that heavy casualties were to be expected in amphibious attacks on occupied positions unless the preparatory bombardment was both great in volume and well-directed. In the absence of land-based bombers, such preparation could be carried out by naval guns if air superiority had been gained, if ample intelligence

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

44

was available, and if the bombardment force had time for methodical destruction of enemy installations. These conditions were met at Tinian and Guam. They were not met at Saipan, and the casualty reports pointed out the results.¹⁸

Iwo Jima, for the number of men engaged, was the scene of the bloodiest fighting of the Pacific War. In part this was due to the terrain of the island, the superbly planned defense installations, and the tactics of the Japanese commander. In part, however, the long casualty roll suffered by the Marines at Iwo Jima resulted from disregard for the lessons taught by previous operations. The same situation prevailed when the Marines went ashore on Iwo Jima that had obtained almost exactly 15 months earlier when the assault was made at Tarawa. The Japanese defensive installations were largely intact, and they took a terrible toll of the men on the beaches soon after the landings began. They continued to take their toll as the battle went on, and the end result was that for the first and only time in the Pacific, Japanese defenders managed to exact casualty for casualty from the invaders.

Failure of the battleships to give adequate support before the landings was partly responsible for the survival of the Japanese fortifications. Because Iwo Jima's capture was sandwiched between the Luzon operation and the assault on Okinawa, the heavy units of the fleet could give but four days of preparatory fire--and this was reduced by weather. Four days did not afford anything approaching enough time for the destruction of known major targets, and there were many which were unknown and would remain so until explosives had torn away the camouflage. Less than half the coast-defense guns and heavy antiaircraft guns were destroyed or damaged before the landings,

USAFHS-125, Chap. V

and less than one fourth of the blockhouses, pillboxes, and gun emplacements were hit. Out of some 915 high priority targets on Iwo Jima, only 194 were destroyed or damaged before D-day.

Not all the blame for defenses' remaining intact can be fixed on the inadequacy of the naval bombardment. The commanders of land-based air must assume a share of responsibility. Beginning in August 1944, Seventh Air Force B-24's made 164 strikes, including night harassing missions, against Iwo Jima. These bombers dropped more than 5,500 tons of bombs; B-29's added 1,000 tons, and before D-day, naval aircraft dropped another 1,000 tons. Never has there been a better demonstration of the fatuousness of the idea of judging bombing by the number of tons dropped. The effect of these strikes in reducing defenses was negligible.

Many reasons have been given for this failure of air power. The weather over Iwo Jima was consistently bad, and many bomb drops were made through overcast. Many of the Japanese installations were, for all practical purposes, impervious to bombs. Seventh Air Force bombardiers were not particularly accurate even when the weather permitted them to make visual runs. Most strikes, presumably on account of antiaircraft fire, were made from altitudes too high to permit good bombing of small targets.

In truth, however, land-based bombers made little effort to knock out the defenses. Of the 164 strikes made by B-24's, 137 were directed against airfields, 8 against antiaircraft guns, and only 6 against defense positions. Since bombing was rather inaccurate, and since the main airfield was in the neighborhood of the landing beaches, these counter-air strikes might have been expected to destroy some defenses, and perhaps they did to

USAFHS-125, Chap. V

46

some degree. It was to a slight degree, however, because it was during the extended period of bombardment by aircraft from Saipan that the bulk of the island's defenses were constructed. Nor were the airfields ever neutralized before the arrival of the invasion fleet off the coast of the island.

The bomber effort available, though large by Central Pacific standards, could not have rendered Iwo Jima defenseless, but it could have had more effect on fortifications than was actually the case. The reason it did not was familiar--the bombs were not heavy enough. Of the more than 5,500 tons dropped by the B-24's, only slightly more than 1,000 tons was in the form of 500-lb bombs. The Seventh Air Force dropped nothing heavier, and almost all the 500-pounders were released before 1 January 1945. In the six strikes on defensive installations, nothing larger than 260-lb. fragmentation bombs was delivered, and most planes carried 100-lb. demolitions.

Perhaps the B-24's were better used in attacking airfields than in blasting defenses. It was certainly essential that they be used for airdrome bombing until enemy attacks on B-29 bases were brought to a halt, though Japanese POW's testified that fighter sweeps which attacked bombers on the ground were more effective than bombing raids which merely cratered runways. It does seem probable that neutralization of airfields in preparation for the assault could have been left to the carriers while the bomb-carrying capacity of the B-24's was used to blast the defenses. Certainly, against Iwo targets, the use of fragmentation and 100-lb. bombs was a waste of effort insofar as destroying defenses was concerned. Obtaining hits with half-ton or one-ton bombs would have been more difficult, but when hits were made, they might have been effective. Obtaining hits with small

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

47

bombs may have been easier, but even when a 100-lb. bomb hit a defensive installation, it was unlikely to put it out of action.¹⁹

Application of lessons learned: Southwest Pacific. An opportunity for applying again the techniques tested at Cape Gloucester did not come to SWPA air commanders for several months. The landing at Saidor in January 1944 was made at a spot known to be unoccupied, and the invasion of the Admiralty Islands was carried out ahead of schedule by a reconnaissance in force which developed into an occupation as reinforcements arrived. Hollandia was too distant from SWPA bases for full dependence to be placed on land-based air support, so carriers from the Central Pacific were called upon for help. Fifth Air Force bombers, however, had already neutralized Japanese air power in the Hollandia area and had disorganized the garrison before the carriers arrived. Little resistance was encountered from the defenders, mostly service troops, and the objectives were quickly captured.

