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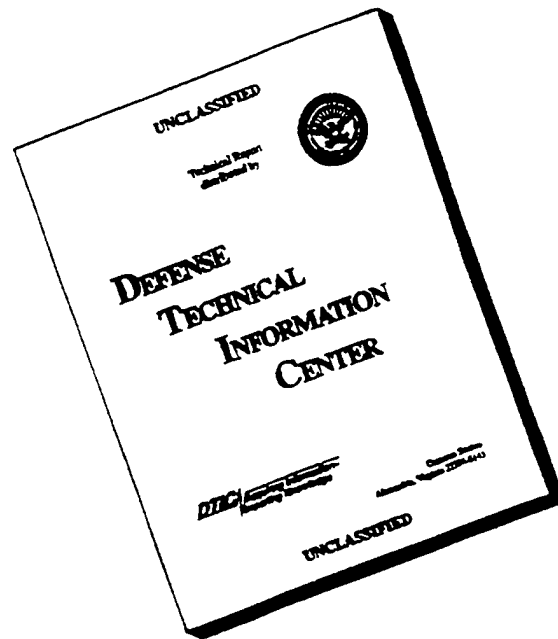


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TITLE: Air Campaigns of the Pacific War					ATI- 13043	
AUTHOR(S) : (Not known)					REVISION: (None)	
ORIG. AGENCY : U. S. Strategic Bombing Survey, Military Analysis Division					ORIG. AGENCY NO. (None)	
PUBLISHED BY : (Same)					PUBLISHING AGENCY NO. (None)	
DATE July '47	DOC. CLASS. Unclass.	COUNTRY U.S.	LANGUAGE English	PAGES 81	ILLUSTRATIONS (None)	
<p>ABSTRACT:</p> <p>The air effort against Japan in World War II is discussed. The position in which the U. S. was situated at the outbreak of actual armed hostilities and the strategy and conduct of the war from that point forward, are related. It is concluded that the war against Japan clearly demonstrates the military potentiality of airpower and its importance and relationship to ground and naval forces, and that national defense agencies must be oriented toward airpower.</p>						
DISTRIBUTION: Copies of this report obtainable from CADO.						
DIVISION: Military Operations (24)				SUBJECT HEADINGS: World-war, 1939-45 - Air warfare -		
SECTION: Operations (7)				Pacific (99383)		
ATI SHEET NO.: R-24-7-22						
Control Air Documents Office Wright-Patterson Air Force Base, Dayton, Ohio				AIR TECHNICAL INDEX		

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THE UNITED STATES
STRATEGIC BOMBING SURVEY

ATTN NO. **13043**

AIR CAMPAIGNS
OF
THE PACIFIC WAR



Air Documents Division, T-2
AMC, Wright Field
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RC-486F/3043

Military Analysis Division
July 1947

THE UNITED STATES
STRATEGIC BOMBING SURVEY

AIR CAMPAIGNS
OF
THE PACIFIC WAR

Military Analysis Division

July 1947

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.
Price 60 cents

This report was written primarily for the use of the United States Strategic Bombing Survey in the preparation of further reports of a more comprehensive nature. Any conclusions or opinions expressed in this report must be considered as limited to the specific material covered and are subject to further interpretation in the light of further studies conducted by the Survey.

FOREWORD

The United States Strategic Bombing Survey was established by the Secretary of War on 2 November 1944, pursuant to a directive from the late President Roosevelt. Its mission was to conduct an impartial and expert study of the effects of our aerial attack on Germany, to be used in connection with air attacks on Japan and to establish a basis for evaluating the importance and potentialities of air power as an instrument of military strategy for planning the future development of the United States armed forces and for determining future economic policies with respect to the national defense. A summary report and some 200 supporting reports containing the findings of the Survey in Germany have been published.

On 15 August 1945, President Truman requested that the Survey conduct a similar study of the effects of all types of air attack in the war against Japan, submitting reports in duplicate to the Secretary of War and to the Secretary of the Navy. The officers of the Survey during its Japanese phase were:

Franklin D'Olier, *Chairman*,
Paul H. Nitze, Henry C. Alexander, *Vice
Chairmen*,
Harry L. Bowman,
J. Kenneth Galbraith,
Rensis Likert,
Frank A. McNamie, Jr.,
Fred Searls, Jr.,
Monroe E. Spaght,
Dr. Lewis R. Thompson,
Theodore P. Wright, *Directors*,
Walter Wilds, *Secretary*.

The Survey's complement provided for 300 civilians, 350 officers, and 500 enlisted men. The military segment of the organization was drawn from the Army to the extent of 60 percent, and from the Navy to the extent of 40 percent. Both the Army and the Navy gave the Survey all possible assistance in furnishing men, supplies, transport, and information. The Survey operated from headquarters established in Tokyo early in September 1945, with subheadquarters in Nagoya, Osaka, Hiroshima, and Nagasaki, and with mobile teams operating in other parts of Japan, the islands of the Pacific, and the Asiatic mainland.

It was possible to reconstruct much of wartime Japanese military planning and execution, engagement by engagement, and campaign by campaign, and to secure reasonably accurate statistics on Japan's economy and war production, plant by plant, and industry by industry. In addition, studies were conducted on Japan's over-all strategic plans and the background of her entry into the war, the internal discussions and negotiations leading to her acceptance of unconditional surrender, the course of health and morale among the civilian population, the effectiveness of the Japanese civilian defense organization, and the effects of the atomic bombs. Separate reports will be issued covering each phase of the study.

The Survey interrogated more than 700 Japanese military, government, and industrial officials. It also recovered and translated many documents which not only have been useful to the Survey, but also will furnish data valuable for other studies. Arrangements have been made to turn over the Survey's files to the Central Intelligence Group, through which they will be available for further examination and distribution.

The present report was prepared by the Military Analysis Division of the United States Strategic Bombing Survey as a supporting study for the Chairman's over-all evaluation of airpower as employed in the war against Japan.

TABLE OF CONTENTS

Introduction	Page
SECTION I. FACTORS ESTABLISHING THE GENERAL PATTERN OF THE WAR AGAINST JAPAN	1
1. Scope	2
2. Factors Influencing the Pattern of the War Against Japan	2
3. Extraneous or Variable Factors Which Influenced the Pattern of the Pacific War	3
a. Concepts of Warfare	3
b. Command Structure	4
c. Evaluation of the Capabilities of the Weapons Available	5
d. Theater Priority	5
e. Pollutant Considerations	6
f. Prematurely Pronounced Objectives	6
g. Summary	6
4. Fixed or Invariable Factors Which Influenced the Pattern of the Pacific War	7
a. Logistical Potential and Vulnerability of the United States, Including Manpower and Material	7
b. Japanese Logistical Potential and Vulnerability	7
c. Geography and Weather	7
II. ORGANIZATION OF MATERIAL FOR ANALYSIS	
1. General	9
2. Chronological Phasing	9
3. Operational Area Groupings, Progressing Counterclockwise Around Japan's Perimeter of Expansion	9
4. Interrelation of Chronological Phases	10
5. Interrelation of Operational Area Groupings	10
6. Consideration of Each Phase	10
7. Evaluation	11
III. PHASE I, DECEMBER 1941-JULY 1942, THE PERIOD OF JAPANESE EXPANSION	
1. Pearl Harbor	12
2. China	12
3. India-Burma	12
4. Southwest Pacific Area	13
5. The South Pacific	14
6. The Central Pacific Area	15
7. The Aleutian Area	15
8. Major Significance of the Action of Phase I	16
IV. PHASE II, JULY 1942-NOVEMBER 1943, THE DEFEAT OF THE JAPANESE NAVAL AIR FORCE	
1. General	17
2. China	17
3. India-Burma	17
4. Southwest Pacific	18
5. South Pacific	19
6. Central Pacific	20
7. Aleutian Area	20
8. Results of the Action of Phase II	20
9. Major Significance of the Action of Phase II	20
V. PHASE III, NOVEMBER 1943-APRIL 1944, THE DEFEAT OF THE JAPANESE ARMY AIR FORCE	
1. General	25
2. China	25
3. India-Burma	25
4. Southwest Pacific	24
5. South Pacific Area	25

SECTION A. PHASE III, NOVEMBER 1943-APRIL 1944, THE DEFEAT OF THE JAPANESE ARMY AIR FORCE.		Page
1. Central Pacific		25
a. General		25
b. Gilbert Islands Invasion		26
c. Invasion of the Marshall Islands		28
d. The Invasion of Eniwetok		29
e. Operations in the Caroline Islands		29
7. Aleutian Area		30
8. Results of the Action of Phase III		30
9. Significance of the Action of Phase III		31
VI. PHASE IV, APRIL 1944-APRIL 1945, EXPLOITATION OF THE DEFEAT OF JAPANESE AIRPOWER.		
1. General		32
2. China		32
3. India-Burma		34
4. Southwest Pacific		35
a. Advance to Morotai		35
b. Leyte Operation and Second Battle of the Philippine Sea		35
c. Balance of the Philippine Campaign		41
5. Central Pacific		42
a. General		42
b. Mariana Operation		42
c. Invasion of Iwo Jima		43
d. Invasion of Okinawa		44
6. Japanese Home Island Area		45
a. General		45
b. Land-Based Air Attacks, Phase IV		46
c. Carrier-Based Attacks, Phase IV		47
7. Aleutian Area		47
8. Results of the Action of Phase IV		47
9. Significance of the Action of Phase IV		48
VII. PHASE V, APRIL 1945-AUGUST 1945, PERIOD OF INTENSE DIRECT AIR ATTACK ON JAPAN PROPER.		
1. China		50
2. India-Burma		50
3. Southwest Pacific Forces		51
4. Central Pacific Forces		51
5. Japanese Home Islands		52
6. Results of the Action of Phase V		52
7. Significance of the Action of Phase V		53
8. The Antisubmarine Campaign		53
VIII. THE SIGNIFICANCE OF THE AREAS OF OPERATION AND POSSIBLE ALTERNATE USE OF FORCES.		
1. China		55
2. India-Burma		55
3. Southwest Pacific and South Pacific		56
4. Central Pacific		57
5. The Aleutian Area		58
IX. AN EVALUATION OF THE OVER-ALL OPERATION.		
1. Limited Concepts		59
2. Logistics		59
3. Intelligence		59
4. Training		59
5. Capacity for War		64
X. SIGNPOSTS.		
1. Faulty Inferences Which May Be Drawn From the War against Japan		65
2. Signposts		65

MAPS

- Map No. 1—Phase I, Japanese Expansion.
 Map No. 2—Phase II, The Defeat of the Japanese Naval Air Force.
 Map No. 3—Phase III, The Defeat of the Japanese Army Air Force.
 Map No. 4—Phase IV, Air Victory Exploited by Rapid Surface Advances, and Phase V, Intense Direct Air Attack on Japan Proper.

INTRODUCTION

In the historical treatment and evaluation of any war, the victor may easily be led into platitudes and innocuous analyses. Observing the results of his work—the defeat of his enemies—the victor has the strong human tendency to believe that his methods were right and proper, because he was the victor.

The mistakes of the defeated foe, however, stand out in bold relief. His national structure, strained to the limit and then finally collapsing, clearly reveals the flaws in his thinking and in his military pattern. However, those same basic flaws may have existed within the structure of the victor—but were never spotlighted nor clearly revealed because the structure was never critically strained.

Thus, glibly and with a sense of righteousness and virtue, numerous writings today point out the weaknesses in the Japanese national structure and the deficiencies of the Japanese war machine. We recognize that his Army and Navy efforts were not well coordinated either in the production echelon or the combat echelon; that his concepts of aerial warfare were limited and faulty; that his logistic support plan was incapable of meeting the demands of his strategy; that his concept of defense in depth was limited to two dimensions; that he consistently violated the principles of concentration of effort and economy of force; that he overestimated the importance and the value of the Pearl Harbor attack and many others. However,

we seldom look critically within for evidence of the same weaknesses.

Actually, the United States of America overwhelmed Japan by virtue of the greater depth in our technological echelon, our much greater logistical potential for war, and the geographic disadvantage of the Japanese economic structure. Many of those weaknesses which we condemn in the Japanese war machine were found in our own organization. In fact, many were patterned after our own thinking and establishments.

We overwhelmed Japan by sheer physical strength. Japan inherently lacked the capacity to wage a successful war on the United States of America. However, had we faced an enemy whose logistical potential for war approximated our own and who did not suffer from geographic disadvantages, the weaknesses in our own structure might soon have been tragically apparent. There exists, in the future, a possible coalition of powers whose logistical potential will exceed our own and whose geographic position will be advantageous. It is therefore imperative that, basking in the glow of victory, we honestly examine some of our derelictions.

This document, therefore, passes over rather quickly those things which were done without serious fundamental flaws, and attempts to emphasize those features, functions, and operations which point up the need for change in thinking, organization, or employment of military forces.

SECTION I

FACTORS ESTABLISHING THE GENERAL PATTERN OF THE WAR AGAINST JAPAN

1. Scope.

Primarily, this report deals with the air effort against Japan in World War II. However, an evaluation of the air effort requires a corollary appreciation of the over-all strategy evolved for prosecution of the war and a corollary treatment of the actions of the surface forces, both land and sea, which were related to the air action.

In order to evaluate the strategy and tactics of the war against Japan and to assess the role of airpower in that war, it is necessary to assume a point of departure with respect to time.

American prewar strategy traditionally has had for its objective the avoidance of war--if such could be accomplished without sacrificing our national security and way of life. With the benefit of hindsight, we now know that firm political action, and possibly minor military action, in the years preceding World War II would have obliterated the major campaigns we later were forced to undertake. Hence, we are led to the conviction that our prewar strategy failed.

Our political strategy and military concept and structure during the interval between World War I and World War II formed the basis from which we mounted our military effort beginning 7 December 1941. An analysis of this interim period, however, is a problem in itself and requires treatment running into many volumes.

This paper, therefore, deals with the position in which we found ourselves at the outbreak of actual armed hostilities and the strategy and conduct of the war from that point forward.

2. Factors Influencing the Pattern of the War Against Japan.

a. The general pattern of the war against Japan was established by a combination of several factors. These factors may be broken down into two groups, as follows:

- (1) Extraneous or variable factors, which depended on decisions made by human beings and influenced, not only by rationality, but also by custom, tradition, precedent, and service-pride.
- (2) Fixed or invariable factors, which could not be altered by decisions of human beings.

b. The extraneous or variable factors affecting, in a major degree, the pattern of the war against Japan were as follows:

Concepts of warfare embraced by our military leaders.

Command structure, resulting from decisions made by human beings and influenced strongly by tradition and precedent.

Evaluation, by responsible leaders, of the capabilities and limitations of weapons.

Theater priority, as influenced by other military or political commitments.

Political considerations.

Prematurely pronounced objectives.

Japanese position or reaction with respect to these same factors listed above.

c. The major fixed or invariable factors which affected the pattern of the war against Japan were as follows:

Logistical potential and vulnerability of our own country, including manpower and matériel.

Japanese logistical potential and vulnerability, including manpower and matériel.

Geography and weather.

Space and time.

Capabilities and limitations of weapons, which in turn were functions of technology and science.

State of military preparedness at the outset of the war with respect to intelligence, training, and logistics.

d. The strategy adopted, thus, was not developed purely from logical process in the solution of a military problem. Rather, through a process of evolution a strategy was adopted which met most of the requirements growing out of the several factors, both real and extraneous.

These factors will be discussed briefly in order that the specific influence of each on the pattern of the Pacific War may be more fully appreciated.

3. Extraneous or Variable Factors Which Influenced the Pattern of the Pacific War.

a. *Concepts of Warfare.* A major factor influencing the pattern of the Pacific War was the automatic adherence of military leaders to two concepts of warfare which had become outmoded prior to our entry into the war through the rapid evolutionary advance in the power of air weapons. These concepts were:

- (1) That the course of the war in the Pacific would be decided by naval surface engagements.
- (2) That physical invasion of the Japanese homeland was essential in achieving the victory.

With respect to the first of these concepts, prior to the war it was generally believed—and strategic plans were made accordingly—that in the event of war with Japan, the decisive action would take place in great naval surface battles, as the result of which one belligerent would emerge victorious and would dominate the sea. Dominating the sea would assure victory, as it would impose economic blockade on the enemy, limit his troop movement, reinforcement, and supply, and eventually permit concentration of friendly troops when and where desired.

Fortunately for the United States of America, this myth was soon exploded. With the greater number of our key battle-line ships on the bottom at Pearl Harbor—as the result, not of naval surface action, but of carrier air attack—our defeat would have been assured if this concept had been true. Later action—in which the British *Repulse* and *Prince of Wales* were sunk by air attack and in which the major engagements of our Navy with the Japanese Navy were won or lost in the air without the surface elements ever making contact—further emphasized that this concept of naval surface action could not survive in the Air Age.

Nevertheless, even though naval tactics and strategy were modified more fully to exploit the Naval Air Arm, construction and training programs for powerful surface units other than carrier and submarine were continued. This diversion of national resources and civilian and military manpower to the production, operation, and protection of heavy surface warships logistically and tactically weakened the major Pacific offensive operations, including Navy carrier power and the Navy submarine strength, which played such a vital role in the interdiction of Japan's life lines of communication.

With respect to the second of these surface concepts—that physical invasion of Japan was essential to victory—theoretical discussion on this point had been continuing for a generation. Only the visionary dared predict that airpower, applied directly at the vital points of an enemy's national structure, could achieve victory without surface invasion. Likewise, only the visionary dared predict that an adequate fleet of submarines, less the resource-consuming heavy battleships and cruisers, could, in this particular war defeat Japan by cutting her line of communication to the Indies. Hence, the core of our strategy in the Pacific, as in the European theater, was to move ground forces into the enemy homeland for the decisive struggle. This basic concept dominated our military thinking during the war and during the years preceding the war, and was thus responsible for our strategy, our military organization, and for the weapons we were to use. Our air weapons, being considered in prewar years as ancillary weapons, were developed under this influence. This concept served to retard, rather than to accelerate, the development of range and firepower in combat aircraft and the over-all capability of airpower.

When the order of battle was drawn, it was this same concept which defined the relative roles of the three main forces and which governed their employment. In order to move ground forces into Japan for the final and decisive battle, we needed staging areas within reasonable range of the Japanese homeland and free movement of our Navy to effect and guard the transport of troops and supplies. However, our fleet could not move freely until it had won domination of its own element, and it could not achieve such control without advancing its line of bases for fleet support. These bases had to be won by land, sea, and air action. Early experience dictated the need for air control

over our advancing surface forces and over our line of communication. To gain and maintain air control, forward bases, were required from which the sustained force of our land-based aircraft could be brought to bear. Each element had its own logic of action and its own requirements. The basic aim of our strategy was invasion of the enemy homeland by ground forces but, since sea-power and airpower had to be enlisted to accomplish this aim, their strategies and logistic requirements had to be met along with those of the invasion itself. Thus the simple need for ground force staging areas, for fleet bases, and for advance airfields snowballed into a full-fledged stepping-stone campaign as the central strategy had to be expanded and modified to fill the needs of the forces enlisted in support of that strategy.

It is important that we distinguish between the over-all strategy and the strategic needs of the forces assigned to carry it out. The over-all strategy called for invasion and we committed air power and sea power to prepare for and support the invasion. By committing these forces, we also committed ourselves to the stepping-stone campaign which is the most conspicuous feature of the early stages of the Pacific War.

In the later stages of the war, while our full-scale amphibious invasion force was being readied, our long-range bombers, based 1,500 miles from Japan and outside the operating radius of her land-based aircraft, carried sufficient tonnage of bombs to Japan to destroy her principal cities and industries and to convince her leaders of the futility of further resistance. Japan surrendered because her intact home army could no longer protect her people from destruction by air attack, even though it should repel the surface invasion.

Thus, concepts of warfare which visualized the decisive military action as occurring either in a fleet battle line action or in a major land battle in the Japanese home islands formed the pattern for each of the two major drives aimed at Japan. That there would be two major drives had been authorized by the Joint Chiefs of Staff and established in the command structure. This factor will be discussed in detail in the next paragraph.

b. Command Structure. The major military effort against Japan was mounted through two axes of advance. Each axis of advance was composed of elements of all three of our military forces—Army, Navy, and Air Force. However,

one axis was predominately Army and was under the command of an Army officer and the other axis was predominately Navy and was commanded by a Navy officer. These two axes of advance were parallel and competing and, throughout the war, were never placed under a single commander for Pacific operations. Thus, there were two major surface thrusts aimed at Japan—each under its own commander—coordination between the two being the responsibility of the Joint Chiefs of Staff.

The major thrust under Army Command began at Port Moresby, in southeastern New Guinea, moved up the northeastern coast of New Guinea through Hollandia, Wakde, and Biak to Nomonfoer and Morotai, and thence to the Philippine Islands. The forces employed were designated as Southwest Pacific Area Forces. Movement of elements of these forces to Okinawa was started in July 1945, after this island had been seized by Central Pacific Forces.

The first thrust under Naval Command was launched in the lower Solomons and advanced from Guadalcanal to Bougainville, Green Island, and Emirau Island. These forces were designated as South Pacific Forces. However, it was obvious from the beginning that the Solomons campaign and the New Guinea campaign would be exploited along the same axis toward Japan—as the New Guinea action, if successful, would pinch off the thrust through the Solomons.

After almost 2 years of Army-Navy-Air Force hammering in the New Guinea-Solomons area had established a breach in the Japanese defenses, there was a choice between several courses of action for employment of our Pacific Forces. One possibility lay in merging the Southwest Pacific and South Pacific Forces under a single command for a continuation of the thrust toward the Philippines. The logistical organization and resources building up behind the South Pacific Forces were greater than that behind Southwest Pacific Forces and much greater power could thus have been thrown against the enemy at one spot along his shaky perimeter. A second possibility was to exploit the New Guinea-Solomons breakthrough and in a combined Army-Navy-Air operation drive directly through the Admiralties toward Truk and the Marianas, bypassing the Gilbert and Marshall Islands and the Philippines. Still a third possibility existed. This was to route the

forces under Naval Command through the Gilbert and Marshall Islands, and thence to the Marianas, Iwo Jima, and Okinawa while the forces under Army Command continued in their drive toward the Philippines by way of New Guinea. This third course of action, which effectively divorced the major Army and Navy Commands in the Pacific and which compromised unity of command and control, was followed.

As a result of this decision, the South Pacific area drive through the Solomons was terminated at Emirau Island and the forces employed under Naval Command in succeeding operations shifted their major effort to the Central Pacific and became generally known as Central Pacific Forces of the Pacific Ocean Area Command.

c. Evaluation of the Capabilities of the Weapons Available. A third major factor which influenced the pattern of the Pacific War is hinged closely to the second factor discussed above, but warrants some individual consideration. This third factor was the restricted appreciation, on the part of military leaders, of the full military potentiality of airpower.

Even though the Marianas were captured before the first Philippine landing—thus providing the base from which Japan could be brought under direct air attack—occupation of the Philippines was considered necessary to provide staging bases for the invasion of Japan proper and to establish complete interdiction of Japan's life lines of communication to the Netherlands East Indies. However, had the potentiality of aerial mining been grasped a year earlier, the one wing of B-29s (operational from China bases in June 1944) in night mining of Japanese harbors from the Marianas would have severed these life lines of communication just as completely as they were severed by the blockade from the Philippine area and at a much smaller cost. Similarly, an early large-scale submarine offensive could have accomplished the same results.

Thus, lack of appreciation of the capabilities of weapons available and failure to appreciate that sustained air attack directed against the Japanese home islands was capable of inducing unconditional surrender, without invasion, led to the acquisition of land masses for interdiction purposes and sufficient in size and at suitable distance to permit staging a large-scale surface invasion of the Japanese home islands.

d. Theater Priority. The fourth major factor influencing the general nature of the Pacific War was the basic top level strategic decision to defeat Germany first and Japan second. That this decision was sound is beyond dispute. The industrial and scientific potentiality of Germany was so much greater than that of Japan that any inordinate delay in attacking Germany could have been extremely costly. Had the strategy been reversed, and had the decision been made to defeat Japan first, German development of V-weapons and jet-propelled aircraft would have increased the probability of a German victory in Europe and the collapse of England before our Air Forces could have been deployed effectively in that theater.

The number one Army priority for men and matériel having been assigned to the European War, early Pacific action was necessarily conducted with less resources than desirable. This fact alone indicated the desirability of combining all resources available for offensive action in the Pacific into a single powerful striking force. However, in Japan we faced an enemy weak in industrial production capability and, even in splitting our forces, we achieved such overwhelming superiority in matériel that it was possible eventually to launch two full-scale attacks. Against an enemy whose strength approximated our own, such strategy would have invited disaster.

Early action—with the greater part of our Navy battle-line strength incapacitated at Pearl Harbor and only remnants of Army air and ground forces scattered from Australia to Hawaii—was necessarily limited to efforts to stop Japanese expansion. From these resistance points, where the Japanese expansion was stopped, initially sprang small Allied counterattacks and, later, as the perimeter defenses were breached, full-fledged offensive thrust were aimed at the heart of the Japanese empire.

Of great significance in the conduct of the Pacific War was the fact that this early action had to be conducted with a minimum of resources. This led to an immediate dependence on airpower, both land- and carrier-based, because even a limited amount of air striking power could penetrate surface defenses and begin to carry the fight to an enemy vastly superior in naval and ground force strength. Hence, while navies were being rebuilt

and ground forces were being mobilized and trained for a final decisive invasion of Japan at some future distant date, airpower was, of necessity, given a greater chance to demonstrate its military potentialities than it otherwise might have been given. Even though only very limited airpower was available, the results of early air action were so conclusive that, subsequently, both Army and Navy tactics were adjusted to exploit more fully the air arm in the attainment of objectives. However, the evolutionary process, which modified tactics, stopped short of full maturity. The basic strategic concept of surface warfare—invasion—was never seriously questioned by military leaders. The surface invasion of Japan was scheduled for November 1945 when—as an unexpected byproduct of air action—Japan surrendered in August, 8 months before the planned assault on the home islands.

Thus, a condition of Army and Navy surface force unpreparedness and inadequacy and a low theater priority forced an evolution in tactics in the Pacific War in that it forced an extensive employment of airpower. Because of the surface concepts of warfare, which dictated our Pacific strategy, it is questionable that airpower would have been given the opportunity to kill the enemy before invasion had we possessed the surface force strength in 1942 which we possessed in late 1945.

c. Political Considerations. The over-all course of the war against Japan was less influenced by political considerations than was the war against Germany. Campaigns in which political considerations did have a profound effect were the Central and South Burma campaigns and the reoccupation of the Philippines.

In the China-Burma-India theaters, American and British National interests were widely divergent. The objective of United States Forces was primarily to utilize India as a springboard for forwarding supplies to China. This action was intended to keep China in the war and to provide attrition and holding operations against Japanese forces in China. The primary objective of British forces in India was to recapture Burma and Singapore, for postwar political reasons, before the end of hostilities. In a compromise of national interests, American forces were committed to the Central and South Burma campaigns for which there was no real military requirement.

With respect to the Philippines, the viewpoint that military advantages would accrue from reoccupation was reinforced by the political requirement to free the Philippine people from Japanese domination. This sense of a national obligation to the Philippine people coupled with the military evaluation fore-ordained the reoccupation of the Philippines.

f. Prematurely Pronounced Objectives. Very early in the war, various objectives, which had not been processed along lines of sound strategy, were established. These objectives had a profound effect on the evolutionary development of Pacific strategy and a continuing impact on all operations. The unconditional surrender policy and the Allied intermediate objectives to go back into Burma, the Philippines, and Singapore are examples of prematurely pronounced objectives which had a major influence on the conduct of the war in that they hampered the development of an objective strategy pointed solely toward the effective removal of Japan as a military and political threat to our national security.

Personalities also affected the establishment of objectives and, further, acted to perpetuate the cleavage in the command structure. Our prewar military structure and system tended to develop specialists trained primarily under the influence of the doctrine and tradition of their own service. It was therefore unavoidable that many senior military leaders suffered from an excess of service pride and adhered to doctrine not sufficiently broad to meet the requirements of integrated land-sea-air warfare. This condition resulted in constant maneuvering within the military structure for positions advantageous to particular services and led to strategic solutions and engagements in consonance with limited, rather than over-all, military appreciations.

g. Summary. Therefore, the general nature of the Pacific War was not purely the result of sound military analysis. Rather:

Surface concepts of warfare, which were tinged to the belief that the decisive military actions of the war would occur in land and sea battles, led to the invasion and acquisition of many militarily unnecessary islands and land masses, and to the logistic preparation for a surface assault of the Japanese home islands.

These same surface concepts of warfare led to a division of our forces between two axes of advance.

Failure to evaluate correctly the capabilities of aircraft and the submarine further supported the acquisition of militarily unnecessary land masses and islands.

Low theater priority and the paucity of surface military force available, at the outset of the war, led to an exten-

the employment of aircraft which forced an evolution in tactics and a potent evolution in military concept. Political considerations supported strategic plans to occupy Central and South Burma and the Philippine Islands.

The personal views and objectives of individuals in responsible positions were, at times, limiting factors in the development of an objective strategy and frequently led to intermediate military operations not fully consistent with the over-all objective of the war.

4. Fixed or Invariable Factors Which Influenced the Pattern of the Pacific War.

a. *Logistical Potential and Vulnerability of the United States, Including Manpower and Material.* Even though our governmental and military structure had barely started mobilization at the beginning of armed conflict with Japan, our potential military power was the greatest in the world at that time. In addition, we were not starting entirely from a peacetime economy. Prior to 7 December 1941, British and other foreign orders had served to expand and develop our aircraft engine and airframe industries and lend-lease had stimulated both basic and end-product industries.

Our great potential military strength lay in the great depth of our technological echelon, in the ready availability, with few exceptions, of basic materials, in the existence of our transportation and communication systems, in the existence of basic mechanical facilities and equipment, in the proximity of our national resources to our basic industries, in the managerial capacity of American business, and in the mechanical and scientific ingenuity of American people.

This American industrial complex was, at that time, relatively safe from crippling attack. The weapons and the military organizations which had been produced by our enemies were incapable of destroying our industry or our domestic training establishments before the raw materials and the raw manpower could be welded into combat units.

b. *Japanese Logistical Potential and Vulnerability.* Japan's emergence from a medieval culture had been fairly recent. While she had made rapid mechanical and technological strides under governmental direction, the great mass of the Japanese people had not been associated from birth with the products or the processes of a mechanical civilization. Hence, her technological echelon had no depth. This made her training problem relatively difficult—as she was forced to conscript agrarian peoples and plunge them into occupations and activities for which they were ill prepared. This

condition also put a high premium on both the civilian and military components who were trained up to a satisfactory proficiency level. Once lost, they were almost irreplaceable.

From the standpoint of war industry and economy Japan was in a very precarious geographical position. Her basic and end-product industries were concentrated largely in the home islands, while the bulk of her natural resources lay almost exclusively in the Netherlands East Indies Area, in northern China, and in Manchuria. Connecting the industrial facilities and the raw materials areas required that Japan establish and secure sea lines of communication—long, tenuous, and inherently vulnerable. Japan's geographic position, with respect to her war economy, was so weak and her industrial potential, at peak load, was so far below that of the United States that, at best, she could plan only for a war of short duration and limited objective.

c. *Geography and Weather.* The effects of geography on the economic vulnerability of Japan and the United States have been mentioned above. In addition to providing a natural target in the Japanese life line of communications, geography also affected our strategy in other ways.

The geography of the axis of advance of the Southwest Pacific Forces through New Guinea and the Philippine Islands provided stepping stones of sufficient land mass to accommodate effective land based airpower and large-scale troop staging areas. This axis of advance was not entirely suitable to support by carrier aviation due to the vulnerability of the carrier and the fleet to land-based enemy aviation.

On the other hand, the geography of the Central Pacific Forces' axis of advance through the Gilbert and Marshall Islands to the Marianas was ideal for carrier action. After the effective striking power of the Japanese Naval Air Force had been broken, principally by a combination of the Fifth Air Force sustained air offensive against Rabaul, the air battles in the New Guinea-Bismarck area, the air battles in the Solomons, and the Battle of Midway, the fleet could advance on the series of small, nonreinforceable atolls with an overwhelming carrier air superiority and meet little effective air opposition. It was recognized early in the war that the strategic mobility of the carrier—the floating air base—was limited by its vulnerability to air attack. Thus, land masses basing an effective

air striking force were necessarily avoided until a reasonable degree of air superiority over the area had been insured.

Geography also affected theater organization and command problems. While it was militarily logical and workable to combine the entire Pacific offensive against Japan under one command and into one powerful thrust, it was not feasible to include within that command India, Burma, and China. In this area and in the Aleutian area only holding operations and limited offensives were at that time logistically practicable. Because of the great distances involved, the short range of air equipment available at the time, the isolated nature of the operations in these areas with respect to Pacific action, and the political aspects of the China-Burma-India Area, separate commands on the theater level were justifiable. Separate commands on the theater level in China-Burma-India and the Aleutians did not lead to parallel and major competing military operations, as did the division between Southwest Pacific and Central Pacific Forces.

Incllement weather has been the bane of military commanders from time immemorial, and weather offered air power one of the greatest challenges it encountered in the war against Japan. Air operations were restricted by bad weather in many ways. The problems of locating and hitting the target, formation control, navigating to and from the target, of getting safely back down to base, of search and reconnaissance, and of rendering close support to the surface forces were all complicated by the weather factor. However, steady advances were made throughout the war. The extension of the range of aircraft, the utilization of airborne radar, and the development of electronic aids to navigation and aircraft control lessened the effect of many of the earlier crippling restrictions.

d. The real factors of time and space, capabilities and limitations of weapons, and state of American military preparedness at the outset of the war have been treated in connection with other factors discussed in the paragraphs above and will not be repeated here.

SECTION II

ORGANIZATION OF MATERIAL FOR ANALYSIS

1. General.

In order to correlate the various actions against Japan and present a composite picture of the overall effort, this paper will consider the war under five chronological phases and under seven operational area groupings as indicated in the following paragraphs.

2. Chronological Phasing.

a. For the purpose of this report, no exact date is established as the end of one phase and the beginning of another. In general, the months selected as transition periods from one phase to another include action which terminated one phase and embarked upon another. It is particularly significant to observe that no phase of air activity started full scale, from scratch, at the beginning of a particular phase. Preliminary and pioneering operations inevitably occurred in the latter part of each phase, setting the stage for the next important series of operations and events.

The phasing selected below is a realistic and not an arbitrary arrangement. It defines the progress of the war in a form which is applicable to any war ever fought with any type of weapon. The basis of this phasing is as follows:

Step 1: The expansion of one of two opposing forces—the threat to the security of one force by the action of another; concessions and/or withdrawals by one force—initial action to stop the resurgence or expansion of the other.

Step 2: The struggle between opposing forces at the decisive time and place—during which the military potential of one belligerent is damaged beyond its future capability for rebuilding and rehabilitation.

Step 3: The exploitation of the decisive victory, by one force destroying in detail the disorganized and ineffective remnants of the opposing military power.

Step 4: The overwhelming application of power by one belligerent at the seat of government or

command of the opposing force in such form as to achieve capitulation.

b. The phasing of this report follows:

Step 1:

Phase I—December 1941–July 1942. The period of Japanese expansion.

Step 2: This step has been broken down into two phases for the sake of clarity in presenting the use of our own forces and the enemy's use of his forces in the decisive battles of the war.

Phase II—July 1942–November 1943. The defeat of the Japanese Naval Air Force.

Phase III—November 1943–April 1944. The defeat of the Japanese Army Air Force.

Step 3:

Phase IV—April 1944–April 1945. Exploitation of the defeat of Japanese airpower by rapid surface advances to the Marianas, Philippines, Iwo Jima, and Okinawa.

Step 4:

Phase V—April 1945–August 1945. Intense direct air attack on Japan proper inducing unconditional surrender without invasion.

3. Operational Area Groupings, Progressing Counterclockwise Around Japan's Perimeter of Expansion.

a. *China Area.* The Fourteenth AF and Chinese ground forces fought a holding operation against Japan's attempt to neutralize and dominate all of China. The Fourteenth AF obtained air superiority over China, attacked Japanese shipping in the Gulf of Tonkin, the Yangtze River, and the South China Sea and interdicted North China and French Indo-China railroads.

b. *India-Burma Area.* The Tenth AF, Royal Air Force, and British, American, and Chinese

ground forces expelled the Japanese from Burma. Fifth AF and Royal Air Force units achieved air superiority over Burma, interdicted Burma and Siam lines of communication, provided close battle strike air support to advancing infantry, and supplied and transported the bulk of the military effort in Burma by air transport. The Air Transport Command, based in India, provided the only line of communications affording military assistance to China from the outside world. The air supply operation across the Himalayan "hump" from India to China was the greatest air transport effort yet attempted.

c. *The Southwest Pacific Area.* The Fifth AF (and Thirteenth AF after June 1944) and ground and naval forces advanced from Port Moresby to the Philippines by way of the northeast coast of New Guinea, Biak, Noemfoor, and Morotai, thence to Okinawa after its seizure by Central Pacific Forces. The effective power of the Japanese naval force was destroyed in air attacks and air battles in the New Guinea-Bismarck-Rabaul area and by simultaneous operations of South Pacific Forces in the Solomon area. The Japanese Army Air Force was destroyed as an effective striking force in the air battles over New Guinea and in the air attacks against New Guinea bases, particularly Wewak and Hollandia. All of Japan's sea lines of communication to the Netherlands East Indies and to New Guinea and the Solomon Islands were brought under the domination of land-based aircraft. Air attacks isolated the battle area from reinforcement, neutralized numerous beachheads before invasion, and subsequently provided close battle strike assistance in securing objectives.

d. *South Pacific Area.* The Thirteenth AF, under naval operational command until June 1944, and Marine and Naval air and surface forces fought the Battle of the Solomons from Guadalcanal to Emirau Island. South Pacific Area air units, jointly with Southwest Pacific Area air units, participated in the destruction of the Japanese Naval Air Force.

e. *Central Pacific Area.* Central Pacific Forces mounted a major effort in the surface advances through the Gilbert and Marshall Islands and the Marianas to Iwo Jima and Okinawa. The Seventh AF was under operational control of the Navy for the greater part of this operation and actually served as a land-based Naval air arm

for the greater part of the campaign. Land-based airpower of the Seventh AF and carrier- and land-based aviation of Navy and Marine units spearheaded this advance.

f. *The Aleutian Area.* The Eleventh AF, and Navy and Army surface forces stopped the Japanese advance in the Aleutian chain and expelled the Japanese from Kiska and Attu Islands. Subsequently, the Eleventh AF continued minor harassing raid against Kurile Island targets.

g. *Japanese Home Islands Area.* The Twentieth AF principally, assisted by the Fifth and Seventh Air Forces and fleet and carrier action, brought the Japanese home islands under decisive aerial attack which ended the war.

4. Interrelation of Chronological Phases.

The chronological phasing selected in this paper is based on significant results of air and surface action which mark a definite milestone in the war against Japan. However, no chronological phase may be considered independently of the phase preceding and following it, and the action of each phase must be evaluated with respect to its relationship to the over-all objective of the war—the defeat of Japan. Only by such approach can a proper correlation be established and possible alternate uses of the forces available be considered. And, these possible alternate uses of the forces available must be considered in any realistic evaluation of the Pacific War.

5. Interrelation of Operational Area Groupings.

Like the chronological phasing, the action occurring in any one operational area cannot be treated realistically as an isolated campaign. Action in each area profoundly affected the action in all other areas, if only from a logistical standpoint. Likewise, both the enemy's and our own local area strategies were influenced by the developments in other areas, and target systems contiguous to two general operational areas frequently came under attack from both. This analysis will show at the appropriate places the interrelation of both chronological phasing and area action.

6. Consideration of Each Phase.

In the text which follows, each of five chronological phases is considered in separate sections and

an attempt has been made to focus on the action and developments which were significant to the over-all conduct of the war against Japan and significant to future military strategy. As a general pattern for presentation, the chronological phasing will be followed and, within each phase, the action will be considered, by areas, in the same order as listed in Paragraph 2 of this section so far as practicable.

7. Evaluation.

Sections III to VII, inclusive, which cover in brief form the history of the war against Japan by the phases defined above, are followed by—

Section VIII—The significance of the areas of operation and possible alternate use of forces.

Section IX—An evaluation of the over-all operation.

Section X—Signposts.

SECTION III

PHASE I, DECEMBER 1941-JULY 1942 THE PERIOD OF JAPANESE EXPANSION

1. Pearl Harbor.

Confident of a German victory in Europe and goaded by the strangulation of the American embargo—which was drastically impairing the development of the Greater East Asia Co-prosperity Sphere—Japan rightly assessed that her capabilities could only wage a successful war of short duration and limited objective. Japanese strategists, like many Americans, believed that the course of the war in the Pacific would be decided by naval surface action. Consequently, the attack of 7 December 1941, on Pearl Harbor, was designed to reduce our naval surface strength to a relatively impotent force. In the attack, launched from Japanese carriers some 300 miles to the northwest, the United States lost five battleships out of action for 1 year or more, three battleships out of action for 3 months or more, three light cruisers out of action for 3 months or more, three destroyers and five miscellaneous ships out of action for 1 year or more, and approximately 200 grounded Army and Navy aircraft out of a total of 402 in the area. Enemy losses were approximately 80 aircraft. The Japanese attack was carried out in two waves. Significantly, initial elements attacked the airfield installations and the aircraft on the ground and the succeeding elements attacked the ships.

This was a surprise attack of crippling proportions and indicated immediately three lessons of continuing value:

- a. That war or attack may develop suddenly and without the formalities of Congressional action.
- b. That exact intelligence of a potential enemy, in peace and war, is of incalculable value. Without exact intelligence on our fleet and airfield disposition and our psychology of preparedness at the moment, the Japanese raid could not have been so devastatingly successful.
- c. That capital surface ships are extremely vulnerable to air attack, with or without atomic

bombs. In this first action of the war it was clearly demonstrated that airpower would dominate naval warfare.

Immediately following the attack on Pearl Harbor, Japanese drives around her entire perimeter were rapidly developed. This Japanese expansion phase will be considered briefly in the order of area groupings given in Paragraph 8 of Section II.

2. China.

During the years 1931-40, Japan had penetrated China to the extent that virtually all Chinese industry and communications were under Japanese domination. Japan had occupied Manchuria, industrial North China, the Yangtze River Valley Corridor, and key coastal areas. Japanese occupation of French Indo-China in July 1941 and the seizure of Hongkong in December 1941, shortly after Pearl Harbor, sealed China off from the Pacific. By May 1942 China's only remaining surface line of communication to the outside world, the Burma Road, was lost in the Japanese occupation of Burma.

Air action during Phase I, by the American Volunteer Group, forerunner of the Fourteenth AF, consisted of—

Air defense of the Kunming base area, which was being developed into the Air Supply Terminal for China.

Air attacks in the Salween area against Japanese troops which were attempting to invade China through the back door from Burma.

3. India-Burma

The Japanese attacked Burma in December 1941 from bases in Thailand. Spearheading their attack, they employed 800 to 600 Army airplanes which were followed by approximately 100,000 ground troops. In initial air battles over Rangoon between the American Volunteer Group and the attacking Japanese Air Force, our limited Air Forces maintained local air superiority sufficiently long to permit an orderly evacuation of the inadequate Rangoon defense forces.

Mergui and Thabeigy were captured by quick Japanese thrusts in January 1942, and Rangoon was evacuated in March. Gen. Joseph Stilwell and Britain's General Alexander unsuccessfully attempted to block the Japanese drive between Toungoo and Lashio with a combination of Chinese, British, and Indian troops. They were badly defeated and, with their forces disorganized and separated, both the British and American Command Headquarters were forced to abandon their troops and retreat back over the China Hills into India.

By May 1942 Japanese ground forces had advanced to Mandalay and Myitkyin. In June their advance was stopped, not by effective Allied resistance, but by the mountain barrier between Burma and India and by supply line difficulties.

In this campaign, the Japanese demonstrated that they understood the employment of tactical air power in direct support of surface operations. From advance air bases the enemy attacked air and surface objectives in strength. When air domination had been won, it was quickly exploited by surface penetration and isolation of objective areas which provided air bases from which the process could be repeated.

During this period the few available aircraft of the nucleus of the Tenth AF and RAF were active principally in evacuating personnel from Burma and in flying in emergency supplies to retreating forces. Local air defense of the Calcutta area, Imphal, and Upper Assam was established with the few AAF and RAF fighter aircraft available.

4. Southwest Pacific Area.

a. *Philippine Islands.* Even though the Pearl Harbor attack was known, the Japanese air attack on our Manila air installations on 8 December 1941 caught our aircraft on the ground. A high percentage of American aircraft was destroyed and the enemy soon dominated the air. Quickly exploiting the air victory, the enemy reinforced his air and surface forces and eliminated Philippine defenses in most of the area. United States and Philippine forces withdrew to an area in which terrain protected them from much of the air attack. There, cut off from logistic support and communications, their ultimate capitulation was assured. Bataan fell in April and Corregidor in May of 1942.

A grave weakness in our national security structure is apparent in this operation. Even though commanders of the Philippine Forces were aware of the attack on Pearl Harbor, no offensive action was taken until war had been declared officially. Delay in waiting for Congressional action in a future war may prove to be fatal.

b. *Malaya.* Spearheading with tactical air attack, as in Burma, Japanese forces landed on the rugged Malaya peninsula and moved south on Singapore in coordinated air-ground salients on both sides of the peninsula. The British, having relied on the rugged terrain to the north for protection, had faced Singapore defenses to the sea. Singapore fell in February 1942 to these forces moving down the Peninsula from the north.

On 10 December 1941 the British battleships *Prince of Wales* and the *Repulse* were sunk by Japanese air attack in the Gulf of Siam, where they were attempting to prevent Japanese amphibious reinforcement of their air-ground teams moving down the Malaya Peninsula. These two British ships were not covered by defending aircraft and were unable to repel the enemy air attack with the antiaircraft guns aboard. Japanese post-war reports indicate that, despite the fact that all attacking aircraft were obsolescent types, only four attacking aircraft were destroyed by the anti-aircraft fire of the two battleships.

c. *Netherlands East Indies and New Guinea.* With negligible air opposition, Japan rapidly exploited her air dominance of the waterways and moved approximately 855,000 troops into the Netherlands East Indies and New Guinea. Inadequate allied garrisons in the advance of the Japanese assault inevitably were attacked by air if they offered determined resistance.

The United States, Dutch, and British navies, operating in the area substantially without carrier or land-based air protection, were driven from the area back to Australia with heavy losses. Added to the destruction of our fleet at Pearl Harbor and the sinking of the *Prince of Wales* and the *Repulse*, numerous allied war and service ships were sunk by air attack in the Netherlands East Indies and Northern Australia Area in the next few months. These losses included the carrier *Langley* which went down before a Japanese task force that included at least one aircraft carrier and a number of land-based medium bombers.

By this time, it was fully understood that air power would dominate naval warfare—that domination of the sea requires, first, domination of the air above the sea. And, it was further understood that in World War II domination of the air above the sea could be achieved only through air action.

Coupled with our naval losses to air action, our forces suffered a serious reverse in the surface battle of the Java Sea, 28 February 1942, in which the heavy cruisers *Houston* and *Eastert* were damaged and withdrew and in which the light cruisers *De Ruster* and *Java* and the destroyers *Jupiter*, *Electra*, and *Kortenaar* were sunk while inflicting negligible damage on the enemy.

By 1 March 1942 Allied surface units had been withdrawn toward Perth, southwestern Australia, outside the reach of Japanese air power. Japanese air power had established an effective interdiction of the waterways over the entire area of operations of the Netherlands East Indies. During the balance of this period, United States Naval action in the Netherlands East Indies area was confined to submarine offensive patrols in enemy held waters and in air patrols of the approaches to western Australia.

Significant Army Air Force action during this period began in February 1942, when the nucleus of the Fifth AF started its counter-air offensive against Rabaul, from Port Moresby. Rabaul was the pivotal base for Japanese supply, reinforcement, and maintenance for the New Guinea-Solomons area and became a focal point of the action in Phase II. During Phase I, the Fifth AF also undertook the air defense of Darwin and soon inflicted such heavy losses on the attacking Japanese Air Force that they gave up their mass air attacks on the area. Local air superiority was established and our forces were able to start the reconstruction of our shattered Darwin bases.

By July 1942, Japanese conquest of the Netherlands East Indies was virtually complete. Sumatra, Java, Borneo, the Celebes, and the northeast coast of New Guinea were securely in enemy hands.

3. The South Pacific.

Shortly following the Japanese invasion of New Guinea, the enemy took possession of the Solomon Islands. Air effort by the nucleus of the Thirtieth AF, under naval operational control, was

predominately area reconnaissance conducted from bases in the Fiji Islands and New Caledonia.

The most significant action in the South Pacific during this period occurred in the Battle of the Coral Sea. This battle was fought between a United States carrier task force and a Japanese carrier task force which was covering an enemy invasion fleet heading for Port Moresby. Exceptional intelligence gave our forces time to prepare and insured that the United States task forces would not be surprised. During the battle, all offensive firepower by both friendly and enemy forces was delivered by carrier aviation. Opposing naval surface craft never made contact and participated in the battle only in defending themselves from air attack. By the second day of the operation, 8 May 1942, the carrier *Lexington* had been heavily damaged, 1 destroyer, 1 fuel ship, and 66 aircraft had been lost and the *Yorktown* had been damaged. The Japanese force had lost 1 carrier, 1 light cruiser, 2 destroyers, 5 miscellaneous ships and approximately 100 aircraft and 1 of her 2 remaining carriers had been damaged. Both forces subsequently withdrew—the American units heading due south, and attempting to save the damaged *Lexington*. However, the night of 8 May, fire broke out aboard and the *Lexington* was lost. The enemy failed to capitalize on the United States Fleet's withdrawal, which left open the approaches to Port Moresby, and likewise withdrew to the northeast.

This battle was of major significance to naval strategy and tactics in the following ways:

(1) It demonstrated that the carrier was the primary striking force of both the Japanese and American navies. Both opponents chose carriers as their primary targets in the interchange of air blows and both sides withdrew when their carrier potential was seriously reduced.

(2) It set the pattern for subsequent operations for our Navy in that from this time forward, daylight naval surface engagements normally were not risked so long as the enemy possessed even limited air strength in the area.

(3) The vulnerability of heavy surface ships to air attack had been demonstrated beyond question at Pearl Harbor and off Malaya where heavy and well protected capital ships were incapacitated. The action in the Battle of the Coral Sea further demonstrated, beyond question, the ineffectiveness of the air protective "CAP", Combat Air Patrol,

over the carriers. Carriers were to remain extremely vulnerable targets, because air attack could penetrate the air protection. While the fighter cover and antiaircraft guns intercepted and destroyed a great percentage of the attacking aircraft—it failed to prevent a few getting through to the target, and only a very few getting through to the target would cripple or sink the carrier.

(4) The relatively limited capability of carriers for sustained operations was demonstrated in the carrier's withdrawal from the area for fuel between 4 May-6 May, before the battle, and again their withdrawal from battle on 8 May after only 36 hours in the combat area. In later operations the carrier capability for sustained operations was increased by developing techniques for refueling and rearming at sea.

(5) This battle again emphasized that airpower dominated naval operations.

6. The Central Pacific Area.

The enemy overwhelmed Guam and Wake defenses in December 1941 and likewise occupied the Gilbert Islands in a thrust from the Marshalls.

In June 1942, a close parallel to the Coral Sea action developed in the Battle of Midway Island. Again exceptional intelligence allowed time for our forces to prepare. A Japanese Fleet of approximately 80 ships, including 5 carriers and 4 battleships, 9 heavy cruisers, and 30 destroyers, heading for Midway, was engaged by a United States Fleet which included 3 aircraft carriers, 7 heavy cruisers, 1 light cruiser, and 14 destroyers. Navy, Marine, and Army Air Forces land-based aircraft at Midway also took part. In the resulting air duel, surface forces again avoided contact and the engagement was decided entirely by air action. Japanese forces lost the four carriers committed to the action and other miscellaneous craft while the United States Navy lost the carrier *Yorktown* and one destroyer. The *Yorktown* was first immobilized by Japanese air attack and later finished off by an enemy submarine. One Japanese carrier, known to be in the general area, was not contacted and did not participate in the battle.

Having lost its carrier air arm, and thus exposing its vastly superior surface fleet to destruction from our remaining airpower, the Japanese Fleet rightly elected to withdraw. As night was coming on, our striking force also executed a temporary withdrawal, in order to avoid a night

surface engagement with the more powerful surface battle line of the Japanese Fleet. The withdrawals separated the two forces by such distance that, subsequently, major air strikes by our carrier air groups were not possible and large scale action was not resumed.

This great battle reiterated in detail the conclusions drawn from the Battle of the Coral Sea. It also established one additional significant point. The Japanese surface fleet was much more powerful than the United States surface fleet, outnumbering our forces by 4 battleships, 1 cruiser, and approximately 22 destroyers. However, the size of the surface fleet had nothing to do with the outcome of the battle. Superior intelligence permitted the proper timing of our air attack, in which approximately one-third of our carrier aircraft available, in their initial attack, knocked out three of the four Japanese carriers while the air striking force of the enemy was either still in flight or in process of re-servicing from an attack on Midway. Having lost his air potential, the enemy was compelled to retire. Our forces not only had air superiority remaining in carriers still afloat, but we possessed land-based aircraft at Midway which would still be operational even if all carriers in the area were incapacitated. The Japanese, having intended quickly to seize Midway, had carefully avoided damaging our one air strip ashore. This proved to be a mistake on the part of the enemy. Our resulting overwhelming air potential in the area, land- and carrier-based, left the Japanese Fleet in an untenable position, hence the withdrawal.

During this period, the Seventh AF, based at Oahu and at Midway, performed reconnaissance duty under naval operational control. Seventh AF aircraft participated in the search for the Japanese convoy heading for Midway and a small AAF B-17 force participated in the attack, although the significant damage inflicted on the Japanese carrier force was the result of carrier air action.

7. The Aleutian Area.

In June 1942, Japan occupied Kiska and Attu Islands in the Aleutian Area. Coincidental with the attack on Midway, the enemy also attacked Dutch Harbor by air. Eleventh AF fighters from the new base at Umnak Island intercepted the second attack wave and destroyed a number of

enemy aircraft. Surprised by air resistance in this area, and having suffered heavy operational losses due to weather, the enemy abandoned the attack and diverted his efforts in this area to the development of new bases at Kiska and Attu.

8. Major Significance of the Action of Phase I.

During the period of Japanese expansion and our initial operations to halt the enemy advance, the following significant facts were demonstrated by the actions which took place:

a. *Airpower Dominated its Own Element.* Only air weapons defeated air weapons. While surface antiaircraft weapons were capable of registering a percentage of hits at final defense points, only airpower had the capability of destroying airpower. The effective disruption of Japanese air attacks on: Kuning, China; Rangoon, Burma; Darwin, Australia; Port Moresby,

New Guinea; Dutch Harbor, Alaska; and on naval surface units in the South and Central Pacific was accomplished by airpower in counter-air action.

b. *Airpower Dominated Naval Warfare.* Our Navy suffered heavy damage at Pearl Harbor as a result of air attack. The Allied Fleet was driven out of the Netherlands East Indies by Japanese air domination. The major naval battles of Coral Sea and Midway were air battles exclusively, with the surface forces never daring to make contact in the face of the air threat.

c. Around the entire perimeter of Japanese expansion, in both land and naval action, the enemy normally preceded surface operations with air attack.

d. Area interdiction of the entire Netherlands East Indies Area, which closed the waterways to Allied naval operations, was accomplished by Japanese airpower.

SECTION IV

PHASE II, JULY 1942-NOVEMBER 1943 THE DEFEAT OF THE JAPANESE NAVAL AIR FORCE

1. General.

A study only of the surface map showing Allied gains during this 17-month period cannot reveal the magnitude or the importance of the action which took place. The almost microscopic surface advances were the results of American efforts to contain the Japanese expansion and to breach the enemy defenses. The resulting attrition of Japanese forces during the period had far reaching effects in the action of subsequent phases. Action in each operational area will be considered beginning with China and moving counterclockwise around the Japanese perimeter.

2. China.

The ground situation in China remained relatively static during this period. Japan, preoccupied with defending her outer ring of bases in the Pacific, made only limited "rice-bowl" drives in the Yangtze River Area.

The China Air Task Force (4 July 1942-10 March 1943) and the Fourteenth AF, after 10 March 1943, offered the only effective resistance to Japanese domination of China. Air action consisted of defense of the Kunming Base Area air supply terminal, which Japanese bombers unsuccessfully attempted to neutralize, offensive air strikes against the Japanese surface lines of communication within French Indo-China and China, attacks on shipping in the Gulf of Tonkin, the Yangtze River, the Formosa Straits, and South China Sea, and attacks against Japanese air and military installations within the area between Saigon and Shanghai, including Formosa. Japanese daylight attacks against the Kunming Base Area resulted in such heavy losses to the attacking forces that the enemy abandoned daylight raids and turned to harassing night operations with small numbers of aircraft.

3. India-Burma

The ground situation in India-Burma also remained relatively static during this period. Limited gains were made in the Naga Hills, separating Northern Burma and the Assam Valley, in connection with General Stilwell's campaign. This road was intended to support the American trained Chinese armies in the surface offensive through Burma and was further intended to link up eventually with the old Burma Road near Bhamo—thus giving China a surface connection with the outside world. Initial estimates of the logistical potentiality of this road were proved by subsequent events to be excessively optimistic. This will be more fully treated in connection with the operations of succeeding phases.

Operations of the Tenth AF and the Royal Air Force from Bengal and Assam bases were directed mainly at enemy air installations and lines of communication in Burma and Siam, interdiction of Japanese shipping to the ports of Mergui, Tavoy, Moulmein and Rangoon, protection of the "Hump" air supply route to China, and defense of our Bengal, Arakan, Imphal, and Assam areas from air attack. By the end of this period, our Air Forces had established air superiority over our base areas, the "hump" route was substantially freed from enemy air attack, 65 percent of the railway and road system in Burma had been disrupted, and the terminals of the sea lines of communication to Burma were under attack.

During the same period, emergency air supply by the Tenth AF to General Stilwell's road engineers and advance troops in Northern Burma set the pattern for later Burma campaigns.

The Air Transport Command relieved the Tenth AF on the "Hump" route to China in December 1942, and built the deliveries to China up to 6,400 tons per month by November 1943.

4. Southwest Pacific.

In July 1942, Japanese forces landed at Buna, on the northeast coast of New Guinea and advanced across the Owen Stanley Mountains toward Port Moresby. In August a second thrust at Port Moresby through Milne Bay was thrown back into the sea by defending air and ground forces. Meanwhile, the enemy forces advancing on Port Moresby from the Buna area were isolated by air attack, and a well coordinated Fifth AF and Australian ground force operation stopped the enemy in September and recaptured Buna in November of 1942.

Following this success, air, ground, and amphibious forces successively neutralized and occupied Salamaua, Lae, and Finschafen. During this period, the general pattern for the Southwest Pacific operation was developed—which resulted in General MacArthur's statement that the purpose of his surface operations was to advance his bomb line. From advance airfields, airpower—

Maintained air superiority over the surface objective area.

Neutralized the more distant enemy air installations within range.

Provided general area reconnaissance.

Isolated Japanese forces from reinforcement by sea.

Attacked military objectives prior to surface advance.

Provided close battle strike support to surface forces during beach landings and ground movement.

By air transport operations, provided logistic support to air and ground forces where surface lines of communication could not be used by virtue of terrain or the time element.

Transported troops, as well as supplies, in airborne and paratroop operations—thus immeasurably increasing the tactical mobility of the surface forces.

Developed new air bases—to continue extending the air penetration—as each objective area was occupied.

During this surface advance from Port Moresby to Finschafen, Rabaul was the main air base from which the Japanese, with their Naval Air Arm, could disrupt our operations. Hence Rabaul became the primary target of Fifth AF counter-air operations. Into Rabaul the Japanese poured a

steady stream of replacement aircraft and highly trained crews of their Naval Air Forces, land basing them. Our occupation of Buna, November 1942, permitted construction of an air base at Dobodura, on the north side of the Owen Stanley Range of mountains. From this base Rabaul was brought under decisive air attack between November 1942 and November 1943. Concurrently, air battles over New Guinea and the Bismarck area paid high dividends. In the course of these attacks, augmented by Thirteenth AF and Naval and Marine land and carrier based air operations in the Solomons area, the experience level of the Japanese Naval Air Force was fatally reduced. According to Japanese records obtained after the war ended, by November 1943 the Japanese Naval Air Force in the New Guinea-Bismarck-Solomons area lost 70 percent of the total of their experienced pilots having between 500-600 hours' flying time and combat experience. From this loss of experience, the Japanese Naval Air Force never recovered. Japanese aircraft carriers, less their air groups, were withdrawn to Truk and then to Japan for complete remanning and reequipping of their air components.

The final Fifth AF attack on Rabaul occurred on 2 November 1943. So complete was the destruction of the enemy air force that the attacking flights ran out of air targets and attacked and burned the shore installations as an alternate.

In all subsequent operations through the Gilbert and Marshall Islands, the Marianas, the Carolines, and Japan proper, the lack of experienced leaders and air crews in the Japanese Naval Air Force insured their quick destruction at small cost in any encounter with American Navy or Army Air Force air units.

Thus, air action in the New Guinea-Rabaul-Solomons area broke the back of Japanese Naval airpower—insured the ineffectiveness of Japanese Naval Air Forces in the area of operations of our Central Pacific Forces—and thereby insured the success of all subsequent operations of our forces toward Japan.

Also during this phase of operations, preparations were being made for the decisive action of Phase III. A string of Fifth AF air bases was developed in the interior of New Guinea in the area west of Lae, Salamaua, and Finschafen. The sites were seized by airborne troops, airborne engineers developed the fields, and air transport oper-

ations provided logistic support for the combat echelons. From these new bases, Wewak was heavily attacked in August 1943 and the bulk of Japanese Army aircraft then in the area were destroyed on the ground. Attacks against the Wewak-Hollandia area were continued into Phase III for the decisive defeat of the Japanese Army Air Force.