It was in the drive westward from Hollandia, along the stepping-stones of Wakde-Sarmi, Biak, and Moenboer that SWPA techniques of pre-invasion bombardment shone to their best advantage. Some strikes on Wakde-Sarmi had been made prior to the landings at Hollandia, but the final preparation began on 28 April 1944. Between that date and 17 May, when the landings began, B-24's flew 15 strikes, more than 300 sorties, against targets in the objective area and released more than 900 tons of bombs. B-25's, making most of their attacks at tree-top altitude, added 380 tons of bombs and uncounted rounds of machine gun ammunition. Wakde Island and the mainland opposite were secured by sundown of 20 May; the invaders suffered only 182 casualties, of whom 43 were killed, while destroying at least 800 Japanese.²⁰

USAFH-125, Chap. V

48

~~CONFIDENTIAL~~

Even as the preparation of Wakde-Sarmi was being carried out, heavy bombers were reaching farther to the west to neutralize Japanese air facilities on Biak Island. Two groups of heavy bombers of the Thirteenth Air Force, having moved forward to bases in the Admiralties, joined in the bombardment of Biak. Because of the distances involved, pre-landing bombing of this island was almost entirely a task for the B-24's, though A-20's from Wakde did make five strikes before the invasion took place. The heavy bombers of the ~~the~~ air forces made 29 strikes in all, and their efforts made it possible to land troops without serious opposition. Biak was a warren of limestone caverns ideally suited to the Japanese type of defense, so the battle ashore was a protracted one. The Allies lost only 400 men killed to approximately 5,000 killed or captured Japanese, but some 2,000 Allied troops were wounded. Biak was the most difficult objective encountered in the western New Guinea campaign; the Japanese defenders fought brilliantly and bravely; yet the defenders suffered two battle casualties to the attackers' one, and lost 12 men killed to the attackers' one. Air support, before and after the landings, was a significant factor in establishing this ratio.

Moemfoor, the last island in Geelvink Bay to be occupied before Allied troops went ashore on the Vogelkop and faced north toward the Philippines, was bombarded in conjunction with the preparation of Biak. This circular, reef-surrounded island had a comparatively small garrison, but because of the reef it was necessary to make the assault against the strongest defenses. Hence it was necessary, before troops went ashore, to destroy as many of these defenses as possible and neutralize the remainder. The destruction was accomplished by 13 B-24 strikes and 17 attacks by A-20's and B-25's before

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

49

D-day. Neutralization before the landing was fully accomplished by the heaviest naval bombardment yet seen in SWPA, and by 1,000-lb. bombs, 300 of them, dropped from 60 B-24's. Allied forces on Moemfoor lost 66 men killed, 343 wounded, as compared to 1,730 enemy troops killed or captured.²¹

A series of landings against unoccupied places--Sansapor and Morotai--and against places too distant for land-based air to handle without carrier support--Leyte, Mindoro, and Luzon--followed the capture of Moemfoor. The SWPA pre-landing bombardment technique received a final test in preparing the way for the capture of Corregidor. This island in Manila Bay, where American forces had held out so long in 1942, was occupied by almost 6,000 Japanese troops and was heavily fortified. Beginning on 23 January 1945, strikes were sent over Corregidor 20 days out of the 25 preceding D-day, 16 February. Other strikes were made on the adjacent mainland of Luzon during the same period. Over Corregidor itself, more than 1,200 sorties were flown, of which more than 900 were by B-24's. These aircraft dropped more than 2,600 tons of bombs before the assault began. As a result, the combined paratroop-amphibious assault force endured only 222 casualties on D-day, many of them resulting from the parachute jump rather than from enemy action, and killed or entombed all of the enemy garrison by 1 March.²²

Several features of these four operations are worthy of note. All four of the objectives were within easy fighter and bomber range of the nearest Allied bases. Only at Biak and Corregidor were the defenses fully manned when the bombardment began, and only at Moemfoor and Corregidor was it necessary to make the initial assault against strong defense positions. Despite these advantages, as compared with Central Pacific objectives, the low casualty lists and quick conclusions to the campaigns showed the

~~CONFIDENTIAL~~

USAFHS-125, Chap. V

50

effectiveness of sustained preparation of the objectives by heavy bombers.