5. South Pacific.

The American surface offensive in the Solomons area was begun on 7 August 1942 with a landing of United States Marines at Guadalcanal and Tulagi. Preceding the invasion, the nucleus of the Thirteenth AF, under Naval operational control, based in the Fiji Islands, Efate, and New Caledonia and staging through Espiritu Santo, directed maximum though limited effort in softening up the landing areas by air attack. The landing was made under carrier air cover, though the carriers were forced to retire southward the night of 8 August due to the presence of enemy land-based aircraft in the area. That same night, an enemy surface force attacked our screening force of cruisers and destroyers off Savo Island and inflicted heavy damage on our forces, sinking four cruisers and several destroyers. This left our transports, discharging cargo at the beachheads, without naval surface protection. However, the enemy failed to capitalize on his success and did not attack the transports. Probably fearing air retaliation at daybreak, the Japanese task force retired at high speed, having suffered only negligible damage. Even though our carriers were within 180 miles of the action at the time, no attempt was made to attack the enemy task force on the following morning. The enemy land-based air threat to our own carriers, if they entered the area, and the fact that there were no carriers in the enemy force—whose presence would have justified risking our own carriers—undoubtedly influenced the decision not to attack with our carrier forces on the following morning.

In the latter part of August 1942, the Japanese made a major effort to retake Guadalcanal. The Battle of the Eastern Solomons resulted when the Japanese convoy was brought under air attack by our carrier aviation, assisted by Thirteenth AF and Marine land based aircraft. Our carrier task forces were also attacked by the Japanese Naval Air Arm. The action paralleled that of Coral Sea

and Midway in the airpower delivered all offensive fire, the surface units never made contact, and the battle was decided entirely by air action. The Japanese lost one carrier and one destroyer and suffered heavy damage to two battleships. The United States carrier *Enterprise* was damaged and was forced to withdraw. Having bruised each other severely in the exchange of air blows, both sides withdrew at approximately the same time.

During this phase, various skirmishes developed in the Solomons area between our own and enemy naval surface forces as each attempted reinforcement and supply to their island garrisons. These surface actions, in general, were significant in that they normally took place at night. Neither our own naval forces nor the enemy could risk a day-time surface engagement within range of either land- or carrier-based airpower. The Battle of Cape Esperance, 11 October 1942, was typical of this kind of action. In position beyond range of Japanese land- and carrier-based aircraft, our forces made a dash under cover of darkness, engaged the enemy, and withdrew before daybreak. In this action the Japanese forces lost two heavy cruisers, one light cruiser, five destroyers and one miscellaneous ship while our forces lost one destroyer, suffered heavy damage to one heavy cruiser, and moderate damage to one heavy cruiser and one destroyer. Damaged Japanese ships were left for land-based aircraft to finish off on the following day.

The seizure of Guadalcanal permitted the land basing of Navy, Marine, and Thirteenth AF aircraft at Henderson Field and extended their range to the Northern Solomons. In the months which followed, Japanese air, supply, and military installations at Munda, Vila, Kahili, Raliala, and Bougainville Island came under constantly increasing air attack. Japanese naval airpower in the area was whittled away steadily—and amphibious landings followed. Each landing permitted establishment of a more forward air base from which the range of land-based air operations could be extended and from which the next objective area could be brought under sustained air attack. Our series of landing operations were always successful because air domination was always established in the objective area before a landing was attempted. In November 1943, a landing was made on Bougainville Island, at Empress Augusta Bay, and the Solomon Islands campaign was virtually complete.

In this connection, it is significant to observe that the Japanese encountered their first reverses in their own surface thrusts when they attempted the operation without air domination in the area. The convoy en route to Port Moresby in May 1942 was thrown back by air attack in the Battle of the Coral Sea; the assault on Midway in June 1942 was likewise repulsed; the Milne Bay attack was thrown back into the sea and the overland drive on Port Moresby from Buna was defeated because the Japanese had lost air domination in the objective area; in the Battle of the Eastern Solomons, carrier air, and in the Battle of the Bismarck Sea, land-based air, likewise frustrated Japanese attempts to land their troops. Air domination was recognized as an essential to landing operations.

Throughout the reconquest of the Solomons, a considerable portion of the Thirteenth AF, and Navy and Marine air effort was directed to interdiction of Japanese efforts to reinforce and supply their garrisons by sea. The "Tokyo Express"—a fast destroyer run from Rabaul to the enemy's Solomons garrisons—became a primary target. Airpower immediately denied the enemy the capability of naval surface movement in the area in the daytime. Hence, for months the enemy attempted to negotiate the trip during the hours of darkness and to hide during the daytime. The Japanese were prevented from substantially reinforcing their garrisons by this land-based air action and by carrier air action in the Battle of the Eastern Solomons and the Battle of Santa Cruz Island. In the Battle of Santa Cruz Island, 26 October 1942, like the Battles of Coral Sea, Midway, and the Eastern Solomons, a Japanese assault convoy was turned back entirely by air action. Again carrier aviation fought the battle without naval surface units making contact. In this engagement our forces lost the carrier *Hornet*—but the enemy, having been discovered and recognizing that air attack in the restricted waters around Guadalcanal would lead to destruction of the convoy, withdrew without attempting the landing.

6. Central Pacific.

There was little action of great significance in the Central Pacific area during this period. Baker Island and sites in the Ellice Islands were developed as staging bases and the Seventh AF, under Naval operational control, began strikes of limited size against the Gilbert Islands, Nauru and Ocean

Islands, and Jaluit and Mille Islands in the Marshalls. These operations, coupled with extensive area reconnaissance, were a prelude to the Gilbert Islands Invasion, for which the Southern Assault Force was being assembled in the Ellice and New Hebrides Islands area.

7. Aleutian Area.

Eleventh AF aircraft, operating from Kodiak, Cold Bay, Umnak Island, and Adak conducted a counter air offensive over the Japanese bases at Kiska and Attu Islands and by March 1943 had driven Japanese aircraft entirely from the area. Air attacks against Japanese military installations at Kiska and Attu followed, and Attu was reoccupied by American Army, Navy, and Marine Forces in May 1943. In August 1943, Kiska was assaulted by our forces—but there were no Japanese left on the Island. Convinced of their inability to maintain troops in this area—and being sorely pressed in the more important Southwest and South Pacific Areas—the Japanese had taken advantage of the poor weather to evacuate their entire garrison under cloud cover.

Thereafter, Eleventh AF air effort was shifted to attacks against shipping, airfields, military installations, fishing canneries, and fishing boats in the Kurile Islands.

8. Results of the Action of Phase II.

The defeat of the Japanese Naval Air Force in the New Guinea-Rabaul-Solomons area, predominantly by land-based aircraft, but materially assisted by carrier-based aircraft, was the most significant result of this phase of the war. This action insured not only local air superiority, but our air domination of any area in which only Japanese Naval Air Force units would be encountered during the balance of the war.

9. Major Significance of the Action of Phase II.

a. With respect to air domination of its own element, the experience of Phase I was borne out. Surface forces, by their inherent nature, were utterly incapable of coping with the enemy air arm. American airpower alone established local air superiority in all operational areas, launched a constantly increasing program of counter air action over the enemy's more distant bases, and destroyed the effective fighting power of the Japanese Naval

Air Force in the decisive Rabaul-Solomon Air campaign.

b. During Phase II, airpower continued to dominate naval warfare. The experiences of the Battles of the Coral Sea and Midway were borne out in the Battles of the Eastern Solomons and Santa Cruz Island. In addition to the items of significance listed in Paragraph 5 of Section III, pertaining to Coral Sea and Midway, two more points significant to naval operations were established by the action of this period.

(1) Even though there was only very limited air power in the area, Navy surface engagements occurred almost exclusively at night. At that time, radar and low-altitude blind bombing technique had not yet been developed to the point that night air attack against shipping had a reasonable chance of success. It is important for the future to appreciate that this limitation on airpower no longer exists. In the action of succeeding phases of World War II, blind-bombing techniques were developed to the point that shipping might be hit at night or through the overcast with accuracy approaching visual bombing standards. Future development by our potential enemies, as well as ourselves, will undoubtedly perfect this technique to achieve even better than the visual daytime results of the past war. In other words, surface craft could—at one time—safely venture within enemy aircraft range under cover of clouds or darkness. Technological advances have eliminated these security factors and ships have now become vulnerable targets to air attack even in fog and darkness.

(2) Naval surface operations, as has already been indicated, were strongly influenced by the range of the opposing aircraft available. Facing an enemy with short range air equipment, it was possible to lurk outside aircraft range, but still close enough to an objective area to get in and out or through an air blockade during the hours of darkness. Both the Japanese and United States forces took advantage of this fact. However, the present range of our aircraft and potential enemy aircraft has increased so radically over the range of aircraft available during this phase of World War II that these tactics will no longer work. Land-based aircraft, in any future war, will have range to cover such a large area that surface vessels may, if desired, be kept days, rather than hours, away from an objective area.

c. During the Japanese expansion, Phase I, the enemy showed an appreciation of the fact that airpower dominated land warfare. Our own pattern of conquest through New Guinea and the Solomon Islands, during Phase II, verified this principle. Without air support, surface forces were either incapable of movement, or experienced prohibitively heavy losses. Airpower dominated land warfare by—

Counter air action, rendering our own forces free from enemy air attack.

Isolation of the battlefield, denying the enemy reinforcement, supply, and mobility.

Direct attack on enemy troops, installations, and equipment in the immediate battle area, depot areas, and on lines of communication.

d. During Phase II, the logistical potential of airpower as a transportation force became apparent. Army Air Force air transport operations supplied the entire war effort in China from India bases, began to supply the North Burma Forces, made possible the New Guinea campaign from Buna to Finschafen, and materially assisted in the logistical support of the Solomons campaign. Logistic support by an air line of communications offered the following advantages to surface forces:

(1) Logistic support by air expanded the scope of surface operations. Surface operations now became feasible in rough and undeveloped areas to or within which there were no land lines of communication.

(2) Logistic support and troop movement by air increased the tactical mobility of surface forces.

(3) Air evacuation of casualties from the battle area insured a minimum of losses in operations.

(4) Air supply reduced the requirement for the reserve logistical build-up in the immediate rear of surface forces. In Burma campaigns, the traditional 80 days' supply requirement in the Army Service Area progressively was reduced from the previous 80 days' requirement to 14½ days, as confidence in air supply developed. This requirement was likewise reduced in the other areas dependent upon an air line of communication. Unencumbered with tremendous masses of supplies, the surface forces achieved a maximum degree of mobility—and further—security of surface

lines of communication was not necessary. This permitted penetration tactics and obviated dragging the Army Service Area and the resource consuming surface lines of communication behind an advance. Wastage of supplies was also greatly reduced by concentrating supplies at the air supply depots, well to the rear, and delivering directly to the combat forces to satisfy their daily needs.

Likewise, the conventional time period between phases of surface advance—which, prior to air logistic support, had been required for logistical build-up for the next phase—was greatly reduced.

c. Airpower efficiently interdicted Japanese sea and land movement within aircraft range during daylight hours. During this phase, land-based airpower isolated the Japanese overland drive on Port Moresby from Buna and land- and carrier-based air power brought the terminal areas of the Japanese sea lines of communication under surveillance so effective that enemy ship movement in critical areas was confined to the hours of darkness. Later technological developments have extended this area interdiction potential of airpower to eliminate much of the limitations earlier imposed by weather and darkness and short range of equipment.

SECTION V

PHASE III, NOVEMBER 1943-APRIL 1944

THE DEFEAT OF THE JAPANESE ARMY AIR FORCE

1. General.

This period was marked by American victory in the Air-versus-Air phase of operations in Burma and New Guinea and by an exploitation in the Gilbert and Marshall Islands of the Phase II air victory over the Japanese Naval Air Force. Action in each area will again be considered starting with China and progressing counterclockwise round Japan's perimeter.

2. China.

Japanese air penetration to American rear bases in the Kunming area was practically stopped during this phase. Enemy air attacks were confined, for the most part, to our advance bases at Hengyang, Lingling, Kweilin, Luichow, and Nanning which lay along the old railroad corridor joining French Indo-China and the Hankow area. The Fourteenth AF successfully defended these forward bases and continued counter air action against enemy bases in northern French Indo-China, at Hongkong and Canton, in Formosa, and in the Yangtze and Yellow River areas. The air campaign against coastwise shipping in the Gulf of Tonkin and South China Sea was accelerated and north French Indo-China railroads were disrupted by air attack. The attacks on this railway system were designed to prevent movement of a troop concentration which was considered a threat to Kunming. Day and night harrasing of river and road supply lines to the enemy forces in the Changsha area was also continued.

During this period, the Japanese attempted one surface thrust west of Tung Ting Lake, in the direction of Chungking. This force met little ground resistance from the Chinese armies in the area but retired with heavy losses in the face of direct air attack on their lines of communication and front line elements.

3. India-Burma.

The Japanese Army Air Force in Burma was defeated during Phase III. Tenth AF units mounted a vigorous counter air offensive over main Japanese air bases to and including Rangoon. By May 1944 our forces had destroyed the greater number of enemy aircraft in Burma and had established air domination over the operational arena. Reinforcements for the Japanese Army Air Force in Burma thereafter were never in sufficient quality or quantity to impair our control of the air. This was undoubtedly due to the more pressing nature of the Japanese Army Air Force reverses in the Southwest Pacific Area. All subsequent air and ground operations in Burma were an exploitation of this air victory—as the Burma campaigns were to be air supplied—and air domination was necessary to air transport operations.

Interdiction of Japanese shipping to Burma was intensified by Tenth AF and RAF attacks on the port facilities and ships at anchor at Bhamo, Bangkok, Tavoy, Mergui, and Rangoon. Both Rangoon and Bangkok were abandoned by the Japanese as ports of entry early in 1944.

The Burma-Siam railway and road system was long, tenuous, indefensible, and offered few alternate routes. Air attacks on these lines—over an area from Bangkok to Myittha—materially reduced the logistic support of Japanese military power in Burma during this period.

Significant action occurred in the Arakan and Imphal areas in February and March 1944. The Japanese Arakan offensive was launched in an attempt to capture the Port of Chittagong, India, while the Imphal thrust was intended to cut the Bengal-Assam rail line of communications between Calcutta and the Assam air bases from which China was being supplied. Both Japanese attacks encircled and isolated the defending forces, which were subsequently relieved—and turned potential

defeats into significant victories by large-scale air combat support and air supply. These campaigns marked the turning point in the surface war in India-Burma and so conclusively demonstrated the potentiality of air supply on a scale suitable to this particular situation that later campaigns in the interior of Burma were planned to be entirely dependent upon air supply and largely dependent upon air movement of troops.

During the same period, in North Central Burma, an airborne long range penetration group, under the command of Major General Wingate, was flown more than 100 miles into the interior of Burma, behind Japanese lines, and commenced operations on the Japanese surface lines of communication. At the same time, in Northern Burma, General Stilwell's American trained Chinese, paced by a regiment of American infantry, closed in on Myitkyina. Like the Arakan-Imphal operations, this campaign daily became more dependent upon air transport operations for logistical support. The muddy and impassable trace of the Stilwell Road could not logistically maintain its own engineers, much less the combat troops proceeding in advance. The capture of Myitkyina air strip early in May 1944 terminated this phase of slow and difficult ground campaigning.

The defeat of the Japanese Army Air Force in Burma, during Phase III, opened the way for greatly accelerated air action in inter-diction, close support, and air supply operations and thereby made possible the rapid surface advance of the succeeding phases.

4. Southwest Pacific.

After November 1943, the responsibility for maintaining the neutralization of Rabaul was passed to the Thirteenth AF and Navy and Marine air units operating from the Northern Solomons. The Fifth AF then directed the major portion of its effort against the Japanese Army Air Force in New Guinea and in support of further surface advances in New Britain and along the northeast coast of New Guinea. Landings by Southwest Pacific forces were successfully made at Arawe and Cape Gloucester in December 1943, after heavy and effective air neutralization of prepared defenses. A further amphibious move was made up the New Guinea coast in early January 1944, when Saidor was captured to provide a valuable new advance airbase. Shortly thereafter, a ground recon-

naissance in force encountered no opposition and seized Los Negros Island in Admiralty. This advance provided immediate air interdiction of the water approaches to Rabaul and completed its isolation.

As enemy naval air forces had been defeated in detail in the Solomon Islands and Rabaul area during Phase II, Japanese Army air units had been advanced into New Guinea. Initially, Wewak was built up as a major base and into Wewak the enemy poured the best of his Army Air Force experience as he had done with his Navy Air Force experience at Rabaul. The destructive Fifth AF raid of mid-August 1943, covered in Phase II, caused the enemy to shift from Wewak to Hollandia, farther up the coast. Hollandia was then brought under sustained Fifth AF heavy and medium bombardment and strafing attack. Here the cap was put on the accumulated attrition of the past 2 years of New Guinea air fighting. By 6 April 1944 Hollandia as an airbase had been destroyed and the Japanese Army Air Force was knocked out of the war as an effective air fighting force. In the carrier strike and amphibious landing which followed, later in April, only negligible air opposition was encountered.

The effect of Fifth AF attacks on the Japanese Army Air Force in the Wewak-Hollandia area was immediate and lasting. The Japanese Army Air Force was disorganized to a point from which it never recovered. Later attacks by the Fifth AF in the Halmaheras and by Carrier Task Forces operating in the area were met with practically no organized and effective air resistance. Even though the enemy's available aircraft strength was high, the pilot quality was gone. The experienced leaders and crews had been killed and a large percentage of the component technicians and mechanics, of which Japan had only a very limited number, had been overrun in the landings and had taken to the hills with no chance of evacuation. According to Japanese records obtained after the war, by early April 1944 the Japanese Army Air Force had lost more than 86 percent of its experienced pilots having between 300-600 hours flying time. The over-all experience level of the Japanese Army Air Force had been reduced to 30 percent of the level existing at the start of the war. In all subsequent action by our own Army Air Force units, air domination was insured because the enemy's air experience had been reduced below

the mission for offensive operations. He had numbers, but he never again had quality and thus in desperation was later driven to suicide or kamikaze tactics.

The latter part of April 1944 found Southwest Pacific Forces based as far north as Hollandia, extending the air preparation into the Halmaheras for the next move forward. During this phase, the Fifth AF units based in the Darwin area also continued operations against air, oil, and shipping targets in Borneo, the Celebes, Java, and the surrounding waters.

3. South Pacific Area.

During Phase III Rabaul remained the primary target of the Thirteenth AF. The offensive capability of Rabaul air units had been effectively neutralized by November 1943, but it was necessary to maintain this neutralization by constant attrition of the enemy's relatively inexperienced air reinforcements. Air domination of the Solomons and Rabaul area was maintained by the Thirteenth AF and carrier- and land-based Navy and Marine Air Units. Air interdiction of the waterways was also maintained and this gradually sealed off enemy reinforcement and supply to the area. Following the pattern developed during the previous phase, Green Island was occupied in February 1944 and Emirau Island in March, terminating the thrust which had started at Guadalcanal and had been developed northwest through the Solomon Islands. Rabaul effectively had been bypassed and isolated, and since Rabaul was militarily useless to both the enemy and ourselves, it was not occupied.

6. Central Pacific.

a. General. Pacific Ocean Area Forces, in an exploitation of the air victory of Phase II over the Japanese Air Force, occupied the Gilbert and Marshall Islands and Eniwetok during this period. The stage was set for these operations by five factors:

(1) First: The decision of the Joint Chiefs of Staff to have one component of Pacific Forces under Army Command and another component under Navy Command.

(2) Second: The Battles of Coral Sea and Midway and numerous other engagements around the Solomons had demonstrated the vulnerability of the carriers to air attack, and had further demonstrated the relatively limited capacity of carriers

for sustained operations. Following these engagements, the Japanese aircraft carriers, less their air components, had been withdrawn to Truk, November 1942, and from there to the home islands for refitting and remanning. Meanwhile United States carriers, after the Battle of Santa Cruz Island in October 1942, had as a general practice kept well out of range of land-based enemy aircraft. The withdrawal of the Japanese carriers left the series of small atolls of the Gilbert and Marshall Islands in a precarious position because of their dispersion and inability to reinforce each other or to receive reinforcement from the Solomons, New Guinea, or the home islands. Thus, the enemy had pieced together his meager remaining air defenses on a series of small non-reinforceable and nonsupporting islands and had invited destruction in detail.

(3) Third: Pacific Ocean Area Forces had begun to profit by a large logistical build-up. Even though our over-all Allied strategy was pointed at the defeat of Germany first—with only minimum resources for security intended to go to the Pacific—the scheduled allocation of our national resources to the separate components of our military forces tended to upset the implementation of this strategy. Our fundamental concepts of warfare dictated that this force of personnel and matériel, which grew prematurely in the Pacific, be committed.

(4) Fourth: The defeat of the Japanese Naval Air Force in the preceding phase, in the Rabaul-Solomons area, insured that whatever air opposition was encountered on these atolls would be low in quality and, further, that it would be decisively outnumbered by the carrier aircraft available. Our carrier forces had approximately 800 aircraft—approximately four times the number of combat aircraft possessed by the enemy in the entire Gilbert-Marshall area. Due to the enemy dispersion of this limited number on the various islands, their inability to render mutual support, and the absence of an enemy carrier force, it was highly improbable that our carrier forces would encounter as much as 1 to 20 in air opposition. Events in the Gilbert Islands operation fully substantiated this estimate—as the enemy air effort was less than 1 to our 100 in number of sorties encountered.

(5) Fifth: The Japanese Fleet, lacking carrier groups, was almost certain to remain out of the

area and offer no opposition to the landing. If it did elect to offer opposition, our Navy Forces had an overwhelming advantage by virtue of their carrier power and would be in a favorable position to destroy the major portion of the enemy fleet.

These factors have been given in detail in order that the results of the Gilbert Islands operation and succeeding operations across the Pacific may be intelligently evaluated. In this age of constantly expanding technology, an analysis of only the results and the technique employed in any campaign may lead to conclusions dangerous to future security. The results must be studied in the light of cause and effect if they are to be properly evaluated.

b. *Gilbert Islands Invasion.* Plans for the invasion of the Gilbert Islands were crystallized in September and executed in November of 1943. The general pattern adopted by Central Pacific Forces for the assault and occupation of Japanese Central Pacific bastions was fairly well defined in the Gilbert Islands operation. The major combat forces and their missions were as follows:

(1) *The Assault Force* (later designated as the Joint Expeditionary Force): This force was composed of the ground forces who were to be put ashore; escort carriers whose mission was to provide air cover for the convoy en route and to give close air support to the landing and beach operations; escorting battleships, cruisers, and destroyers accompanying the convoy whose mission was to increase the antiaircraft defenses of the convoy, guard against surface or subsurface attack against the convoy en route and at the beachhead, and participate in naval surface bombardment of the objective area; miscellaneous service and combat vessels for the purpose of minesweeping, underwater demolition, beach reconnaissance, landing operations, air-raid warning, control, and logistic services.

(2) *The Carrier Force:* This force included the main force of large and small aircraft carriers, battleships, cruisers, and destroyers. Its missions were to launch air strikes before the arrival of the Assault Force for the purpose of neutralizing enemy air units and shipping in the area; to shield the operation from interference by the Japanese Fleet; to assist, as required, in close support air and surface bombardment operations during and after establishment of the beachhead.

(3) *Defense Forces and Shore-Based Air:* For the Gilbert Islands operation and for the majority of Central Pacific assaults, this Force was composed of the Seventh AF, a Marine Base Air Defense Wing, and naval search and reconnaissance groups. This force was shore based at the most forward fields available and was responsible for pre-invasion bombardment of the objective area over a period of time, for search and reconnaissance, and for air defense of its operating base area. As soon as an air strip could be opened up or captured in the area under attack, elements of this force were moved rapidly forward to assist in the close air support operations being conducted by carrier and escort carrier forces in the area.

For the Gilbert Islands operation the "Defense Forces and Shore-Based Air" were based on the islands of the Ellice, Phoenix, and Samoan Groups and on Baker Island. Daily strikes were made by these forces, between 18-19 November, on Japanese bases in the Gilbert and Marshall Islands, but the weight of effort was relatively light—between 350-400 bombing sorties.

The Assault Force was broken down into two attack forces, the Southern and the Northern. The objectives of the Southern Attack Force were Tarawa and Abemama, and the objective of the Northern Attack Force was Makin Island. The Southern Attack Force was assembled in the New Hebrides area, as the 8d Marine Division was in New Zealand and the Marine defense battalions to be employed were in Samoa, Wallis, Nanomea, and Nukufetai. It is significant to observe that this force was not committed from Hawaii or the United States but was in the South Pacific and, with equal facility, could have been employed in exploiting the New Guinea-Solomons breakthrough.

The Northern Attack Force was assembled in the Hawaiian area. The 27th Infantry Division was in Oahu, and the Army defense battalions were in the United States. The Northern Attack Force left Pearl Harbor on 9 November 1943; the Southern Attack Force left the New Hebrides on 12 November 1943. Both groups refueled at sea while en route and carried on additional intensive training.

Carrier strikes were made on 15 November at Nauru and Tarawa and on the 19th at Tarawa, Mille, and Makin. On 19 November the naval surface bombardment of Tarawa was also begun,

and on 20 November assault was made on Tarawa by the Southern Attack Force and on Makin by the Northern Attack Force.

In securing a beachhead on Tarawa, our landing forces suffered very heavy casualties from Japanese machine gun, mortar, and artillery firing from well-protected and dug-in positions. It is therefore appropriate that the factors which contributed to these losses be analyzed.

First: Tarawa was on the fringe of the Japanese defensive perimeter and was fortified to the best of the enemy's ability. In New Guinea and later in the Philippines it was many times possible to select areas for the landing which were not heavily defended. In the Gilbert Islands this was not feasible.

Second: Only a very limited long range, land-based pre-invasion air bombardment had been undertaken. A time schedule had been established which did not permit more than a token land-based air bombardment prior to the assault. Over 80 percent of the fire directed at the enemy defenses was delivered by surface vessels, approximately 10 percent by land-based aircraft in the pre-invasion softening-up period, and not more than 10 percent by carrier aircraft.

Third: The Tarawa Atoll was flat and raised only a few feet above the sea. The Japanese dug-in positions on this flat surface offered a very difficult target to naval gunfire, which, having high velocity, flat trajectory, and limited warhead, was actually a grazing fire. This flat surface offered a natural target to horizontal and dive bombing from the air. Had the time schedule been more flexible, the carrier-based dive bombers with the force had the capability to neutralize the Japanese defenses before the landing was made.

Fourth: The time schedule was based on the principle of surprise. Even though it is patently impossible to make a major landing on a small defended coral atoll without alerting the defending garrison, the operation was geared to a time schedule which was calculated to minimize the chance of enemy reinforcement or interference from the Japanese Fleet. A more realistic evaluation would have recognized that, at this stage of the war, it was highly improbable that the enemy, lacking carrier groups, would attempt

to reinforce his garrison or oppose with his fleet in the defense of this perimeter outpost, and that our land-based air, carrier air, and surface bombardment operations could be allowed the time necessary to effectively neutralize the defenses.

These factors resulted in a preassault air and naval surface bombardment which failed to effect a satisfactory degree of neutralization of the enemy defenses and was chiefly responsible for our heavy losses. We had the necessary force and capability to effect an acceptable neutralization, but our evaluation of the enemy's capability and probable reaction prevented our effectively employing the forces available.

The Tarawa landing was marked by:

Minimum enemy air defenses. The CVL *Independence* was the only vessel damaged by enemy air attack—being struck and damaged by an aerial torpedo from a Betty on 20 November. Enemy air attacks on our beach positions and ships at anchor were very limited. The first attack, by eight aircraft, occurred at about 0400 hours on 21 November. The following night four aircraft attacked and on succeeding nights raids by only one or two aircraft developed. Official Navy documents list these attacks as of no more than nuisance value. The absence of effective air opposition supports the conclusion drawn in Section IV that the Japanese Naval Air Force had been defeated in the Bismarck-Solomons area by November 1943.

Minimum enemy submarine activities. Our forces sank one submarine and probably destroyed another—while suffering no damage from Japanese submarines.

No mines and no serious barriers at the landing beaches.

No opposition from the Japanese Fleet.

Vigorous fire from pillboxes and dug-in positions by machine guns and artillery resulting from the failure of the preliminary air and naval bombardment to destroy these positions.

A comparison of the landing operation at Tarawa with that of the Southwest Pacific Forces at Cape Gloucester is significant from a military standpoint. While it is impossible to find any two landing operations which are identical in de-

forces encountered, and while it is not assumed that Tarawa and Cape Gloucester presented similar problems in full detail, enough similarity does exist to warrant a comparison of the tactics involved and the results achieved. Cape Gloucester was defended by dug-in positions and the pre-assault fire was delivered chiefly by air bombing. Approximately the same tonnage of bombs was delivered by air on Cape Gloucester as by naval gunfire on Tarawa. At Cape Gloucester, the invasion forces went ashore standing up with negligible opposition and casualties.

An evaluation of the action of this phase strongly indicates that methodical and sustained air preparation for landing operations against well defended positions materially reduced the casualty rate and that air preinvasion preparation offered the following advantages over naval gunfire preparation:

(1) The air blow could be struck in a concentrated form—rather than over a period of time—thus giving benefit of shock and providing minimum opportunity for the enemy to adjust to the situation and seek protection.

(2) The degree of air domination required in the objective area was much less for air than for surface attack, and much less for land-based aircraft than for carrier-based aircraft due to the vulnerability of the carrier.

(3) Measured in terms of national resources, the logistic support required for each ton of air delivered bombardment was far less than that required for each ton delivered by the guns of a fleet.

(4) Prepared beach defenses, having little frontal area, offered a poor target to the flat trajectory fire of naval guns, and offered a suitable target to air attack.

The Northern Attack Force encountered less opposition in the assault on Makin Island. Enemy resistance consisted chiefly of machine gun fire from the beach area and from two hulks in the lagoon. Casualties were light, however, and a beachhead was soon established. The advance across the island met small, though tenacious, enemy resistance and our superior force required 3 days to blast the battered enemy from entrenched positions. In connection with the operation, however, enemy submarines succeeded in destroying one of our escort vessels—the CVE *Liscome Bay*—on 24 November. Enemy air reaction, however,

was negligible and the Japanese Fleet, having no carrier group, failed to appear.

Abemama was occupied against negligible resistance. Only 24 Japanese were found on the island, and there were no fortifications.

The limited number of Japanese involved in the Gilbert Islands operations tied up a large American force for months, requiring immense logistics compared to that required by the Japanese. The Gilbert Islands were perimeter outposts of the Japanese prepared surface defense in depth. Inasmuch as our strategy elected to occupy these bastions by surface assault, preceded by a minimum of air preparation, it was inevitable that the attacking forces, to be successful, would require larger numbers and greater logistic support than would the entrenched defenders.

In support of the Gilbert Islands landings, the Seventh AF, under Navy operational control, operated from Canton Island, Baker Island, and the Ellice Islands. Extensive area reconnaissance, limited preinvasion bombardment of the Gilbert Islands group, and flank neutralization raids against Kusaie, Nauru, and Ocean Islands were conducted.

c. *Invasion of the Marshall Islands.* With occupation of the Gilbert Islands, the Seventh AF was rapidly deployed to Tarawa, Makin, and Abemama Islands and immediately began sustained preinvasion attack against Japanese air and naval installations in the Marshall Islands.

The forces assembled for the Marshall Islands operation were organized basically as were the forces for the Gilbert Islands assault, with the addition of a "Neutralization Group" whose task was to maintain neutralization of two enemy airfields at Wotje and Taroo from D-2 onward.

The general plan of operations was to seize three key points—Kor and Kwajalein Islands, about 45 miles apart, and Majuro Atoll, 250 miles to the southeast. Preinvasion neutralization was accomplished by Task Force 57 (largely Seventh AF) in attacks against enemy air bases and defenses beginning 15 January. These attacks were augmented by carrier strikes beginning 27 January 1944 on D-2. Thereafter, land- and carrier-based air and naval surface bombardment cooperated to complete the neutralization. Preinvasion estimates credited the Japanese with a maximum of 200 aircraft scattered throughout the Marshalls. Naval records credit the preliminary softening-up air

attacks with approximately 74 aircraft destroyed before D-2, leaving the balance to the 900-plus carrier aircraft available for covering the assault.

In the face of this array of power the enemy had little to offer. The Japanese fleet offered no opposition, the landing approaches were not obstructed, and the beaches were not mined. Majuro Atoll offered no resistance and only minor opposition of the Ret-Namur garrison, the most heavily defended island of the Kwajalein Atoll. Between 31 January and 8 February 1944, our assault forces thus reduced and occupied another perimeter defense point.

d. The Invasion of Eniwetok. The ease with which the Marshall Islands were overrun resulted in advancing the date for the invasion of Eniwetok by 8 months. The Attack Force Reserve Group had not been required in the Marshalls, hence these troops, with available warships and a portion of the carrier strength, were detailed to capture Eniwetok.

The Eniwetok Atoll is roughly circular, with a circumference of about 70 miles, and included some 30 small islands. The three main islands are Egebi to the north, which contained the only air strip, and Parry and Eniwetok Islands to the south. Egebi Island, containing the best enemy defenses, received most of the preinvasion bombing and bombardment. The defenses and installations of all three islands were reduced to rubble by the time of invasion.

Enemy opposition consisted of shore-based coastal defense and antiaircraft—which inflicted no casualties on our forces; one enemy submarine located—but no submarine attack; two enemy aircraft located—but no attack.

By 19 February 1944, Eniwetok Atoll had been captured against small enemy resistance. The naval and air preparation at Eniwetok represented nearly one ton of projectiles for each Jap defender on the islands. This preinvasion preparation so badly decimated Japanese defenses that our assault casualties were relatively light.

e. Operations in the Caroline Islands. Concurrent with the operations in the Gilbert and Marshalls, neutralization raids in force were carried out by Seventh AF and carrier units against the Caroline Islands. These operations ostensibly served as flank support to both the Central Pacific and Southwest Pacific thrusts—insuring that

there would be no air or surface retaliation from these Japanese island bases.

(1) Neutralization of Truk.—The atoll of Truk had been built up as a tremendous "Bogey" in the minds of the American military and public. It was assumed that it had become an impregnable citadel which was the key to Japanese empire defenses. But with the loss of the air war in the Solomons and New Guinea, highly experienced pilots were few in number. Japanese carriers had returned to Japan for a new complement of personnel and were out of the battle for the time being. The Japanese had some 550 aircraft in the entire Central Pacific at this time, approximately 200 of which were fighters, and against this, our carrier task force could put up 900. The exact aircraft disposition at Truk is unknown, but considering the number of other islands known to have air defenses, it is improbable that as much as half the enemy's air defense was concentrated at Truk.

Early in February 1944, a reconnaissance flight reported a concentration of enemy naval vessels at Truk. A fast task force, including carriers and battleships, was dispatched to engage this force. Upon arrival in the waters near Truk, an air sweep showed that the enemy fleet had fled, leaving only a small naval force, some commercial vessels, and Truk's air defenses. In fighter-to-fighter engagements, our carrier aircraft claimed 123 enemy aircraft destroyed in the air and 89 on the ground, for the loss of three American aircraft to fighters, 13 to antiaircraft, and 8 operational causes. The score of 123 enemy to 3 United States aircraft losses in the air engagements is a fair measure of the relative quality of the Truk air defenses and the degree to which the Japanese Naval Air Forces had deteriorated.

Carrier torpedo planes and dive bombers attacked and crippled or sunk the Japanese ships remaining at Truk, but the major elements of the Japanese Fleet had made good their escape. While a strong force of heavy surface warships accompanied our assault force, they remained throughout the air strikes at a conservative distance from the objective and did not participate in the attack.

On 26 February 1944, the Seventh AF, operating from Kwajalein, began attacking Truk, principally by night, their Liberators being unescorted. These attacks continued until the fall of the year. Formation daylight attacks by the Thirteenth AF, operating from Los Negros in the Admiralties

and Bougainville, also assaulted, began in March and continued until June. On 30 April-1 May 1944, carriers again attacked Truk, bombing and strafing airfields.

(2) *The Destruction of Ponape.* Ponape is only 362 miles from Eniwetok and 576 miles from Kwajalein. It was considered to constitute a potential threat to the operations at Eniwetok, being the most important enemy base of the scores of islands in the Carolines group—with the exceptions of Truk and Palau. It possessed a harbor, an airfield, a seaplane base, and a sizeable town of densely concentrated buildings extending half a mile back from the waterfront into the mountains. The waterfront itself was approximately half a mile in length and was covered with warehouses and shops.

Between 15-26 February 1944, the Seventh AF attacked Ponape in four heavy raids and the installations and village at Ponape were wiped out. These were the only attacks on Ponape except for an occasional bomb from a long-range reconnaissance plane.

(3) *Attacks at Ulithi, Woleai, Palau, and Yap.* Palau, the most important enemy base in the Carolines with the single exception of Truk, was attacked on 30 March 1944 by a United States task force which had hoped to engage the Japanese Fleet. The Japanese had fled, however, leaving only cargo ships in the harbor. In 9 days of attack at Palau, carrier aircraft sank virtually all of the shipping. When the task force retired from the ruins of Palau, they paused briefly to launch several attacks at Ulithi, Woleai, and Yap. Ulithi was undefended, although it is one of the great natural harbors of the Pacific. Woleai and Yap offered only minimum defenses. Our carrier force claimed 111 enemy aircraft destroyed in the air and 46 on the ground for a loss of 3 aircraft to enemy fighters and 90 to enemy antiaircraft fire in the attacks on Palau, Yap, and Woleai. The entire Caroline group of islands thus fell without invasion—solely to land- and carrier-based air penetration and domination. They could be bypassed or occupied—as our forces desired—but occupation was not necessary—as they no longer offered a threat to our security or future operations. The consistently ineffective Japanese air defenses encountered in the Carolines, the Gilberts, and the Marshalls was the direct result of the air war which had been fought and won in the New Guinea-Bismarck-Solomons area.

7. Aleutian Area.

During this phase of operations there was no change in the ground situation in the Aleutian area. The Eleventh AF continued operations against Kurile Island targets as indicated in Phase II.

8. Results of the Action of Phase III.

a. The defeat of the Japanese Army Air Force, principally by Fifth AF operations in the Wewak-Hollandia area, was the most significant achievement of this phase. From this point forward, action by air and surface forces on the axis of the Southwest Pacific advance would be an exploitation of the air victory. Large numbers of Japanese Army Air Force aircraft would be encountered in succeeding operations—but the quality of their pilots was gone—and they could offer little effective opposition. The gateway to Japan was open. Similarly in Burma, defeat of the Japanese Army Air Force in that area and the Japanese inability to reinforce laid Burma open for the air-supplied land campaigns to follow.

b. The northeastern coast of New Guinea was occupied to and including Saidor, Wewak, Aitape, and Hollandia. This operation extended the range of land-based airpower to the Halmaheras and Celebes, thus widening the area of air interdiction of Japanese shipping and permitting concentration of sustained land-based airpower on objective areas in preparation for the next step forward.

c. The occupation of Western New Britain, the Admiralties, and Green and Emirau Islands permitted land-based airpower to operate from these points and complete the isolation of Rabaul. With the establishment of an air blockade of Rabaul and other bypassed areas of less importance, their occupation was considered superfluous and was not attempted.

d. The Gilbert and Marshall Islands and Eniwetok were occupied by Pacific Ocean Area Forces in an exploitation of the Phase II air victory over the Japanese Naval Air Force.

e. The Caroline Islands, from Palau to Ponape, were neutralized by carrier- and land-based air attack and thereafter could offer no serious threat to either the Southwest Pacific or the Central Pacific thrusts.

9. Significance of the Action of Phase III.

a. From the standpoint of military concept, the most significant event of this phase was a dawning recognition among military leaders that reduction and occupation of every enemy bastion was not necessary in the Air Age. This was a major evolutionary step in military concept. Recognition of this principle may be found in Southwest Pacific Area plans which outlined the scope of operations for Phase III. This plan indicated that the objective of operations westward from the Finschafen area would be to advance the land-based bomber line rapidly westward along the land mass of New Guinea to the Philippine Islands by successive occupation of minimum bases required.

Additional evidence of this evolution may be found in the Bismarcks, Carolines, and Gilbert and Marshall Island areas. Original plans had called for the occupation of Rabaul. With the demonstrated capability of airpower to maintain interdiction and domination over areas within range, plans for the occupation of Rabaul were abandoned. The same was true of many bypassed islands in the Solomons, Carolines, the Gilberts and Marshalls, and bypassed enemy pockets in New Guinea. Even though surface occupation was not consummated, airpower—working in depth, in the third dimension—provided the same security and domination which physical occupation would have established.

If this concept had been further developed to its logical and ultimate conclusion, based on the demonstrated capability of airpower, the invasion of Japan proper prior to her surrender might never have been planned.

b. *Airpower Continued to Dominate Its Own Element.*—The A¹ versus-Air Phase of the war in the New Guinea area was completed—and the door was opened for exploitation of the air victory over the Japanese Army Air Force.

c. *Airpower Continued to Dominate Naval Warfare.* Having lost their carrier air components, the Japanese Navy was powerless to resist the Gil-

bert and Marshall Islands and the Caroline Islands operations—even though they still possessed formidable naval surface force strength. Having air domination, both in quality and numbers, our naval surface units moved freely on the series of Pacific atolls under carrier air protection—though properly and wisely avoiding the remaining Japanese Army Air Force threat from the land mass of New Guinea until it had been reduced to impotency by the sustained action of land based aircraft.

d. *Airpower Continued to Dominate Ground Warfare.* The Japanese were defeated in the Arakan and Imphal thrusts in Burma because they failed to achieve air domination. Our own forces successfully made numerous landings in the Pacific after adequate air preparation and supported by effective airpower in the objective area.

e. *Logistical Support of Air and Surface Forces by Air Transport Continued to Grow.* Wingate's long range penetration behind Japanese lines in Burma was entirely dependent upon an air line of supply. Air supply came to the rescue of the besieged forces at Imphal and in the Arakan. New Guinea operations remained heavily dependent on the Air LOC and the constantly growing war effort in China was supplied entirely by air from India.

f. Japanese shipping and port facilities at Burma terminals, off the South China Coast, in the Yangtze River and Formosa Straits, in the Celebes, Halmaheras, and Rabaul terminal area came under constantly increasing land based air attack. Army Air Force targets were, in large measure, coastwise or river supply vessels whose loss immediately affected the garrison for which intended. Thousands of small ships under 500 tons were destroyed in maintaining air interdiction of the waterways leading to the various garrisons. At the same time, our submarine forces were plying the Japanese sea lines of communication, beyond the range of our land-based airpower, and were making gigantic inroads into the shipping capabilities of the Japanese empire.

SECTION VI

PHASE IV, APRIL 1944-APRIL 1945

EXPLOITATION OF THE DEFEAT OF JAPANESE AIRPOWER

1. General.

The Phase II defeat of the Japanese Naval Air Force, by November 1943, paved the way for the exploitation operations in the Gilbert and Marshall Islands of Phase III. Likewise, the Phase III defeat of the Japanese Army Air Force paved the way for a similar exploitation in the balance of the Pacific. By the end of Phase III, April 1944, the decisive air battles and campaigns of World War II in the Pacific had been fought. Since air domination was recognized as essential to all surface operations, it follows that these decisive air campaigns were the decisive campaigns of the war. From this point forward our land, sea, and air forces were at liberty to exploit the air victory. We could adhere to the orthodox and accepted surface invasion pattern, or we could point our strategy toward a three dimensional domination which would obviate the necessity for a surface assault of the home islands. Our military strategy adhered basically to the orthodox concept. The air effort against Japan was increased rapidly—but invasion of Japan was still considered necessary. Air power was an ancillary force to be utilized in obtaining staging areas for marshalling the final invasion forces and to be utilized in softening up the enemy for the final surface assault. However, the requirements for implementing both an air strategy and a surface strategy were met. The requirements for implementing an air strategy were met with the occupation of the Marianas and Iwo Jima—from which what were visualized as softening up operations developed into conclusive operations. Therefore, the action of Phase IV of this report is a composite series of events, part of which represent an exploitation based on surface concepts of warfare and part of which represent an exploitation based on an over-all appreciation of the capabilities of the weapons available.

For the sake of background information essential to the later evaluation, action will again be considered in each operation area, beginning with China.

2. China.

Air operations in China throughout the entire war were unique in that here a small air force, living and fighting entirely on air supply from over the Himalayan "Hump," was compelled to fight both an enemy air force and an enemy ground army—and largely without friendly ground force support. The status of training, equipment, organization, and morale of the Chinese armies was such that, in general, they could offer no resistance to the Japanese ground army. Likewise, the matter of language, the loose Chinese organization, the spotty nature of troop deployment, and the status of training, precluded close air support of Chinese ground operations except in a few isolated cases late in the war. Chinese armies normally withdrew well in advance of Japanese surface thrusts—preferring to live to fight another day and trusting to the mass of China to absorb the invaders in traditional custom.

Testimony taken from Japanese commanders in North China after VJ-Day attributed at least 75 percent of the total resistance they encountered to the Fourteenth AF alone. The nucleus of the Fourteenth AF started operating in 1942 with logistical support adequate to the needs of one-fourth of one American infantry division in combat. By April 1944 the tonnage of supplies going to the 14th AF would have supported one-half of 1 infantry division, and by April of 1945—1 1/4 divisions. With these meager resources, the Fourteenth AF faced an enemy numerically superior in the air and possessing one and one-half million ground troops—disposed around a 2,000-mile

front. Although this meager force was sufficient to so impair the logistical support of the Japanese ground forces that they failed to take Kunning and Chungking—it was insufficient to expell or destroy the entire Japanese military effort in China. It was also insufficient to prevent surface movement of Japanese forces, largely by night, in their campaigns to reduce the eastern and central American air bases and to close the old railroad corridor from Northern China to French Indo-China.

In April 1944 Japanese forces started a series of campaigns designed to eliminate American air operations from central and eastern China bases and at the same time to occupy the old railway corridor between the Yellow and Yangtze Rivers and between Hankow, Canton, and French Indo-China. These campaigns were started for the following reasons:

a. Japan feared an American landing on the East China coast and believed that air support for this landing would come from the central and eastern China bases. Capturing these bases would eliminate this threat and would at the same time allow Japanese forces to concentrate on the East China coast, free of our China based air attack, as desired to meet the invasion forces.

b. The central and eastern American bases in China were a thorn in the side of all Japanese efforts in China, in the South China Sea, Formosa Straits, and in the Gulf of Tonkin. From these forward bases, enemy air installations, coastwise and river shipping, and Japanese lines of communication to her troop dispositions were constantly harassed. The most effective of these American bases were located in the old railway corridor between Hankow and Canton.

c. Completing the inland line of communication between Industrial North China and French Indo-China had long been a part of the Japanese strategic plan. The serious enemy losses of coastwise shipping during 1943 reemphasized the need for an inland line of communications.

d. Having knocked out the eastern and central bases—Japan planned to drive overland to Kunning, the air supply terminal for China, and Chungking, the seat of the National Government, and to thereby knock China entirely out of the war.

The Japanese campaign to close the northern segment of the old railroad corridor, between the Yellow and Yangtze Rivers, achieved a temporary

success, although excessively costly to the enemy in forces committed. The limited American air resources opposing this thrust made the enemy pay heavily for his advance, but was not in sufficient force to prevent the occupation—most of the movement being confined to the hours of darkness. By the middle of May 1944 this corridor was in Japanese hands.

In the latter part of May, the enemy attack on the southern segment of the railway corridor was launched, south of the Hankow-Changsha area, toward Hengyang. Although the Japanese schedule for the operation was delayed 2 months by the air resistance, the less than one divisional logistical effort available to the Fourteenth AF in this operation was insufficient to stop the 600,000 Japanese troops committed to the campaign. One after the other our central bases fell and the corridor between Hankow and Canton was occupied by the Japanese by December 1944.

During this drive, Fourteenth AF fighters and medium bombers inflicted such punishment on Japanese lines of communication, troops, and installations that the movement lagged 2 months behind schedule and eventually winter weather, for which the Japanese were unprepared, coupled with the now ending air attacks, caused the failure of the extension of the drive toward Kunning and Chungking.

Air operations against Japanese forces did not cease with the loss of the Eastern China bases. Constant pressure was maintained on the enemy's lines of communications, supply dumps, and air and military installations. These operations effectively prevented the enemy from consolidating his position and exploiting his gains and eventually forced him to withdraw back to the Canton and Hankow areas.

The significance of this campaign is not that airpower, unaided by competent ground troops, was incapable of stopping the advance of Japanese Forces, but, rather, that insufficient military force was available. No ground forces commander would normally attempt to stop a force of 600,000 well armed and trained troops when his own logistical support was adequate for only one division. Yet, this operation has been misinterpreted and generalized to sustain the faulty conclusion that airpower, shorn of ground support, is incapable of coping with surface forces. Contravention of this viewpoint does not mean that there is no role for

ground forces in any future foreseeable conflict. Certainly, a force of well trained ground troops in China—capable of exploiting the advantage which our general air domination over the battle area gave us—would have assisted materially in arresting the Japanese advance. In this connection, air forces and surface forces should not be placed on a competitive or comparative status. Each has specific capabilities, limitations, and functions. The principle of economy of force, and a clear recognition of the capabilities and limitations of weapons, if applied with sound logic to each problem, will clearly indicate the employment of each type of force.

Aerial mining from China bases by the Fourteenth AF and XX Bomber Command was accelerated during this period and produced excellent results at relatively low logistical cost. Harbor areas mined and periodically closed to Japanese shipping included Haiphong, Canton, Hongkong, and Shanghai. An intensive mining of the Yangtze River also paid high dividends. This operation seriously affected the entire Japanese war economy by shutting off the transport of one of Japan's main sources of iron ore.

American air superiority over the Japanese Air Force in China, from Shanghai to Haiphong, was established by 1 January 1945. It is significant to observe that China was the last of the original operational areas to be brought under our air domination. Air superiority had been secured over our own local base areas in China early in Phase II, but the logistical support was not available to run the long range, sustained, offensive operations against Japanese air installations in sufficient strength to crush the enemy Air Force quickly and permanently.

Hence the air war in China was a long, drawn out affair—Japanese forces suffering gradual attrition by Fourteenth AF operations and being unable to provide replacements of adequate quality, due to the more pressing demands of the Pacific Area. By 1 January 1945 this gradual attrition and withdrawal of some units to other more critical areas had so reduced the effectiveness of Japan's China based airpower that enemy air raids on our own forward installations ceased entirely and our own attacks, on even the most vital enemy installations in the China area, were only sporadically and weakly intercepted.

With the occupation of the Philippine Islands, in the latter part of 1944, Japanese shipping in the South China Sea and Formosa Straits could be brought under land based air attack from the Pacific side at a lower logistical cost than from the China side. Hence, in the latter part of 1944, the bulk of Fourteenth AF strategic effort was reoriented toward North China against the railroad system. This railroad system was an integral part of the over-all Japanese economic organization for war—as it permitted exploitation of industrial North China and provided direct support by transporting coal, iron, and food for shipment to the home islands.

Between January and May 1945, the Fourteenth AF threw the bulk of its logistical support into operations against bridges, locomotives, and shops of the North China railways and so disrupted the system—

That the Japanese exploitation of industrial North China came virtually to a stop.

That a planned Japanese campaign to take Kuming and Chungking was abandoned partially due to inability of the lines of communications to provide logistic support for the operation.

Concurrently with the attacks on the North China railways, the French Indochina rail system, north from Vinh to the China border, was attacked in strength and rendered largely unserviceable. These operations isolated the Japanese Forces in French Indo-China from those in China. Thus, the Japanese inland line of communications from industrial North China, through Central China, to French Indo-China was broken in two places—north of the Yellow River and south from Hanoi—making large-scale troop movements or reinforcement impossible and multiplying the Japanese logistical difficulties in supporting their extended garrisons. Later, during Phase V, these logistical difficulties and the constant harassing by air caused the Japanese to retreat from east Central China and give back to our forces the eastern bases that the enemy had so dearly bought the previous year.

3. India-Burma.

Between April and October 1944, American, Chinese, and British positions in the Myitkyina, Imphal, and Arakan areas were strengthened,

and preparations were completed for the reconquest of Burma. In August, the town of Myitkyina, adjacent to the airport, was finally reduced by dive bombing and was occupied. In June, the Imphal garrison—living and fighting on air supply—was relieved and the Japanese were expelled from tenaciously held positions on the perimeter of the Imphal Plains. Simultaneously, forces in the Arakan secured their lines and prepared for amphibious operations down the Arakan coast. Meanwhile, Tenth AF and Royal Air Force heavy and medium bombers and fighters ranged over Burma and Siam as far south as Bangkok, attacking air and military installations, ports and lines of communication. By 15 October 1944, when the offensive surface campaigns in the Arakan, Imphal, and Myitkyina areas were resumed with vigor, the enemy was isolated, devoid of air support, and tactically immobilized.

Between October 1944 and March 1945 the air victory in Burma was rapidly exploited in an air supplied and air supported surface campaign over some of the most difficult terrain in the world.

Air operations of the previous phases had destroyed the Japanese air capability and had isolated the enemy ground forces from supply and reinforcement. The enemy was buried in the jungle—short on medical supplies, food, and ammunition, devoid of air support, and even denied air reconnaissance intelligence. Three Allied armies converged on the relatively helpless enemy and easily crushed his defenses—though he fought with suicidal determination. By April 1945 the enemy was evacuating Rangoon as our forces approached its gates.

Aerial mining of Southeast Asia ports had been started by AAF and RAF units in February 1943. Commencing in March 1944, this program against Japanese held ports supplying Burma was intensified. India based B-29s also participated in this program. These operations, coupled with those against shipping on the Pacific side, effectively sealed Burma off from logistic support by deep sea vessels.

Also, during Phase IV, the Air Transport Command continued to build up the air deliveries across the Himalayan "Hump" to China, delivering 46,545 tons during the month of March 1945, and 44,354 tons during the month of April 1945.

4. Southwest Pacific.

a. Advance to Morotai. Rapid surface advances in the Southwest Pacific Area now became possible—because air domination had been won. Following the air-ground-amphibious pattern discussed in more detail earlier, the Southwest Pacific Forces, including the Fifth AF, advanced from Hollandia to Morotai in the Halmaheras by 15 September 1944. In this operation Biak, the Gelvink Bay area, and Noemfoor successively were neutralized and occupied. From Morotai, the range of land-based aircraft could now be extended to Mindanao and Borneo, and the waterways of the Netherlands East Indies, from Borneo to New Guinea, came under the surveillance of land-based aircraft.

Thirteenth AF units participated in these operations, attacking Biak and Noemfoor in strength before the invasion of May and July of 1944, and in flank attacks against Truk, Woleai, Palau, and Ceram. On 15 June 1944, the Thirteenth AF was transferred from the South Pacific Forces to the Far Eastern Air Forces, Southwest Pacific Area, and westward movement of its units from the Solomons and Admiralties to New Guinea was commenced.

b. Leyte Operation and Second Battle of the Philippine Sea. Original plans of the Southwest Pacific Force for occupation of the Philippine Islands provided for an intermediate landing at Sarangani Bay (15 November 1944), a diversionary operation in Misamis Occidental (7 December), and the assault of Leyte on 20 December 1944. The Island of Yap was also to be occupied by Pacific Ocean Area Forces on 8 October. This plan would have provided the intermediate air bases from which Leyte and the Visayan area could have been brought under sustained land-based air attack and would have permitted covering the Leyte Beach operations with land-based airpower. Even this proposed disposition of air bases was not entirely satisfactory to the Commanding General, Allied Air Forces, Southwest Pacific Area, who, before the occupation of Morotai, pointed out that the distances between Sansapor, Morotai, Sarangani, and Leyte were too great for effective air support from one to the others. It was recognized that these bases were not mutually supporting, that the enemy might select any one for attack without being interfered with from adjacent bases. It was fully understood by Southwest Pacific Area

Forces that the Japanese distribution of separated bases had exhibited this same weakness to our advantage.

However, between 9-14 September, carrier aircraft of Task Force 38 attacked shipping, air-dromes, and land targets in the Davao, Visayan, and Zamboanga areas and met such little opposition that the Third Fleet Commander recommended elimination of the Yap, Sarangani, and Misamis operations and a direct attack on Leyte. It was generally recognized that an additional risk would be entailed in depending on carrier air cover for the Leyte landing—due to the transitory and uncertain nature of such support in the face of sustained air attack. However, the additional risk was considered acceptable, because the remaining Japanese Air Forces definitely had been reduced to a low level of efficiency and because it could not be predicted that they would discard orthodox tactics and adopt suicide or kamikaze tactics. Nevertheless, at this stage of the war, the time was past in which it was necessary to accept great risks and it remains problematical that the acceptance of the additional risk was justifiable.

Based on the information (relative to the inadequacy of Japanese air and naval defenses) contained in the message from the Third Fleet Commander, the Joint Chiefs of Staff, on 15 September 1944, authorized the Commander in Chief, Southwest Pacific Area, and the Commander in Chief, Pacific Ocean Area, to proceed against Leyte on 20 October. On the same date the Commander in Chief, Southwest Pacific Area, notified the Joint Chiefs of Staff and Commander in Chief, Pacific Ocean Area, that the Leyte assault would be moved up to 20 October, accepting the additional risk in order to accelerate the tempo of our operations.

On 20 September a conference was held between the Commander, Allied Air Forces, Southwest Pacific Area, Allied Naval Forces Southwest Pacific Area (Seventh Fleet), and Third Fleet, Pacific Ocean Area. This conference was for the purpose of assignment of tasks for neutralization of enemy airpower for the Leyte operation. The conference agreed as follows:

The Fifth AF (Assault Air Force) was assigned the responsibility for destroying hostile air forces in the Celebes Sea Area; protecting the western flank of the operation; attacking enemy air forces in the Mindanao area south of 8°45' from 10 October on; extending neutralization strikes to include

the Visayan area, exclusive of Leyte and Samar, as soon as heavy bombers could be established at Morotai; extending neutralization attacks to include Leyte and Samar upon departure of escort carriers; providing air cover for convoys within range of land-based aircraft.

The Thirteenth AF (Supporting Air Force) was assigned the missions of neutralizing enemy air forces on the east coast of Borneo and supporting the operations of the Assault Air Force as requested.

Allied Naval Forces, Southwest Pacific Area (Seventh Fleet), was assigned responsibility for providing air cover for the convoys and direct air support of the landing operations until relieved by land-based aviation. The Commander, Seventh Fleet, was also designated as the coordinating agency for requesting carrier strikes from the Third Fleet for operations in the objective area.

The Third Fleet (Task Force 30) was to neutralize enemy air forces on Okinawa, Formosa, and Northern Luzon from 10 to 13 October; to attack enemy air forces in the Luzon-Bicol area on 16 and 17 October; to neutralize enemy air forces in the Visayan area on 18 and 19 October; to support the landing operations in coordination with Seventh Fleet.

The Seventh AF was assigned the task of operating in the Bicol area (Southern Luzon) as directed by the Commander, Third Fleet.

The Fourteenth AF and XX Bomber Command were to support the Leyte operation by attacks against Formosa and China Coast air installations.

Operation instructions for the assault on Leyte issued by GHQ, Southwest Pacific Area, summarized the missions agreed upon for the Third Fleet and assigned missions to the Seventh Fleet. In general, the Third Fleet was responsible for containing or destroying the Japanese Fleet; for air attacks against shipping and enemy airpower in the Formosa, Luzon, Visayan, and Mindanao areas from A-9 to A+30; for destruction of ground defenses and installations in the objective area from A-9 until escort carriers of the Seventh Fleet assumed the mission of direct support; and for providing direct support of the landing and subsequent operations as required.

In general, the Seventh Fleet was assigned the missions of transporting and establishing the landing forces ashore; providing the air protection

for convoys and for direct support of landing operations in coordination with Third Fleet and land-based Allied Air Forces; denying Japanese reinforcement of the Leyte area; clearing the Surigao Strait of hostile shipping and mines; providing submarine offensive reconnaissance along probable routes of enemy naval forces and waterborne reinforcements.

The Seventh Fleet was part of the Allied Naval Forces of Southwest Pacific Area and was in the direct command chain. However, the mission of the Third Fleet was based on concurrence of the commanders concerned, since our division of authority in the Pacific required cooperation rather than command in operations involving major components of SWPA and POA forces. The results of these conditions again became apparent when the Third Fleet Operations Order was issued. This order indicated that the Commander, Third Fleet, considered the destruction of the Japanese Fleet as his primary objective. This difference of concept between the Commander, Third Fleet, and the Commander in Chief, Southwest Pacific Area—whether the success of the Leyte landing was primary or the destruction of the Japanese Fleet was primary—subsequently greatly endangered the Leyte landing operations, and ironically, gave the Seventh, rather than the Third Fleet, the major naval surface engagement of the war.

On 10 October, A-10, strikes were conducted by Task Force 38 against shipping, airdromes, and land targets in the Ryukyus area. This inaugurated Third Fleet participation in the planned assault on Leyte.

On 11 October, the Seventh Fleet Convoy left the Admiralty Islands and New Guinea bound for Leyte with the invasion forces.

Between 11-16 October, Task Group 77.4, Seventh Fleet, with escort aircraft carriers covered the Seventh Fleet and Amphibious Forces en route from Manus and Hollandia toward Leyte. At the same time, Task Force 38, with four carrier groups, attacked airfields, shipping, and industrial targets on Formosa, Northern Luzon, and Nansai Shoto.

On 14 October the Commander of the Third Fleet warned the Commander in Chief, Pacific, and Commander in Chief, Southwest Pacific Area, that enemy naval vessels were assembling at Singapore and off the northern coast of Borneo. On the same day the Commander in Chief, Pacific, warned

Commander, Third Fleet that the enemy might reorganize his forces and throw all available air and naval power against the Third Fleet.

The Commander, Third Fleet, then immediately notified the Commander in Chief, Southwest Pacific Area, that, except for operations being conducted on 15 October, A-5, no fast carrier force would be available to support the Leyte landing. This notice of intent to withdraw came 5 days before the scheduled landing. This meant that the neutralization strikes in the Visayan area, agreed upon for Task Force 38 for 18 and 19 October, would not be run. It also indicated that Task Force 38 would not be available for the initial critical stages of the landing.