One very important reason for the effectiveness of the pre-invasion air attacks in S&PA was the use of the right bombs for the targets attacked. Some 2,000-pounders were used at Wakde-Sarmi, but in the main, when heavy bombs were desired, the 1,000-lb. general purpose type was preferred. Over half the tonnage dropped on amphibious objectives during May and June of 1944 was of this type, and no less than 2,250 of the half-tonners showered down upon Corregidor. Much of the remaining tonnage was in the form of 500-pounders. What the effect of such bombing would have been against Central Pacific targets must remain unknown, but when used against carefully determined target areas on S&PA objectives, these bombs destroyed supplies, installations, and guns above ground, killed enemy troops caught in the open and some of those in shelters, and left the remainder deafened, dazed, and unable, however brave they might be, to fight at their best.²³

USAFHS-125

Chapter VI

CONCLUSIONS

Study of the Tarawa and Cape Gloucester operations leads to certain conclusions which have more than passing validity when applied to air bombardment in preparation for amphibious operations.

Good intelligence concerning the objective is essential to a successful pre-invasion bombardment. This knowledge of the strength, location, and nature of the defenses must be applied in laying out targets for the attacking aircraft. Otherwise the preparation will amount to no more than flinging bombs into an area at random. Probably as much was known about the defenses of Tarawa and Saipan as was known about those on Cape Gloucester and Guam, but the intelligence available was not so well used in the first named operations. Even the best of intelligence must be kept up to date during the bombardment. Bombs must not be wasted on targets which have already been destroyed, and when important new targets are discovered, they must be brought under fire.

Closely akin to the problem of intelligence and proper targeting is the selection of ordnance. The fact that bombs dropped on Tarawa and Iwo Jima were not large enough is not so significant as the fact that the wrong bombs were used. Ordnance for each target should be selected on the basis of what is needed for that particular target. The probability of obtaining hits is important, but if this factor alone is considered, the smallest possible bombs will always be used. Hits which do not damage the target mean nothing. It would be foolish, on the other hand, to use 1,000-lb. bombs to destroy a target which could be destroyed equally well by 100-pounders.

USAFHS-125, Chap. VI

52

Pre-invasion bombardment should be deliberate. Even were it possible to assemble a force capable of dropping in a few hours the weight of explosives required to destroy all targets on an objective, such destruction could not be accomplished in so short a time. The first bombs would raise such clouds of dust and smoke that aiming points would be invisible. Certainly the destruction of defenses should proceed as rapidly as possible, but speed should not be obtained at the expense of accuracy. One of the strong points of land-based bombardment, as shown at Cape Gloucester, is its ability to return to the objective day after day, blasting away until its targets are destroyed.

Another advantage of land-based aircraft, of course, is their ability to deliver a greater weight of bombs than is possible for carrier-based planes. Overemphasis upon this point, however, can lead to debacles such as the air bombardment of Iwo Jima, which so clearly showed the dangers of evaluating bombing results on the basis of tonnage dropped. Bombs which hit no worthwhile target are wasted, no matter how heavy they are, and bombs too small to accomplish the desired results are wasted whether or not they hit the target. Tonnage figures without reference to results are meaningless at best and misleading at worst. There is a constant danger that emphasis upon tonnage delivered will lead to a belief that sheer tonnage can compensate for poor intelligence, poor targeting, poor ordnance selection, and poor accuracy.

In pre-invasion air operations, some realistic balance must be struck between counter-air bombing and destruction of defenses. Absolute neutralization of enemy airfields was not accomplished in either the

USAFHS-125, Chap. VI

53

~~CONFIDENTIAL~~

Cape Gloucester or Tarawa operation, but in the latter a far greater proportion of the bombardment effort was devoted to airfields than was the case in the Southwest Pacific. Certainly it was necessary to reduce the enemy's air potential to such a point that friendly fighters could maintain control of the air over the objective during the landing operation. Effort expended upon airfields after this had been achieved, however, might have been better applied to reduction of defenses on the objective.

A final conclusion must be that land-based aircraft, based within comfortable range of the objective, supplied with the correct ordnance to use against carefully selected targets, and given time to destroy those targets methodically, can do a more effective job of destroying the defenses on an amphibious objective than can carrier aircraft. Neither land-based bombers nor carrier aircraft can effectively destroy defenses when good intelligence, the right ordnance, and enough time are lacking.

USAFHS-125

G L O S S A R Y

AAF	Army Air Forces
AAFS&PA	Allied Air Forces, Southwest Pacific Area
CV	Aircraft carrier
CVE	Escort carrier
CVL	Light aircraft carrier
GP	General purpose
POA	Pacific Ocean Areas
POW	Prisoner of war
RAAF	Royal Australian Air Force
SWPA	Southwest Pacific Area

~~CONFIDENTIAL~~

USAFHS-125

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~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

USAFHS-125, Notes, Chap. II

56

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~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

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~~CONFIDENTIAL~~

USAFES-125, Notes

58

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USAFHS-125, Notes, Chap. V

60

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