The Seventh Fleet Commander immediately requested additional reconnaissance of the San Bernardino and Surigao Straits, which mission was assigned to and performed by Fifth AF units from the distant Halmahera and New Guinea Bases.

On 17 October, a landing was made on Dinagat Island, at the south end of Leyte Gulf, in order to secure approaches to the Gulf. On the same day the Fifth AF and the Thirteenth AF were advised that the Third Fleet had withdrawn from the operation and that Far East Air Forces must support the landings as a first priority mission. The Fifth AF was assigned the mission of neutralizing Visayan airdromes by long range attacks and the Thirteenth AF was directed to expedite staging of bombers through Morotai.

Between 17-19 October, Task Force 38 attacked airfields and shipping in Luzon—though it did not launch the neutralization attacks in the Visayan areas as originally planned. A large percentage of the effort of Task Force 38 was being devoted to search for the Japanese Fleet, and to maintaining combat readiness for the expected engagement.

On 18-19 October, Task Force 77, Seventh Fleet, covered the convoy and in addition attacked airdromes and small shipping from southern Luzon to northern Mindanao, including installations on Leyte Island.

On 20 October, A-day, the landing on Leyte was accomplished under air cover of Task Force 77.

From 20-22 October, the Third Fleet, standing by east of Luzon, launched air attacks against airdromes and shipping from Luzon to northern

Mindanao, and provided a limited amount of air support to the ground operations on Leyte.

The uncertainty of the operation is apparent here. Even though the Third Fleet had given notice that it would not be available, the Japanese Fleet had not yet appeared and, consequently, limited assistance was being given the landing operations by Task Force 38.

On 23 October one group of Task Force 38 (Task Group 38.3) searched for the Japanese Fleet, one group refueled, and two groups headed for Ulithi. One of these groups (Task Group 38.4) reversed course during the day and returned to the Philippines. Seventh Fleet aircraft continued to support operations at the Leyte beaches.

On 24 October the Japanese Fleet was committed to action against the Philippine Invasion Force. The Japanese Fleet was in desperate plight, due to previous reverses, and was dispersed in the Borneo, Singapore, and home islands areas. From this unsound tactical disposition, due to the urgency of the situation, the enemy fleet was committed piecemeal in three salients toward the Philippines, inviting destruction in detail. Two of these salients had to accept an inland passage through restricted waters, depending on land-based aircraft of the debilitated Japanese Air Forces for air support which could not be provided by reasons of poor communications, inadequate logistics, lack of planning, and low operational efficiency. These two forces were committed by the Japanese High Naval Command with full knowledge of the suicidal nature of the operation, but it was also recognized that no further war mission for the Japanese Fleet remained if the Allied Leyte invasion were successful. These two forces were compelled to traverse restricted waters due to the air blockade of the Celebes Sea, and the critical time element involved which precluded their journey around the Philippines, through the South China Sea, for an approach from the north. The third force was in position to approach through open waters from the Empire and was intended to act as a decoy to our screening forces on the desperate gamble that one of the three salients would be able to penetrate to the Leyte beachhead before meeting destruction, and seriously disrupt our invasion attempt. This desperate gamble almost succeeded.

The Japanese forces were organized as follows:

A Southern Attack Force, which formed off the coast of Borneo and approached Leyte by way of the Sulu Sea, Mindanao Sea, and Surigao Straits. This force was composed of 2 battleships, 2 heavy cruisers, 2 light cruisers, and 10 destroyers.

A Central Attack Force, which came from the Singapore area through the Sibuyan Sea and San Bernardino Straits and approached Leyte from the north, off Samar. This force was composed of 4 battleships, 7 heavy cruisers, 1 light cruiser, and 11 destroyers.

A Northern Attack Force, which came south from the Empire to a position off Luzon. This force was composed of 1 aircraft carrier, 3 small aircraft carriers, 2 converted battleships with flight decks, 1 heavy cruiser, 4 light cruisers, and 10 destroyers. Interrogation of Japanese officials after the war established the fact that this was a decoy force, intended to pull our heavy screening forces away from the Leyte area. Aircraft of the enemy carriers were to shuttle to the Philippines, as their status of training was such that the pilots could not land back on the carriers.

The Japanese Southern and Central Forces had suicide orders. Had the Japanese admiral commanding the Central Fleet allowed these orders, as the battle developed, his force had the capability to seriously disrupt our landing operations and to inflict heavy damage on our assault forces on the beach and standing off the beach.

During the day of 24 October 1944, aircraft of Task Force 77 and Task Group 38.4 attacked the Japanese Southern Force and the major Seventh Fleet surface units were moved to Surigao Straits to intercept the enemy in the narrow waters. The balance of Task Force 38 meanwhile located and attacked by air the Central Japanese Force in the Sibuyan Sea. This Central Force was apparently heading for the San Bernardino Straits. In the afternoon of 24 October, Task Group 38.4 headed north to join the balance of Task Force 38, and Task Force 38 located the approaching Japanese Northern Force which was reported to contain some carriers. The Commander of the Third Fleet then recovered his aircraft, which had been attacking the Central Force, and headed north—in the afternoon of 24 October—to attempt to engage the Northern Japanese Force. The entire Task Force 38, the major component of which was

Task Force 88, was pulled out of the area, including the heavy surface units, leaving the San Bernardino Straits unguarded. The message of the Commander, Third Fleet, to the Commander, Seventh Fleet, made no mention of withdrawing the heavy capital ships and leaving San Bernardino Straits unguarded. The Seventh Fleet Commander immediately messaged back an inquiry on this point—but established ineffective precautions in the form of reconnaissance and guard. He received the answer from the Commander, Third Fleet after he was under fire the next day. Against the Japanese Northern Force, the Commander, Third Fleet, had at least 5 aircraft carriers, 6 small aircraft carriers, 6 battleships, 2 heavy cruisers, 6 light cruisers, and 41 destroyers, outnumbering the Japanese Forces in every way by more than three to one.

During the night of 24-25 October, the Japanese Central Force, its battle strength only slightly reduced by the Third Fleet air attacks of the 21st, reformed and—undetected—passed through the San Bernardino Straits and headed south, off Samar, for Leyte Gulf. Meanwhile, Third Fleet Forces steamed northward to prepare for a dawn attack and possibly a battle line action with the Northern Forces. During the same night, the Seventh Fleet blockaded and engaged the Japanese Southern Force in a night surface action as it emerged in single file through the mouth of Surigao Straits, sinking or heavily damaging the greater part of the enemy force. Fleeting cripples were sunk by land- and carrier-based aircraft and surface units during the next 2 days.

The Third Fleet attack on the Japanese Northern Forces began early on 25 October and went well. Air attacks were launched between 0840 and 1750, 25 October, sinking several ships and damaging practically the entire fleet. Surface units closed on and sank one crippled small aircraft carrier and one crippled light cruiser or destroyer. In all, one enemy aircraft carrier, three small aircraft carriers, one light cruiser, and one destroyer were definitely sunk and the balance of the fleet was damaged.

Meanwhile the Seventh Fleet was in difficulty. The enemy Central Force approached undetected to within 17 miles of the northernmost carrier group, standing off the Leyte beaches, and opened fire shortly after dawn. The heavy surface ships of the Seventh Fleet, all of which had been de-

ployed for the Surigao action, were low on ammunition and fuel after the battle of the previous night and were not in position to support the CVEs or the assault forces. Our escort carriers covering Leyte were shielded only a light destroyer screen. Many aircraft were airborne in search of the retreating cripples of the enemy Southern Force—and others were in the air participating in Leyte support operations. Coincident with these difficulties, the enemy stepped up the tempo of his land-based air attack—utilizing suicide tactics. The destroyer screen and the escort carrier air components fought against what appeared to be hopeless odds. Soon out of torpedoes and bombs, carrier aircraft pilots made dummy runs on the Japanese fleet in an attempt to turn them. Also many strafing missions were run without bombs or torpedoes. Unable to land on damaged escort carriers—scores of carrier-based fighters were compelled to land on the unfinished strip at Tacloban—resulting in the loss of many aircraft. Two American destroyers and one destroyer escort made a suicide torpedo run against the heavy units of the Japanese fleet and were immediately sunk. The battle was going well for the Japanese Forces when, at about 0024 in the morning—either as a result of cowardice, stupidity, or confusion—the Japanese commander ordered a withdrawal. At that time his forces were at the entrance to Leyte Gulf. Two of the escort carriers of the Northern Carrier Group had been sunk, the balance had been damaged, the destroyer screen had been sunk or driven off, and destruction apparently awaited our transports, crippled carriers, and beach forces. But for the poor decision of this Japanese admiral, his forces were capable of seriously disrupting our first invasion of the Philippines.

After the Japanese Central Force turned back and was retreating north off the coast of Samar, elements of the Third Fleet, which had been sent back from the attack on the Northern Enemy Force and Task Group 38.1, returning from Ulithi, entered into the pursuit and assisted in the air attack on the retreating enemy.

The Seventh Fleet had borne the brunt of the enemy assault. On the afternoon of 25 October the Commander of Task Force 77 notified the Commander in Chief, Southwest Pacific Area, that his escort aircraft carriers had been seriously crippled by air and surface attack, that there had been no fighter cover for Leyte on that date, and in some

cases none for the escort aircraft carriers, and that the escort aircraft carriers' maximum effort had been expended in defending themselves. He further stated that apparently a large number of enemy aircraft had been flown in and that it was of the utmost importance for land-based aircraft to be flown into Leyte immediately. Original plans had called for land-based aircraft to be operational and take over the defense of Leyte on 5 November. However, due to the inability of the Seventh and Third Fleets to break up the enemy air opposition—which was taking heavy toll of our destroyers and escort carriers in suicide attacks—Fifth AF P-38s were flown into the area on 27 October, just as soon as the Tacloban strip could take them. At 1600, 27 October, the Fifth AF assumed the responsibility for the air defense of Leyte and for air support to the surface forces—with a total of 33 P-38s. By 31 October all carriers of Task Force 58 had been withdrawn toward Ulithi. The 33 P-38s had been built up to 66 and this force of land-based AAF fighters, 6 days after arrival, had established local air superiority.

The loss of air superiority in the area prior to the arrival of land-based fighters was not due to a rebirth of Japanese air power. Actually, of the thousands of enemy aircraft in the Philippines at the time, only a small number were operable. Enemy aircraft sorties in the Leyte area averaged less than 100 per day during the critical period of the Leyte operation. The enemy's adoption of suicide tactics increased the vulnerability of our carriers and to this was added the damage inflicted by the Japanese surface fleet. The air power of the fleet, being dependent upon the floating airbase, found itself unable to reassert a sufficient degree of air domination.

Between 25 October and 12 December, the enemy attempted to land troops at Ormoc Bay—across the island from our beachhead—in eleven different convoys. Eight of the eleven convoys were decimated by land- and carrier-based air action. It was estimated that in the reinforcement attempts the enemy landed approximately 25,000 troops—most of them before 1 November.

Following the establishment of land-based air power on Leyte, the next 6 days witnessed a battle for air superiority over the area. The enemy very foolishly piecemealed and frittered away his

remaining air potential and failed to attack our only air base in sufficient strength to render it inoperable. By 8 November our force of land-based fighters dominated the air over the Leyte area and turned their attention to isolation of the battlefield and the destruction of Japanese forces in the local area. In order to expedite clearing the entire island, our forces made additional landings on the west side of Leyte on the flank of the enemy Ormoc garrison. These operations were given air support by Fifth AF and the battle for Leyte was successfully completed on 26 December 1944.

In order to understand the decision of the Commander of Task Force 58 to leave the northern approach to Leyte unguarded, it is necessary to appreciate five factors which bore heavily on the decision:

First.—A battle line action had been desired during the first battle of the Philippine Sea—while Task Force 58 (later designated Task Force 38) was guarding the Marianas landing against the Japanese Fleet. It will be recalled that the Fifth Fleet Commander had decided, on 15 June, against heading westward toward the enemy fleet during the night of 18-19 June because such action might lay the Saipan landing operations open to attack—if portions of the enemy fleet outflanked Task Force 58 during the night. Actually, the enemy launched his carrier planes for a shuttle to the Marianas Islands the next morning and withdrew. Task Force 58 got close enough to launch one attack by carrier aircraft at the retreating enemy—but could not effect a surface closure. On 24 October the Third Fleet Commander was faced with essentially the same problem. Task Force 58 could remain in position to guard the Leyte operation against both the Central and Northern Force—or it could close during the night to destroy what appeared to the Commander, Third Fleet, to be the most important Japanese Force—the Northern Group. If the Third Fleet did not close on the Northern Force, the enemy again might launch his aircraft for shuttle to the Philippine Islands while still outside range of Third Fleet aircraft (which had to make a round trip) and again the northern component of the enemy fleet might escape.

Second.—The Japanese Central Fleet had no carriers. In all experience up to this time when our naval forces and the Japanese naval forces had bruised each other with air blows, the unfortunate

attacked Japanese oil resources and installations at Balikpapan, Borneo.

Only once during the Philippine Campaign (Leyte invasion) was our position seriously jeopardized and this occurred when carrier-based airpower—in the face of strong enemy surface and air attack—failed to maintain air superiority over the area of our landing operations. The strategic mobility of the carriers, in this case, could not compensate for the disadvantages of vulnerability and inability to maintain a relatively high operational rate in the face of determined opposition. The decision which took the Third Fleet out of the area at a critical time also materially contributed to the loss of air superiority in the area.

5. Central Pacific.

a. *General.* Following the pattern adopted in the Gilbert and Marshall Islands, Pacific Ocean Area Forces occupied Saipan, Tinian, and Guam between June and August 1944. From bases in the Gilbert and Marshall Islands, the Seventh AF continued to support these operations in neutralizing attacks against Truk, Ponape, Wake, and Nauru Islands. In the latter part of the period, Seventh AF units were moved to the Marianas and cooperated with Naval and Marine Forces in close support operations in the occupation of Tinian and Guam. From the Marianas the Seventh AF also initiated, during this period, neutralization strikes against the Bonin Islands and Iwo Jima. Following the seizure of the Mariana Islands, Pacific Ocean Area Forces occupied Ulithi Island and Palau Island in September 1944. A more detailed account of these operations is given below.

b. *Marianas Operation.* Pacific Ocean Area Forces occupied the Marianas between 15 June–10 August 1944 in the manner outlined below.

On D–4, Carrier Task Force 58 made a long range fighter sweep of Guam, Rota, Tinian, Pagan, and Saipan Islands primarily aimed at the destruction of the Japanese air defenses.

On D–3 the carrier air strikes were continued and the fast battleships and destroyers of Task Force 58 bombarded the defenses and air installations of Saipan and Tinian.

On D–1 air attacks were continued and air cover was maintained for mine sweeping and beach reconnaissance by underwater demolition teams. No mines or obstacles were encountered in the approach to Saipan. During the night preceding

D-day, destroyers continued harassing fire on Saipan and Tinian.

On D-day, 15 June, the amphibious assault on Saipan was made by the Joint Expeditionary Force (Task Force 51). The assault was preceded and supported throughout the day by heavy air strikes and naval gun fire by Task Force 51. Initial landings met only light resistance. Twenty thousand assault troops were put ashore the first day. Enemy resistance stiffened after the original beach positions had been secured—artillery, mortar, and machine gun fire harassing the beach area, ships, and unloading operations—although the fire was not of sufficient intensity to stop the assault.

On D-day Task Force 58 struck Iwo Jima and Chichi Jima in fighter sweeps to neutralize air opposition or reinforcement from these bases. On D+1 Task Force 58 again sent fighter sweeps against Iwo Jima and immediately thereafter was ordered by the commander of the Fifth Fleet to return to a position westward of the Mariana Islands. The Japanese Fleet was reported as assembling in the Philippine Sea and Task Force 58 had been assigned the responsibility for preventing the enemy fleet's interference with the occupation of Saipan.

Between 16 June and 21 June Task Force 58 maneuvered in the waters west of the Marianas and repulsed the Japanese Fleet—again by air action.

In anticipation of a battle-line surface action, Task Force 58 had been reorganized to provide a separate strong surface battle-line group at the expense of the carrier components. In order to save the time necessary to form the battle-line, the battleships had been removed from the carrier groups and placed in a separate force. This force was placed toward the direction of the enemy from the carrier groups at maximum communications distance. It was realized that this action would reduce the antiaircraft protection of the carriers—but it provided maximum opportunity to engage the enemy surface force with our more powerful battle line.

The surface battle might have taken place but for the decision of the Fifth Fleet Commander not to seek a night surface engagement on the night of 18 June. This decision not to head westward toward the enemy fleet was influenced by the possibility (if Task Force 58 did head west) that the enemy fleet

might outflank our forces in the darkness, and get between Saipan and our Task Force. The security of the landing operations could not be jeopardized; therefore, the Fifth Fleet Commander made the decision to remain between the enemy fleet and the beachhead and not to seek the surface engagement until a carrier strike had been launched. This decision was made on 18 June. On 19 June the air battle developed, as enemy aircraft, shuttling from the enemy fleet to the Marianas bases, assisted by additional enemy aircraft operating from the island bases, attacked our air and surface forces. In the course of this action the Japanese inflicted some damage on our fleet but lost approximately 350 of their attacking aircraft, mostly to our carrier-based fighters. The same day the submarine *Ocella* reported that she had hit a carrier of the Japanese Fleet with torpedoes. This constituted the only surface combat action of the First Battle of the Philippine Sea.

The following day, 20 June, Task Force 58 attempted to close with the enemy fleet which by this time—having shot its carrier air component—was retreating. However, the enforced delay had been too great and closure could not be effected. It was therefore decided to make a maximum range air strike at the enemy fleet in order to damage it and slow it down. This was considered to be the only chance of bringing the retreating enemy fleet into decisive surface contact. The air strike was launched at 1634 in the afternoon, at maximum range, with knowledge that returning aircraft, whose crews had no night carrier training, would have to make night landings and that they would be very low on gasoline. A successful air strike on the Japanese Fleet was made at 1845—but a high percentage of our attacking force was not recovered.

During the night, the battle line was released by the Task Force Commander from the necessity of maintaining stations on the carrier task groups, who were compelled to head eastward into the wind to effect recovery of those air components which returned. This was done so that the battle line group could pursue the enemy and be in position for decisive surface action at daybreak. However, during the night the crippled enemy fleet increased the distance between our forces to 360 miles. At 0800, 21 June, the enemy was outside air strike range. For this reason pursuit was abandoned, and the enemy fleet escaped.

While the maneuvering for this battle was taking place, on 16 June, D+1, the invasion date for Guam, scheduled for 18 June, was postponed indefinitely.

On 22 June, D+7, Seventh AF P-47's arrived at Aslito Field, Saipan, and assumed responsibility for the CAP (Combat Air Patrol). Thereafter and during the assault on Guam and Tinian, Seventh AF fighters cooperated with naval air units in providing close air support to the ground forces.

Progress on Saipan was slow. Heavy fighting with many casualties on both sides resulted from numerous Japanese suicide attacks. Two Marine divisions and one Army division did the bulk of the surface fighting. By 25 June, the bulk of our troops had been landed and by 9 July 1944 all organized enemy resistance had been overcome.

During and following the reduction of Saipan, Guam and Tinian were softened up by air attacks by both carrier-and-land based aircraft. Guam was assaulted on 21 July and fully occupied by 10 August. Tinian was assaulted on 24 July and was fully occupied by 1 August 1944. In both operations, air and naval bombardment were coordinated to systematically reduce the enemy prepared defenses—following the general pattern of operations employed in the seizure of Saipan.

Major forces employed in the Marianas operation were the Joint Expeditionary Force, the carrier force, and elements of the defense forces and shore-based air.

c. *Invasion of Iwo Jima.* Pacific Ocean Area Forces continued the exploitation of the enemy's debilitated air force on their axis of advance and, following the Mariana operation, pointed toward Iwo Jima.

From August 1944, until the middle of February 1945, Seventh AF B-24's, operating from the Marianas, attacked Iwo Jima as a primary land target and devoted approximately 50 percent of their effort to attacks on Japanese shipping. B-29's of the XXI Bomber Command, between October 1944 and February 1945, also devoted about 10 percent of their effort against Iwo Jima. The purpose of these attacks was principally to neutralize Japanese Air Forces which were in position on the island to threaten the B-29 bases in the Marianas. As a result of these attacks, there were no Japanese attacks against B-29 bases after 9 January 1945.

The assault on Iwo Jima followed the pattern of the Marianas operation. Task Force 58 attacked air and shipping in Japan proper on 10-3 and the heavy air and naval bombardment of the island started on the same day. Task Force 51, the Joint Expeditionary Force, again conducted the assault. Due to hills, caves, and the cinder-like nature of the terrain, extreme difficulty was encountered in neutralizing the Japanese dug-in gun positions by the preassault air and naval bombardment. As a result, the underwater demolition teams and beach reconnaissance parties suffered heavy casualties, and the later advance across the island was very slow.

The assault was made on 19 February, initially against light opposition, but movement became progressively slower as the initial beach positions was expanded. Close support to the ground forces was provided by carrier aircraft until 8 March when Seventh AF fighters occupied a captured airstrip and began operations.

Our surface advance on Iwo Jima was slow and our casualties were heavy principally because the preliminary air and naval bombardment had not effected a satisfactory degree of neutralization of the enemy surface defenses. The cinderlike soil absorbed and cushioned bomb blast, and caves and reinforced dug-in positions on the hills were hard to get at. Direct hits with heavy caliber bombs or large shells were required to neutralize such positions. Napalm was tried more or less experimentally against various of these positions, but was not employed in such manner as to prove effective. It is highly probable that a very heavy saturation of entire areas with napalm—before ignition—would have provided the desired results, which some 6,000 tons of bombs and 10,000 tons of naval gun fire failed to produce.

Air opposition was relatively light throughout the operation—though our fleet suffered the loss of one escort carrier, damage to one aircraft carrier, and hits on several smaller vessels by suicide attacks which were normally launched in the half light of dawn or dusk. The high vulnerability of destroyers and smaller vessels resulted from the practice of placing these isolated units as early as possible warning pickets several miles out. In this position, the isolated vessel received no support fire from other fleet units and became a vulnerable target for suicide attack.

The island was finally fully occupied by 17 March 1945 after some of the bitterest and costliest ground fighting of the entire war.

d. *Invasion of Okinawa.* On 31 December 1944, the Commander in Chief, Pacific Ocean Area, ordered the Ryukus operation, and directed the Commander, Fifth Fleet, to capture, occupy, defend, and develop air and naval bases on Okinawa Retto, to gain and maintain control of the Nansai Shoto area, and to protect air and sea communications along the Central Pacific axis. All forces of the Pacific Fleet and Pacific Ocean Area were assigned support tasks and the target date was set as 1 April 1945. Naval forces employed consisted of Task Force 58 (the strategic striking and covering force), Task Force 51 (the Joint Expeditionary Force), and various supporting groups totaling more than 1,200 ships. The assault force was composed of infantry, amphibious, and Marine units.

Southwest Pacific Air Forces supported the operation by search of the China Sea, Straits of Formosa, and sea areas east of Formosa, and by air strikes from Luzon bases against enemy air bases in Formosa.

The Fourteenth AF covered the China coastal areas and the XX Bomber Command attacked enemy air installations in northern Formosa. The XXI Bomber Command assisted the operation by strikes against Kyushu airfields on L-8 and L-1 and by continuing strikes against targets on the mainland of Japan.

On 18-19 March, L-14-18, aircraft of Task Force 58 raided airfields on Kyushu and Honshu and shipping in the Inland Sea. On 28 March, Task Force 58 attacked 6 airfields in the Okinawa area. Air opposition was light. From L-6 to L-3, initial landings were made on Kerama Retto and on 1 April the assault on the western beaches of Okinawa was made. Initial landings were practically unopposed and the island was swiftly crossed from west to east. However, stubborn opposition developed in the northern and southern sectors and 81 days were required to destroy the last organized resistance points. Again the Japanese took advantage of naturally defensible terrain, and our air and naval preliminary bombardment failed to destroy the well-defended positions.

Shortly after L-day, Japanese air resistance became very heavy in numbers, though the pilot quality was so low that the greater bulk of the

damage suffered by our forces was the result of suicide attacks. On 6 April, as an example, Task Force 58 claimed 238 enemy aircraft destroyed in combat for a loss of 2 carrier aircraft. On 5 April, aircraft of Task Force 58 also intercepted the dying effort of the Japanese Fleet, sinking by air attack the Japanese battleship *Yamato*, 1 light cruiser, and 4 destroyers of a force of 1 battleship, 1 light cruiser, and 8 destroyers. The remaining 4 destroyers were damaged but escaped.

As a result of the suicide attacks during the Okinawa operation, our naval forces lost approximately 50 ships sunk and 216 damaged. Destroyers and destroyer escorts serving as pickets took the bulk of suicide attacks as they were normally on the fringe screening the carriers and heavier surface ships.

6. Japanese Home Island Area.

a. *General.* Air attacks of Phase IV against the Japanese home islands were of two distinct types as follows:

(1) Attacks by carrier task forces for the purpose of increasing the degree of our air domination over Japan proper, destroying Japanese shipping, and attacking selected shore installations.

(2) Pioneering and service testing operations with very heavy bombardment aircraft against Japanese industry and cities for the purpose of preparing for the major air assault against Japan's national war structure.

The further extension of air domination over Japan proper was an exploitation phase of the air war, the decisive engagements of which had been fought by April 1944. Just as the advance of the Southwest Pacific Area Forces from Hollandia to the Philippines and the advance of the Pacific Ocean Area Forces through the Gilbert, Marshall, and Marianas Islands to Iwo Jima and Okinawa were exploitations of the air victory in New Guinea and the Solomons—so also were the air operations against Japan proper a further exploitation. The complete air domination established over Japan proper during Phase IV, itself an exploitation of an air victory, was further and finally exploited in Phase V in the intensive heavy bombardment attacks which ended the war. The carrier attacks of Phase IV against Japan's home island air installations also furthered the more immediate objectives of the Pacific Ocean Area

Forces by reducing the enemy air opposition to the occupation of Iwo Jima and Okinawa. After our landing operations had commenced on Okinawa, 1 April 1945, Japan assigned first priority to the disruption of this operation and the destruction of our fleet by suicide attacks. Carrier strikes on Japan proper undoubtedly reduced the numbers of enemy aircraft which were flown to the Okinawa area for this purpose. Carrier strikes against Japan proper had little, if any, effect on the opposition encountered by the Twentieth AF over Japan. B-29 attacks had been started 8 months before the first carrier attack and had been going on successfully since that time. Here again was clearly shown that a high degree of air domination had to be achieved before a fleet might approach land masses with impunity—while a lesser degree of air domination permitted air attack with an acceptable loss rate.

Preceding these carrier operations, our long range heavy bombardment attacks against Japan's home industry and people, both from the CBI in June 1944, and the Marianas in November 1944, had begun on a limited scale. Our earliest heavy bombardment attacks had been able to penetrate remaining Japanese air defense—but operations were limited during Phase IV by the following factors:

Inadequate base facilities within economical bombing range of Japan.

Service testing the very heavy bombardment equipment and eliminating the mechanical difficulties inherent to new devices.

Assembling and training the forces and providing the logistics for the final assault.

Light to moderate Japanese air and antiaircraft opposition in the objective area.

Weather.

All of these limitations were largely overcome during Phase IV. Phase IV may be considered as an assembly and preparation phase in which was developed an air striking force of sufficient weight to crush the enemy's will and ability to continue the war. During Phase IV the forces were built up, tactics were developed, and, in experimental attacks, serious damage was inflicted upon Japan's home industry and civilian population. A brief résumé of air attacks against Japan proper during Phase IV follows:

b. *Land-Based Air Attacks, Phase IV.* On 15 June 1944, China based B-29s of the XX Bomber

Command made the first raid on Japan proper since General Doolittle's carrier-borne B-29 attack of April 1942. Forty-seven B-29s bombed Yawata, steel center in northern Kyushu, in a night attack. Thereafter, and until early 1945, China-based B-29s made periodic strikes at the Japanese home islands with forces usually under 100 B-29s. Bomb loads were fairly light on these attacks due to the fact that mechanical difficulties were being worked out of the aircraft and all operations were high altitude, maximum range missions.

On 24 November 1944, the first B-29 attack against Japan proper was launched from the Marianas. This was a daylight attack against the major aircraft engine plants in the Tokyo area and was performed from high altitude. Between 24 November 1944 and 25 February 1945, B-29 attacks against Japan proper were launched from the Marianas about every fifth day with forces composed of less than 200 effective aircraft over the target. Targets under attack were principally aircraft engine and airframe plants. These were daylight, high-altitude (28,000-32,000 feet) formation attacks.

On 25 February the first 200-plane attack was run—a successful high-altitude, daylight, incendiary raid against Tokyo by radar through the overcast. This raid burned out more than 1 square mile of the city and indicated the vulnerability of Japanese cities to incendiary attacks.

Bomb loadings in these initial attacks varied between 2 and 5 tons per aircraft—due to the high altitude at which the missions were being run. March 8, 1945, marked a change in tactics which doubled the bomb loading. On this date the Twentieth AF sent approximately 300 B-29s against Tokyo at night, in an incendiary raid, at low altitude. The enemy's capability for defense against this type attack had been correctly assessed and losses were very light. Between 9 March-10 March five great incendiary raids were run against Japan's principal cities, in the same manner, with forces approximating 300 aircraft. Tokyo, Osaka, and Kobe were each bombed once and Nagoya was attacked twice. These five attacks completely destroyed approximately 32 square miles of these cities.

By 10 March, the Twentieth AF had exhausted its supply of incendiaries and turned its attention to night, visual, precision bombing with high ex-

plosives against targets illuminated by flares and fires. The results were not particularly impressive and this form of attack was discontinued.

On 27 March 1945, the first aerial mines from the Marianas were laid by B-29s. These operations started directly in support of the Okinawa landings and were for the purpose of blocking the western egress from the Inland Sea. This type operation was outstandingly effective and was continued until the end of the war. Not only did the aerial mines succeed in blocking the Shimonoseki Straits to what was left of the Japanese Fleet, but they completed the interdiction of Japan's lifelines of communication to the Indies. After the aerial mining program was started, more shipping was sunk by this means than by any other agent, including submarines. During the latter part of March 1945, B-29s also attacked Kyushu airfields in support of the impending Okinawa landing.

During the first 15 days of April, the Twentieth AF turned again to Japanese industry and cities. Daylight, medium level attacks, at 12,000 to 18,000 feet altitude, were run against aircraft engine plants at Tokyo and Nagoya and two night incendiary raids against Tokyo were made.

On 7 April 1945, B-29s were provided fighter escort for the first time. Eighty P-51s of the VII Fighter Command, based on Iwo Jima, joined three hundred B-29s in an attack against the aircraft engine factories at Tokyo and Nagoya. Intercepting P-51s shot down 21 Japanese fighters for a loss of two aircraft.

Meanwhile, Japanese kamikaze attacks against fleet units supporting the Okinawa landing were causing the Navy serious concern. Carrier air components were being held, for the most part, close to the Fleet in an attempt to break up the enemy suicide attacks. They were thus not at liberty to seek out and attack the enemy in strength at his Kyushu bases. The situation was so critical that it was feared all naval forces would be compelled to retire if the situation did not improve. The Twentieth AF was then directed to attack Kyushu airfields, from which the kamikaze attacks were being mounted, as a first priority mission.

Between 17 April-11 May 1945, B-29s attacked Kyushu airfields every day with forces averaging 75 to 100 aircraft. Enemy air opposition was more determined and in greater numbers here than in the Tokyo area and 22 B-29s were lost. However, the major air installations on Kyushu were re-

duced to rubble by the Twentieth AF attacks and the kamikaze efforts immediately started falling off.

On 29 April, Seventh AF P-51s, which had been escorting B-29s since 7 April, were turned loose in a dive-bombing and strafing attack against Atsugi Airfield, Tokyo, and added to the general decimation of Japanese airpower in the area.

c. *Carrier-Based Attacks, Phase IV.* Eight months after the first B-29 attack against Japan proper, Task Force 58 launched its first raid against the Japanese home islands. In support of the Iwo Jima landings, the Tokyo area was attacked on February 16-17 by several hundred carrier-based aircraft. Targets were principally air installations and shipping, and 500 enemy aircraft were claimed destroyed.

On 25 February the same task force again attacked the Tokyo area with approximately 600 carrier-borne aircraft. This mission was coordinated with the Twentieth AF's B-29 attack of the same date and cleared the target area one minute before the first B-29 bomb, released by radar, came plunging through the overcast.

March 18-21, preceding the Okinawa landing, carrier aircraft attacked Kyushu airdromes and the Japanese Fleet in the Inland Sea. It had been hoped that this series of preinvasion air strikes would discourage enemy air opposition to the Okinawa landings. However, the enemy's reaction was exceptionally strong and replacement aircraft were flown into the Kyushu bases as fast as they were destroyed. The carrier attacks—while easily capable of destroying the half-trained Japanese pilot and his aircraft—lacked the bomb tonnage required to wipe out the air installations and facilities and thereby reduce the Japanese capability for continuing operations. After the Okinawa landings started, limited carrier strikes were launched against enemy Kyushu bases—but the more pressing task of defending the fleet units prevented concentration of a decisive weight of effort. The combination of B-29 attacks on the Kyushu bases, fleet antiaircraft defenses, and the carrier air battles in the Okinawa area eventually cleared the area over Okinawa and set the stage for the next and last planned invasion.

7. Aleutian Area.

No change of note occurred in this area. The Eleventh AF continued harassing raids against

fishing boats, canneries, and military installations in the Kurile Islands.

8. Results of the Action of Phase IV.

That the period April 1944–April 1945, Phase IV of this report, was truly an exploitation phase of the war against Japan is beyond dispute. The 28 months preceding this phase had been marked by relatively strong Japanese air resistance and capability and by only minor American geographical surface advances on the perimeter of the expanded Japanese Empire. The 12 months of Phase IV, however, witnessed rapid extension of air domination to Japan proper and corollary surface advances so rapid that our own logistical and marshalling problems impeded our rate of advance more than did the Japanese opposition.

During the 28 months preceding Phase IV, our forces reoccupied a surface area, land and water, of approximately 940,000 square statute miles. Of this total, approximately 140,000 square miles were reoccupied during Phase II in the New Guinea–Solomons area, 180,000 square miles were reoccupied during Phase III in the New Guinea–Solomons area, and 640,000 square miles were reoccupied in the first exploitation operation into the Gilbert Islands.

During the 12 months of Phase IV, an additional 6,590,000 square statute miles (approximate), land and water, came under our complete air and surface domination. This is an area more than twice the size of the United States.

Our exploitation of the defeat of the Japanese Air Forces manifested itself in two ways:

First—Extension of our air domination toward Japan proper.

Second—Surface occupational moves over tremendous distances in a very short period of time.

The ultimate result of the operations of Phase IV was to set the stage for a final exploitation of the air domination which our Army, Navy, and Marine air units had established and an exploitation of the surface advances our air forces had made possible. This final exploitation could be accomplished in one of two methods as follows:

First—From the Marianas, Iwo Jima, and Okinawa, it was now possible to launch direct air attack in force against the Japanese Home Islands. It was believed by some few air commanders that this method of exploitation would induce unconditional surrender without the necessity for a sur-

face assault and invasion at the final defense point.

Or second.—Our airpower could continue to operate against the final objective and soften it up, over a period of time, for a surface assault to follow. This pattern was already doctrine—and no commander minimized the advantages accruing to his forces by following this procedure. However, at this point a full evaluation was not made of the difference in circumstances which existed between softening up perimeter defenses by air and softening up the home islands by air. True, it had been necessary to launch surface assault against many areas which were desired for advancing our chain of air and fleet bases—and preliminary air attack rarely eliminated all resistance. It could therefore be expected, by a superficial evaluation, that the same would hold true for the home islands. In hindsight, however, the differences were obvious. The outer defenses were military installations, whose suicidal sacrifices were justifiable in that they served to protect the people of Japan. On the other hand, sustained air attack against Japan proper was capable of exterminating modern Japanese industry, economy, transportation, and culture and plunging the remnants of the population into a state of chaos. General Takashima, when interrogated after VJ-day, stated that surrender had become unavoidable, that the intact Japanese home army, even though it might repel a surface invasion attempt, could no longer protect the Japanese people from extermination. However, without the benefit of hindsight, this evaluation was not made by our leaders in April of 1945, and invasion plans, following this second possible course of action, were prepared.

9. Significance of the Action of Phase IV.

This exploitation phase of the war further substantiated the observations made earlier in the text relative to the role of airpower in the war against Japan.

a. Airpower Dominated Its Own Element. By resorting to kamikaze tactics, the Japanese Air Force was able to inflict a degree of damage on our carriers sufficient to enable the enemy to achieve temporary control of the air. This jeopardized the security of our beach operations, resulted in withdrawing the carriers before the planned date, and hastened the deployment of land-based aircraft to the area. Land-based airpower then reasserted our general domination of the area by

again achieving domination of the air. It is significant to note that, at Leyte, our carrier air forces for the first time in the Pacific War endeavored to maintain air superiority in the proximity of a land mass suitable for the basing of an effective land-based air force, and that, despite the low order of combat capability to which that opposing land-based air force had been reduced, it still retained the capability of forcing a more powerful concentration of airpower, far exceeding the defender in combat capability, to an early withdrawal from the battle area by reason of a fundamental and controlling factor—the high vulnerability of the carrier base.

While obtaining many hits, all of the anti-aircraft of the fleet off Okinawa was incapable of preventing heavy damage from the kamikaze attacks. Carrier fighter operations and B-29 destruction of the Kyushu fields brought this menace under control.

b. Airpower Dominated Naval Warfare. Our naval forces assaulted the Mariana Islands under a cloud of aircraft which insured air domination over the limited enemy forces that could be mustered in defense.

The First Battle of the Philippine Sea was fought west of the Marianas—again by carrier aircraft—without surface elements making contact.

Our naval carrier force was compelled to withdraw from the Leyte operation when we temporarily lost air domination.

Our naval forces off Okinawa were suffering excessive damage due principally to enemy kamikaze air attacks—when the combination of carrier fighter aircraft, B-29s, and final defense anti-aircraft artillery again secured air domination in the objective area.

c. Airpower Continued to Dominate Land Warfare. This point has been covered in detail in Sections IV and V. The experience in the Marianas, the Philippines, and Okinawa only add historical examples of the advantages accruing to a land army which enjoys friendly air supremacy and support.

d. Airpower Continued to Expand As a Logistical Instrument. All American military operations in China depended on air supply.

Burma was recaptured in an air-ground campaign in which more than 900,000 troops were en-

tirely dependent on air supply for months at a time.

The Tenth Army on Okinawa, having encountered more effective opposition than anticipated, and consequently running short of ammunition, was relieved from a very precarious logistical position by the emergency diversion of all available transport aircraft to the task of flying in ammunition.

The rapid advance of Southwest Pacific Forces from New Guinea to the Philippines was materially expedited by air supply and air movement of units.

In all theaters, the world girdling Air Transport Command performed a vital service in the transportation of personnel and matériel.

c. Airpower Conclusively Demonstrated Its Area Interdiction Potential. Numerous islands and Japanese pockets of resistance were bypassed. Methodical sea search, air attack against shipping, and aerial mining of the terminal approaches to Japan, coupled with the submarine offensive, insured the isolation of Japan from her raw material resources in the Netherlands East Indies. This was a form of occupation—an occupation in the third dimension which insured domination of critical surface activities.

1. The rapid advance of Southwest Pacific Forces from New Guinea to the Philippines was materially expedited by air supply and air movement of units.

2. The rapid advance of Southwest Pacific Forces from New Guinea to the Philippines was materially expedited by air supply and air movement of units.

SECTION VII

PHASE V, APRIL 1945-AUGUST 1945

PERIOD OF INTENSE DIRECT AIR ATTACK ON JAPAN PROPER

1. China.

Japanese forces in China made their last major effort in April 1945, in two surface assaults at Fourteenth AF key forward air bases. One thrust was aimed at the North Central Base, Hsian, on the Yellow River, from which the Fourteenth AF was attacking the railway system in North China. The second enemy assault was aimed at Chihkiang, the only east central base remaining in Allied hands, and a key base controlling the approaches to Chungking and Kunning. These two Japanese attacks were repelled by close air-ground cooperation between Fourteenth AF, the Chinese-American composite wing, and Chinese ground forces. The intense training of the past year, during which the Fourteenth AF had attempted to develop an air-support system for the Chinese armies, was finally rewarded. Close tactical air support, controlled by air-support parties in the battle line, was successfully provided to the defending Chinese troops and the enemy retired from both sectors with very heavy casualties.

The Fourteenth AF continued the railway interdiction program in industrial North China and in North French Indo-China and also attacked Japanese air installations ranging from Shanghai to Formosa to Tourane, French Indo-China.

In June 1945, constantly harassed by air attack on his lines of communication and unable to support or effectively supply the forces on the railroad corridor between Hankow and Canton, the enemy commenced withdrawing north toward Hankow and south toward Canton. Chinese forces followed in the wake of the withdrawal and re-occupied our eastern bases in June and July. These bases were promptly reconditioned and Tenth AF units moved in.

In July 1945, Headquarters, Tenth AF was re-deployed from India-Burma to China. At this time an over-all Air Headquarters was estab-

lished in the China Theater to which was assigned the Fourteenth and Tenth Air Forces. The Fourteenth AF was given the mission of operating against Japanese economy and communications in North China and was based north of the Twenty-seventh parallel. The Tenth AF was designated as the Tactical Air Force and was based south of the Twenty-seventh parallel. Its mission was to support the operations of the Chinese armies in the assault on Canton, planned to begin on 15 August 1945, with the occupation of Fort Bayard, at the head of the Luichow Peninsula.

When the war ended, the Tenth AF was assigned all tactical transport aircraft in China and effected the bulk of the large-scale air redeployment of Chinese troops to North China. The Fourteenth AF, at the same time, was assigned all combat aircraft in China and deployed these forces on an offensive-defensive line running from Hsian to Hankow to Shanghai. This was done as a security measure to guard against the unpredictable outcome of mixing 1 1/4 million surrendered Japanese troops, several Chinese National armies, and hundreds of thousands of Chinese Communists in the area north of the Yellow River and south of the Great Wall. Russian forces converging on northern China also added an element of doubt to this complex situation.

2. India-Burma.

Organized Japanese resistance in Burma ended during the preceding phase when the Allied three pronged air-ground assault covered 450 miles in 6 months and approached Rangoon. Rangoon fell on 2 May 1945, when a joint airborne, amphibious force moved into the city. The forces were welcomed by a lone RAF pilot who had landed alone at Mingaladon Airfield, Rangoon, the day before and had taken possession of the city. Japanese forces, decimated and disorganized by months of

air attack, had evacuated the city. Rangoon, like Tokyo, fell to airpower, and surface invasion became a political rather than a military problem.

In July, redeployment of Tenth AF units to China was commenced. This was to be a gradual process—consistent with the logistical build-up in China—and was only partially completed when the war ended.

The Air Transport Command continued to expand its operations to China during this phase in anticipation of accelerated operations against Japanese positions in South China. With the fall of Burma, tactical transport groups and one heavy bombardment group, which had been committed to Burma operations, were put on the Hump run, ferrying supplies to China. Deliveries reached the peak in July 1945, when approximately 70,000 tons were delivered by air to China bases. By this time it was apparent that the Stilwell road and pipe line to China would not serve the logistical purpose for which they were built. During this phase, the India-Burma Theater plan for logistical support to China anticipated that a maximum of 13,000 tons of POL would be delivered through the pipe line to China each month and 4,000 tons per month (excluding the weight of transporting vehicles) would be delivered by the road. Air deliveries were to be expanded from the 70,000 tons of July 1945 to 130,000 tons per month by February 1946.

3. Southwest Pacific Forces.

While the greater effort of Southwest Pacific Forces was being marshalled for the planned invasion of Japan, mopping up operations in the Philippines continued until May 1945. The Fifth AF continued to give close tactical air support to these operations, employing high explosives, with a constantly increasing ratio of Napalm.

During April 1945, Fifth AF Philippine-based B-24s and P-38s attacked shipping and shore installations at Hongkong, and Thirteenth AF and Royal Australian Air Force heavy bombers attacked military installations and shipping at Soerabaja, Java.

Minor surface thrusts were also made into the Netherlands East Indies area. On 1 May 1945, Australian ground troops landed at Tarakan, Borneo, after the area had been softened by Thirteenth AF attacks. On 8 June 1945, Thirteenth AF aircraft also attacked the Japanese seaplane

base at Batavia, Java, in an 18-hour round trip from Palawan, P.I. landings were also made in the Brunel Bay area, Borneo, on 17 June 1945, following heavy raids by Thirteenth AF B-24s, B-25s, P-38s, and by Royal Australian Air Force units. Also, after 18 consecutive days of air strikes by Thirteenth AF units at Balikpapan, a landing was made by Australian ground forces. American Air Force and RAAF units continued to give air support to these ground operations during July.

During May and June, Thirteenth AF attacks were made from Philippine bases against shipping and shore installations on the China coast and Formosa.

On 2 July 1945, Southwest Pacific Area Forces began moving to Okinawa. In the latter part of July, Fifth and Seventh AF Okinawa-based aircraft attacked Shanghai air installations and began shipping sweeps of the waterways between Japan and Korea. In August the tempo of air attacks from Okinawa was stepped up, principally against tactical targets on the Island of Kyushu in preparation for the invasion. The Seventh AF concentrated a large part of its effort against the Nagasaki area destroying the docks and Mitsubishi aircraft factory while the Fifth AF has as its primary task the isolation of Kyushu from adjacent islands, disruption of communications on the island, and preparation for the planned invasion. During this period, the Thirteenth AF was also moved to Okinawa and was being organized and equipped to be used as a close tactical air support force after the Kyushu landings.

4. Central Pacific Forces.

Mopping up on Okinawa was a slow and tedious process. All organized resistance ceased on 23 June 1945, releasing Pacific Ocean Area Carrier Forces for more active participation in operations against the Japanese home islands.

Principal carrier activity for balance of war was as follows: May 1945, strikes against Japan proper; June, strikes in force against the Ryukyus and Japan proper, and a minor strike on Wake Island; July, strikes in force against Central and Northern Honshu and Kyushu, and minor strikes against Wake Island and Balikpapan; August, strikes against Central and Northern Honshu and Hokkaido.

5. Japanese Home Islands.

During Phase V, B-29s of the Twentieth AF continued to support the Okinawa operation by attacking Kyushu kamikaze fields until 11 May 1945. The final mission in support of Okinawa, 11 May, was a heavy attack on the enemy fleet and Army refueling stations in the Inland Sea between Yawata and Kure. In this attack the oil and gasoline storage and refining installations were destroyed.

In the latter part of May and early June, the incendiary attacks on the large industrial centers of Japan were virtually completed and on 17 June 1945, all of the big cities having been destroyed, attention was turned to the cities of secondary industrial importance.

Target selection was based generally on the following factors: Inflammability, incidence of war industry supported by the city, congestion, communications facilities of importance, and population.

Night incendiary attacks against the secondary cities were supplemented by daylight precision

attacks to complete the destruction of important industrial priority targets.

In July, 42 secondary cities were wiped out by radar night bombing, incendiary attacks—bombing absolutely blind.

During June, one entire B-29 Wing, stripped of all armament excepting the tail gun and employing improved radar, was deployed in the Marianas and began the precision destruction of oil refineries and oil installations by night radar bombing.

Toward the end of the war, having run out of large and small cities, and having paralyzed Japanese industry, attention was being turned to the communication system of the home islands, which was to be completely paralyzed before the invasion. The planned invasion was still 3 months in the future, allowing more than sufficient time to completely paralyze the Japanese communication system before the first landing was to be made.

A resume of the major Army Air Force B-29 attacks of this period follows:

Date	Target	Comment
May 14, 1945.....	Nagoya.....	Second B-29 fire blitz launched—2.15 square miles of Nagoya burned out.
May 16-17.....	do.....	Incendiary bombs fired 3.81 square miles of Nagoya; half of the Mitsubishi Aircraft Plant destroyed.
May 28.....	Tokyo.....	520 B-29s dropped 3,720 tons of incendiary bombs.
May 28.....	do.....	Tokyo was again struck by 464 B-29s; 32.1 square miles of the city destroyed in these 2 attacks.
May 29.....	Yokohama.....	440 B-29s destroyed 6.9 square miles of Yokohama.
June 1.....	Osaka.....	More than 3 square miles of Osaka burned out.
June 3.....	do.....	More than 2 square miles of Osaka burned out. Second fire blitz ended.
July 2-4.....	Honshu Island.....	More than 470 B-29s struck secondary cities on Honshu Island.
July 2-10.....	Sendai, Sakai, Wakamatsu, and Gifu.....	Secondary cities attacked by 497 B-29s.
Do.....	Yokohama.....	53 stripped down special radar B-29s attacked the Utsunomiya River oil refineries at Yokohama.
Do.....	Inland Sea.....	Shimonoseki Strait, Niigata Harbor and Naha Bay waters mined by 80 B-29s.
July 12-13.....	Utsunomiya, Yawata, Ichinomiya, and Uwa Jima.....	Fire and demolition bombs dropped by radar by 305 B-29s in raids on urban areas and Kawasaki petroleum center.
July 14-15.....	Kudamatsu.....	Radar B-29s destroyed Nippon Oil Co.
July 16-17.....	Numazu, Kuwana, Hiratsuka on Honshu and Oita on Kyushu.....	471 B-29s carried out incendiary attack.
July 18-20.....	Fukuoka, Hitachi, Choshi, and Osaka.....	547 B-29s dropped 4,000 tons of incendiary and demolition bombs on industrial sections by visual and radar means.
July 21-22.....	Ube.....	Synthetic oil plant destroyed by 77 radar B-29s.
July 24.....	Osaka-Nagoya.....	4 large aircraft factories, Osaka arsenal, and textile mill in Osaka-Nagoya sector hit by 599 B-29s, bombing visually and by radar.
July 25.....	Kawasaki.....	Oil water attacked by 76 radar-equipped B-29s.
July 26.....	Omura, Matsuyama, and Tokuyama.....	Bombard by 305 B-29s, dropping incendiaries.
July 28.....	Tsu, Aomori, Ogaki, Utsunomiya.....	562 B-29s started general conflagration in wide area, including Shimotsu Oil Refinery.
Aug. 1-3.....	Nagasaki, Toyama, Mito, Hirohito, and Kawasaki.....	766 B-29s in incendiary and high-explosive attack.

Date	Location	Comment
Aug. 6 Do	Hiroshima Japan	Atomic bomb dropped on Hiroshima. 604 B-29s dropped incendiaries on Japanese industrial areas and the Coal liquefaction Plant.
Aug. 8	Tokyo	Daylight attack, 412 B-29s hit Nakajima Aircraft Plant in Tokyo.
Aug. 9	Nagasaki	Second atomic bomb attack.
Aug. 10	Amagasaki and Tokyo	Oil refinery at Amagasaki and Tokyo arsenal bombed by 185 B-29s escorted by 102 P-51s.
Aug. 14	Japan	Attacking a variety of targets in the largest and last series of bombings, 833 B-29s attacked industrial and urban areas.

6. Results of the Action of Phase V.

The action of Phase V culminated in the unconditional surrender of Japan on 14 August 1945. The Japanese Government had been planning and negotiating for surrender since May 1945. The surrender was decided upon at this time because the debilitated Japanese Air Force and the intact Japanese Home Army were powerless to prevent the complete extermination of modern Japanese economy, industry, communications, and culture by our air attack. At the time of surrender, Japan possessed approximately 9,000 aircraft which could have been employed in suicide attacks against our invasion attempt, but these 9,000 aircraft did not remotely approximate an air force. Due to pilot inexperience, organization, Japanese concept of aerial warfare, and technological limitations, these aircraft could not be brought to bear in the war in the air. They were incapable of denying our Air Force free exploitation of the skies over the Japanese homeland. It is possible that this force, employing suicide tactics, and aided by the heavy surface defenses existing at our planned invasion point, could have seriously damaged or disrupted our invasion attempt. However, Japanese leaders recognized that even this would not save the Japanese people from destruction from the air; hence the surrender.

Interrogation of the highest Japanese officials, following VJ-day, indicated that Japan would have surrendered to the air attack even if no surface invasion had been planned, if Russia had not entered the war, and if the atomic bombs had not been dropped.

7. Significance of the Action of Phase V.

a. In the preceding pages, it has been pointed out and substantiated by conclusive specific action that—

- (1) Airpower dominated its own element.
- (2) Airpower dominated naval warfare.
- (3) Airpower dominated ground warfare.
- (4) Airpower developed tremendous logistic capabilities, both strategic and tactical.
- (5) Airpower developed an effective area interdiction potential by occupation of the third dimension.

b. The action of Phase V added a sixth item to the role of airpower in the war against Japan, namely, the demonstrated capabilities of airpower established it as the dominant combat force of the war against Japan, and further established it as a decisive military force capable of achieving the capitulation of an enemy nation by direct attack against the vital points of its national structure.

8. The Antishipping Campaign.

A brief summary of the antishipping operations against Japan is given in the table below. In evaluating the antishipping campaign, it should be borne in mind that shipping was not the primary target of land-based airpower during World War II. Only 1.7 percent of the total Army Air Force effort in the Pacific was directed at Japanese merchant shipping. This 1.7 percent of Army Air Force total effort accounted for approximately 10 percent of the total of Japanese merchant shipping sunk.

Any comparison of the effectiveness of agents in the war against Japanese merchant shipping must be premised on an appreciation of the over-all antishipping strategy that was adopted. The agents were in no sense competitive; to the contrary, they were complementary, with the various areas of shipping activity often assigned to or divided between specific agents. These restrictions distort the over-all picture from what it might have been had the priorities of missions been changed or had the agents been given free

rein within their operational radii. The following table presents the actual resultant, with tonnage figures taken from the Joint Army-Navy Assessment Committee Report of February 1947, and the sortie figures taken from the Transportation Division Report of the United States Strategic Bombing Survey. All tonnage figures represent only the tonnage allotted to a specific agent and do not include tonnages for which two or more agents received partial credit. The figures are therefore conservative.

Agent	Sorties	M/V tonnage sunk	Number of ships	Tonnage sunk per sortie	Sorties per ship sunk
Submarines	31,871	4,779,802	1,118	181	18.7
Navy and Marine carrier-based aircraft	17,635	1,800,241	350	79	40
Army aircraft	7,270	670,067	240	86	30
Aerial mines (both A & V)	1,424	266,050	241	704	0
Navy and Marine land-based aircraft	8,011	218,718	88	27	91

1 Days on offensive patrol.
2 Actual attacks per ship sunk.

SECTION VIII

THE SIGNIFICANCE OF THE AREAS OF OPERATION AND POSSIBLE ALTERNATE USE OF FORCES

1. China.

a. China was important to our military effort against Japan in four major ways:

(1) If China capitulated to Japan and actively joined the Axis camp, her resources of men, material, and food and her geographical position would lend important assistance to Japan.

(2) Unoccupied China was on the flank of the extended Japanese sea lines of communication to the Netherlands East Indies, and also within air striking distance of the communication lines of industrial North China. If she remained a friendly and independent nation, she offered a base for air operations against the life lines of the Japanese empire.

(3) Similarly, if China remained in the war against Japan, a base was provided for other attrition operations against a considerable portion of the Japanese war machine.

(4) Japanese domination of all China would have rendered British control of India dangerously insecure. The nervous Indian population had been heavily propagandized by Japan—and Indian revolt conceivably could have resulted from the capitulation of China.

b. China was kept in the war by our military support and approximately 1 million tons of Japanese shipping was claimed sunk in air operations from China.

c. From hindsight it appears that the military effort expended in China was justified by the circumstances and the results achieved.

d. The China-Burma-India Theaters were predominately air theaters. In addition to the orthodox functions of obtaining air superiority, attacking enemy logistical potential, and isolating the battle areas, airpower was utilized extensively for transport of personnel and matériel and more than customarily for close surface support operations, due to the dearth of artillery with ground

forces in Burma and China. With the exception of one American infantry regiment in Burma, all American combat forces in India-Burma were Army Air Force units and, without exception, all American combat units in China were Army Air Force units. Even though India-Burma and China were air theaters, neither was commanded by an air officer. Throughout the war, a high percentage of the logistic support provided to the theaters was dispersed to support operations having little significance or value to the over-all war effort against Japan. The development and maintenance of 36 American sponsored Chinese infantry divisions in China, principally from air tonnage over the "hump," the construction of the Stilwell Road, and the diversion of resources to the Central and South Burma Campaigns are examples of providing logistic support to secondary operations of little over-all war value. Had the logistic support which went to these programs been provided to the combat air arm in China, cumulative dividends of importance would have resulted from strengthening the inadequately supported air campaigns against Japanese deep sea and river shipping, industrial North China lines of communication, and Japanese air and military installations throughout China.

2. India-Burma.

a. British and American national interests in India-Burma were divergent. The primary American interest lay in utilizing India as a springboard for forwarding supplies to China—while the British interest lay in expelling the Japanese from Burma and recapturing Singapore—for postwar political reasons.

b. In order effectively to give aid to China by air supply, it was necessary to capture Northern Burma down to and including Myitkyina. The capture of Myitkyina permitted a low altitude

air crossing of the Himalayan "hump," provided an oil head and transport staging base halfway to China, and thereby materially increased our air supply potential to China. It also permitted establishment of adequate fighter defenses to protect the air ferry route. This much of the Burma operation can be justified as essential to keeping China in the war. Myitkyina was captured by August 1941—at relatively low cost in air effort when compared to the campaigns which followed. In the entire Burma operation leading up to the capture of Myitkyina, 57,000 tons of supplies were air lifted, 65,940 personnel were transported by air, and 22,814 tons of bombs were dropped.

c. The Quebec Conference of September 1943 resulted in a compromise of American and British interests in India-Burma, and committed our India-Burma air forces to a campaign which not only contributed little to ending the war but actually penalized our paying operation from China.

Following the close of the Myitkyina campaign, this compromise committed our forces to three major campaigns in Burma which resulted in—

(1) Clearing the area for completion of the Stilwell Road and pipe line to China.

(2) The expulsion of the Japanese from Burma and the capture of Rangoon.

From August 1944 to 1 June 1945, these three campaigns cost the following air effort to and within Burma:

Tons supplies and equipment air lifted	467,242
Personnel moved by air	617,737
Tons bombs dropped	22,075
Close cooperation sorties flown (excluding transport)	83,000

As a tangible result of these three campaigns, a total of 151,793 tons, including the weight of vehicles, came over the Stilwell Road to China, and 21,685 tons of POL came through the pipe line.

Thus, while the Fourteenth AF in China was fighting on less than an average of 20,000 tons of supplies per month, Allied strategy spent 467,242 air lifted tons, moved 617,737 personnel by air, dropped 22,075 tons of bombs, and flew 83,000 combat missions in Burma, and as a militarily useful result of three operations a total of 173,478 tons of equipment and supplies were moved over the road and through the pipe line to China.

Retaking the terrain of Burma south of Myitkyina served no essential military objective. Burma was at the end of the Japanese line of communications. Rather than evicting the

Japanese from Burma in a costly operation, the enemy logically should have been encouraged to maintain his expensive garrisons—which were so vulnerable to air attack—in this part of the world. The more the enemy put into Burma, the less he would have elsewhere, and, here, at the end of the line, 1 airplane operational probably cost Japan 10 or 20 on the production line.

This diversion of air resources to these three campaigns to retake Central and Southern Burma reduced the over-all air potential and supply available for China by 40 to 50 percent.

d. The Stilwell Road, likewise, was a resource consuming enterprise which never supported its own engineers during the construction period and proved to be of little value as a supply route to China. Construction of the road required large air transport support—and the entire air program in China-Burma-India was greatly retarded by the diversion of aviation engineers from airdrome construction to road-building.

3. Southwest Pacific and South Pacific.

a. *Netherlands East Indies and New Guinea.* The Netherlands East Indies were most vital to the Japanese Empire as the main source of raw materials. All air, ground, and naval operations in this area which disrupted supply of these raw materials to Japan contributed directly to our war effort.

In addition, air operations in New Guinea broke the back of the Japanese Army Air Force, were decisive, and influenced the course of all succeeding operations toward Japan.

Surface operations and advances from Port Moresby to Morotai were also essential—in that they permitted advancing our chain of air bases, aided in the conduct of our air war and in the air interdiction of the Netherlands East Indies.

b. *Rabaul-Solomons Area.* Operations in the Rabaul-Solomons area were both decisive and necessary. Here at a perimeter defense point—and in New Guinea—Japan elected to defend the Netherlands East Indies. Our air and surface operations stopped the Japanese expansion at Guadalcanal, and our Army, Navy, and Marine air operations in the Rabaul-Solomons area destroyed the effective fighting power of the Japanese Naval Air Force. This decisive air action, plus the action in the New Guinea area, made possible advancing our chain of air bases to within striking distance of Japan proper.

c. Philippine Area. The significance of the Philippine area is hinged to basic concept as to how Japan was to be defeated. We elected to conduct the war in the Southwest Pacific area in consonance with a basic Army strategic concept—that of invasion and fighting decisive land battles to secure the final enemy capitulation. In pursuit of this strategic concept, the occupation of the Philippine Islands became a natural and legitimate objective. The Philippines provided the land masses necessary for developing air and fleet bases and for marshalling large invasion forces. However, had our strategy been predicated on a full recognition of the military potentiality of air power and had it pointed all our efforts, after the defeat of the Japanese Air Force, toward marshalling an air striking force for decisive air attack, rather than surface attack, on the Japanese national structure, our combined forces had the capability of exploiting the New Guinea-Solomons break-through and proceeding directly to the Admiralties, Truk, and the Marianas.

Operations in the Philippines undoubtedly paid military dividends. They resulted in increasing the degree of our air domination over the Japanese Air Force, in reducing the air opposition we would encounter in the home islands, in increasing the effectiveness of our blockade of Japanese life lines of communication, in reducing Japanese naval power, and in destroying large components of enemy land forces. However, as a result of these operations, Manila was wrecked and large numbers of Philippine citizens were casualties. With the benefit of hindsight, it is apparent that, had our strategy been hinged to concepts of air war, the power of our combined air, sea, and land forces operating through the Admiralties, Truk, and to the Marianas and Iwo Jima was capable of achieving the ultimate objective without the flank operations.

Paralleling these observations, if the effectiveness of aerial mining had been appreciated a year earlier, and adequate steps had been taken to prepare for the program, night mining of Japanese sea terminals could have started by June 1944 from the Marianas. This action would have rendered the sea and air blockade from Philippine bases superfluous.

The comments above pertain solely to military considerations. If, on the other hand, our Nation were morally obligated to free the Philippines of

Japanese domination before capitulation of the Emperor, these ethical considerations might be considered as governing factors overriding purely military considerations.

d. Borneo. The minor invasions of Borneo late in the war undoubtedly were unnecessary militarily.

4. Central Pacific.

a. Gilbert and Marshall Islands. Quite similar to the Philippines, the significance of the Gilbert and Marshall Islands is hinged to basic concept as to how Japan was to be defeated. While basic Army strategy was predicated on the invasion and decisive land battle concept, basic naval strategy was predicated on the concept of decisive naval surface battle line action with heavy fleet units and an exploitation of such decisive action by an advance across the Pacific. An advance across the Pacific required neutralization of key enemy Pacific bastions and provision of forward fleet bases. Again—as our over-all strategy elected to employ Central Pacific Forces in consonance with Naval Strategic Concept—the seizure of the Gilbert and Marshall Islands became a natural and legitimate objective. Again—however—had our strategy been oriented toward air power and air weapons and had our air, sea, and land forces been combined in one powerful thrust, the route for all major forces through the Admiralties, Truk, and to the Marianas and Iwo Jima would have eliminated the requirement for the occupation of the Gilbert and Marshall Islands, as well as the Philippines.

As early as September 1943, there were definite indications that Japan was rapidly losing the air war. Postwar intelligence has fully confirmed these indications. By November 1943, the Japanese Naval Air Force had been destroyed as an effective fighting force, enemy carriers were out of the war for the time being, and the Japanese Army Air Force in New Guinea was being rapidly destroyed. At that time Truk and Guam were not fortified nor heavily defended—while the Gilbert Islands were. Thus, postwar intelligence clearly confirms that the Marianas could have been taken at a much earlier date than was actually achieved in implementing our Army strategic concepts through the Philippines and our Navy strategic concepts through the Gilbert and Marshall Islands.

b. *Mariana Islands.* Occupation of the Marianas provided essential air bases from which Japan could be brought under sustained, heavy air attack. Later developments of the war indicated that the B-29 operations from these bases had the capability to bring about the collapse and surrender of the Japanese Empire.

c. *Iwo Jima.* The occupation of Iwo Jima was highly desirable in that it eliminated possible Japanese air action against the Marianas bases, provided an intermediate and emergency B-29 base, and provided a base from which land-based fighters could perform escort and attack missions over Japan proper.

d. *Okinawa.* Like the occupation of the Philippines, the Okinawa operation reduced the amount of air opposition remaining in the home islands. It also provided another base from which direct air attack on Japan proper could be mounted. However, later events showed that the Okinawa air bases were not essential to a decisive exploitation of our airpower. The B-29 operation from the Marianas constituted the great bulk of the attack against Japan proper—both in physical damage and in tons of bombs dropped. Forces in the Marianas were only reaching full strength

when the war ended. Actual air operations from Okinawa were directed principally toward preparation of Kyushu for the projected landing. Although five wings of B-29s were scheduled to go into Okinawa in order to double the air offensive against Japan proper, the Japanese capitulation prevented implementation of this plan. Hence, from hindsight, the Okinawa operation is justifiable in supporting an invasion strategy—unjustifiable in supporting a decisive air assault or in supporting a strategy which did not require invasion.

5. The Aleutian Area.

As in the Burma area, Japanese efforts in the Aleutians were extremely costly and could pay little dividends to the Empire. The enemy logically might have been encouraged to weaken his more critical defenses by dissipation of resources to this area. However—with a constantly expanding and unpredictable technology to cope with—this course of action would have contained elements of danger. The Aleutian bases were only half as far from the United States as Japan proper, and, for this reason, our action in neutralizing the enemy in this area was justifiable.

SECTION IX

AN EVALUATION OF THE OVER-ALL OPERATION

1. Limited Concepts.

Since the strategy of war is a product of the military thinking of the time, it is appropriate that a brief review be given of the military concepts, both American and Japanese, which at times led to the abandonment of sound principles. The flaws in our military concepts, without exception, resulted from the failure of military thinking to keep pace with the evolutionary processes going on in the outside world. They were founded on tradition, precedent, custom, and classic example and influenced by service pride and a study of military history which emphasized technique and results achieved, rather than cause and effect. These faulty concepts were not inherently faulty from earliest inception. They became faulty, with the passage of time, as technology and science increased the destructive power and range of weapons. Before World War II, it was not fully appreciated by military thinkers that changes in the limitations and capabilities of weapons might profoundly affect the entire military structure, forcing a change, not only in tactics and employment of the new weapon, but in the logistic structure, the training structure, the intelligence requirements and in the basic strategic concept of warfare.

a. *National Concept of Army and Navy Functions.* Before the advent of the airplane, the functional division between Army and Navy was rather clear. The American public, the Congress, and military leaders accepted the concept that the Navy was the first line of defense—that it would first meet an aggressive enemy on the high seas and attempt to defeat his forces before he approached our shores. If the Navy failed—then our land armies would be employed to engage the enemy on shore. Military forces, before the airplane, moved in two dimensions. The Navy was inherently chained to the sea, and the Army was inherently chained to the land for military operations. The line of demarcation was definite.

This discontinuity of land and sea was eliminated, for military purposes, by the airplane. The air mass over the earth is a continuous blanket. The medium of air eliminated the two dimensional land-water barrier—and demanded a new military concept. This concept was slow in coming, and because it was not grasped by the American people, by the Congress, and by most military leaders, our preparation for and initial steps in the war against Japan were faulty.

This old concept—which saw a clear division between Army and Navy functions—produced no requirement for unified command of these two forces, and no requirement for a common strategic military concept. Hence we entered and finished the war in the Pacific with a divergence of military concept between Army and Navy leaders and, smothered beneath this conflict, the strategic concept of three dimensional warfare—air warfare—was struggling for expression.

b. *The Army Surface Concept of Warfare.* Modern history contained no examples of a military victory without an invasion and a decisive land battle. Surface assault and occupation of the enemy's vital areas had always been necessary in the past. In general, our political and military leaders adhered to this concept, putting insufficient value on the potentiality of the new weapon. As a general rule, the new weapon—the air weapon—was accepted as an extremely valuable ancillary which would expedite surface operations. That airpower was a decisive military force in its own right was not accepted.

c. *The Navy Battle Line Concept.* Based on the theory that the Navy was the first line of defense, and that he who controlled the sea would emerge victorious in the Pacific War, naval doctrine was developed which embraced the "battle line" concept. This concept visualized opposing fleets engaging in a decisive naval surface battle as the result of which one would be outgunned and sunk. Having free exploitation of the sea, the

victor could then blockade the enemy, move troops and supplies as desired, and eventually emerge victorious. Before the advent of the airplane, this was a sound concept. This doctrine demanded heavy battleships and a "balanced fleet."

This battle line concept, however, outlived its temporal period during World War II, resulting not only in placing limitations on the employment of carriers and submarines but in major national logistical efforts in the production, operation, and protection of heavy surface vessels which had been rendered obsolescent by the progress of science and technology.

The Japanese also suffered under this battle line concept. They sought domination of the sea by the attack at Pearl Harbor and later hoped to force the battle line action as a result of the Midway assault. However, in both of these engagements, the air weapon gave a clear demonstration that a new era in war had been ushered in. Surface elements were incapable of closing in the face of even a limited amount of air opposition. A major naval surface battle occurred only in the night action in Surigao Straits, when the Japanese Southern Attack Force had suicide orders and no carriers and was blocked in the narrow waters by the Seventh Fleet.

d. *The Navy Concept of Carrier Airpower.* Naval doctrine developed prior to World War II, being based primarily on the battle line concept, visualized naval airpower, like all components of the fleet, as a supporting element which would be utilized generally to further the mission of the fleet. Since the primary mission of the fleet was the destruction of the enemy fleet, carrier aircraft, like cruisers, destroyers, and even battleships, justifiably could be sacrificed, if necessary, to assist in winning the decisive battle line engagement. It was a one-decisive-engagement, one-incident, theory to which were geared all the components of the fleet. So long as the battle line engagement did in fact retain its importance as the decisive action of the Pacific War, this concept was sound. However, this doctrine did not provide for sustained offensive air action in a war which was to be decided, not by the battle line engagement, but by the war in the air. Evolution had passed the emphasis from control of the sea to control of the air—control of the air as a prerequisite to control of the sea and all surface operations—and hence

this doctrine for the employment of airpower became unsound.

e. *The Air Force Concept of Strategic Bombing.* While in varying measures disagreeing with Army and Navy Strategic concept, many Air Force leaders had not fully evaluated the requirements which would have to be met in implementing an air strategy.

The Air Force strategic bombing doctrine was developed theoretically between World War I and World War II and was based on the concept of defeating an enemy nation by air bombing of her logistical potential for war. In order for this strategy to be effective, it is mandatory that the over-all damage inflicted on the enemy's capacity to wage war be greater than the loss of our own logistical and production potential through operational losses of matériel and personnel. Our initial air operations failed to achieve this result for several reasons:

First.—Our Air Forces suffered from a strong tendency to commit forces to combat prematurely—before a satisfactory degree of combat effectiveness had been achieved by training and before a force of sufficient strength for the task had been assembled. In the early days of the war, this resulted in a piecemealing of effort. It failed to saturate enemy air defensive capabilities, resulted in a high loss rate and a bombing effort ineffective both in accuracy and in weight of effort.

Second.—A satisfactorily balanced air force was not developed prior to the war. This failure was hinged directly to the supporting role we had assigned to airpower in our prewar thinking. We failed to appreciate that a defense in depth for our bomber formations probably would be required. Hence, our fighter aircraft, at the outset of the war, were short range, suitable for interceptor defense and close support to surface forces, but incapable of accompanying our bombardment formations on deep penetrations into enemy territory. Since the limited power of the explosives then available and the target systems selected required a sustained bombing effort running into many thousand sorties, it immediately became mandatory to establish a defense for the bombers which would enable them to carry out the bombing offensive. As the war progressed, it became apparent that the best defense to the bombardment effort was the destruction of the opposing Japanese Air Force—rather than a shielding of the bomber

formation by fighter aircraft on each of many missions or a reliance on the defensive fire power of the bombers themselves. This realization led to drastic extension of the range of our fighter aircraft and to a sustained war in the air against both airborne intercepting fighters and against air installations from which Japanese defensive and offensive operations were mounted. This air war against the Japanese Air Force initially had to be fought against the enemy air force in being on the perimeter and not against the production echelon, as the range of our aircraft and their ability to penetrate enemy defenses was not sufficient to carry the war, at the outset, to the Japanese industrial and production centers. Thus, our prewar failure fully to evaluate the nature of the air war which would develop resulted in the production of short range fighter aircraft, and our early premature commitments, after the war started, resulted in a piecemeal and ineffective bombing effort. Fortunately, these shortcomings were recognized early in the war and corrective steps were taken.

However, it should be pointed out that these same circumstances may not be repeated in a future war and an air war of a totally different nature conceivably may develop. The destructive power of the atomic bomb coupled with a long range air weapon with the power to penetrate enemy defenses might permit progressing directly to the strategic bombing phase without the necessity for the preliminary destruction in detail of the enemy's air force in being. In all such efforts, the ultimate criterion is the measure of the damage inflicted on the enemy versus the cost of the effort to our own war potential. On this criterion, acceptable loss rates may vary from 0 to 100 percent of the attacking force.

Third: Although the tendency was not so pronounced in the air war against Japan as in the air operations against Germany, there was, at times, a compartmentation of airpower into strategic and tactical roles. This was an artificial division which at times led to compromising fundamental principles of war. It tended to restrict the ability to concentrate at the decisive time and place, diverted airpower on many occasions to diversionary or premature exploitation and secondary operations and did not provide for flexibility in employment.

d. The Japanese Concept of Defense in Depth. The principle of defense in depth may be supported by logic—but the Japanese failed to project

perimeter defense points early in the war. Perimeter defense points were backed up by an adequate geographical disposition of middle and rear bases, but these middle and rear bases were not logistically developed nor heavily fortified. They were particularly undeveloped and inadequate with respect to land-based airpower. However, even this defense would have been difficult to penetrate solely by surface forces. It was clearly tinged to the concept of opposing military forces impinging upon each other and making contact on the surface of the earth at the external fringes of occupied areas. While the perimeter defense points were so situated that they were actually mutually supporting against slow-moving surface forces—once the Japanese had lost the initiative and had lost air domination, the natural military advantages of these areas were lost. Having won control of the air, our airpower, by virtue of its speed and range, isolated these garrisons. The distances were such that these enemy bases were incapable of providing mutual support against air attack with such of their air defenses as remained. Thus, the perimeter defense points became isolated, nonreinforceable garrisons—each subject to individual destruction in detail. Into these perimeter defenses Japan poured a steady stream of resources in a stubborn and vain attempt to hold the surface areas she had occupied. The decisive battles of the war were fought on this perimeter. Here Japan dissipated her airpower and resources to a fatal degree.

Japanese strategy, in effect, established a surface defense in depth, but failed to make provision for effective concentration of her land based airpower at any point on her expanded perimeter.

e. Japanese Concept of Airpower. Japanese leaders saw airpower as an ancillary weapon extremely valuable to the conduct of surface operations. They failed to project their concept of naval warfare into the medium of air. They could visualize a naval battle line action and an exploitation of a naval victory—but they failed to visualize an air war and an exploitation of an air victory. Our victory in the air was made much easier by the limited Japanese appreciation of the principles of aerial warfare than it otherwise might have been. The enemy chained his air weapon to his surface objectives. He failed to establish an air order of battle and the logistic structure

necessary for its support. He piecemealed and dissipated his air resources on a surface perimeter which, by its geographic nature, dispersed his air strength too thinly and insured its destruction.

2. Logistics.

Our prewar failure to keep pace with the impact of technology on warfare resulted not only in limited strategic concepts of warfare, but also in a faulty evaluation of the logistic requirements necessary to implement our holding strategy in the Pacific.

Our most basic strategic decision of the war had been to defeat Germany first and Japan second. This was a sound decision and was to be implemented by sending minimum resources essential for holding operations to the Pacific while building the big hammerhead to crush Germany. This same hammerhead, having been bought and paid for, would then be available to overwhelm Japan. However, the forces actually allocated to Navy, Army, and Air Forces in the Pacific proved to be far in excess of the minimum requirements for security. Each area commander obtained sufficient logistic support to seize the initiative in the air and to start major surface advances very early in the war. These logistics were necessarily diverted (as far back as the production line in the case of the excessive naval forces created) from the number one job of defeating Germany first. We actually defeated the Japanese Air Forces before we defeated the German Air Forces, and Japan was hopelessly crushed before the German surrender.

Thus, an excessive allocation of resources to the war against Japan upset our planned strategy and resulted in the construction of two major military machines instead of one. This was a direct result of the prewar failure to realistically and fully evaluate the war potential of airpower and the combat capabilities of the submarine in a war against Japan.

3. Intelligence.

The most outstanding feat of American military intelligence in connection with the war against Japan was the breaking of the Japanese code. This permitted forewarning our forces of Japanese intentions in many instances and permitted making advance preparations for countering Japanese operations.

Three major factors, however, adversely affected our military intelligence operations throughout the war. These were—

a. *First.* An artificial barrier existed between the intelligence services of the Army and Navy. Throughout the war, lacking unified command in the Pacific, we operated without an intelligence system capable of meeting the requirements of coordinated land, sea, and air warfare. In numerous cases, at all levels of command down to and including the squadron and company, essential intelligence available to one service was not necessarily available or expeditiously forwarded to another participating service. At all levels of command, however, cooperation and coordination was attempted in the exchange of intelligence information, many times with outstanding success. However, a system was not established during the war which insured the timely production of balanced, objective intelligence and the timely dissemination of that intelligence to all those who needed it in the performance of their tasks.

b. *Second.* American intelligence, prior to World War II, had not been objective. As a result, much basic information which was essential to military operations was not available when needed. Such basic geographical information as weather, tides, winds, topography, depth of waters, locations of roads, trails, swamps, mountain passes, and so forth was inadequate and wholly lacking in many cases. Similarly, specific information on man-made features in such form as to facilitate selection of target systems was wholly inadequate. Much of the essential information was available in hundreds of different businesses, books, documents, and other sources, but a gigantic task was faced in its colation for military use.

Combat intelligence, initially underestimating enemy capabilities, swung to the opposite extreme and became overcautious, consistently overrating the enemy's forces and capabilities. Improvement in combat intelligence, however, was steady throughout the war as experience with the enemy increased and as aerial reconnaissance and other sources of information provided a constantly increasing measure of the enemy's deployment and capabilities.

c. *Third.* The American national viewpoint has traditionally abhorred the spy. Consequently, our national intelligence, including our espionage organization, was not adequate to satisfy our na-

tional security requirements. Traditionally, we were prepared to accept the first blow before obtaining essential objective intelligence and before taking up arms to defend ourselves. This abhorrence of national intelligence work and this willingness to learn that a war is in progress only after we have been attacked can be disastrous in a future war. Our national security demands that our intelligence organization of the future, beginning today, be aware of the plans, capabilities, and probable intentions of possible future enemies at all times. Only by having such information can our military forces have an even chance of protecting our Nation.

4. Training.

The training of military forces becomes more complex and requires more time with each successive war. Advances in technology have served to complicate warfare, not only in the intricacies of the equipment employed, but also in the problems of coordination and control. The ancient problem of training armed masses in the use of the spear and shield or the rifle and bayonet has given way to the problem of training highly specialized technicians, both in the military service and in the supporting civilian economy.

Fortunately, during World War II, the United States of America possessed the greatest depth in its technological echelon of any nation in the world. Our fighting and production forces already had a major degree of basic technical training due to our highly developed mechanical civilization.

However, laboring under great pressure and in the fog of war, our military establishment did make some serious errors in its training programs. It must be borne in mind that the training problem was gigantic. The Air Force was expanding one-hundred-fold and the ground and naval forces were also expanding greatly. Even though a tremendous task was accomplished in the training program, for the sake of future national security those mistakes which were made should not be overlooked. The two most serious errors are discussed below.

The Numbers Racket. In general, the emphasis of our training program was on quantity rather than on quality. In meeting deployment schedules and in prematurely committing forces to combat theaters, we became obsessed with the numbers of

people and units produced rather than with the state of their training. Particularly during the first 2 years of the war, air crews, specialists, and units would have achieved a barely operable proficiency level when they were committed to active theaters. This was false economy. It actually delayed rather than accelerated the effective impact of our Air Forces on the enemy. Only a moderate increase in the training given air crews and technicians would have produced a much higher combat capability and thereby would have reduced the logistic requirements and the over-all structure required. We had not fully comprehended that a war of technology depends more on the efficiency and the skill of a relatively small number of people employing powerful weapons than on the sheer weight of numbers of armed masses.

The Japanese Air Force made a much more serious mistake in this matter than did our own military establishment. Lacking a general depth in their technological echelon, at all levels, the Japanese Air Force could ill afford to lose those technicians and specialists which had been trained in prewar years. It required much more time for Japan to train a replacement than for the United States. Having planned a war of short duration and limited objective, Japan had not provided the training organization to replace attrition losses with an acceptable product. Hence, the early losses suffered by the Japanese Air Forces, both in pilots and technicians, confronted the enemy with an impossible replacement task. When Japan had lost her best pilots and technicians in the New Guinea-Solomons area, she had thereby lost the air war. While thousands of aircraft could still be built, only hundreds could be maintained and only scores could be manned by pilots qualified to fight or bomb effectively.

Utilization of Civilian Skills. The second greatest weakness in our training program was a failure, in many instances, to utilize properly and build from civilian skills. This was not, however, exclusively a training problem or failure. Many sectors, including our draft laws, worked to transplant highly qualified individuals from one line of productive war endeavor to other fields in which their specialties were not employed. One bright spot illuminating this situation, however, was the fact that utilization of civilian acquired skills was much better in World War II than in

World War I. Nevertheless, it is mandatory that in a future war a system be established which will provide much better results than were obtained in World War II.

3. Capacity for War.

The principle of capacity has not been promulgated in classic military literature as a fundamental principle of war. It would be appropriate if this generation contributed to the classic understanding of the art of war and recognized that "capacity" has a universal, direct, and major influence on military operations.

The over-all capacity of a national economy, the capacity of an integrated military force, and the capacity of individual weapons affect strategy and tactics at every level of command.

Japan violated the principle of capacity in her first action by attacking the United States. Her national industry and economy could not begin to compete with our own, and since her strategy did not visualize the destruction of our economy and industry, her entry into the war was a violation of the principle of capacity.

The principle of capacity with respect to individual weapons profoundly affected our own strategy. In November 1943, just prior to the assault of the Gilbert Islands, we had assembled a powerful carrier task force. There was no physical barrier between that task force and Japan proper. However, it was 15 months later before carrier task forces raided Japan. The principle of capacity was being observed. In November 1943, and throughout all of 1944, the evaluation of Japanese defenses indicated that a carrier task force could not penetrate to and attack Japan proper with an acceptable degree of losses. In order to go direct to Japan, the required penetration into remaining enemy defenses was beyond the capacity of force.

However, in June of 1944, 8 months before the first carrier strike on Japan, B-29 attacks were initiated against Japan proper with an acceptable degree of losses. These circumstances served to show that the degree of air domination required to bring air operations within the capacity of the air weapon was less than the degree of air domination required to bring fleet and carrier operations within the capacity of the carrier forces.

SECTION X

SIGNPOSTS

1. Easy Inferences Which May Be Drawn From the War Against Japan.

a. If any written evaluation of the war against Japan were to leave with civilian or military readers the impression that another world war may be waged economically and successfully by the United States essentially along World War II lines, it were better that that evaluation had never been written.

This paper has attempted to accent that the factors of geography and weather, time and space, capabilities and limitations of weapons (which are functions of science and technology), and logistical organization and potential are the real factors which govern successful and economical strategy.

To evolve a strategy for the future from the experience of the past in employing carriers, battleships, airplanes, and armor—and to depart from the basic considerations which should dictate, not only strategy, but also lines of technological endeavor—is to invite disaster.

b. There follows a list of inferences, *possibly dangerous to future national security if accepted without critical appraisal*, which may be drawn from studying only the techniques and results of the military action against Japan.

(1) That it will be necessary to fight for and win air superiority in the area of operations.

(2) That conventional very long range bombardment aircraft will be capable of penetrating hostile defenses to the maximum limit of their radius of action and destroying the enemy's war economy.

(3) That aircraft carriers will be capable of successfully operating against an effective land-based air force.

(4) That naval surface fleets will be able to approach an enemy's shores and bombard his installations during the decisive phase of a war.

(5) That it will be possible to build, deploy,

and utilize great fleets of bombardment and fighter aircraft after open armed hostilities are underway.

(6) That the logistical pattern of a future war will so nearly approximate that of the past war that our Nation will receive timely forewarning of an enemy's preparation for war.

(7) That the nation with the greatest natural resources and logistical potential for war will be the victor.

(8) That amphibious forces, supported by air-power, may concentrate such overwhelming force in selected areas that landings generally may be made and beachheads secured.

(9) That submarines, which could almost single-handedly have defeated Japan, will have the same capability in a future war.

(10) That, since our forces were successful in maintaining and protecting our sea lines of communication in the past war, they will be capable of doing the same thing in a future war.

(11) That the bulk of future land armies will be airborne.

(12) That, since the United States of America has been able to absorb the first blow in past wars, she will always be able to do so in a future war, and that the great military potential of the United States may again be mobilized and brought to bear after armed hostilities are under way.

c. While some of these inferences may be sound, depending upon the timing of a future war, there is evidence today that many will be very unrealistic in the near future. A brief examination of each, viewed in the light of cause and effect, follows:

(1) That it will be necessary to fight for and win air superiority in the area of operations.

Air superiority is not an end in itself. Air superiority was necessary in the past war in order that surface operations could be successfully undertaken and in order that decisive bombing of the enemy's vital components could be accomplished. If science and technology produces an air weapon which can, unaided, penetrate enemy defenses and

accurately deposit its bombs, it may not be necessary to fight the conventional air battle and obtain conventional air superiority before the decisive attacks on an enemy's economy are mounted. Any force, having successfully made such attacks, however, probably would quickly inherit air domination for the exploitation phase of the war.

(2) That conventional very long range bombardment aircraft will be capable of penetrating hostile defenses to the maximum limit of their radius of action and destroying the enemy's war economy.

Such operations must be evaluated in terms of the decisiveness of the action and the cost to our own war potential. If the over-all damage inflicted on the enemy significantly outweighs the cost of the operation in terms of manpower, matériel, and production potential, the operation may be strategically sound. However, committing a bombing force beyond its capacity to penetrate enemy defenses and deliver effective fire could be disastrous in its dissipation of our own war potential. The quality of enemy defenses, the decisive nature of the targets selected, the destructive power of the weapons employed, the accuracy with which the warhead may be delivered, and the range and power of the air weapons employed to penetrate enemy defenses are factors which will indicate the acceptability or unacceptability of such operations.

(3) That aircraft carriers will be capable of successfully operating against an effective land-based air force.

Major carrier operations in World War II against land-based aircraft were conducted after the Japanese Air Forces had been reduced to a relatively impotent and ineffective force. Geography, also, permitted massing an overwhelming carrier-borne air strength on the objectives selected. Geography, likewise, dispersed the enemy's remaining air defenses, prevented them from being mutually supporting, and reduced their combat capability by compounding command, control, and logistic difficulties. In the history of war, to date, a carrier force has never been pitted against an effective land-based air arm operating from a sizable land mass.

Land- and carrier-based aircraft, once they are airborne, are equally effective within their design restrictions. Carrier-based aircraft, however, have a quality of vulnerability not suffered by

land-based aircraft and that weakness lies in the vulnerability to air attack of the carrier itself. It was the vulnerability of the carrier, and not its airborne aircraft, which kept our powerful carrier task forces away from Japan proper until long after land-based aircraft were making the journey to the enemy's home industry on regular schedule.

The carrier's greatest advantage lies in its mobility and its ability to concentrate a relatively large number of aircraft quickly at selected points. This may be particularly appropriate and useful against an enemy who does not have an effective air force and whose vital targets are exposed to water approaches, or against isolated defensive forces such as those frequently encountered in the Pacific War. However, we must approach with caution any future strategy which calls for the employment of carriers within an area accessible to an effective land-based air arm—particularly if such strategy is founded on the faulty deduction that carriers performed this task successfully in the past war.

Excepting the atomic bomb, the carrier is the most powerful and complete military force concentrated into such a small area. Its landing field, maintenance shops, logistics, manpower, living quarters, communications, antiaircraft, and command post are above one keel. Because of its concentration it presents a very productive and attractive target, singularly vulnerable to modern weapons.

In evaluating carrier aviation of World War II, the primary role of the force must be borne in mind. The carrier was designed to an objective which was sound and which was achieved. The carrier was intended to operate beyond the effective radius of land-based aircraft in furtherance of the over-all mission of the fleet. Functions of carrier aviation included the maintenance of local air superiority in the fleet area, destruction of opposing enemy fleet air capability, destruction of opposing surface fleet units, search, and reconnaissance. Carrier aviation was not intended to operate against the enemy's sustaining industry, as the weapon was too costly, the fleet in close proximity to enemy shores was too vulnerable to counter-air attack, and it was not feasible to mass from carrier decks the great air effort required to neutralize an industrial complex. As the war progressed and air domination was achieved, car-

the aviation assumed another role with effectiveness in augmenting the fire of the fleet against shore objectives. Carrier aviation, thus, was not a competing instrument to land-based aviation, but was primarily a special task weapon designed to further the over-all mission of the fleet.

(4) That naval surface fleets will be able to approach an enemy's shores and bombard his installations during the decisive phase of a war.

All major naval bombardments of enemy shore installations during World War II occurred after the over-all war in the air had been won and after local air superiority had been established.

(5) That it will be possible to build, deploy, and utilize great fleets of bombardment and fighter aircraft after open armed hostilities are under way.

An early enemy blow in strength at our internal economy, either by subversion or military force, very conceivably could disrupt our training and production capacity to the point that a planned mobilization over a period of time would be impossible. The time required to develop the force, the logistics, and the base areas essential to the operation of a large air force runs into years. As this time may not be available, it may be necessary to fight the war with the forces-in-being at the outset of armed conflict. Bearing on the size of the required force-in-being are the atomic bomb and, possibly, more advanced weapons of mass destruction. Such weapons, scientifically employed, may reduce to a high degree the numerical strength in aircraft of the air force required.

(6) That the logistical pattern of a future war will so nearly approximate that of the past war that our nation will receive timely forewarning of an enemy's preparation for war.

It is possible that a war in the foreseeable future may be decided by a force so radically different from the over-all military structure of the past war that the essential logistic preparations will not be self-evident. It is also possible that the over-all logistical effort required will be only a small fraction of that required for World War II.

(7) That the nation with the greatest natural resources and logistical potential for war will be the victor.

Logistical potential for war must be converted from "potential" to a force-in-being before it can

be applied. Here, again, the time of strategy is virtually important. An inferior over-all economy which is highly organized and directed toward a war objective may be capable of overpowering a much greater peaceful economy before it can be reoriented toward war production. In World War II, the range and destructive power of weapons was so small that major economic efforts had to be focused on the war program in order to produce significant attrition effects on an enemy national structure. This gave a tremendous advantage to the nation potentially the most powerful. The nature of weapons now available goes far toward eliminating this advantage and places the emphasis on force-in-being rather than potential force.

(8) That amphibious forces, supported by air power, may concentrate such over-whelming force in selected areas that landings generally may be made and beachheads secured.

Geography, technological inferiority of the Japanese, early defeat of the Japanese Air Force, limited destructive power of explosives then available, and America's great logistical potential for war made amphibious operations possible. All these factors may be changed in a future war. An enemy's possession of the atomic bomb in reasonable quantities, alone, would cast serious doubt on the feasibility of major amphibious operations against vital or seriously defended objectives.

(9) That submarines, which could almost single-handedly have defeated Japan, will have the same capability in a future war.

The geography of Japan's economic structure made her a natural target for the submarine. Possible future enemies, relying on interior land lines of communication, would not offer this vulnerable target to the submarine. On the other hand, if our strategy in a future war elected to conduct major operations from base areas which had to be supplied by long sea lines of communication, as in World War II, our own military effort would become extremely vulnerable to enemy submarines. It is possible that the technological advances in submarine design and construction since World War II ended would make such an attempt on the part of the United States prohibitively costly.

(10) That since our forces were successful in maintaining and protecting our sea lines of com-

mutual en in the past war, they will be capable of doing the same thing in a future war.

Commented on above.

(11) That the bulk of future land armies will be airborne.

It should be recognized that all significant airborne operations of World War II were exploitation operations conducted with almost negative air opposition. Further, the troops moved were equipped with such inadequate transportation that they were not satisfactorily mobile on the ground and such light firepower that they could not engage standard ground force units on even terms. If we plan mass air movement of armies with artillery and equipment essential to survival in ground combat, we face a staggering logistic problem. Such plans, if fully implemented, could result in the development and construction of only transport type aircraft from the limited peacetime budget available. For example, the movement of one infantry corps of three divisions (no tanks) on a 1,500-mile penetration, within a period of time considered tactically necessary to insure the security of the debarkation airhead, currently would require the equivalent, in transport types only, of a 70-group air force. This is the total authorized size of the postwar Army Air Forces. If the movement of the airborne army were to be accomplished before general air domination had been won, World War II experience indicates that an additional requirement for fighter aircraft, far beyond our capacity, would be necessary to protect the extremely vulnerable Army aerial train in flight. If the air movement were made after air domination had been won, the requirement of the ground Army for artillery and heavy equipment is open to serious question. It therefore appears that the advisability and practicability of using the air weapon for the mass transportation of lower order combat forces bears close examination, as it very conceivably could impair the development and maintenance of the combat air arm and once again nullify its capabilities by binding it in an ancillary role to a surface component.

This does not preclude the requirement for special purpose airborne forces designed for the exploitation of specific situations. Such special forces may be highly productive. However, mass air movement of armies for orthodox modern

surface combat appears logistically impractical, uneconomical, and unnecessary.

(12) That, since the United States of America has been able to absorb the first blow in past wars, she will always be able to do so in a future war, and that the great military potential of the United States may again be mobilized and brought to bear after armed hostilities are under way.

In World War II, we had the protection of space and therefore time in which to mobilize our resources after the first blow had been struck. Because of the limited range and capabilities of the weapons then available, the enemy was incapable of seriously interfering with our mobilization and training programs. However, these barriers which were our protection in the past have been shrunk by the increase in range and destructive power of weapons and they now constitute a threat, rather than a protection, to our security. They constitute a threat in that they protect and conceal possible enemy axes of approach to within very short distance of our industrial vitals. With the example of two World Wars (in which American industrial capacity was the deciding factor) before a future enemy, he can hardly be expected to plan a strategy which would permit that industry and manpower ever to be mobilized again.

2. Signposts.

From the experience of the past, however, certain fundamentals which are established by a cause and effect relationship may be drawn. An evaluation of the war against Japan, in this light, leads to the conclusion that our national security structure must embrace the following programs:

a. *Keeping the American Public Informed With Respect to the Dangers of Accepting the First Blow in a Future War.* An enlightened American public will appreciate that, to be effective, defense of the Nation must be extended in space and time. We fully understand, today, that we will be defending ourselves if our forces are attempting to destroy enemy forces which are already raining weapons of destruction down upon our heads. We must appreciate, further, that it is still defensive action, and not aggression, if we intercept and destroy an enemy force en route to our Nation, bent upon our destruction. Still further, we must recognize that an overt act of war has been committed by an enemy when that enemy builds a military force intended for our eventual destruction,

and that the destruction of that force before it can be launched or employed is defensive action and not aggression. If we adhere to the old concept that an overt act by an enemy nation can be only the actual delivery of the first military blow of the war, we invite disaster as a result of the decisiveness of that first blow. As a Nation, we must understand that an overt act of war has been committed long before the delivery of that first blow and that the earlier such an overt act is recognized the more effective the defenses may be.

b. Provisions for Adequate National Intelligence. National security cannot be effected in darkness and ignorance. A national intelligence system abridging the compartmentation of State Department, Army, and Navy intelligence activities of the past war is mandatory. To insure our national security—to permit the proper timing of our strategy—this agency must be capable of providing and properly interpreting political, economic, geographical, scientific, technological, and military information concerning any possible combination of future enemies.

c. Extensive Basic and Applied Research and Development Programs. The United States no longer has an overwhelming logistical potential for war. The potential of possible coalitions of powers at a future date may even exceed our own. But even if we were to retain a preponderant logistical strength, technological superiority would still be essential to survival, and technological superiority depends primarily on the products of our research and development programs. The experience of World War II in the war against Japan confirms that the "new weapon" may well be the decisive weapon.

d. Maintenance of an Adequate Military Force in Being. The maintenance of a military force in being does not mean simply manning a number of ships, aircraft, tanks, and associated weapons. It means the construction of a balanced military force, abreast of technology, fully cognizant of the capabilities, limitations, and techniques of employment of weapons, organized and administered

to exploit fully the current weapons of war, organized and administered to assist in the timely development of new weapons of war, and supported by key segments of sustaining industry in being.

For the future, it is important that our people, our Congress, and our military leaders fully appreciate the part airpower played in World War II and grasp something of its future potentialities.

Before World War II the growth and development of airpower was restricted by concepts of surface warfare which visualized the air weapon as an ancillary force. Airpower entered the war under this handicap and by slow evolutionary steps, each based on hindsight, emerged as the primary force. Airpower was the dominant combat force of the war against Japan and was decisive in that --

Airpower dominated its own element.

Airpower dominated naval warfare.

Airpower dominated ground warfare.

Airpower possessed powerful and independent logistical capabilities.

Airpower established effective area interdiction by occupation of the air space over an objective area.

Airpower was capable of forcing the capitulation of an enemy nation without surface invasion.

The war against Japan clearly demonstrated the military potentiality of airpower and its importance and relationship to ground and naval forces. To be successful and efficient, our national military organization of the future must be so constituted and directed that airpower may be fully exploited and employed in consonance with the principles of war.

If our Nation is to survive in this atomic age, logic demands that our national defense agencies be oriented toward airpower, and, further, that the future development of airpower not be restricted, as in pre-World War II years, by the inertia of established organizations or personalities.

MAPS

Military maps normally show surface areas which are occupied by the opposing forces and arrows indicating surface operations. Such maps cannot accurately present the action of a war fought in three dimensions, nor do they show the

air action which takes place beyond surface boundaries. The four maps which follow give a pictorial relationship between the air action and the surface action of the war against Japan.

UNITED STATES STRATEGIC BOMBING SURVEY

LIST OF REPORTS

The following is a bibliography of reports resulting from the Survey's studies of the European and Pacific wars. These reports marked with an asterisk (*) may be purchased from the Superintendent of Documents at the Government Printing Office, Washington 25, D. C.

European War

OFFICE OF THE CHAIRMAN

- *1 The United States Strategic Bombing Survey: Summary Report (European War)
- *2 The United States Strategic Bombing Survey: Overall Report (European War)
- *3 The Effects of Strategic Bombing on the German War Economy

AIRCRAFT DIVISION

(By Division and Branch)

- *4 Aircraft Division Industry Report
- 5 Inspection Visits to Various Targets (Special Report)

Airframes Branch

- 6 Junkers Aircraft and Aero Engine Works, Dessau, Germany
- 7 Erla Maschinenwerke G m b H, Hettlerblek, Germany
- 8 A T G Maschinenbau, G m b H, Leipzig (Mockau), Germany
- 9 Gothaer Waggonfabrik, A G, Gotha, Germany
- 10 Focke Wulf Aircraft Plant, Bremen, Germany
- 11 Messerschmitt A G, Augsburg, Germany
 - Over-all Report
 - Part A
 - Part B
 - Appendices I, II, III
- 12 Dornier Works, Friedrichshafen & Munich, Germany
- 13 Gerhard Fieseler Werke G m b H, Kassel, Germany
- 14 Wiener Neustädter Flugzeugwerke, Wiener Neustadt, Austria

Aero Engines Branch

- 15 Bussing NAG Flugmotorenwerke G m b H, Brunswick, Germany
- 16 Mittel-Deutsche Motorenwerke G m b H, Taucha, Germany
- 17 Bavarian Motor Works, Inc., Eisenach & Dürrenhof, Germany
- 18 Bayerische Motorenwerke A G (BMW) Munich, Germany
- 19 Henschel Flugmotorenwerke, Kassel, Germany

Light Metal Branch

- 20 Light Metals Industry (Part I, Aluminum of Germany; Part II, Magnesium)

- 21 Vereinigte Deutsche Metallwerke, Hildesheim, Germany
- 22 Metallgussgesellschaft G m b H, Leipzig, Germany
- 23 Aluminiumwerk G m b H, Plant No. 2, Bitterfeld, Germany
- 24 Gebrüder Gullini G m b H, Ludwigshafen, Germany
- 25 Luftschiffbau, Zeppelin G m b H, Friedrichshafen on Bodensee, Germany
- 26 Wieland Werke A G, Ulm, Germany
- 27 Rudolph Rautenbach Lechmetallgesellschaften, Solingen, Germany
- 28 Lippowwerke Vereinigte Aluminiumwerke A G, Lunen, Germany
- 29 Vereinigte Deutsche Metallwerke, Heildelheim, Germany
- 30 Dürener Metallwerke A G, Düren Wittenau-Berlin & Waren, Germany

AREA STUDIES DIVISION

- *31 Area Studies Division Report
- 32 A Detailed Study of the Effects of Area Bombing on Hamburg
- 33 A Detailed Study of the Effects of Area Bombing on Wuppertal
- 34 A Detailed Study of the Effects of Area Bombing on Düsseldorf
- 35 A Detailed Study of the Effects of Area Bombing on Solingen
- 36 A Detailed Study of the Effects of Area Bombing on Remscheid
- 37 A Detailed Study of the Effects of Area Bombing on Darmstadt
- 38 A Detailed Study of the Effects of Area Bombing on Lübeck
- 39 A Brief Study of the Effects of Area Bombing on Berlin, Augsburg, Bochum, Leipzig, Hagen, Dortmund, Oberhausen, Schweinfurt, and Bremen

CIVILIAN DEFENSE DIVISION

- *40 Civilian Defense Division—Final Report
- 41 Cologne Field Report
- 42 Bonn Field Report
- 43 Hanover Field Report
- 44 Hamburg Field Report—Vol I, Text; Vol II, Exhibits
- 45 Bad Odessee Field Report
- 46 Augsburg Field Report
- 47 Reception Areas in Bavaria, Germany

EQUIPMENT DIVISION

Electrical Branch

- *48 German Electrical Equipment Industry Report
- 49 Brown Boveri & Cie, Mannheim Kaferthal, Germany

Optical and Precision Instrument Branch

- *50 Optical and Precision Instrument Industry Report

Abrasive Branch

- *51 The German Abrasive Industry
- 52 Mayer and Schmidt, Offenbach on Main, Germany

Anti-Friction Branch

- *53 The German Anti-Friction Bearings Industry

Machine Tools Branch

- *54 Machine Tools & Machinery as Capital Equipment
- *55 Machine Tool Industry in Germany
- 56 Herman Kell Co., Cologne, Germany
- 57 Collet and Engelhard, Offenbach, Germany
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MILITARY ANALYSIS DIVISION

- 59 The Defeat of the German Air Force
- 60 V-Weapons (Casshow) Campaign
- 61 Air Force Rate of Operation
- 62 Weather Factors in Combat Bombardment Operations in the European Theatre
- 63 Bombing Accuracy, URAAI Heavy and Medium Bombers in the ETO
- 64 Description of RAF Bombing
- 64a The Impact of the Allied Air Effort on German Logistics

MORALE DIVISION

- *64b The Effects of Strategic Bombing on German Morale (Vol I and Vol II)

Medical Branch

- *65 The Effect of Bombing on Health and Medical Care in Germany

MUNITIONS DIVISION

Heavy Industry Branch

- *66 The Coking Industry: Report on Germany
- 67 Coking Plant Report No. 1, Sections A, B, C, & D
- 68 Gutehoffnungshutte, Oberhausen, Germany
- 69 Friedrich-Alfred Huette, Rhodlaheim, Germany
- 70 Neunkirchen Eisenwerke A G, Neunkirchen, Germany
- 71 Reichswerke Hermann Goering A G, Hallendorf, Germany
- 72 August Thyssen Huette A G, Hamborn, Germany
- 73 Friedrich Krupp A G, Bochum, Germany
- 74 Dortmund Hoerder Huttenverein A G, Dortmund, Germany
- 75 Hoesch A G, Dortmund, Germany
- 76 Bochumer Verein fuer Guetstahlfabrikation A G, Bochum, Germany

Motor Vehicles and Tanks Branch

- *77 German Motor Vehicle Industry Report
- *78 Tank Industry Report
- 79 Daimler-Benz A G, Unterturkheim, Germany
- 80 Renault Motor Vehicle Plant, Billancourt, Paris
- 81 Adam Opel, Rueschheim, Germany
- 82 Daimler-Benz-Gesellschaft Werke, Gaggenau, Germany
- 83 Maschinenfabrik Augsburg-Nurnberg, Nurnberg, Germany
- 84 Auto Union A G, Chemnitz and Zwickau, Germany
- 85 Henschel & Sohn, Kassel, Germany
- 86 Maybach Motor Works, Friedrichshafen, Germany
- 87 Voegtlinger, Maschinenfabrik A G, Plauen, Germany
- 88 Volkswagenwerke, Fallersleben, Germany
- 89 Bussing NAG, Brunswick, Germany
- 90 Maschinenbau Industrie A G (Mig) Brunswick, Germany
- 91 Friedrich Krupp Grusonwerke, Magdeburg, Germany

Submarine Branch

- 92 German Submarine Industry Report
- 93 Maschinenfabrik Augsburg-Nurnberg A G, Augsburg, Germany
- 94 Blohm and Voss Shipyards, Hamburg, Germany
- 95 Deutsche Werke A G, Kiel, Germany
- 96 Deutsche Schiff und Maschinenbau, Bremen, Germany
- 97 Friedrich Krupp Germaniawerft, Kiel, Germany
- 98 Howaldtswerke A G, Hamburg, Germany
- 99 Submarine Assembly Shelter, Farge, Germany
- 100 Bremer Vulkan, Vegesack, Germany

Ordinance Branch

- *101 Ordnance Industry Report
- 102 Friedrich Krupp Grusonwerke A G, Magdeburg, Germany
- 103 Bochumer Verein fuer Guetstahlfabrikation A G, Bochum, Germany
- 104 Henschel & Sohn, Kassel, Germany
- 105 Rheinmetall-Borsig, Duesseldorf, Germany
- 106 Hermann Goering Werke, Braunschweig, Hallendorf, Germany
- 107 Hannoverische Maschinenbau, Hanover, Germany
- 108 Guetstahlfabrik Friedrich Krupp, Essen, Germany

OIL DIVISION

- *100 Oil Division, Final Report
- *110 Oil Division, Final Report, Appendix
- *111 Powder, Explosives, Special Rockets and Jet Propellants, War Gases and Smoke Acid (Ministerial Report #1)
- 112 Underground and Dispersal Plants in Greater Germany
- 113 The German Oil Industry, Ministerial Report Team 78
- 114 Ministerial Report on Chemicals

Oil Branch

- 115 Ammonlawerke Merseburg G m b H, Leuna, Germany—2 Appendices
- 116 Braunkohle-Eisen A G, Salts and Bohlen, Germany
- 117 Wintehshall A G, Luetschendorf, Germany
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- 125 Eban Asphalt Werke A G, Harburg Refinery, Hamburg, Germany
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- 126 Deutsche Dunlop Gummi Co., Hanau on Main, Germany
- 127 Continental Gummiwerke, Hanover, Germany
- 128 Huels Synthetic Rubber Plant
- 129 Ministerial Report on German Rubber Industry

Propellants Branch

- 131 Rocket-Chemischewerke, Munich, Germany
- 131 Rheinstetten Explosive Plant, Lignose Sprengstoff Werke G m b H, Bad Soden, Germany
- 132 Plants of Dynamit A G, Vermet, Alfred Nobel & Co, Troisdorf, Clausthal, Drummel and Dunsberg, Germany
- 133 Deutsche Sprengchemie G m b H, Kralburg, Germany

OVER-ALL ECONOMIC EFFECTS DIVISION

- 134 Overall Economic Effects Division Report
Gross National Product..... Special papers
Kriegsbeschichte..... which together
Hermann Goering Werke..... comprise the
Food and Agriculture..... above report
- 134a Industrial Sales Output and Productivity

PHYSICAL DAMAGE DIVISION

- 134b Physical Damage Division Report (ETO)
- 135 Villacoublay Airfield, Paris, France
- 136 Railroad Repair Yards, Malines, Belgium
- 137 Railroad Repair Yards, Louvain, Belgium
- 138 Railroad Repair Yards, Hasselt, Belgium
- 139 Railroad Repair Yards, Namur, Belgium
- 140 Submarine Pens, Brest, France
- 141 Powder Plant, Angoulême, France
- 142 Powder Plant, Bergerac, France
- 143 Coking Plants, Montigny & Liège, Belgium
- 144 Fort St. Blaise Verdun Group, Metz, France
- 145 Gnome et Rhone, Limoges, France
- 146 Michelin Tire Factory, Clermont-Ferrand, France
- 147 Gnome et Rhone Aero Engine Factory, Le Mans, France
- 148 Kugelfischer Bearing Ball Plant, Ebelbach, Germany
- 149 Louis Breguet Aircraft Plant, Toulouse, France
- 150 S. N. C. A. S. E. Aircraft Plant, Toulouse, France
- 151 A. I. A. Aircraft Plant, Toulouse, France
- 152 V Weapons in London
- 153 City Area of Krefeld
- 154 Public Air Raid Shelters in Germany
- 155 Goldenberg Thermal Electric Power Station, Knapsack, Germany
- 156 Brauwerler Transformer & Switching Station, Brauwerler, Germany
- 157 Storage Depot, Nabbollenbach, Germany
- 158 Railway and Road Bridge, Bad Munster, Germany
- 159 Railway Bridge, Eller, Germany
- 160 Gustav-Werke Weimar, Weimar, Germany
- 161 Henschel & Sohn G m b H, Cassel, Germany
- 162 Area Survey at Pirmasens, Germany
- 163 Hannover, Hanover, Germany
- 164 M A N Werke Augsburg, Augsburg, Germany
- 165 Friedrich Krupp A G, Essen, Germany
- 166 Erie Maschinenwerke, G m b H, Heiterblick, Germany
- 167 A T O Maschinenbau G m b H, Mockau, Germany
- 168 Erie Maschinenwerke G m b H, Mockau, Germany
- 169 Bayerische Motorenwerke, Murnauhof, Germany
- 170 Mittel-Deutsche Motorenwerke G m b H, Taucha, Germany
- 171 Submarine Pens Deutsche-Werft, Hamburg, Germany
- 172 Multi-Storeyed Structures, Hamburg, Germany
- 173 Continental Gummiwerke, Hannover, Germany
- 174 Kassel Marshalling Yard, Kassel, Germany
- 175 Ammoniumwerke, Merseburg, Leuna, Germany
- 176 Brown Boveri & Cie, Mannheim, Karlsruhe, Germany
- 177 Adam Opel A G, Rüsselsheim, Germany
- 178 Daimler-Benz A G, Untermythen, Germany
- 179 Valentin Submarine Assembly, Farge, Germany
- 180 Volkswagenwerke, Fallersleben, Germany
- 181 Railway Viaduct at Bielefeld, Germany
- 182 Ship Yards Howaldtswerke, Hamburg, Germany
- 183 Blohm and Voess Shipyard, Hamburg, Germany

- 184 Daimler-Benz A G, Mannheim, Germany
- 185 Synthetic Oil Plant, Moerbeck-Hamburg, Germany
- 186 Gewerkschaft Victor, Castrop-Rauxel, Germany
- 187 Klockner Humboldt Deutz, Ulm, Germany
- 188 Ruhroel Hydrogenation Plant, Bottrop-Roy, Germany
- 189 Neukirchen Eisenwerke A G, Neukirchen, Germany
- 190 Railway Viaduct at Altenbocken, Germany
- 191 Railway Viaduct at Arnburg, Germany
- 192 Deuring-Nerag Refineries, Misburg, Germany
- 193 Fire Raids on German Cities
- 194 I G Farbenindustrie, Ludwigshafen, Germany, Vol I & Vol II
- 195 Roundhouse in Marshalling Yard, Ulm, Germany
- 196 I G Farbenindustrie, Leverkusen, Germany
- 197 Chemische-Werke, Huels, Germany
- 198 Gremberg Marshalling Yard, Gremberg, Germany
- 199 Locomotive Shops and Bridges at Hamm, Germany

TRANSPORTATION DIVISION

- *200 The Effects of Strategic Bombing on Germany Transportation
- 201 Rail Operations Over the Brenner Pass
- 202 Effects of Bombing on Railroad Installations in Regensburg, Nurnberg and Munich Divisions
- 203 German Locomotive Industry During the War
- 204 German Military Railroad Traffic

UTILITIES DIVISION

- *205 German Electric Utilities Industry Report
- 206 1 to 10 in Vol I "Utilities Division Plant Reports"
- 207 11 to 20 in Vol II "Utilities Division Plant Reports"
- 208 21 Rheinische-Westfälische Elektrizitätswerke A G

Pacific War

OFFICE OF THE CHAIRMAN

- *1 Summary Report (Pacific War)
- *2 Japan's Struggle to End The War
- *3 The Effects of Atomic Bombs on Hiroshima and Nagasaki

CIVILIAN STUDIES

Civilian Defense Division

- 4 Field Report Covering Air Raid Protection and Allied Subjects, Tokyo, Japan
- 5 Field Report Covering Air Raid Protection and Allied Subjects, Nagasaki, Japan
- *6 Field Report Covering Air Raid Protection and Allied Subjects, Kyoto, Japan
- 7 Field Report Covering Air Raid Protection and Allied Subjects, Kobe, Japan
- 8 Field Report Covering Air Raid Protection and Allied Subjects, Osaka, Japan
- 9 Field Report Covering Air Raid Protection and Allied Subjects, Hiroshima, Japan—No. 1
- *10 Summary Report Covering Air Raid Protection and Allied Subjects in Japan
- *11 Final Report Covering Air Raid Protection and Allied Subjects in Japan

Medical Division

- *12 The Effects of Bombing on Health and Medical Services in Japan
- *13 The Effects of Atomic Bombs on Health and Medical Services in Hiroshima and Nagasaki

Morale Division

- *14 The Effects of Strategic Bombing on Japanese Morale

ECONOMIC STUDIES

Aircraft Division

- *15 The Japanese Aircraft Industry
- *16 Mitsubishi Heavy Industries, Ltd.
Corporation Report No. I
(Mitsubishi Jukogyo KK)
(Airframes & Engines)
- *17 Nakajima Aircraft Company, Ltd.
Corporation Report No. II
(Nakajima Hikoki KK)
(Airframes & Engines)
- *18 Kawasaki Aircraft Company
Corporation Report No. III
(Kawasaki Kokuki Kabushiki Kaisha)
(Airframes)
- *19 Kawasaki Aircraft Industries Company, Inc.
Corporation Report No. IV
(Kawasaki Kokuki Kogyo Kabushiki Kaisha)
(Airframes & Engines)
- *20 Aichi Aircraft Company
Corporation Report No. V
(Aichi Kokuki KK)
(Airframes & Engines)
- *21 Sumitomo Metal Industries, Propeller Division
Corporation Report No. VI
(Sumitomo Kinzoku Kogyo KK, Tsurumi)
(Propellers)
- *22 Hitachi Aircraft Company
Corporation Report No. VII
(Hitachi Kokuki KK)
(Airframes & Engines)
- *23 Japan International Air Industries, Ltd.
Corporation Report No. VIII
(Nippon Kokusai Koku Kogyo KK)
(Airframes)
- *24 Japan Musical Instrument Manufacturing Company
Corporation Report No. IX
(Nippon Gakki Seizo KK)
(Propellers)
- *25 Tachikawa Aircraft Company
Corporation Report No. X
(Tachikawa Hikoki KK)
(Airframes)
- *26 Fuji Airplane Company
Corporation Report No. XI
(Fuji Hikoki KK)
(Airframes)
- *27 Showa Airplane Company
Corporation Report No. XII
(Showa Hikoki Kogyo KK)
(Airframes)
- *28 Ishikawajima Aircraft Industries Company, Ltd.
Corporation Report No. XIII
(Ishikawajima Koku Kogyo Kabushiki Kaisha)
(Engines)
- *29 Nippon Airplane Company
Corporation Report No. XIV
(Nippon Hikoki KK)
(Airframes)
- *30 Kyushu Airplane Company
Corporation Report No. XV
(Kyushu Hikoki KK)
(Airframes)
- *31 Shoda Engineering Company
Corporation Report No. XVI
(Shoda Seisakusho)
(Components)
- *32 Mitaka Aircraft Industries
Corporation Report No. XVII
(Mitaka Koku Kogyo Kabushiki Kaisha)
(Components)

- *33 Nissan Automobile Company
Corporation Report No. XVIII
(Nissan Jidosha KK)
(Engines)
- *34 Army Air Arsenal & Navy Air Depots
Corporation Report No. XIX
(Airframes and Engines)
- *35 Underground Production of Japanese Aircraft
Report No. XX

Basic Materials Division

- *36 Coal and Metals in Japan's War Economy

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- *37 The Japanese Construction Industry
- *38 Japanese Electrical Equipment
- *39 The Japanese Machine Building Industry

Electric Power Division

- *40 The Electric Power Industry of Japan
- *41 The Electric Power Industry of Japan (Plant Reports)

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- *42 The Japanese Wartime Standard of Living and Utilization of Manpower

Military Supplies Division

- *43 Japanese War Production Industries
- *44 Japanese Naval Ordnance
- *45 Japanese Army Ordnance
- *46 Japanese Naval Shipbuilding
- *47 Japanese Motor Vehicle Industry
- *48 Japanese Merchant Shipbuilding

Oil and Chemical Division

- 49 Chemicals in Japan's War
- 50 Chemicals in Japan's War—Appendix
- 51 Oil in Japan's War
- 52 Oil in Japan's War—Appendix

Over-All Economic Effects Division

- *53 The Effects of Strategic Bombing on Japan's War Economy (Including Appendix A: U. S. Economic Intelligence on Japan—Analysis and Comparison; Appendix B: Gross National Product on Japan and Its Components; Appendix C: Statistical Sources).

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- *54 The War Against Japanese Transportation, 1941-1945

Urban Areas Division

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- *56 Effects of Air Attack on Urban Complex Tokyo—Kawasaki-Yokohama
- *57 Effects of Air Attack on the City of Nagoya
- *58 Effects of Air Attack on Osaka-Kobe-Kyoto
- *59 Effects of Air Attack on the City of Nagasaki
- *60 Effects of Air Attack on the City of Hiroshima

MILITARY SERVICES
Military Analysis Division

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- 62 Japanese Air Power
- 63 Japanese Air Weapons and Tactics
- 64 The Effect of Air Action on Japanese Ground Army Logistics
- 65 Employment of Forces Under the Southwest Pacific Command
- 66 The Strategic Air Operations of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force)
- 67 Air Operations in China, Burma, India - World War II
- 68 The Air Transport Command in the War Against Japan
- 69 The Thirteenth Air Force in the War Against Japan
- 70 The Seventh and Eleventh Air Forces in the War Against Japan
- 71 The Fifth Air Force in the War Against Japan
- 71a Air Campaigns of the Pacific War.

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- *73 Campaigns of the Pacific War
- *74 The Reduction of Wake Island
- *75 The Allied Campaign Against Rabaul
- 76 The American Campaign Against Wotje, Makelap, Mille, and Jaluit (Vols. I, II and III)
- *77 The Reduction of Truk
- 78 The Offensive Mine Laying Campaign Against Japan
- 79 Report of Ships Bombardment Survey Party - Foreword, Introduction, Conclusions, and General Summary
- 80 Report of Ships Bombardment Survey Party (Enclosure A), Kamishih Area
- 81 Report of Ships Bombardment Survey Party (Enclosure B), Hamamatsu Area
- 82 Report of Ships Bombardment Survey Party (Enclosure C), Hitachi Area
- 83 Report of Ships Bombardment Survey Party (Enclosure D), Hakodate Area
- 84 Report of Ships Bombardment Survey Party (Enclosure E), Muroran Area
- 85 Report of Ships Bombardment Survey Party (Enclosure F), Shimizu Area
- 86 Report of Ships Bombardment Survey Party (Enclosures G and H), Shimonoseki and Nojima-Baki Areas

- 87 Report of Ships Bombardment Survey Party (Enclosure I), Comments and Data on Effectiveness of Ammunition
- 88 Report of Ships Bombardment Survey Party (Enclosure J), Comments and Data on Accuracy of Firing
- 89 Reports of Ships Bombardment Survey Party (Enclosure K), Effects of Surface Bombardments on Japanese War Potential

Physical Damage Division

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- 92 Effects of the Atomic Bomb on Hiroshima, Japan
- 93 Effects of the Atomic Bomb on Nagasaki, Japan
- 94 Effects of the Four Thousand Pound Bomb on Japanese Targets (a Report on Five Incidents)
- 95 Effects of Two Thousand, One Thousand, and Five Hundred Pound Bombs on Japanese Targets (a Report on Eight Incidents)
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G-2 Division

- 97 Japanese Military and Naval Intelligence
- 98 Evaluation of Photographic Intelligence in the Japanese Homeland, Part I, *Comprehensive Report*
- 99 Evaluation of Photographic Intelligence in the Japanese Homeland, Part II, *Airfields*
- 100 Evaluation of Photographic Intelligence in the Japanese Homeland, Part III, *Computed Bomb Plotting*
- 101 Evaluation of Photographic Intelligence in the Japanese Homeland, Part IV, *Urban Area Analysis*
- 102 Evaluation of Photographic Intelligence in the Japanese Homeland, Part V, *Camouflage*
- 103 Evaluation of Photographic Intelligence in the Japanese Homeland, Part VI, *Shipping*
- 104 Evaluation of Photographic Intelligence in the Japanese Homeland, Part VII, *Electronics*
- 105 Evaluation of Photographic Intelligence in the Japanese Homeland, Part VIII, *Beach Intelligence*
- *106 Evaluation of Photographic Intelligence in the Japanese Homeland, Part IX, *Artillery*
- *107 Evaluation of Photographic Intelligence in the Japanese Homeland, Part X, *Roads and Railroads*
- 108 Evaluation of Photographic Intelligence in the Japanese Homeland, Part XI, *Industrial Analysis*

1. The first of these is the fact that the Japanese have been able to maintain a high level of production of war materials, despite the fact that they have been subjected to a severe embargo on the export of oil and other raw materials. This has been achieved by the Japanese through a combination of factors, including the use of synthetic materials, the development of new technologies, and the implementation of a strict rationing system.

2. The second factor is the fact that the Japanese have been able to maintain a high level of morale among their troops, despite the fact that they have been subjected to a severe embargo on the export of food and other necessities. This has been achieved by the Japanese through a combination of factors, including the use of propaganda, the implementation of a strict rationing system, and the development of new technologies.

3. The third factor is the fact that the Japanese have been able to maintain a high level of production of war materials, despite the fact that they have been subjected to a severe embargo on the export of oil and other raw materials. This has been achieved by the Japanese through a combination of factors, including the use of synthetic materials, the development of new technologies, and the implementation of a strict rationing system.

4. The fourth factor is the fact that the Japanese have been able to maintain a high level of morale among their troops, despite the fact that they have been subjected to a severe embargo on the export of food and other necessities. This has been achieved by the Japanese through a combination of factors, including the use of propaganda, the implementation of a strict rationing system, and the development of new technologies.

5. The fifth factor is the fact that the Japanese have been able to maintain a high level of production of war materials, despite the fact that they have been subjected to a severe embargo on the export of oil and other raw materials. This has been achieved by the Japanese through a combination of factors, including the use of synthetic materials, the development of new technologies, and the implementation of a strict rationing system.

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